

# BBRC

Bioscience Biotechnology  
Research Communications

SPECIAL ISSUE NUMBER-2 (2017)

Print ISSN: 0974-6455

Online ISSN: 2321-4007

CODEN: BBRCBA

[www.bbrc.in](http://www.bbrc.in)

University Grants Commission (UGC)  
New Delhi, India Approved Journal

An International Peer Reviewed Open Access  
Journal For Rapid Publication

Published By:

**Society for Science & Nature (SSN)**

Bhopal, India

**Indexed by Thomson Reuters ISI ESCI**

**Online Content Available: Every 3 Months at [www.bbrc.in](http://www.bbrc.in)**



**SOCIETY**  
FOR SCIENCE AND NATURE

SCIENCE FOR LIFE

**Registered with the Registrar of Newspapers for India under Reg. No. 498/2007**  
**Bioscience Biotechnology Research Communications**  
**SPECIAL ISSUE NUMBER-2 (2017)**

Design, implementation and data analysis of a comprehensive screening scheme of common non-communicable diseases in some semi-public organizations in Tehran in 2016	
<b>Behshad Alimadadi Jani and Ahmad Shafaeizadeh</b>	<b>1-6</b>
Esophageal cancer: the changes in incidence during last years	
<b>Mohammad Yaqub Rajput</b>	<b>7-11</b>
The relationship between metacognitive and self-efficacy beliefs with test anxiety and academic achievement of students	
<b>Adis Kraskian Mujembari (PhD) and Fatemeh Jahedtabar (MA)</b>	<b>12-21</b>
Examination of underground tunnels for vulnerability against water entrance into the tunnel and proper approaches to cope them	
<b>Mina Aligholi</b>	<b>22-28</b>
Importance of providing electrical harmony performance standards during use of hospital medical equipments	
<b>Hossein Shokrehoda</b>	<b>29-32</b>
Illness perception and self-care behavior in patients with myocardial infarction	
<b>Leila Ahmadi Ghahnaviyeh, Reza Bagherian, Awat Feizi, Atefeh Afshari and Firoozeh Mostafavi Darani</b>	<b>33-38</b>
Evaluation of correlation between lower jaw and lip rate of paresthesia and inferior alveolar canal diameter changes after mandibular fracture	
<b>Anis Moradi and Seyed Mehdi Hosseini</b>	<b>39-45</b>
Prevalence of tachydysrhythmia disorders in patients with acute cardiogenic pulmonary edema in Dr Heshmat Hospital of Rasht city, Iran	
<b>Seyyed Aboozar Fakhrmousavi and Seyyed Mahdi Zia Ziabari</b>	<b>46-49</b>
Effect of HESA-A, a herbal-marine origin compound on quality of life among Iranian women with breast cancer: A clinical trial	
<b>Shahnaz Pouladi, Roohollah Esmati, Mohamadreza Yazdankhah Fard and Niloufar Motamed</b>	<b>50-57</b>
Why industrial workers tend to choose unhealthy eating behaviors? Perceptions and experiences of Iranian workers	
<b>Ali Ramezankhani, Mahnaz khalafenilsaz and Parisa Amiri</b>	<b>58-67</b>
Investigating the factors associated with Sexual satisfaction in women of different ages referred to health center of Shahid Beheshti University of Medical Sciences	
<b>Nahid Khodakarami, Farzaneh Hosseini, Mahyar Azar and Alireza Akbarzadeh Baghban</b>	<b>68-76</b>
Living with infertility: A descriptive phenomenological study	
<b>Nahid Khodakarami, Farzaneh Hosseini, Somayeh Hashemi, Sediqeh Sediq, Mostafa Hamdiyeh and Robabeh Taheri Panah</b>	<b>77-84</b>
An investigation into the relationship between efficiency and competition among banks listed in Tehran Stock Exchange	
<b>Ghodrat Farahi and Seyed Ali Reza Mousavi</b>	<b>85-91</b>
Fear or genius: Camouflage tactics recognition of cuttlefish, <i>Sepia officinalis</i> living in the Persian Gulf of Kish Island	
<b>Sara Asadi Gharabaghi</b>	<b>92-99</b>
Detection and molecular identification of avian metapneumovirus in commercial flocks of Qazvin	
<b>Saman Jabbari Zahirabadi, Gita Akbariazad, Hossein Hosseini, Majdedin Ghalavand, Mahdi Tat, Mohammad Sadegh Hashemzadeh and Ruhollah Dorostkar</b>	<b>100-104</b>
Phylogenetic analysis of <i>Alternaria raphani</i> , <i>A. arborescens</i> and <i>A. brassicicola</i> from canola in Iran	
<b>Reza Mahmoudi, Masoud Shams-Bakhsh and Naser Safaie</b>	<b>105-111</b>
Study and hybrid simulation of enhanced oil recovery (EOR) and asphaltene precipitation in injection of carbon dioxide in one of the oil reservoirs	
<b>Yousef Amraei Astani and Roohollah Taghizadeh</b>	<b>112-125</b>

Continued Inside Cover

Printed By:  
**Faraz S. Ali**  
C-52, HB Colony, Koh-e-Fiza  
Bhopal - 462001, INDIA

ISSN 0974-6455



9 770 974 645 002

**Registered with the Registrar of Newspapers for India under Reg. No. 498/2007**  
**Bioscience Biotechnology Research Communications**  
**SPECIAL ISSUE NUMBER-2 (2017)**

**Continued From Back Cover**

The effect of resistance exercise on vascular diameter and some physiological factors in elderly men <b>Hasan Sanian, Hassan Matin Homaee and Maghsoud Piry</b>	<b>126-129</b>
Comparative effect of atropine and hyoscine premedication in patients with major depression treated by electroconvulsive therapy <b>Mahshid Ghasemi, Mostafa Hamdieh, Faranak Behnaz, Elham Memary and Ali Kheradmand</b>	<b>130-137</b>
Studying the causes of lack of blood sugar in neonates born in Boali Hospital, Tehran from March 2014 to March 2016 <b>Marjan Mohammadnuri</b>	<b>138-140</b>
The response of the spring barley genotypes to drought stress during vegetative and reproductive phases <b>Parastou Ghashemi, Ahmad Rezbane Haghigi and Ali Hossein Babaiy</b>	<b>141-144</b>
Concept of Self-knowledge as the Basis for Lifestyle <b>Mohammad Reza Shamshiri</b>	<b>145-152</b>
A study to assess the effectiveness of training package and group counseling with framework of skilled helper model on social, intellectual and occupational wellness of the students <b>Mojtaba Tamadoni, Masoud Janbozorgi, Ph.D., Masoud Azarbaijani, Ph.D., Gholam Ali Afroz, Ph.D. and Seyed Kazem Rasoulzadeh Tabatabaei, Ph.D</b>	<b>153-160</b>
The effect of narrative therapy on the reduction of aggressiveness among Kindergarten children <b>Marziyeh Mirdamadi and Farnaz Keshavarzi Arshad</b>	<b>161-168</b>
Comparing styles and life satisfaction among faculty members of public universities and the self-employed people in Tehran <b>M. Molaei, K. Hashemian and P. Farrukhzad</b>	<b>169-178</b>
Macro ergonomics: An approach to improve safety efficiency and the quality of working life <b>Hashemi Zahra, Nasl Saraji Gebrail and Asadi Nasrin</b>	<b>179-187</b>
Examining self-care behavior in patients with type II diabetes in Tehran <b>Fatemeh Mohammadkhah, Mohtasham Ghaffari, Sakineh Rakhshandehrou, Mahnaz Khalfeh Nilsaz, Kobra Noori, Mohammad Hossein Vaziri and Parisa Kasmaei</b>	<b>188-191</b>
Study of the rheological behavior of yoghurt as a viscoelastic fluid <b>Amir Heidarinasab and Pirouz Peivast</b>	<b>192-197</b>
Effects of resveratrol on morphine-induced liver injuries in male Balb/c mice <b>Mohammad Reza Salahshoor, Sahar Ahmadi, Fatemeh Makalani, Shiva Roshankhah and Cyrus Jalili</b>	<b>198-205</b>
Relationship between job stress and sexual function index among females employed in public hospitals of Shushtar, Iran <b>Azam Jahangirimehr, Azam Honarmandpour and Fatemeh Safarzadeh</b>	<b>206-215</b>
Investigating the Effect of Home-Based Cardiac Rehabilitation on Fatigue of Patients with Coronary Heart Disease (A Clinical Trial) <b>Saeede Piri, Aazam Dabirian, Zahra Safavi Bayat, Sima Zohari Anbohi, Mohamad Amin Pourhoseingholi and Mehrdad Namdari</b>	<b>216-220</b>
The relationship between organizational culture with social loafing <b>Irandegani M, Nastiezaie N and Shahrakipur H</b>	<b>221-227</b>
The effects of Spirulina supplementation on lipid peroxidation and GPO glutathione peroxidase antioxidant capacity after resistance exercise in disabled men <b>Ameneh Zandi, Hassan Matin Homaiee and Maghsoud Piri</b>	<b>228-233</b>
Framework for developing human resource strategies for educational organizations with educational management approach <b>Zohreh Hassani</b>	<b>234-245</b>
An investigation on antibiotic resistance of <i>Shigella</i> species in Javadieh's Amir-al-Momenin (PBUH) Hospital <b>Mehmaz Ghafarypour Jahromi</b>	<b>246-251</b>
Feasibility study of a construction dam of Karun II Hydro Power Plant Project <b>Mahdi Zandi</b>	<b>252-262</b>
Content analysis of men's graffiti in toilets of inter-city terminal in Tehran <b>Abdolreza Bagheri Bonjar and Mohammad Reza Heshmati</b>	<b>263-271</b>
Studying the effects of cooperative learning on development of social skills of grade 2 girl students of Ardabil high schools <b>Hamideh Faraji Niri</b>	<b>272-278</b>
An investigation on the quality of closed air of Bahman Ghareghozli Primary School with emphasis on parameters of air pollution index <b>Shahzad Mohammadkhani Ghale Hashemkhani, Nooshin Sadjadi and Mojgan Zaeimdar</b>	<b>279-285</b>

**Continued on Back Cover**

**Registered with the Registrar of Newspapers for India under Reg. No. 498/2007**  
**Bioscience Biotechnology Research Communications**  
**SPECIAL ISSUE NUMBER-2 (2017)**

**Continued From Back Cover**

Social and economic factors affecting the teaching and learning of high school students in Ardabil <b>Vahid Abohasanzadeh, Elham radmehr, Shahram Mahmoudi, Ali Danesh and Mohammad Reza Abdollahi</b>	<b>286-296</b>
Ultrastructural studies on apoptotic forms of seminiferous tubules and levels of certain hormones in testes of Wistar rats exposed to Sertraline <b>Laleh Pasha, Mokhtar Mokhtari, Saeed Khatamsaz and Mehrdad Shariati</b>	<b>297-302</b>
The relationship between the level of iron serum and the development of cardiovascular disease in Iran: A systematic review and meta-analysis <b>Ehsan Shabani, MSc; Ali Delpisheh, PhD; Samiramiss Gavam, MD; Behzad Badakhsh, MD; Shoboo Rahma, MSc and Kourosch Sayehmiri, PhD</b>	<b>303-310</b>
The relationship between industrial noise exposure and smoking on hearing threshold levels in a steel industry workers <b>Abbas Mohammadi, Behzad Fouladi Dehaghi, Ghasem Mardi and Amel Saki</b>	<b>311-316</b>
Examination of Frequency of Substance Abuse in Surgical and Internal Patients Referred to Imam Reza and Shahid Motahari and Shahid Faghihi Clinics in Shiraz (based on new criteria DSM-5) <b>Jamshid Ahmadi, Ebrahim Moghimi, Atoosa Moradi, Marjan Dehghanian and Saba Kheirandish</b>	<b>317-322</b>
Studies on changes in lead and cadmium concentrations of urban landfill soils around Ardebil <b>Reza Fekri, Masoume Mollaei, Aboutaleb Ghaffari, Roghayeh mohammadpour and Malihe Shahmorad Moghanlou</b>	<b>323-327</b>
Acute phase of stroke and dysphagia: A cross-sectional study in Shiraz, Iran <b>Sima Farpour and Hamid Reza Farpour</b>	<b>328-334</b>
Identification and assessment of factors affecting decline in the quality of construction projects in a phased approach with solutions to improve <b>Dara Parsa and Saber Shiri Pour</b>	<b>335-344</b>
Evaluating the vibration system of steel building using viscose separator and damper <b>Behzad Dezhkam</b>	<b>345-353</b>
Risk Factors Related to Leukemia in Adults Referred to Teaching Hospitals in Ahwaz, Iran <b>Zeinab Ahmadi, Mahnaz Rahmani, Leila Amirmohseni, Marzieh Azarkish, Fatemeh Hordani and Marjan Naseri</b>	<b>354-366</b>
Assessing genetic measurement of local <i>Citrullus colocynthis</i> species using SSR molecular markers of 8 regions of Sistan-Balouchestan state, Iran <b>Sattar Enayat Avval</b>	<b>367-373</b>
Meta-analysis of the impact of medical tourism and health tourism in the United States of America and Canada in the treatment of cancer <b>Farhad Hemmati, Fatemeh Dabbaghi and Ghahraman Mahmoudi</b>	<b>374-381</b>
Water quality index of Karaj dam with regard to providing solutions for surface water management <b>Maryam Mazhari, Nooshin Sajjadi and Saeed Malmasi</b>	<b>382-389</b>
Studies on drug absorption based on form, dosage, drug functional groups and intestinal conditions <b>Majid Reza Kaviani</b>	<b>390-397</b>
Enhancement of copper recovery from chalcopyrite concentrate using chemically mutated mesophilic bacteria <b>Rafezi Farid, Pourbabaee Ahmadali and Shafaei Seid Ziaedin</b>	<b>398-407</b>
Gorgan Bay hydrodynamic model to calculate water flow velocity <b>Majid Dastdaran, Hossein Morovvati, Afshin Mohseni Arasteh, Masoud Torabi Azad and Kamran Lari</b>	<b>408-416</b>
Determining the concentration of heavy elements and nitrate ion in heavy-used tea of Ardebil City <b>Nasim Ghane Anzabi and Hossein Saadati</b>	<b>417-422</b>
A comparative study of everyday memory performance, suicidal tendencies and mental disorders between depressed and non-depressed high school students of Zahedan <b>Fateme Barakzaei Kemak and Bahman Kord Tamini</b>	<b>423-432</b>
Effect of group consultation based on maternal communication skills on the perspectives of 13-15-year-old girls about sex dialogues <b>Tayebe Ziaei, Maryam Ghanbari Gorji, Naser Behnampour and Masumeh Rezaei Aval</b>	<b>433-440</b>
Association of phosphoinositide-3-kinases and genetic polymorphisms on the risk of multiple sclerosis in South East of Iran <b>Atefeh Mir, Pouria Mohammadi and Dor Mohammad Kordi-Tamandani</b>	<b>441-445</b>

# CONTENTS



SPECIAL ISSUE • NUMBER 2 • 2017

<b>Design, implementation and data analysis of a comprehensive screening scheme of common non-communicable diseases in some semi-public organizations in Tehran in 2016</b> <i>Behshad Alimadadi Jani and Ahmad Shafaeizadeh</i> .....	1-6
<b>Esophageal cancer: the changes in incidence during last years</b> <i>Mohammad Yaqub Rajput</i> .....	7-11
<b>The relationship between metacognitive and self-efficacy beliefs with test anxiety and academic achievement of students</b> <i>Adis Kraskian Mujembari (PhD) and Fatemeh Jahedtabar (MA)</i> .....	12-21
<b>Examination of underground tunnels vulnerability against water entrance into the tunnel for and proper approaches to cope them</b> <i>Mina Aligholi</i> .....	22-28
<b>Importance of providing electrical harmony performance standards during use of hospital medical equipments</b> <i>Hossein Shokrekhoda</i> .....	29-32
<b>Illness perception and self-care behavior in patients with myocardial infarction</b> <i>Leila Ahmadi Ghahnaviyeh, Reza Bagherian, Awat Feizi, Atefeh Afshari and Firoozeh Mostafavi Darani</i> .....	33-38
<b>Evaluation of correlation between lower jaw and lip rate of paresthesia and inferior alveolar canal diameter changes after mandibular fracture</b> <i>Anis Moradi and Seyed Mehdi Hosseini</i> .....	39-45
<b>Prevalence of tachydysrhythmia disorders in patients with acute cardiogenic pulmonary edema in Dr Heshmat Hospital of Rasht city, Iran</b> <i>Seyyed Aboozar Fakhrmousavi and Seyyed Mahdi Zia Ziabari</i> .....	46-49
<b>Effect of HESA-A, a herbal-marine origin compound on quality of life among Iranian women with breast cancer: A clinical trial</b> <i>Shahnaz Pouladi, Roohollah Esmati, Mohamadreza Yazdankhah Fard and Niloufar Motamed</i> .....	50-57
<b>Why industrial workers tend to choose unhealthy eating behaviors? Perceptions and experiences of Iranian workers</b> <i>Ali Ramezankhani, Mahnaz khalafenilsaz and Parisa Amiri</i> .....	58-67
<b>Investigating the factors associated with Sexual satisfaction in women of different ages referred to health center of Shahid Beheshti University of Medical Sciences</b> <i>Nahid Khodakarami, Farzaneh Hosseini, Mahyar Azar and Alireza Akbarzadeh Baghban</i> .....	68-76
<b>Living with infertility: A descriptive phenomenological study</b> <i>Nahid Khodakarami, Farzaneh Hosseini, Somayeh Hashemi, Sediqeh Sediq, Mostafa Hamdiyeh and Robabeh Taheri Panah</i> .....	77-84
<b>An investigation into the relationship between efficiency and competition among banks listed in Tehran Stock Exchange</b> <i>Ghodrat Farahi and Seyed Ali Reza Mousavi</i> .....	85-91
<b>Fear or genius: Camouflage tactics recognition of cuttlefish, <i>Sepia officinalis</i> living in the Persian Gulf of Kish Island</b> <i>Sara Asadi Gharabaghi</i> .....	92-99
<b>Detection and molecular identification of avian metapneumovirus in commercial flocks of Qazvin</b> <i>Saman Jabbari Zahirabadi, Gita Akbariazad, Hossein Hosseini, Majdedin Ghalavand, Mahdi Tat, Mohammad Sadegh Hashemzadeh and Ruhollah Dorostkar</i> .....	100-104
<b>Phylogenetic analysis of <i>Alternaria raphani</i>, <i>A. arborescens</i> and <i>A. brassicicola</i> from canola in Iran</b> <i>Reza Mahmoudi, Masoud Shams-Bakhsh and Naser Safaie</i> .....	105-111
<b>Study and hybrid simulation of enhanced oil recovery (EOR) and asphaltene precipitation in injection of carbon dioxide in one of the oil reservoirs</b> <i>Yousef Amraei Astani and Roohollah Taghizadeh</i> .....	112-125

<b>The effect of resistance exercise on vascular diameter and some physiological factors in elderly men</b> <i>Hasan Sanian, Hassan Matin Homaee and Maghsoud Piry</i> .....	126-129
<b>Comparative effect of atropine and hyoscine premedication in patients with major depression treated by electroconvulsive therapy</b> <i>Mahshid Ghasemi, Mostafa Hamdieh, Faranak Behnaz, Elham Memary and Ali Kheradmand</i> .....	130-137
<b>Studying the causes of lack of blood sugar in neonates born in Boali Hospital, Tehran from March 2014 to March 2016</b> <i>Marjan Mohammadnuri</i> .....	138-140
<b>The response of the spring barley genotypes to drought stress during vegetative and reproductive phases</b> <i>Parastou Ghashemi, Ahmad Rezbane Haghigi and Ali Hossein Babaïy</i> .....	141-144
<b>Concept of Self-knowledge as the Basis for Lifestyle</b> <i>Mohammad Reza Shamshiri</i> .....	145-152
<b>A study to assess the effectiveness of training package and group counseling with framework of skilled helper model on social, intellectual and occupational wellness of the students</b> <i>Mojtaba Tamadoni, Masoud Janbozorgi, Ph.D., Masoud Azarbaijani, Ph.D., Gholam Ali Afrooz, Ph.D. and Seyed Kazem Rasoulzadeh Tabatabaei, Ph.D.</i> .....	153-160
<b>The effect of narrative therapy on the reduction of aggressiveness among Kindergarten children</b> <i>Marziyeh Mirdamadi and Farnaz Keshavarzi Arshad</i> .....	161-168
<b>Comparing styles and life satisfaction among faculty members of public universities and the self-employed people in Tehran</b> <i>M. Molaee, K. Hashemian and P. Farrukhzad</i> .....	169-178
<b>Macro ergonomics: An approach to improve safety efficiency and the quality of working life</b> <i>Hashemi Zahra, Nasl Saraji Gebrail and Asadi Nasrin</i> .....	179-187
<b>Examining self-care behavior in patients with type II diabetes in Tehran</b> <i>Fatemeh Mohammadkhah, Mohtasham Ghaffari, Sakineh Rakhshandehrou, Mahnaz Khalfeh Nilsaz, Kobra Noori, Mohammad Hossein Vaziri and Parisa Kasmaei</i> .....	188-191
<b>Study of the rheological behavior of yoghurt as a viscoelastic fluid</b> <i>Amir Heidarinasab and Pirouz Peivast</i> .....	192-197
<b>Effects of resveratrol on morphine-induced liver injuries in male Balb/c mice</b> <i>Mohammad Reza Salahshoor, Sahar Ahmadi, Fatemeh Makalani, Shiva Roshankhah and Cyrus Jalili</i> .....	198-205
<b>Relationship between job stress and sexual function index among females employed in public hospitals of Shushtar, Iran</b> <i>Azam Jahangirimehr, Azam Honarmandpour and Fatemeh Safarzadeh</i> .....	206-215
<b>Investigating the Effect of Home-Based Cardiac Rehabilitation on Fatigue of Patients with Coronary Heart Disease (A Clinical Trial)</b> <i>Saeedeh Piri, Aazam Dabirian, Zahra Safavi Bayat, Sima Zohari Anbohi, Mohamad Amin Pourhoseingholi and Mehrdad Namdari</i> .....	216-220
<b>The relationship between organizational culture with social loafing</b> <i>Irandegani M, Nastiezaie N and Shahrakipur H</i> .....	221-227
<b>The effects of <i>Spirulina</i> supplementation on lipid peroxidation and GPO glutathione peroxidase antioxidant capacity after resistance exercise in disabled men</b> <i>Ameneh Zandi, Hassan Matin Homaiee and Maghsoud Piri</i> .....	228-233
<b>Framework for developing human resource strategies for educational organizations with educational management approach</b> <i>Zohreh Hassani</i> .....	234-245
<b>An investigation on antibiotic resistance of <i>Shigella</i> species in Javadieh's Amir-al-Momenin (PBUH) Hospital</b> <i>Mehrnaz Ghafarypour Jahromi</i> .....	246-251
<b>Feasibility study of a construction dam of Karun II Hydro Power Plant Project</b> <i>Mahdi Zandi</i> .....	252-262
<b>Content analysis of men's graffiti in toilets of inter-city terminal in Tehran</b> <i>Abdolreza Bagheri Bonjar and Mohammad Reza Heshmati</i> .....	263-271
<b>Studying the effects of cooperative learning on development of social skills of grade 2 girl students of Ardabil high schools</b> <i>Hamideh Faraji Niri</i> .....	272-278
<b>An investigation on the quality of closed air of Bahman Ghareghozli Primary School with emphasis on parameters of air pollution index</b> <i>Shahzad Mohammadkhani Ghale Hashemkhani, Nooshin Sadjadi and Mojgan Zaeimdar</i> .....	279-285

<b>Social and economic factors affecting the teaching and learning of high school students in Ardabil</b> <i>Vahid Abolhasanzadeh, Elham radmehr, Shahram Mahmoudi, Ali Danesh and Mohammad Reza Abdollahi</i> .....	286-296
<b>Ultrastructural studies on apoptotic forms of seminiferous tubules and levels of certain hormones in testes of Wistar rats exposed to Sertraline</b> <i>Laleh Pasha, Mokhtar Mokhtari, Saeed Khatamsaz and Mehrdad Shariati</i> .....	297-302
<b>The relationship between the level of iron serum and the development of cardiovascular disease in Iran: A systematic review and meta-analysis</b> <i>Ehsan Shabani, MSc; Ali Delpisheh, PhD; Samiramiss Gavam, MD; Behzad Badakhsh, MD; Shoboo Rahma, MSc and Kourosh Sayehmiri, PhD</i> .....	303-310
<b>The relationship between industrial noise exposure and smoking on hearing threshold levels in a steel industry workers</b> <i>Abbas Mohammadi, Behzad Fouladi Dehaghi, Ghasem Mardi and Amel Saki</i> .....	311-316
<b>Examination of Frequency of Substance Abuse in Surgical and Internal Patients Referred to Imam Reza and Shahid Motahari and Shahid Faghihi Clinics in Shiraz (based on new criteria DSM-5)</b> <i>Jamshid Ahmadi, Ebrahim Moghimi, Atoosa Moradi, Marjan Dehghanian and Saba Kheirandish</i> .....	317-322
<b>Studies on changes in lead and cadmium concentrations of urban landfill soils around Ardebil</b> <i>Reza Fekri, Masoume Mollaei, Aboutaleb Ghaffari, Roghayeh mohammadpour and Malihe Shahmorad Moghanlou</i> .....	323-327
<b>Acute phase of stroke and dysphagia: A cross-sectional study in Shiraz, Iran</b> <i>Sima Farpour and Hamid Reza Farpour</i> .....	328-334
<b>Identification and assessment of factors affecting decline in the quality of construction projects in a phased approach with solutions to improve</b> <i>Dara Parsa and Saber Shiri Pour</i> .....	335-344
<b>Evaluating the vibration system of steel building using viscose separator and damper</b> <i>Behzad Dezhkam</i> .....	345-353
<b>Risk Factors Related to Leukemia in Adults Referred to Teaching Hospitals in Ahwaz, Iran</b> <i>Zeinab Ahmadi, Mahnaz Rahmani, Leila Amirmohseni, Marzieh Azarkish, Fatemeh Hordani and Marjan Naseri</i> .....	354-366
<b>Assessing genetic measurement of local <i>Citrullus colocynthis</i> species using SSR molecular markers of 8 regions of Sistan-Balouchestan state, Iran</b> <i>Sattar Enayat Aaval</i> .....	367-373
<b>Meta-analysis of the impact of medical tourism and health tourism in the United States of America and Canada in the treatment of cancer</b> <i>Farhad Hemmati, Fatemeh Dabbaghi and Ghahraman Mahmoudi</i> .....	374-381
<b>Water quality index of Karaj dam with regard to providing solutions for surface water management</b> <i>Maryam Mazhari, Nooshin Sajjadi and Saeed Malmasi</i> .....	382-389
<b>Studies on drug absorption based on form, dosage, drug functional groups and intestinal conditions</b> <i>Majid Reza Kaviani</i> .....	390-397
<b>Enhancement of copper recovery from chalcopyrite concentrate using chemically mutated mesophilic bacteria</b> <i>Rafezi Farid, Pourbabaee Ahmadali and Shafaei Seid Ziaedin</i> .....	398-407
<b>Gorgan Bay hydrodynamic model to calculate water flow velocity</b> <i>Majid Dastdaran, Hossein Morovvati, Afshin Mohseni Arasteh, Masoud Torabi Azad and Kamran Lari</i> .....	408-416
<b>Determining the concentration of heavy elements and nitrate ion in heavy-used tea of Ardebil City</b> <i>Nasim Ghane Anzabi and Hossein Saadati</i> .....	417-422
<b>A comparative study of everyday memory performance, suicidal tendencies and mental disorders between depressed and non-depressed high school students of Zahedan</b> <i>Fateme Barakzaei Kemak and Bahman Kord Tamini</i> .....	423-432
<b>Effect of group consultation based on maternal communication skills on the perspectives of 13-15-year-old girls about sex dialogues</b> <i>Tayebe Ziaei, Maryam Ghanbari Gorji, Naser Behnampour and Masumeh Rezaei Aval</i> .....	433-440
<b>Association of phosphoinositide-3-kinases and genetic polymorphisms on the risk of multiple sclerosis in South East of Iran</b> <i>Atefeh Mir, Pouria Mohammadi and Dor Mohammad Kordi-Tamandani</i> .....	441-445

## Design, implementation and data analysis of a comprehensive screening scheme of common non-communicable diseases in some semi-public organizations in Tehran in 2016

Behshad Alimadadi Jani<sup>1\*</sup> and Ahmad Shafaeizadeh<sup>2</sup>

<sup>1</sup>MA Biomedical Engineering – Medical Information Technology Management, Department of Biomedical Engineering, Amirkabir University of Technology (Tehran Polytechnic), Tehran, Iran

<sup>2</sup>Assistant Professor, Community and Preventive Medicine Specialist, Department of Electronic Health Institute Amirkabir University of Technology (Tehran Polytechnic)

### ABSTRACT

Until very recently, communicable diseases used to be counted the premier health problem. However, having controlled them, their pattern shifted to non-communicable. Currently, the attempt to decrease the burden of non-communicable diseases is among health priorities. Since many non-communicable chronic diseases are initially asymptomatic and several years after their onset and observation of complications they happen to be diagnosed, screening is crucial. The statistical population comprised all staff in some semipublic organization located in Tehran City. Applying enumeration, 5 sections (2134 individuals) were screened. Data collection was carried out using questionnaires, tests, and body experiments by a committed doctor; the data included demographic, bodily, and laboratorial variables obtained via mobile screening team. SPSS software was applied to analyze the data. Regarding cardiovascular diseases, diabetes, and breast or prostate cancer, individuals were categorized in three main color groups; green (having no risk factors), yellow (in risk), and red (in high risk, or having some disease not known by the patient). Subjects who had some other unhealthy status, other than the above-mentioned diseases, were indicated by gray color. In order to better enhance screening, the present survey did not suffice to statistics, but ingrained medical intervention as well as constant follow-up in the form of clinical prevention. Identifying at-risk individuals, in addition to shortening disease course, decreasing therapeutic-diagnostic costs and disease burden (DALY), leads to improved life quality and life expectancy.

**KEY WORDS:** SCREENING, COMMON NON-COMMUNICABLE DISEASES, COMPREHENSIVE SCHEME, DALY (DISABILITY-ADJUSTED LIFE YEAR)

### ARTICLE INFORMATION:

\*Corresponding Author: [behshad.alimadadi@gmail.com](mailto:behshad.alimadadi@gmail.com)

Received 27<sup>th</sup> April, 2017

Accepted after revision 29<sup>th</sup> July, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal  
NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

In recent years, significant achievements in the field of exploration and production of various vaccines and drugs has led to reduction in the rate of communicable and infectious diseases as the leading causes of death and disability in general. These changes, along with increased use of technology and the rapid changes in lifestyle, smoking, older population, urbanization and industrialization has led to increase in the proportion of non-communicable diseases and chronic increase and placed in top causes of death and disability (Arjmand Kermani and Farbakhsh, 2014).

Today, non-communicable diseases are the major cause of death around the world, such as cardiovascular disease and diabetes. (Koochpayehzadeh Esfahani et al., 2011). Four major non-communicable diseases (cardiovascular diseases, cancers, chronic pulmonary obstructive disease and diabetes) are directly associated with three main preventable risk factors include smoking, poor diet and lack of physical inactivity. Cancer is one of the causes of death worldwide and after cardiovascular disease is the second most common cause of death in developed countries and the third cause of death in less developed countries.

On the other hand, a recent report by the Ministry of Health facilities in Iran published in 2014 shows that cancer has become the second leading cause of death in Iran and accidents and incidence are in third place, and every year more than 35 thousand people lose their lives due to cancer, and it is anticipated that more than 85 thousand new cases of cancer each year occur in the country. Also, the World Health Organization states that 7.6 million people (about 13% of all deaths) deaths from cancer has been documented in 2008 and about 70 percent of all cancer deaths occur in low and middle-income countries. It has also been estimated that deaths from cancer by 2030 reach to more than 13.1 million. Now many of these deaths are preventable, because more than 30 percent of cancers, with a healthy life cycle immunization against infections causing cancer (HBV, HPV) can be prevented. Other cancers with early diagnosis can be cared and treated. Even pain of patients in the advanced stage of cancer with palliative medicine care can be improved.

The World Health Organization in 2012 has emphasized on prevention of cancer and enhancement of the quality of life in cancer patients. Controlling risk factors, nearly 40% cancer deaths caused by cancer would be preventable and with early diagnosis and treatment, one third of its burden will be reduced, so at the current time, planning for prevention and control of cancers of the health necessities of every community and every organization is the most effective in reducing the inci-

dence and burden of cancer (Arjmandpoor, 2012). In the first national study on the burden of disease in Iran in 2003, the three main clusters of disease according to the classification of the global burden of diseases are non-communicable diseases, accidents and diseases associated with pre-transition health including infectious diseases, diseases associated with pregnancy and childbirth in women, prenatal and nutritional deficiencies diseases, therefore, the share of non-communicable diseases in the total disease burden is enormous (Naqavi et al., 2008). Also according to statistics released by the Center for Iranian cancer in 2009, among 10 common cancers in women, breast cancer is the first cause of death in Iran and Tehran and among the 10 most common cancers in men, prostate cancer is the third mortality in Iran and in Tehran is the second most deadly cancer.

Therefore, in this study due to limitations of laboratory equipment in the organization, among the various types of cancer in men, prostate cancer has been selected, just because compared to other cancers in men are easier to recognize and its diagnosis in the organization is possible. Despite the limitations and the lack of specificity of tumor markers in the study of malignant tumors in the early phases of formation, several tumor marker now have the potential to be used in the screening tests, including vanillylmandelic acid and homovanillic acid in screening of infants with neuroblastoma, AFP for hepatocellular cancer, CA125 for patients with uterine cancer and marker PSA in prostate cancer. PSA as a screening test for prostatic carcinoma has been confirmed (approved) and as the single most important marker for prostate cancer screening is used, because this marker only made by prostate cells and the identification of this marker in a person indicates a problem with the prostate and secondly, the amount of this marker is increased at the start of cancer that can help detect prostate cancer in the early phases. In fact, PSA is the most sensitive tumor marker that mankind has ever discovered (Chavoshi et al., 2013).

The glycoprotein PSA tumor marker that is produced in prostate by epithelium cells in men with prostate cancer and other prostate-related diseases is higher than normal (Rawdin and Hayes, 2000). However, prostate cancer screening at short intervals of three years or less is more cost-effective than the use of longer distances. In the screening at ages 55 to 59 years, every two years, the cost-effectiveness increased relatively to 73,000 \$ in life years with adjusted quality (QALY) and was considered desirable. Also, while post-treatment can lead to better quality of life, but age from 65 to 72 years was obtained to end screening (Hjnzdig et al, 2014). In a study on screening for type 2 diabetes, systematic review for Preventive Services United States Preventive Services Task Force, showed that screening for type 2 diabetes can

lead to the diagnosis and treatment of diabetes without symptoms namely impaired fasting glucose (IFG) or impaired glucose tolerance (IGT) (Shelley et al., 2015).

The national program for prevention and control of hypertension suggested for early diagnosis of high blood pressure (hypertension), a mass screening program must be carried out for covered population (Samavati et al., 2002). To control the non-communicable diseases, various global programs with regional conditions of countries have been tailored by the World Health Organization and encourage countries to operate them. In our country, in the past ten years, various measures have been provided in the line with envisaged purposes but compared to global and national targets (purposes), there is a big gap (Entezar-Mahdi et al., 2011).

The World Health Organization about the design of screening for the disease in 1968, released principles include: The disease should be an important health problem, a treatment should be present, to treat it, the medical facilities to diagnose and treat of that disease must be present, the disease must have a hidden course (period), a test should be exist for testing or examination of a disease, the natural history (course) of the disease should be enough known, a agreed policy should be exist to treat the disease, the overall cost of finding one case towards the medicine cost in general, should be economically balanced and case finding should be a continuous process, rather than a plan to once and for all, which is still applicable. Design screening is an effective way to identify the main and significant effects. The term designing screening refers to an experimental plan to find several important and influential factors from a list including potential factors. The use of screening design is when many factors are taken into account (Turgay et al., 2010).

Fortunately, many common non-communicable diseases are identifiable through education, self-examination and screening and carrying out early preventive and therapeutic interventions of, in addition to promoting and improving the quality of life of suffered people, reduces greatly additional costs and heavy treatment and complications of this disease and reduces deaths caused by common non-communicable diseases. Adherence to the guidelines after conducting screening programs to reduce morbidity and mortality from the diseases as well as reduce costs in the future has been accepted (Leegale et al., 2014). Thus designing, implementation and analysis of non-communicable disease screening was performed in this study.

## METHODOLOGY

The statistical population comprised all staff in some semipublic organization located in Tehran city which

applying enumeration, 5 sections (2134 individuals) were screened. The data collected using questionnaires, tests, and body experiments electronically in an employee's personal file was recorded completely confidential. To analyze the data descriptive statistics in SPSS and Excel software were used. The comprehensive plan inventory of common non-communicable diseases, including cardiovascular disease, hypertension, diabetes, obesity, breast cancer and prostate cancer, along with a healthy lifestyle questionnaire, containing the personal information of employees and specialized information about the disease and health, physical measurements such as blood pressure, body mass index and waist circumference (abdominal obesity), as well as laboratory measurements of fasting blood glucose (FBS) and serum cholesterol, PSA, and other tests to identify individuals at risk of developing these diseases.

In order to more inclusion of targeted population, the trained screening team, including 2 general practitioners, 1 gynecologist, two midwifery experts, two nurses, two laboratory experts, 2 receptionist and ultimate control, 1 driver and 1 member of procurement publicly in various deputies of organization who were screened, respectively, were deployed. Due to the large number of the target population and limited human resources and most importantly, the limited financial resources and time, instead of recording clients' characteristics, danger signs, the explanation of taken measures and monthly or quarterly reports traditionally on paper and use of forms and tables, appropriate database was used and the organizational units were equipped by appropriate computer facilities and access to internet to share information across the relevant units and the possibility of presenting health services to each patient across the organization was provided.

Concurrent with the formation of screening team, the data processing and data analysis consists of two people with experience in the field of IT and 2 health experts, assumed the responsibility of registration raw information and data of the questionnaires, para-clinical experiments and examination results prepared in software. Given the importance of recording history and the progress of treatment, accurately and legibly and fastly, in the case (file) of patients, the use of computer mechanized systems, tracking a patient's condition and course of non-communicable diseases for the first time in the organization became possible.

All raw information and data after several turns revise and data modification were recorded in computer systems and electronic health records. This is one of the important features of current study which using new information and communication technologies and recording all stages of screening examination and para-clinical experiments electronically, data analyzing and

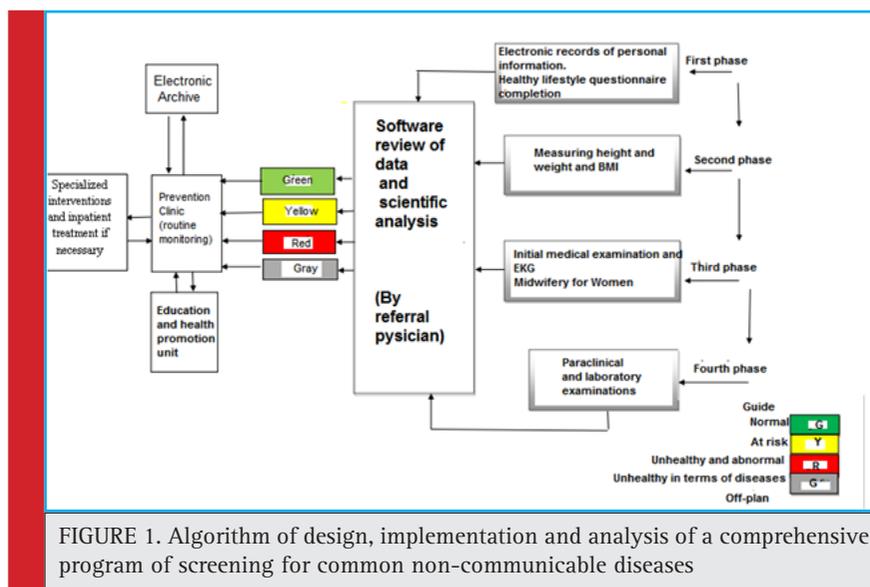


FIGURE 1. Algorithm of design, implementation and analysis of a comprehensive program of screening for common non-communicable diseases

processing and transmitting them to the targeted population through electronic file was performed.

The team’s results after processing data were presented to the next team namely prevention and treatment interventions team. Then in the prevention and treatment interventions team, one trained general practitioner (physician) under the supervision of preventive and social medicine expert, did data analysis and classification of subjects in the groups of green, yellow, red and gray. In the current study, in addition to the screening, upon identifying individuals at risk, the prevention and treatment interventions team began its work in prevention clinic. In fact, this research did not stop only on data received from the targeted population and also simultaneously carried out preventive and therapeutic interventions and in the end assessed (evaluated) the results of screening and interventions scientifically and simultaneously.

## RESULTS AND DISCUSSION

5 important risk factors for common non-communicable diseases, such as cardiovascular disease, cancer, diabetes and hypertension, according to the World Health Organization are daily cigarette smoking, overweight or obesity, hypertension, servings less than 5 units of fruit or vegetables at day and low physical activity. Based on the latest researches carried out in 2012 in the Ministry of Health [Iran], four main types of non-communicable diseases are cardiovascular diseases, cancers, chronic respiratory diseases and diabetes.

Given the important and critical role of the control and surveillance of individuals against common non-communicable diseases and action priority in the pre-

vention and reduction of injuries, mental and physical disabilities and disabilities caused by these diseases as well as low self-caring index in Iran (Karim Dashti, 2012), and screening of cardiovascular diseases, breast cancer and prostate cancer and diabetes concurrently hadn’t been done in the country and there was no certain pattern, in this study, the algorithm of design, implementation and analysis of a comprehensive program of screening common non-communicable diseases was designed and set up. The designing of this process wasn’t solely to obtain statistics, but for greater effectiveness, the screening was integrated with preventive and therapeutic interventions.

After collecting and classifying of data, the data were encoded in statistical software SPSS and then by descriptive statistics, data analysis was performed. Respondents were divided by gender into two groups, male and female and each of these groups were divided according to 5 age groups in the following table. According to Table 1 age group of 30 to 40 years accounted for most frequency of men and women.

Age group	Male	Female	Total
20-30	64	56	120
30-40	569	396	965
40-50	657	243	900
50-60	88	39	127
60-70	21	1	22
Total	1399	735	2134

Age group	Green (normal)	Yellow (at risk)	Red (unhealthy and abnormal)	Total
20-30	53	64	3	120
30-40	387	558	20	965
40-50	222	651	27	900
50-60	33	89	5	127
60-70	7	13	2	22
Total	702	1375	57	2134

According to the study framework, each of the screened people, were assigned in three main groups of colors green, yellow and red shown in Table 2. According to this table, 702 people in green (normal), 1375 people in yellow (at risk) and 57 in the red (abnormal) were studied in terms of the diseases and their risk factors.

After classification of subjects in three main categories of green, yellow and red it was found that a number of them in addition to the diseases in question, have symptoms and signs of other diseases as well, that in addition to being classified as main colors, have also been marked with color gray. So, three other sub-groups with a total frequency of 668 including green and gray with a frequency of 229 subjects, yellow and with a frequency of 418 and red and gray with the frequency of 21 were specified revealed in Table 3.

Also, after further investigation among the gray people, it was found 17 individuals of this group need to have fast follow (track). These people such as those classified in red, were followed quickly.

## CONCLUSION

Identifying at-risk individuals, in addition to shortening disease course, decreasing therapeutic-diagnostic costs and disease burden (DALY), leads to improved life quality and life expectancy in the future. And of course

medical care of prevention, in the form of a comprehensive care facility, is a safe bridge to achieving the goals of the health system, because it meets the objective of optimum performance of health system with features such as prioritized basic services, justice in providing services, providing continuous health services, appropriate facilities and training and support service providers (designing center (clinic) of prevention and health promotion, 2009). Adherence to treatment throughout the health care system as an essential element is vital for improving patient outcomes and reducing health care costs (Pringer et al, 2013).

Therefore, improved interventions process and continuous follow-up in screening plans leads to greater adherence to treatment and will reduce health care costs. As a result, while the screening is effective and useful, reduces disease burden in the future, and it also reduces health care costs. Therefore, after the screening, interventions should be carried out, the interventions process should also be improved and constant pursuit by the organization performing the screening be done. Otherwise patient adherence to treatment would be decreased and prevention wouldn't be done well and imposing rework costs will be higher (Turgay et al., 2010).

Thus, at the end of the study as a result, the prevention and health promotion center (clinic) was established aimed to provide health care with high quality, high availability and continuous and comprehensive health

Age group	Green and gray	Yellow and gray	Red and gray	Total
20-30	17	18	1	36
30-40	123	167	9	299
40-50	70	200	10	280
50-60	16	28	1	45
60-70	3	5	0	8
Total	229	418	21	668

care of workers. The functions of this clinic are assessing the health risks of individuals in the target population with the health team, a comprehensive program to reduce health risks and health promotion, implementation, programs to reduce health risks and health promotion, implementation, monitoring and evaluation of programs developed with the help of members of the health team, providing health counseling on lifestyle changes and reducing risk factors, participation in screening programs in the management dealing with common non-communicable diseases (designing of prevention and health promotion center (clinic), 2009).

## REFERENCES

- Arjmand-Kermani, Nahid, Farbkahsh, Farzaneh (2014). Screening and management of chronic diseases. *Journal of health workers*, twenty-fifth year. (90).
- Koohpayehzadeh Isfahani, Jalil; Asgari, Fereshteh; Azimi, Syedeh Sara; Rafeyee, Ali, Bejani, Soraya. (2011). Surveillance system of risk factors for non-communicable diseases. Department of Health Care Office of Management Center of non-communicable diseases risk factors –Administration of risk factors for noncommunicable diseases. Ministry of Health and Medical Education.
- Arjmandpoor, Masoomeh. (2012). History of Cancer Record. *Newsletter of non-communicable diseases*. Number 5. Page 12.
- Naqavi, Mohsen et al. (2008). The first national study of the burden of disease in Iran in 2003
- Chavoshi, Somayeh.; Heidari Kashel, Said, Rezaei Tavirani, Mustafa and other colleagues. (2013). Cancer markers at a glance. *Journal of Medical Sciences*. Twenty-first, the sixth number.
- Rawdin P, Hayes DF. Prostate-specific antigen (PSA) best practice policy. *Oncology* 2000; 14: 267-72
- Hjnzdig E A, de Carvalho TM, Auvinen A, Zappa M, Nelen V. et al., Cost-effectiveness of prostate cancer screening: a simulation study based on ERSPC data. *J Natl Cancer Inst*. 2014 Dec 13; 107 (1): 366. doi: 10.1093 / jnci / dju366. Print 2015 Jan.
- Shelley Selph, MD, MPH; Tracy Dana, MLS; Ian Blazina, MPH; Christina Bougatsos, MPH; Hetal Patel, MD; and Roger Chou, MD. (2015). Screening for Type 2 Diabetes Mellitus: A Systematic Review for the U.S. Preventive Services Task Force. *Annals of Internal Medicine*. Vol. 162 No. 11. pp. 765-795.
- Samavati, T., H. Zadeh, Ellich; Najmi, Mehdi. (2002). A comprehensive national program for prevention and control of cardiovascular disease and its risk factors, paramedic training text. Ministry of Health and Medical Education. Deputy health. Center for Disease Control.
- Entezar Mahdi, Rassol, Ramadani, Rashid; Shamshiri, Ahmad Reza; Etemad, Cyrus. (2011). National Breast Cancer Control Program of the Islamic Republic of Iran, operational programs and executive instruction of cancer screening with mammography and clinical examination. Management of non-communicable diseases Department of Health and Department of Health.
- Leegale Adonis, Debashis Basu, and John Luiz. Predictors of adherence to screening guidelines for chronic diseases of lifestyle, cancers, and HIV in a health-insured population in South Africa. Published online 2014 Mar 14. doi: 10.3402/gha.v7.23807, PMID: PMC3957800
- Karim Dashti, Mohammad. (2012). Identification and care for patients with heart disease, diabetes, hypertension and cancer in the Hormozgan province. *Newsletter of noncommunicable diseases*. 5.s number 19.
- Turgay Ayer<sup>1</sup>, Oguzhan Alagoz<sup>1</sup>, Natasha K. Stout<sup>2</sup>, Elisabeth S. Burnside<sup>3</sup>. (2010). Designing a New Breast Cancer Screening Program Considering Adherence, <sup>1</sup>Department of Industrial and Systems Engineering, University of Wisconsin-Madison, <sup>2</sup>Department of Ambulatory Care and Prevention, Harvard Medical School, <sup>3</sup>Department of Radiology, University of Wisconsin-Madison.
- Designing center (clinic) of prevention and health promotion (2009), University of Medical Sciences of Tabriz, Faculty of Medicine, Department of Social Medicine

## Esophageal cancer: the changes in incidence during last years

Mohammad Yaqub Rajput\*

*Assistant Professor of Internal Medicine, Gastroenterology and Hepatology, Jahrom University of Medical Sciences, Fars, Iran*

### ABSTRACT

Esophageal cancer is one of the least studied and deadliest cancers worldwide because of its extremely aggressive nature and poor survival rate. The most common histologic types are squamous cell carcinoma (SCC) and adenocarcinoma (AC), which together constitute more than 90% of esophageal malignancies. The incidence of SCC increases with age as well and peaks in the seventh decade of life, which is three times higher in blacks than in whites, whereas adenocarcinomas are more common in white men. For esophageal cancer, like most cancer types, incidence trends largely reflect changing prevalence of risk factors and improvements in diagnosis and data recording. Recent incidence trends are influenced by risk factor prevalence in years past, and trends by age group reflect risk factor exposure in birth cohorts.

**KEY WORDS:** ESOPHAGUS - CANCER - INCIDENCE

### INTRODUCTION

Esophageal cancer has long been considered one of the deadliest malignancies, and considerable controversy has surrounded its management. The most common histologic types are squamous cell carcinoma (SCC) and adenocarcinoma (AC), which together constitute more than 90% of esophageal malignancies. Rarely, melanoma, sarcoma, small cell carcinoma, or lymphoma may arise in the esophagus. Although SCC is more evenly distributed throughout the length of the esophagus, AC

is predominantly a disease of the distal esophagus and gastroesophageal junction, and is rarely found in the cervical esophagus (Pohl et al, 2010).

Until the 1970s, the most common type of esophageal cancer in the United States was squamous cell carcinoma, which has smoking and alcohol consumption as risk factors; since then, there has been a progressive increase in the incidence of esophageal adenocarcinoma, for which the most common predisposing factor is gastroesophageal reflux disease (GERD). See the image below. (figure 1) (Buas et al, 2013; Siegel et al, 2017; Torre 2015)

### ARTICLE INFORMATION:

\*Corresponding Author: [shabnamrajput2014@gmail.com](mailto:shabnamrajput2014@gmail.com)

Received 20<sup>th</sup> April, 2017

Accepted after revision 2<sup>nd</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

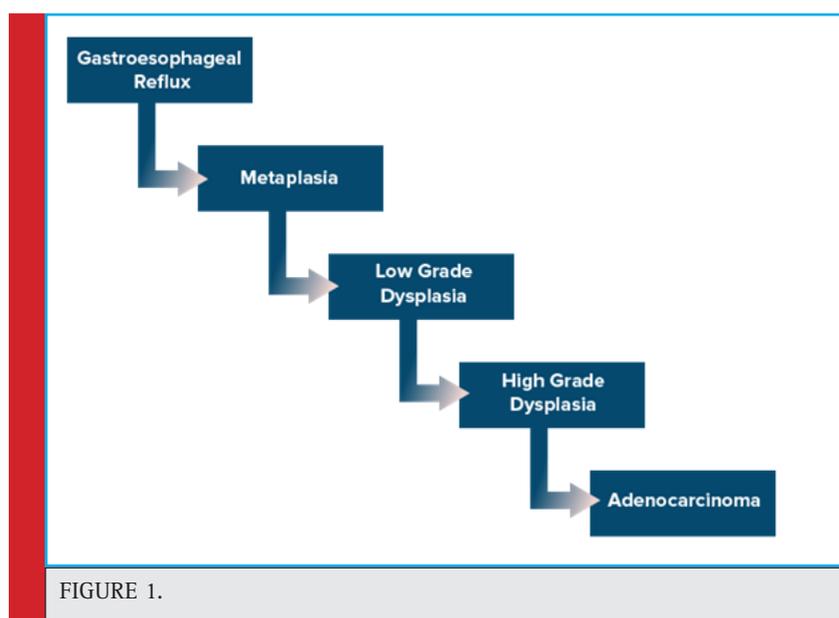
Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal  
NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>



**Staging Classification:**(Gholipour et al, 2008)

- Tis - Carcinoma in situ/high-grade dysplasia
- T1 - Lamina propria or submucosa
- T1a - Lamina propria or muscularis mucosae
- T1b - Submucosa
- T2 - Muscularispropria
- T3 - Adventitia
- T4 - Adjacent structures
- T4a - Pleura, pericardium, diaphragm, or adjacent peritoneum
- T4b - Other adjacent structures (eg, aorta, vertebral body, trachea)
- N0 - No regional lymph node metastasis
- N1 - 1-2 regional lymph nodes (N1 is site dependent)
- N2 - 3-6 regional lymph nodes
- N3 - More than 6 regional lymph nodes
- M0 - No distant metastasis
- M1 - Distant metastasis (M1a and M1b are site dependent)

**INCIDENCE**

Cancers arising from the esophagus, including the GE junction, are relatively uncommon in the United States (Ku et al, 2012; Fein R et al, 1985). The incidence of SCC increases with age as well and peaks in the seventh decade of life, which is three times higher in blacks than in whites, whereas adenocarcinomas are more common in white men. (Cummings et al, 2008).

Although the disease is relatively uncommon in the United States, it is a major global health threat (Ilson

2008). Esophageal cancer is four times more common and slightly more lethal in men than in women. According to the National Cancer Institute (Cancer.gov) in 2012, it is estimated that 17460 persons (13950 men and 3510 women) will be diagnosed with and 15070 persons will die of cancer of the esophagus in 2012. Esophageal cancer occurs at a rate 20 to 30 times higher in China than in the United States. An esophageal “cancer belt,” primarily squamous cell cancers, extends from northeast China to the Middle East (Rasool et al, 2012; Khuroo et al, 1992; Li 1982)

From 1996-2009, the annual percentage change was increased by 0.5% in all races and 0.4% in white. However, the increase of incidence is because of the increase incidence in men. Actually, the incidence in woman dropped by 0.4% (SEER Cancer Stat Facts: Esophageal Cancer. National Cancer Institute, Bethesda).

Stage IA	T1	N0	M0
Stage IB	T2	N0	M0
Stage IIA	T3	N0	M0
Stage IIB	T1,T2	N1	M0
Stage IIIA	T4a	N0	M0
	T3	N1	M0
	T1,T2	N2	M0
Stage IIIB	T3	N2	M0
Stage IIIC	T4a	N1,N2	M0
	T4b	Any N	M0
	Any T	N3	M0
Stage IV	Any T	Any N	M1

**Table 2. Stage distribution and 5-year relative survival by stage at diagnosis for 1998-2009, all races, both sexes**

Stage at diagnosis	Stage distribution	5-year relative survival
Localized (confined to primary site)	22%	37.80%
Regional (spread to regional lymphnodes)	30%	19.80%
Distant (cancer has metastasized)	35%	3.40%
Unknown (unstaged)	13%	10.50%

Using population based cancer data from the Surveillance, Epidemiology and End Results Program of the United States; we generated the most up-to-date stage distribution and 5-year relative survival by stage at diagnosis for 1998-2009. Survival varied widely according to cancer site. The differences in survival related to histology were also expected (Faivre et al 2012).

Although survival was poor for all groups, it was significantly poorer in blacks than in whites. The overall 5-year relative survival for 2002-2008 from 18 SEER geographic areas was 16.9%. Five-year relative survival by race and sex was: 18.1% for white men; 17.0% for white women; 10.4% for black men; 12.6% for black women. The overall relative 5-year survival rates over time increase gradually in white and black, man and women. For example, the rate was below 2% in 1995 to over 10% in 2008 in black men. (table 2) (Lepage et al, 2013).

The number of new cases of esophageal cancer was 4.2 per 100,000 men and women per year. The number of deaths was 4.1 per 100,000 men and women per year. These rates are age-adjusted and based on 2010-2014 cases and deaths. Approximately 0.5 percent of men and women will be diagnosed with esophageal cancer at some point during their lifetime, based on 2012-2014 data. In 2014, there were an estimated 45,547 people living with esophageal cancer in the United States. (table 3) (Howlader et al, 2014).

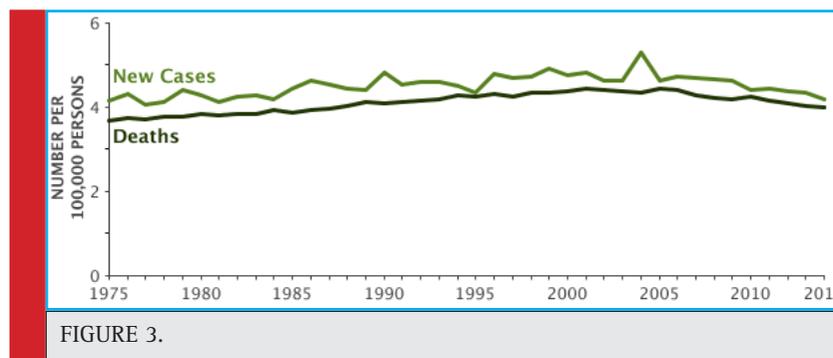
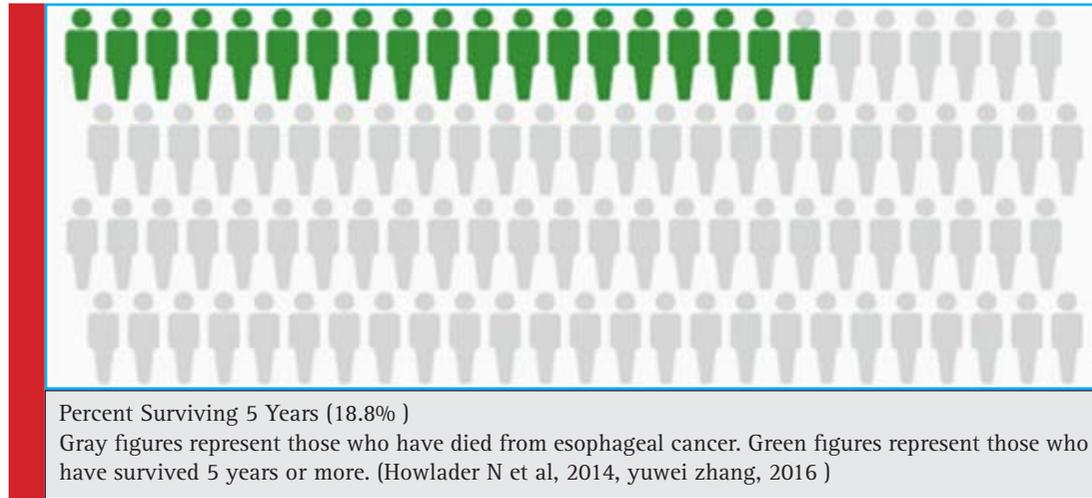
Relative survival statistics compare the survival of patients diagnosed with cancer with the survival of people in the general population who are the same age, race, and sex and who have not been diagnosed with cancer. Because survival statistics are based on large groups of people, they cannot be used to predict exactly what will happen to an individual patient. No two patients are entirely alike, and treatment and responses to treatment can vary greatly. (table 4) (Howlader et al, 2014).

Figure 2 shows Number of new cases per 100,000 person by race/ethnicity and sex during 2010-2014.

Using statistical models for analysis, rates for new esophageal cancer cases have been falling on average

**Table 3. Number of New Cases and Deaths Per 100,000 People (All Races, Males and Females), Age-Adjusted**

Year	New Cases - SEER 9	New Cases - SEER 13	Deaths - US
1975	4.1	-	3.7
1976	4.3	-	3.7
1977	4.1	-	3.7
1978	4.1	-	3.8
1979	4.4	-	3.8
1980	4.3	-	3.8
1981	4.1	-	3.8
1982	4.3	-	3.8
1983	4.3	-	3.9
1984	4.2	-	3.9
1985	4.5	-	3.9
1986	4.6	-	3.9
1987	4.5	-	4.0
1988	4.4	-	4.0
1989	4.4	-	4.1
1990	4.8	-	4.1
1991	4.6	-	4.1
1992	4.6	4.4	4.2
1993	4.6	4.6	4.2
1994	4.5	4.3	4.3
1995	4.4	4.4	4.3
1996	4.8	4.6	4.3
1997	4.7	4.5	4.3
1998	4.7	4.5	4.4
1999	4.9	4.7	4.3
2000	4.8	4.5	4.4
2001	4.8	4.6	4.4
2002	4.6	4.4	4.4
2003	4.6	4.4	4.4
2004	5.3	5.0	4.4
2005	4.6	4.3	4.4
2006	4.7	4.3	4.4
2007	4.7	4.3	4.3
2008	4.7	4.3	4.2
2009	4.6	4.4	4.2
2010	4.4	4.2	4.3
2011	4.5	4.2	4.2
2012	4.4	4.0	4.1
2013	4.3	4.0	4.0
2014	4.2	3.9	4.0



Incidence & U.S. Mortality 1975-2014, All Races, Both Sexes								
Year	1975	1980	1985	1990	1995	2000	2005	2009
5-Year Relative Survival	4.0%	5.6%	8.6%	10.0%	11.6%	18.9%	18.9%	20.6%

1.4% each year over the last 10 years. Death rates have been falling on average 0.9% each year over 2005-2014. 5-year survival trends are shown below the figure (figure 3) (16,17).

## DISCUSSION AND CONCLUSION

Gastric and esophageal cancers are among the most common tumors that cause significant mortality worldwide, although their incidence is much higher in specific geographic locations. Data showed that esophageal cancer incidence rates have increased by 6% in the UK since the early 1990s. This includes an increase in males and a decrease in females.

Over the last decade (between 2003-2005 and 2012-2014), esophageal cancer incidence rates have remained stable for males and females.

The incidence of esophageal cancer is increasing dramatically in Western countries but not in Eastern countries. For esophageal cancer, like most cancer types, incidence trends largely reflect changing prevalence of risk factors and improvements in diagnosis and data recording. Recent incidence trends are influenced by risk factor prevalence in years past, and trends by age group reflect risk factor exposure in birth cohorts.

## REFERENCES

- Buas MF, Vaughan TL. Epidemiology and risk factors for gastroesophageal junction tumors: understanding the rising incidence of this disease. *SeminRadiatOncol* 2013; 23:3.
- Cummings LC, Cooper GS. Descriptive epidemiology of esophageal carcinoma in the Ohio Cancer Registry. *Cancer Detect Prev* 2008;32: 87-92.
- Fein R, Kelsen DP, Geller N, Bains M, McCormack P, Brennan MF. Adenocarcinoma of the esophagus and gastroesophageal junction. Prognostic factors and results of therapy. *Cancer* 1985;56:2512-2518.
- Faivre J, Trama A, De Angelis R, Elferink M, Siesling S, Audisio R, Bosset JF, Cervantes A, Lepage C. Incidence, prevalence and survival of patients with rare epithelial digestive cancers diagnosed in Europe in 1995-2002. *Eur J Cancer* 2012;48: 1417-1424.
- Gholipour C, Shalchi RA, Abbasi M. A histopathological study of esophageal cancer on the western side of the Caspian littoral from 1994 to 2003. *Dis Esophagus* 2008; 21:322.
- Howlader N, Noone AM, Krapcho M, Miller D, Bishop K, Kosary CL, Yu M, Ruhl J, Tatalovich Z, Mariotto A, Lewis DR, Chen HS, Feuer EJ, Cronin KA (eds). SEER Cancer Statistics Review, 1975-2014, National Cancer Institute. Bethesda, MD, [http://seer.cancer.gov/csr/1975\\_2014/](http://seer.cancer.gov/csr/1975_2014/), based on November 2016 SEER data submission, posted to the SEER web site, April 2017.
- Ilson DH. Esophageal cancer chemotherapy: recent advances. *Gastrointest Cancer Res* 2008;2: 85-92.
- Khuroo MS, Zargar SA, Mahajan R, Banday MA. High incidence of oesophageal and gastric cancer in Kashmir in a population with special personal and dietary habits. *Gut* 1992;33:11-15.
- Ku GY, Ilson DH. Adjuvant therapy in esophagogastric adenocarcinoma: controversies and consensus. *Gastrointest Cancer Res* 2012;5: 85-92.
- Lepage C, Drouillard A, Jouve JL, Faivre J. Epidemiology and risk factors for oesophageal adenocarcinoma. *Dig Liver Dis* 2013;45:625-629.
- Li JY. Epidemiology of esophageal cancer in China. *Natl Cancer Inst Monogr* 1982; 62: 113-120.
- Pohl H, Sirovich B, Welch HG. Esophageal adenocarcinoma incidence: are we reaching the peak? *Cancer Epidemiol Biomarkers Prev* 2010; 19:1468.
- Rasool S, A Ganai B, Syed Sameer A, Masood A. Esophageal cancer: associated factors with special reference to the Kashmir Valley. *Tumori* 2012; 98: 191-203.
- SEER Cancer Stat Facts: Esophageal Cancer. National Cancer Institute. Bethesda, MD, <http://seer.cancer.gov/statfacts/html/esoph.html>.
- Siegel RL, Miller KD, Jemal A. Cancer Statistics, 2017. *CA Cancer J Clin* 2017; 67:7.
- Torre LA, Bray F, Siegel RL, et al. Global cancer statistics, 2012. *CA Cancer J Clin* 2015; 65:87.
- Yuwei Zhang. Epidemiology of esophageal cancer. *World J Gastroenterol* 2013 September 14; 19(34): 5598-5606.

## The relationship between metacognitive and self-efficacy beliefs with test anxiety and academic achievement of students

Adis Kraskian Mujembari (PhD)<sup>1</sup> and Fatemeh Jahedtabar (MA)<sup>2\*</sup>

<sup>1</sup>Department of Psychology, Karaj Branch, Islamic Azad University, Karaj, Iran

<sup>2</sup>Graduate of General Psychology, Kish International branch, Islamic Azad University, Kish Island, Iran

### ABSTRACT

This research aims to investigate the relationship between meta-cognitive beliefs and self-efficacy beliefs with test anxiety and academic achievements of students. This is a correlational research. The population includes all the girl and boy students of Kish Free Zone first grade secondary school in the academic year 2014-2015 by 280 people. The research is done according to data from 162 of subjects from the targeted population. The required information was collected by using the standard questionnaires and Average grade of samples (as the criterion variable of academic achievement). Correlation test and simple linear regression was used to assess and test research hypotheses. The findings related to the research hypotheses show, from the viewpoint of girl and boy students of the first grade of secondary school in Kish Free Zone, given to Beta coefficient, t statistic value, the probability and determinant coefficient R<sup>2</sup> from simple linear regression, there is negative significant relationship between metacognitive beliefs and test anxiety and between self-efficacy beliefs and test anxiety. Moreover, there is positive significant relationship between meta cognition and test anxiety and between self-efficacy beliefs and academic achievement, so the first to fourth hypotheses are confirmed. At the end, according to the findings, applicable and practical recommendation are provided to improve the metacognitive and self-efficacy beliefs in order to decrease the test anxiety and enhance the academic achievement of students.

**KEY WORDS:** METACOGNITIVE BELIEFS, SELF-EFFICACY BELIEFS, TEST ANXIETY, ACADEMIC ACHIEVEMENT

### ARTICLE INFORMATION:

\*Corresponding Author: [negar.jahedtabar@yahoo.com](mailto:negar.jahedtabar@yahoo.com)

Received 21<sup>st</sup> April, 2017

Accepted after revision 29<sup>th</sup> July, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

Metacognitive psychology is a new thinking area that dates back to 1970s. one of the variables effecting on the character, is the meta cognitive beliefs. Metacognition is consisted of any cognitive knowledge or process in which there is cognitive evaluation, control or monitoring (Flavell 1979 & Moses and Bird, 2002). In one point, it can be regarded as general aspect of cognition that contributes in all cognitive activities. Some of the special aspects of metacognition is related to psychologic disorders. Metacognitions directs the focuses, determines the thinking style and directs the coping responds in a way that leads to inefficient knowledge. In other words, metacognition is a multi-dimension concept involving knowledge, processes and strategies that evaluate, monitor or control the cognition (Flavell, 1979 & Welz, 2000). It seems the metacognition includes both cognitive processes and cognitive experiences or adjustment. Metacognitive knowledge refers to achieve the knowledge about cognitive processes and the knowledge about how to use the cognitive control processes. Metacognitive beliefs predict the experience of negative feelings such as anxiety and depression (Saeed et. al., 2010).

In interaction between the person and the environment, self-efficacy is one of the most important effective components. Self-efficacy is the individuals' judgement about their abilities to organize and perform a series of tasks to reach any determined performances (Bandura stated by Pintrich and Shank, 1986). In Bandura opinion, Quoted by Liyav, (2009) self-efficacy has two dimensions that one dimension is the expectation of efficiency in performing a special task and its other aspect is the expectation of the consequence of task. The expectation of efficiency suggest that the person is sure about his ability in and the concept of expectation of teaching sequences is the person expectation of his teaching that make behavioral changes in students. The expectation of sequences is related to the structure of expectation of success in the expectation value theory, but it is not exactly similar to it. Self-efficiency is one of elements of self-concept and includes beliefs and expectations relating effectively to the individual tasks and needs. Strong self-efficiency beliefs are presented as a strong individual personal source in stressful situations (Schwarz and Match, 1995).

The processes related to the self is very important in cognitive theories. The necessary requirement for these processes is to have awareness of self or self-processing that includes metacognition and the ability to self-viewing and self-evaluation and require to pay attention to the own and this includes self-concept, positive and negative statements about individual personal beliefs, expectation, targets, feelings and rules (Hofman and

Bareloo, 2002). Anxiety is a state occurring in almost all humans during their lifetime to various degrees so that everyone experiences anxiety at least one time during their lifetime (File & Hide, 2012). A little anxiety in human is both natural and necessary, but if it is exhausted it would be problematic for him, so that, with the knowledge and skills he would not be able to gain necessary points. Test anxiety is an unpleasant emotional reaction to the position of evaluation. This excitement is determined by subjective feeling of tension, encouragement and arousal of the autonomic nervous system.

In various researches, the prevalence of test anxiety among students has been reported 10 to 30% His (1983) has described test anxiety as a cognitive - attention structure to explain how test anxiety effects on function. According to the cognitive - attention model, people with test anxiety focus their attention on activities unrelated to the task, intellectual occupation, self-criticism and physical concerns and therefore pay less attention to their task that This would reduce the performance of these patients (Abolqasemi, 2009).

High levels of test anxiety may cause to distraction from one task to another task. This theory predicts a curved form relationship between test anxiety and academic success. In contrast, Rocklin and Thompson (1985) have reported a linear relationship between test anxiety and academic achievement. They think that difficult tests make more test anxiety than simple tests. Specially, this cause to anxiety among the students that are not able to do the test well. Generally, there is a negative relation between the anxiety and academic success in fairly difficult tests, in contrast, there is a positive relationship for easy tests (Abolqasemi, 2009). Academic success and achievement can cause to Self-actualization and increase the confidence of students (pupils). In Maslow's hierarchy of needs, the need for success has a special place (Meri, 2001).

The term of academic achievement consists of achievement of students to preset goals that we expect they achieve them in their learning efforts. The study of factors effecting on academic achievement, during three recent decades, has been focused by education specialists more than ever. The sensitivity education on the one hand and the complexity of today's world on the other hand has changed the focus of Principals and teachers to foster motivated and strategic student (Paris, 2001). Various factors effect on academic achievements of individuals which the education specialists divided them to four categories of individual, Academic, family and social factors.

Nowadays, the importance of education is not a secret, it is our present and futures' asset; an asset which cannot put a price on it and it is what has led the human being from the era of darkness and ignorance to the

era of light. This research has focused on the relationship between metacognitive beliefs and self-efficiency beliefs with test anxiety and academic achievements of students in the First grade secondary school students of Kish Free Zone in the academic year 2014-2015 and tends to answer the question that: is there any relationship between metacognitive beliefs and self-efficiency beliefs with test anxiety and academic achievements of students in the First grade secondary school students of Kish Free Zone in the academic year 2014-2015? Research literature metacognitive beliefs and self-efficiency metacognition is a multi-dimensional concept involving the knowledge of (beliefs) processes and strategies that evaluate, control or monitor the cognition (Wells, 2009).

Metacognition is taken into consideration as a basis for evaluation of many psychologic disorders (Wells, 2000). According to the Welz and Papaqgeorgio, metacognition can be an important factor on development of psychological disorders. The basis of new theories is that, in psychological disorders, beliefs are consisted of metacognitive components and directs the adaption and thinking function.

Also, the content of thinking is important on explaining the nature of psychological disorder; the notion that how people think, has an important role in understanding psychological disorder and its treatment. One of the main components in this field is the positive and negative concerns and beliefs on it. Most theoreticians distinct between two aspects of metacognition, namely metacognitive beliefs and metacognitive monitoring (Flavell, 1979). Metacognitive knowledge is the information people have about recognizing themselves and learning strategies that these strategies effect on them. Metacognitive monitoring refers to a number of executive functions such as consideration, control, planning and recognizing errors in performance (Wels, 2000). Moreover, metacognitive beliefs include tow wide content area: positive metacognitive beliefs believe that concerning about the future help us to plan for better future. Negative metacognitive beliefs include the beliefs related to our Uncontrollability and dangerous of cognitive thoughts and experiences. Negative metacognitive beliefs include: Inability to remember names is a sign of my poor memory. Metacognition is one of important variables disordered during the disease and has an important role on aggravation of mental illness symptoms. The role of metacognition on psychological disorders through information process pattern is developed by Wels and Mathews which vulnerability to psychological disorders, maintaining these disorders is associated with cognitive -attentive syndrome in the self-regulatory executive function model (Wells,1996). cognitive -attentive syndrome includes Continuous dis-

order of thought control and occurs as concerning and rumination.

Schizophrenia is a complicated disorder that has the strongest and most destructive impact on the lives of any individual ad the prevalence of this disorder is about 1%. According to statistics, about 16% of world mental patients includes Schizophrenias and usually 50% of these patients occupy beds in mental hospitals .

Experts believes that Schizophrenia behavior can be developed by wide variety of factors. On the other hand, schizophrenia is a disorder determined through two categories of positive and negative symptoms. Positive symptoms are those which are characterized with their presence. These symptoms include Hallucinations, delusions and strange behavior and mental disorders. Schizophrenics have many problems in their logical thoughts arrangement and the reasonable conclusions, their beliefs are in conflict with reality and perceive stimuli that do not exist. Negative symptoms are characterized by behavioral deficits and involve shallow emotional response, poverty of speech, lack of innovation and sustainability, blunted affect, inability to gain pleasure, the isolation and attention deficit . Negative symptoms and behavioral indicators are numerous and are related to each other.

However, it seems that positive and negative symptoms are not related to each other and indicate different processes which may occur at the same time, trying to psychological explanation of schizophrenic or symptoms thereof, in the late 1950s, may result in different researches in this field. According to the findings, cognitive processes in schizophrenic patients is inadequate and disturbed. According to Flavell, metacognition is one of the key parameters in the course of Schizophrenia which is impaired and has an important impact on patient's hallucinations and delusions (Flavell and Miller, 1998).In addition, Metacognitions has considerable importance in continuity, diagnosis and treatment of psychotic patients. This variable plays an important role in the acquisition, preservation and perpetuation of illusions and delusions in schizophrenic patients. Based on the self-regulation executive function model, some theorists have attempted to identify and investigate metacognition in schizophrenic patients. Morrison, Hdouk and Taryer believe that Metacognitions may have an essential role in the development of hallucinations and delusions.Wales and Carter stated that patients with schizophrenia have more metacognitive beliefs and disrupted monitoring than patients with generalized anxiety disorder, social phobia, panic disorder and normal group. Lobban, Hedouk, Hedouk, Kinderman and Wales in found that in schizophrenic patients with hallucinations and no hallucination have more disturbed metacognitive beliefs compared with anxious patients and non-patients

group. Patients with hallucinations and the anxiety control group have lower confidence in cognitive processes compared with non-hallucination schizophrenic patients and normal control group. The results of this research showed that metacognition have an important role in the development of psychotic symptoms.

Depression has a meaning for everyone and can be a detectable clue or a disorder. The depression is a disorder that has special signs, is durable enough and has undesirable effect on the persons' performance and causes to distress. According to Beck, thoughts themes and contents in depressed patients is related to past failures. These thoughts cause to the formation of negative beliefs of the people. Beck Theory cognitive theories history is important because it emphasizes to the effects of negative beliefs on morality and behaviors and deals with the impact of the people's thinking, Shepard and Teasdale, Dysfunctional thinking in major depression disorder as a deficit in metacognitive review .

For this reason, Teasdale has distinguished between metacognitive knowledge and metacognitive insight. in Metacognitive knowledge, person knows that his thoughts are not necessarily correct but in the metacognitive vision, person experiences her thoughts as events in consciousness rather than knowing them a direct representation of reality. Teasdale et al in their study found that metacognitive beliefs predict recurrence rate in patients with depression. Accordingly, metacognition is consisted of the knowledge and belief of person about himself, metacognitive experiences (e.g. fear of concern) and metacognitive strategies (such as suppression of thoughts or using distraction).Based on the metacognitive theory, emotional vulnerability and response pattern that cognitive system shows for coping and interpreted as attentive cognitive syndrome has a main role in semiotics and emotional disorders including depression and anxiety disorders.

Results from other studies shown that metacognition has significant positive relationship with negative emotions (depression and anxiety). self-regulation Executive function model has led to the creation of explanatory models and special treatment of depressive disorder, pervasive Anxiety Disorder, obsessive-compulsive disorder, social anxiety disorder and post-traumatic stress disorder. In addition, researches has shown that metacognitive beliefs are associated with depression, psychosis, post-traumatic stress disorder, alcoholism, obsessive-compulsive disorder symptoms, nicotine dependence and test anxiety (Wells, 2000).

## TEST ANXIETY IN STUDENTS

Learning and evaluation have a long history in education. Historically, Chinese were pioneering test results

by final evaluation way, for about 2,200 years to select administrative officials. In ancient Iran, in Sassanid king Shapur era, in Jundishapur, there was sessions for testing medical students and granting medical licenses was dependent on the success of students in this test (Aboulghasemi, 2009).

Nowadays, the purpose of evaluating education is very different from the past and has been dramatically changed for various purposes. In traditional education methods, test is a practice that was done at the end of each training period to measure students learning and determine who passed the exam in order to promote them to a higher level. in new terms, the concept of examination and evaluation is the same. Because both are related to measure what students learned. Exam, to the scientific concept, is some kind of evaluation, which is performed on the basis of certain principles and it can be defined that it is to determine the changes in certain aspects of the student's behavior in regular intervals and to achieve the objective of education (Naderi, 2010).

Generally, human doesn't like to be examined and criticized by others, so when he places in the exam position, gets anxious. Anxiety is not unusual, in fact, the severe anxiety and excitement is considered as a disturbing agent. Anxiety has various kinds which any kind influences on one aspect of human life. One of them is test anxiety occurring in the evaluation position or problem solving and is centered on doubts about outcomes and its sequences with significant drop in Vienna (1971) about the effects of ability to cope with the situation. Test anxiety inhibitor says people with high test anxiety often focus on variables associated with them, unlike people with low test anxiety who often pay attention on variables associated with assignment.

This anxiety makes the level of performance more decreased than the real level in the person. More anxiety in test, more decreased academic efficiency and cause to loss many Human potential and economic resources and talents of the society and remains adverse effects on people. Many practices are suggested to treat test anxiety among which systematic desensitization, relaxation, observational learning and cognitive methods can be referred. In the early 60<sup>th</sup> century, researchers focused on using behavioral practices for treating test anxiety. Later, cognitive practices were more emphasized and researches has also supported the effectiveness of cognitive practices.

In the area of newer psychologic treatments, Wells and Matiuose (1996), for the first time, introduced metacognitive model based on Self-regulation executive function model by combining the schema and data processing approach to explain and treat emotional disorder. The main idea in this model is that beliefs in psychological disorders consisted of metacognitive

components, directs Functioning of thinking and coping style and are affected by them. Wells, Konrith (2004) considered this model as the cause of vulnerability to emotional disorder, because it causes to form the pattern of Excessive attention to himself, activity of inconsistent metacognitive beliefs and specific reflective processes in the person. These processes are activated when the person feels inconsistent between his inner goals and the outer situation. In this circumstances, special strategies are applied such as absorbing information into beliefs, thought suppression, mental rumination and concerns in order to preventing the entrance of disturbing stimuli into consciousness or solving problems resulted from disharmony of monitoring on the physical and mental state and the preparedness against risks, in order to reduce the disharmony with self-regulation executive function (Wells, 2009).

The mediating role of academic self-efficacy beliefs on academic achievement. In three recent decades, various theoretical visions in extensive researches has investigated the processes and sequences of motivational self-regulation, specially that how does individuals regulate a set of development goals or revise in them and how do they try to achieve these goals .

In Nickol's opinion (1987) the goals of cognitive representations achievement are a kind of tasks that individuals try to achieve them and the goals are the reasons selected by individuals to do a task (Mansfield et. al., 2012). According to researchers, motivational and cognitive factors are the most important factors effecting on academic achievements (Asif, 2011). In this regard, motivational variables are divided into expectation and value components in the expectation-value model. The value component includes the goals and beliefs of person about the importance and interest to assignments. This motivational component essentially oversees the reasons for students to do an assignment .One of the important components of value is also proposed as the development goals. Development goals is one of important structures for understanding individuals' behavior in educational settings and is divided into two groups of Mastery goals and functional goals. Functional goals are also divided to Performance-orientation goals and performance-avoidance goals (Plant et. al., 2012).

However, Elliot and Mac Grigor (2001) designed 2x2 development goals plan that relates the concepts of mastery-functional and avoidance-orientation. In their plan, they distinguished the goals to two different practices: Definition (function of mastery) and orientation (oriented or avoided), individuals with mastery goals has an Intra-personal view from their competence levels. These goals focuses on skills development and mastering the assignments and intrinsic value of learning, while individuals with functional goals gain their competency

with normative standards and compared with others. Orientation or avoidance goals features also refers to personal desire to move away or to approach assignment in order to achieve the goal, this view is called multiple goals (Vanyepn, 2006).

In general, there are two main view on multiple goals. First View is from the increase perspective. It means the revised aspect of the theory of goals and considers more compatible role for functional goals. On this view, if mastery goals and function orientation have positive effects, then high levels of both goal may lead to the most adaption for the individual. Compared with this aspect, the second look has often reduced aspects. This aspect, suggests when individuals operate function orientation goal, simultaneously the levels of involving with the assignment with the master goal will be less.

According to Bandura (2000), self-efficacy beliefs act as a cognitive intermediary and oversees the belief in ability to do specific assignments or activities (Bandura, 2000). Academic self-efficacy beliefs, as one of the dimensions of self-efficacy beliefs is the sense of individual ability for learning content and doing assignments given to him and is affected by past and current experience during the school year and specific roles. In fact, academic self-efficacy beliefs mean perception and belief of students on their capability in understanding and learning lessons problem solving and achieving academic achievement that this belief impact on the many aspects of life such as selection of goals, decisions, effort, level of continuity and sustainability and dealing with challenging issues (Bandura, 2006).

Achievement goals, as one of the motivational variables interacting with cognitive variables, is effective on academic achievements. The most important motivational variable associated with achievement goals, from the perspective of researchers, is the self-efficacy beliefs (Lim et al., 2008). Factors such as self-efficacy beliefs and goals play an important role in understanding of the motivational self-regulation. According to the theory of achievement goals, the mastery goals is associated with adapted models of learning such as self-efficiency of using deep processing strategies and stability for doing assignments.

Additionally, the relationship between orientation-function goals with learning outcomes differ according to the nature of outcomes, individuals' characteristics and environmental conditions. For example, in the research by Migueli, there was positive relationship between function orientation goals and self-efficacy but Anderman and Jung (1994) studies indicated that there is negative relationship between function orientation goals and self-efficiency. Also, in Pakharys, Breitner and Valiant (2000) studies there was no significant relationship between function orientation goals and self-efficacy.

Dovik and Leggett (1988) predicted some of the negative effects of function goals happen only in lower levels of self-efficacy so that when individuals perceive their self-efficacy at high levels there will be less evidence indicating the difference between the consequences of achievement goals (Grant and Dovik, 2003).

## BACKGROUND RESEARCH

Aqajani et al (2014), in a research as analysis of the structural relationship between self-differentiation training with test anxiety and self-efficacy, showed that self-differentiation has a significant effect on the anxiety of students and also self-efficacy plays a mediating role in relationship between these two variables, so that it can be said self-differentiation has effect on self-efficacy and also self-efficacy has effect on test anxiety. In addition, all secondary hypotheses measuring the effect of self-differentiation dimensions (emotional reactions, fusion with others, personal and emotional faults positions) on test anxiety dimensions, were confirmed. In a study conducted by Momeni et al (2012) as the Effectiveness of metacognitive counseling on the exam anxiety in girl students, in this research 120 students were selected by using cluster sampling method and complete the Test Anxiety Inventory. 34 of students with the highest test anxiety score placed randomly in one test group and one control group (17 students per group). Each participant in the test group and the control group during pre-test, post-test and follow-up, completed anxiety Inventory. metacognitive counseling was conducted during 9 sessions for an hour at a week in test group. After completing the metacognitive counseling program, post-test and then follow-up test (one month after the post-test) were administered to both groups.

In order to analyze the data, the statistical method of covariance (MANCOVA) and variance (ANOVA) with repeated measurements was used. The results showed that metacognitive counseling has decreased test anxiety symptoms in post-test and follow-up. Ghalay et al (2012), in a study as the evaluation of teachers' self-efficacy beliefs model as determinant of their job satisfaction and student achievement, said; components of previous academic achievement, teachers' self-efficacy, job satisfaction and next academic achievement of students are correlated two by two.

In a study by Salehi and Foumanat (2015) on the relationship between identity styles, self-efficacy and metacognitive beliefs with academic achievement in high school girl students, various aspects of the personality and identity style, self-efficacy and understanding the ability of students in learning and academic achievement was evaluated and the results were used to predict the success rate of students in educational levels. In this

study, 380 students were selected on random sampling method. Results showed that self-efficacy and self-cognitive has been largely effective in the academic success of students.

In a research by Dan et al (2013) on the relationship between anxiety, self-efficacy and test scores of students, 110 students were examined during 2012 of which 70 were boys and 40 girls. The results showed a strong relationship between the anxiety of scores in students. Also, intermediate self-efficacy variable had an effect with a high degree on reducing anxiety of student. Chang and Salomon (2010), in a research investigated the relationship between self-efficacy and academic achievement that the results showed there is positive relationship between self-efficacy and academic achievement.

## METHODOLOGY

This is an applied research and is descriptive-survey and cross-sectional, methodologically and in terms of data collection in can be regarded as field research. The population includes all boy and girl students of first secondary school in Kish Free Zone in academic year of 2015-2016 by 280 students according the latest statics. In addition, 8 school were selected involving students in this grade. Samples were selected by classified sampling method by Chocran formula who were 162 persons, so that each school under study in Kish Free Zone is considered one class. Inventories were distributed randomly. Metacognitive beliefs questionnaire of Wales and Hutton (2004), self-efficacy questionnaire of Schrer et. al. (1982), test anxiety questionnaire of Spillberger (1980) are used as data collection instruments and the previous semester grade point average of students has regarded as the criteria of academic achievement of students. The validity of the questionnaires was of face and content validity kind that in this context, the content of the questionnaire has been investigated by Worshipful Guide Master and after his diagnosis and confirmation; the questionnaire used in this research was determined appropriate. To determine the reliability Cronbach's alpha method was also used that the accounted alpha for variables metacognitive beliefs, self-efficacy and test anxiety has been respectively 0.85, 0.87 and 0.83 indicating the high reliability of used questionnaire.

## RESEARCH HYPOTHESES

1. there is relationship between Metacognitive beliefs and test anxiety of students in first grade secondary school of Kish Free Zone in 2015-2016 school year.
2. there is relationship between Metacognitive beliefs and academic achievement of students in first

Table 1. ANOVA on the linear regression between metacognitive beliefs and Test anxiety in students						
Resources	Total of squared	Freedom degree	The average of squared	F statistic	Sig.	Conclusion
Regression	2.04	1	2.04	39.65	0.0009	The regression is meaningful.
Remaining	8.26	160	0.052			
Total	10.31	161				

Table 2. regression coefficient among metacognitive beliefs and Test anxiety in students						
Variables	R2 determinant coefficient	Beta	Standard Beta	T statistic	The probability of Sig.	Conclusion
The width of the origin	0.199	3.91		17.28	0.0009	Meaningful
Metacognition beliefs		-0.56	-0.44	-6.29	0.0009	Meaningful

- grade secondary school of Kish Free Zone in 2015-2016 school year.
3. there is relationship between self-efficacy beliefs and test anxiety of students in first grade secondary school of Kish Free Zone in 2015-2016 school year.
  4. there is relationship between self-efficacy beliefs and academic achievement of students in first grade secondary school of Kish Free Zone in 2015-2016 school year.

data was described by using descriptive statistics such as frequency distribution, frequency percentage, cumulative frequency, mean, median, standard deviation, minimum and maximum and Inferential statistics methods including Kolmogorov-Smirnov test, correlation and simple linear regression was used to analyze data. SPSS software was used to assess research hypotheses and the Kolmogrove-Smirnove test was used to investigate the normality of data from research variables.

Data analysis :Descriptive findings :In descriptive assessment, 74 students (45.7%) were boy and 88 students (54.3%) were girl. In age range, there was 39 students (24.1%) lower than 15 years, 98 students (60.5%) 15 to 17 years and 25 students (15.4%) higher than 17 years. In the category of GPA of subjects, there was 21 students (13%) lower than 14, 51 students (31.5%) 14 to 16, 65 students (40.1%) 6 to 18 and 25 students (15.4%) higher than 18.

Analytical findings : After collecting data for research variables, the Kolmogrove-Smirnove test was performed that the findings showed the research variables are normal, so Parametric, correlation and simple linear regression tests was used to assess and answer the research hypotheses.

Hypothesis 1: there is relationship between Metacognitive beliefs and test anxiety of students in first grade secondary school of Kish Free Zone in 2015-2016 school year. To assess the relationship between Metacognitive beliefs and test anxiety of students, simple linear regression was used. Table (1) shows the findings from the regression between these two variable.

As it can be seen from table (1), the F statistic is equal to 39.65 and according to the Sig. which is lower than 0.05, the hypothesis of non-significant regression between variables of metacognitive beliefs and Test anxiety in students is rejected, so the conclusion of regression is meaningful.

As it can be seen from table (2), the variable of metacognition beliefs with the standard coefficient of -0.56 and t value of -6.29 which is meaningful for test anxiety, it can be said that R2 determinant coefficient is equal to 0.199. this result indicates that, from the viewpoint of first secondary school students of Kish Free Zone in 2015-2016 school year, there is a negative relationship between metacognition beliefs and test anxiety and by increasing the scores of metacognition beliefs test anxiety is decreased. So the first hypothesis is confirmed.

Table 3. ANOVA on the linear regression between metacognitive beliefs and academic achievements in students						
Resources	Total of squared	Freedom degree	The average of squared	F statistic	Sig.	Conclusion
Regression	157.12	1	157.12	57.72	0.0009	The regression is meaningful.
Remaining	435.50	160	2.72			
Total	592.62	161				

Variables	R2 determinant coefficient	Beta	Standard Beta	T statistic	The probability of Sig.	Conclusion
The width of the origin	0.256	3.80		2.31	0.0009	Meaningful
Metacognition beliefs		4.97	0.515	7.59	0.0009	Meaningful

Resources	Total of squared	Freedom degree	The average of squared	F statistic	Sig.	Conclusion
Regression	1.52	1	1.52	27.73	0.0009	The regression is meaningful.
Remaining	8.79	160	0.055			
Total	10.31	161				

Hypothesis 2: there is relationship between Metacognitive beliefs and academic achievement of students in first grade secondary school of Kish Free Zone in 2015-2016 school year.

To assess the relationship between Metacognitive beliefs and academic achievements of students, simple linear regression was used. Table (3) shows the findings from the regression between these two variable.

As it can be seen from table (3), the F statistic is equal to 57.72 and according to the Sig. which is lower than 0.05, the hypothesis of non-significant regression between variables of metacognitive beliefs and academic achievements in students is rejected, so the conclusion of regression is meaningful.

As it can be seen from table (4), the variable of metacognition beliefs with the standard coefficient of 0.515 and t value of 7.59 which is meaningful for academic achievement, it can be said that R2 determinant coefficient is equal to 0.265. this result indicates that, from the

viewpoint of first secondary school students of Kish Free Zone in 2015-2016 school year, there is a negative relationship between metacognition beliefs and academic achievement and by increasing the scores of metacognition beliefs, academic achievement is decreased. So the second hypothesis is confirmed.

Hypothesis 3: there is relationship between self-efficacy beliefs and test anxiety of students in first grade secondary school of Kish Free Zone in 2015-2016 school year.

To assess the relationship between self-efficacy beliefs and test anxiety of students, simple linear regression was used. Table (5) shows the findings from the regression between these two variable.

As it can be seen from table (5), the F statistic is equal to 27.73 and according to the Sig. which is lower than 0.05, the hypothesis of non-significant regression between variables of self-efficacy beliefs and test anxiety in students is rejected, so the conclusion of regression is meaningful.

Variables	R2 determinant coefficient	Beta	Standard Beta	T statistic	The probability of Sig.	Conclusion
The width of the origin	0.148	3.44		18.93	0.0009	Meaningful
Metacognition beliefs		-0.31	-0.384	-5.26	0.0009	Meaningful

Resources	Total of squared	Freedom degree	The average of squared	F statistic	Sig.	Conclusion
Regression	80/36	1	80/36	10.59	0.001	The regression is meaningful.
Remaining	81/555	160	47/3			
Total	62/592	161				

Table 8. regression coefficient among self-efficacy beliefs and academic achievements in students						
Variables	R2 determinant coefficient	Beta	Standard Beta	T statistic	The probability of Sig.	Conclusion
The width of the origin	0.062	11.56		7.99	0.0009	Meaningful
Metacognition beliefs		1.56	0.249	3.25	0.001	Meaningful

As it can be seen from table (6), the variable of self-efficacy beliefs with the standard coefficient of  $-0.384$  and t value of  $-5.26$  which is meaningful for academic achievement, it can be said that R2 determinant coefficient is equal to  $0.148$ . this result indicates that, from the viewpoint of first secondary school students of Kish Free Zone in 2015-2016 school year, there is a negative relationship between self-efficacy beliefs and academic achievement and by increasing the scores of self-efficacy beliefs, test anxiety is decreased. So the third hypothesis is confirmed. Hypothesis 4: there is relationship between self-efficacy beliefs and academic achievement of students in first grade secondary school of Kish Free Zone in 2015-2016 school year.

To assess the relationship between self-efficacy beliefs and academic achievements of students, simple linear regression was used. Table (7) shows the findings from the regression between these two variable.

As it can be seen from table (7), the F statistic is equal to  $10.59$  and according to the Sig. which is lower than  $0.05$ , the hypothesis of non-significant regression between variables of self-efficacy and academic achievements in students is rejected, so the conclusion of regression is meaningful.

As it can be seen from table (8), the variable of self-efficacy beliefs with the standard coefficient of  $0.249$  and t value of  $3.25$  which is meaningful for academic achievement, it can be said that R2 determinant coefficient is equal to  $0.062$ . this result indicates that, from the viewpoint of first secondary school students of Kish Free Zone in 2015-2016 school year, there is a negative relationship between self-efficacy beliefs and academic achievement and by increasing the scores of self-efficacy beliefs, academic achievement is decreased. So the fourth hypothesis is confirmed.

## CONCLUSION

At first, Kolmogorov-Smirnov test was used to assess the distribution of quantitative variables data that the findings showed research variables are normal and after performing this test and obtaining this finding, we were allowed to use parametric tests for assessing research hypotheses. The findings related to the research hypoth-

eses show, from the viewpoint of girl and boy students of the first grade of secondary school in Kish Free Zone, given to Beta coefficient, t statistic value, the probability and determinant coefficient  $R^2$  from simple linear regression, there is negative significant relationship between metacognitive beliefs and test anxiety and between self-efficacy beliefs and test anxiety and by improving the predictive variable among students, the criterion variable will be reduced.

Moreover, there is positive significant relationship between meta cognition and test anxiety and between self-efficacy beliefs and academic achievement, and by improving the predictive variable among students, the criterion variable will be improved. More simply, the independent variables of research can predict dependent variables, so the first to fourth research hypotheses are confirmed. Proposals on research findings

Based on the data obtained and according to the results from hypotheses of the present study the following suggestions is offered:

1. to design handbooks to change negative beliefs metacognitive among the students in order to propel them towards positive beliefs;
2. verbal encouragement and motivating students (such as the celebration of the elite and privileged student), including positive ways to strengthen their self-efficacy beliefs;
3. observational learning, which means the experience Background of viewing environments, is of important points that should be noted in the discussion of self-efficacy beliefs, because more positive environment has the beneficial effects on self-efficacy. Therefore, to establish a positive atmosphere of culture and education is one of the ways to strengthen the self-efficacy beliefs. Training stress management techniques also plays an important role in increasing people's self-efficacy; so, it is necessary to note.

## REFERENCES

Abolqasemi A. et al, 2009, investigate the relationship between disrupted metacognitive beliefs with academic achievement of the students with test anxiety, Education Studies and Psychology, Volume 10, Issue 3, Pages 5-20.

- Aqajani T., Shoqi, B., Naemi, Sara., 2014, Analysis of the structural relationship between self-differentiation with test anxiety and self-efficacy training, knowledge and research in *Journal of Applied Psychology*, Vol. 15, No. 1, Spring 93, row 55, pp. 34-43.
- Ghalay B, Kadivar. Parvin, Sarrami, Gholamreza., Esfandiari, Mohammad., 2012, the evaluation of teachers' self-efficacy beliefs model as determinant of their job satisfaction and students' academic achievement, *Journal of Research in curriculum planning*, Vol. 9, Volume II, Issue 5, a row 32, pp. 95-107.
- Momeni, M.; Rezaei, F, Gorji, Yousef. 2013, The effectiveness of metacognitive counseling on test anxiety in girl students, knowledge and research in applied psychology, Issue 4. winter 2013. ss107-101.
- Naderi, F. the anxiety psychology: test anxiety, death anxiety, the computer anxiety, Islamic Azad University, Ahvaz.
- Asif, M. (2011). Achievement goals and Intrinsic motivation: A case of IIUM. *International Journal of Humanities and Social Science*, 1(6): 196-206.
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood clhffs, NJ:prentice- hall.
- Bandura, A. (1997). Self-efficacy: The exercise of control. New York: Freeman. 84(2), 191-215
- File, S.E., & Hyde, J.R.G. (2012). Can social interaction be used to measure anxiety?. *British journal of pharmacology*, 62(1), 19-24.
- Flavell, J.H.(1979). Metacognition and cognitive monitoring: A new area of cognitive developmental inquiry. *American Psychologist*, 34 ,906-911.
- Hofmann, S.G., Sawyer, A.T., Witt, A.A., & Oh, D. (2010). The effect of mindfulness-based therapy on anxiety and depression: A meta-analytic review. *Journal of consulting and clinical psychology*, 78(2), 169-181.
- Mansfield, F., Wosnitza, M., & Beltman, S. (2012). Goals for teaching: Towards a framework for examining motivation of graduating teachers. *Australian Journal of Educational & Developmental Psychology*, 12:21-34.
- Meri V (Translator). [Guild lines for teaching in university]. Meller WRM (Author). Tehran: Tehran University; 2001. (Persian)
- Moses, L.J., & Baird, J.A.(2002). Metacognition. In R.A. Wilson & F.C. Keil (Eds.), *The MIT encyclopedia of the cognitive sciences*. Cambridge, MA: MIT Press.
- Paris, S. G., Winograde. P. (2001). The role of self-regulation learning in contextual teaching: Principle and practice for preparation. [www.w.ciera.org/library/achieve](http://www.w.ciera.org/library/achieve).
- Plante, I., O'Keefe, P., & Théorêt, M. (2012). The relation between achievement goal and expectancy-value theories in predicting achievement related outcomes: A test of four theoretical conceptions. *Journal of Motivation and Emotion*, 10(3):1-14.
- Saeed, O., Purehsan, S., Akbari, S. (2010). Correlation among meta cognitive beliefs and anxiety-depression symptoms *Procedia Social and Behavioral Sciences* 5.1685-1689.
- Schwarzer, R., & Hallum, S. (2008). Perceived teacher self-efficacy as a predictor of job stress and burnout: Mediation analyses. *Applied Psychology*, 57(s1), 152-171.
- Wells, A. & Fisher, P. & Myers, S. & Wheatley, J. & Patel, T. & Brewin, C. (2008). An open trial of meta cognitive therapy in the treatment of major depressive disorder, Manuscript in hn preparation.
- Wells. A. (2009). *Meta cognition therapy for anxiety and depression*, New York, Oxford Univ Press.

## Examination of underground tunnels for vulnerability against water entrance into the tunnel and proper approaches to cope them

Mina Aligholi

*B.Sc in Civil Engineering & M.Sc in structural Engineering, Shomal University, IRAN*

### ABSTRACT

Subway and traffic tunnels are of the most important underground spaces in sustained urban development, built for facilitating traffic decrease in urban passages. In design and executing urban tunnel projects, there are many important issues like cost, safety, material and execution quality, environment and finally interference with urban lively environment. Integrating above issue in execution problems, challenges and difficulties has made tunnel building a difficult and complex project. Urban tunnel execution faces many problems and water entrance into the tunnel is a challenge which has many problems during execution step and many destructive consequences during exploitation step. Therefore, it's important to anticipate water flow location and extent, pressure on tunnel covering by underground water, chemical quality and drainage model and considering them in design. This study examines underground tunnel vulnerability against underground water entrance and offers approaches to cope these damages. Also in a case study, we examine water entrance into the Hakimeh-Niayesh tunnel from underground water leakage point of view and offer proper approach which is use of geo-membranes for valve grinding of the above mentioned tunnels.

**KEY WORDS:** TUNNEL, WATER ENTRANCE, GEO-MEMBRANE, VALVE GRINDING, HAKIM & NIAYESH TUNNELS

### INTRODUCTION

Today, considering climate and geographical conditions of the country and cities and industrial centers development, tunnel and underground spaces have been paid special attention for intra- and trans-city transporta-

tion application. Many big cities don't have ability and capacity for ground transportation thus seek for underground systems. Recently there has been grown attention to this underground structure considering scientific and technological developments in geotechnical engineering and geological studies and better and more knowledge

#### ARTICLE INFORMATION:

\*Corresponding Author: [heyda.javadi@gmail.com](mailto:heyda.javadi@gmail.com)

Received 22<sup>nd</sup> March, 2017

Accepted after revision 21<sup>st</sup> July, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

of the ground conditions and production and development of the tunnel construction and exploitation equipments. In tunnel construction, there many challenges the most important of which are: key factors causing challenge in tunnel constructions, tunnel construction method, ground and tunnel peripheral soil type and condition, tunnel structure up-loading, underground water condition, covering structure characteristics and tunnel maintenance system, errors of planning, specification and design parameters estimation stage, computational or numerical errors, errors of tunnel construction, problems caused by unknown underground spaces in urban regions, unknown aqueduct, waste-water storages and underground excavations, problems of the underground water appearance in the tunnel, ground subsidence, engineering geology risks, hard soils, tunnel peripheral soil deflation because of erosion caused by scour and common errors. Since intra-city transportation tunnels like subway tunnels are interconnected, a failure in a section of the structure of the tunnel placed in saturation environment, say, local gap in tunnel covering or failure in segments connection seam, could cause water entrance into the tunnel following by perfect tunnel flooded and finally flood and its transfer to other interconnected tunnels. By flood, it's also possible that a significant amount of soil including sand, silt, gravel or deposits of fault zones enter into the tunnel. So, in a short time a significant part of the tunnel internal space could be possibly filled by peripheral material entrance that in turn could block part of the tunnel. In addition, relaxation of the soil beneath above structures foundation of the tunnel caused by above mentioned event could cause significant subsidence of structures foundation or even their complete destruction.

### **PROBLEMS CAUSED BY WATER ENTRANCE INTO THE UNDERGROUND TUNNELS**

Most tunnels dig in mountains or other regions; face the problem of water leakage into the tunnel. In order to prevent underground water crowding into the tunnel, in both construction and exploitation stages, first we should identify the hydro geological condition of the region of the tunnel and then design proper drainage system for it. One of the most mentioned reasons of the failure is the un-certainty in the identification of the tunnel's peripheral conditions and many experts have emphasized the influence of its related parameters in a certain tunnel project. Hydrological studies and geological explorations are performed simultaneous since considering that water leakage is one of the most common problems faced by tunnels; its related studies could be very effective in tunnel placement. So, to construct underground structures, underground water movement

in the considered region need to be analyzed. These analyses should examine the behavior of the region's underground water and analyze the possible changes in the flow behavior and regime and its effects on tunnel's construction, exploitation and main tenancy. Underground water behavior examination after construction of the underground structures is important since water always flows in a direction with the minimum path and the maximum hydrolicgradian. Since after constructing any underground structure, there would be established a short path by high hydrolic slope gradian for underground water to move and exit from porous environment and arrive to regional baseline, it's normal for co-potential lines to match at the borders of the dig underground structure and water movement direction to be perpendicular to these potential lines that is toward the structure.

These issues are true for porous environment but it's somehow different for hard structures. Since there is no real porous environment in which water can move in all directions. In hard structures, water is directed in seams and gaps path however the hydrolic principle is constant that water always moves in hydrolicgradian direction and tries the shortest path and follows the highest hydrolicgradian. It's not possible to anticipate water leakage in stone environment precisely because of lack of ability to determinig all factors effective on water flow but since high levels of pressure and debi of watwe entering into the tunnel is a main problem during the construction or in mine environment and should be prevented, it's necessary to have an overall estimate of them before design to perform proper solutions to cope water entering.

Tunnel construction in saturated underground spaces containing underground water is risky and provides many problems and challenges during digging operation. By wide evaluations in different situations and using exploring suggestions, we can anticipate problems possibly caused by underground water around tunnels for this structure tunnel laver balance being beneath underground water balance or exposed to underground excavations may allow saturation and weak material to flow into the tunnel space. So it's very important and critical to identify and prevent these risky conditions on the other land, underground waterinfluences tunnel digging in its all stages. During tunnel digging, hydrolicgradian caused by underground water may result in scour of materials around this underground structure. In addition, this gradian causes hydrodynamic pressures in peripheral environment which decreases sustainability of excavation chest of the tunnel. After excavation, it's also possible that water softens silt and clay soils. Grounds containing anidrite or certain clay minerals like Montmorionit tend to inflate. Inflation of

these soils provides additional pressures on tunnel covering which if not considered, they could cause crack or even failure in tunnel covering that ends up with water and soil materials crowding into the tunnel. In exploitation stage, tunnel anti-leak covering should be designed considering hydrostatic pressures caused by peripheral saturation environment. Also, tunnel drainage systems need regular maintenance to insure permanent drainage process today, considering high possible damages of water entrance, it's inevitable to make underground structures including tunnel, subway stations, ...., seamless. To this it's necessary to compare and select optimal approach which insures structure seamlessness against underground flows leakage into the structure. By making tunnel seamless, water leaked from tunnel walls would be transferred to side runners and finally discharged from tunnel by underground drainage system and ground water collection system.

### PROPER APPROACHES FOR MINIMIZING DAMAGES CAUSED BY UNDERGROUND WATERS ENTRANCE INTO THE TUNNEL

Generally, to control underground water, there are two methods: rinsing and prevention of water entrance into the tunnel. Rinsing methods refer to water collection and transfer which are common and traditional methods to control underground water. In this method, water is allowed to enter into the tunnel and then it is discharged. These methods are also known as internal methods. The most common rinsing methods are: open resource pump age, well pump age, enhancing well points and use of venture suckers. Also known as external methods, the other method for control of underground water prevents water entrance into the tunnel. External methods include dement and chemical injecting materials, ground freezing, compressed air buffers, closed work front buffers and ground pressure balance buffers. Table 1 provides a summary of underground water control methods for under construction tunnels.

Based on the peripheral soil and water condition and situation, leakage from different parts of tunnel could be realized as under pressure (artesian) or leakage from seams. Tunnels exploitation system and service level as well as it's useful life highly depends on tunnel's walls and floor to be protected against water leakage and any kind of damage caused by freezing. So, all leaked waters including leakage under pressure or freely in different sections and all directions (transversal and longitudinal) should be collected and discharged under controlled condition.

This is true for all urban tunnels (even if there is no connection with water leakage or hydrostatic pressure) using sound and proper methods.

### COMMON WATERPROOFING METHODS FROM GEOMETRICAL VIEW

From geometrical view, there are two general classes of waterproofing methods: umbrella and circumferential system.

#### A) umbrella waterproofing method.

In this system, waterproofing element is placed in tunnel's ceiling and walls. This method is used when water leaks from wall and ceiling and tunnel is not under hydrostatic pressure when using this system, proper drain should be considered in tunnels crust.

#### B) Circumferential waterproofing system.

In this system, waterproofing element covers throughout the tunnels crust. This system is necessary when tunnel is under hydrostatic pressure. Under such conditions, type and thickness of waterproofing materials is different from umbrella system and need higher confidence coefficient.

### COMMON WATERPROOFING METHODS CONSIDERING THE TYPE OF WATERPROOFING MATERIAL

These methods are classified in two general classes: traditional and modern.

#### A. traditional method (using bitumen – based materials)

Structure sections, connecting to wet ground, need wet insulation. However, traditional material's production and placement is simple and fast, there are some defects as following.

- \*gradual, and sometimes fast, solution of bitumen in water specially by permanent connection with water.

- \*Lack of environmental compatibility because of polluting underground waters (because of gradual solution of bitumen in the water).

- \*Lack of self-sealing capability in overlapping and joint places.

- \*Lack of self-amending capability when there is partial damages at placement time and after it.

- \*Relative waterproofing (high leakage level compared to other methods)

- \*Undesired chemical resistance specially when insulation is placed adjacent to fluids containing waste water and chemicals.

- \*Very different behavior of bitumen-based products in structure deformations.

- \*Non-applicability under negative hydrostatic pressure.

Currently, above defects have limited the use of this material to preventing water leakage in dams and tech-

nical facilities of the road and railway. The same condition is true for isogum too, but, it should be noted that because of different production processes, these products have different qualities.

#### B. Modern methods

### GEOSYNTHETIC MATERIALS

Today, use of geosynthetic material such as geotextiles, bitumenic and polymeric geomembranes, geonets, geogrids, geomats, bentoniticeocomposites, geocells, geofoam structures and etc. is an essential part of building projects. There are many applications of this material in building engineering specially geotechnic, environment, hydrolic and drainage. Geosynthetic materials are mainly polymeric and transformed to appropriate form usable in building projects by fabricating, sewing or injection processes and occasionally combining by non-polymer materials such as clay. so it's important to consider primary material type and production method of these materials.

Depending on design and exploitation condition, there material perform one of the following as the main function and one or more of them as the secondary functions (side advantages):

1. isolation 2- filtration 3- arming 4- waterproofing 5- waterproofing or liquid barrie or liquid containment that as known applications of geosynthetics have been used for more than 30 years. Among geosynthetic materials, geomembrane and bentoniticeocomposite are used for tunnel waterproofing.

#### B-1) geomembrane

Geomembranes are flexible membrane by very low (near zero) leakubility manufactured from engineering and non-engineering polymers such as polyethilen, PVC and other polymers like different rubbers which have molecular structure by high density and can prevent liquif leakage. The main applications pf geomembranes include waterproofing structures like tunnel, underground structures,... water and wastewater lagoons, protection covering of pipes, landfills, secondary covering of tanks and mine.

#### B-2) bentoniticeocomposite.

Bentunical detent covering geocomposit consist of two layers of non-fabri geotextile or is a combination of non-fabricated geotextile beneacated and fabricated geotextile above bentoniticedetend covering. There are many ways to connect three consisting layers of bentunitical detent covering. That is two geotextile layers and one bentunit clay layer including: 1- sewing layer in certain sewing row, 2- use of glue and chemicals and,

3- needle sewing way. In needle sewing way, some kind of bentunitical detent covering by a uniform structure and very high cut resistance is produced at the connection of its layers that makes this method the best and the highest quality method for producing bentunitical detent covering. using needle works to produce bentunitical detent causes uniform distribution of bentunit clay and weight and thickness stabilization during all production, transport and placement time and in the case of the contact between bentunitical detent covering and water or moisture before exploitation, there won't be undesired inflation of bent unit clay.

### PREVENTION METHODS OF WATER LEAKAGE INTO THE CONSTRUCTED TUNNELS

This section examines control methods for preventing water leakage into the tunnels. Observing and studying water leakage into five different tunnels, parks concluded that the main point to address underground water problem is reliance on the structure strengthening of the primary concrete concrete blocks production need very precise attention since experiments and experience has shown that preventing, water leakage and penetration has very lower cost in primary stages than maintenance in the following stages. Another effective way to prevent water entrance into the tunnel is use of multi membrane systems. Such systems are relatively expensive but significantly effective. These membranes have more applications in tunnels excavated by beehive-cover method. However would be used into the tunnel and their advantages and disadvantages.

### CASE STUDY (HAKIM AND NIAYESH TUNNEL)

#### CASE STUDY 1: HAKIM TUNNEL

Constructing Hakim tunnel allows completion of Tehran west highways ring and connection of Resalat highway and Tehran – Karaj highway by Karvansara-ye-Sangi cross-section bridges 1 and 2. In the other words, Hakim tunnel (fig1), passing chgitgar complex, arrives Karvansara-ye-Sangi where turns to a north-south highway and connects to Tehran-Karaj highway. Around 2Km length. Hakim tunnel operation construction includes a 2-way tunnel each by 3 main and 1 emergency lines, the main tunnels enter and exit ramps, excavation, primary stabilization and finallimimg of access tunnels along with all related facilities including air conditioning. ITS, electrical and mechanical operations, flood mitigation tank in south area of Hakim tunnel to control flood of mean upper areas of district 22 and bedding and building construction on chitgar dam crust by protector placement and light systems. So, an important discussion

considered in tunnels construction was its waterproofing that eliminated underground water entrance into the tunnel during construction as well as exploitation in the following we explain waterproofing of this tunnel.

#### **examination of different geomembrane for Hakim tunnel waterproofing.**

Geomembranes are polymer material (like PVC) – based unpen treatable plates, classified based on the mechanical characteristics. Considering polymers diversity, many different geomembranes are produced, including HDPE, LLDPE, VLDPE, FPP, CSPE, PVC, BGM, and , ... . Considering application type for tunnel waterproofing and possibility of internal production in the country, among above geomembranes , HDPE, LLDPE and PVC geomembrane were selected for additional investigation for tunnel waterproofing and other geomembrane examinations were ignored.

##### **\* HDPE geomembrane**

One of the most common applications of the polymer throughout the world is its use to produce HDPE type of geomembrane. Important characteristics this product are high strength in tension and great chemical resistance for wide specter of chemicals mainly because of its crystalline structure.

Generally, it could be said that because of resistance against UV, low cost, mechanical characteristic compatibility and great chemical resistance, HDPE is a popular product. GM13 standard controls this product's quality.

##### **\* LLDPE geomembrane**

This product has intrinsic flexibility and compared to HDPE geomembrane, it has high toughness and lower potential of crack because of environmental stress.

This layer is more penetrable than HDPE. GM 17 standard controls its quality. The most important advantage of this geomembrane type is that this product overcomes the limitations of HDPE geomembrane (brittle fracture and low flexibility).

##### **\* VLDPE geomembrane.**

This is a kind of LLDPE by lower density than LLDPE. This geomembrane has more flexibility than other polyethylene geomembrane. Other characteristics of this geomembrane are relatively similar to LLDPE. Considering this geomembrane characteristics, VLDPE is a proper choice for Hakim tunnel waterproofing.

##### **\* PVC geomembrane**

PVC geomembranes are a combination of pvc hard material (like what is used for PVC pipe) and softener material as lubricant. These plates have good resistance against corrosive material and their mechanical, electri-

cal, waterproof, ant fire and chemical resistance characteristics have provided a wide range of applications in different industries including construction, building , automobile, home appliances and .... PVC plates are used in tunnel and underground structures isolation. PVC geomembrane are produced by different (very low to very high) qualities and should have special characteristics depending on their application. This product is a notable choice for Hakim tunnel. However because of above mentioned limitations its prioritized after LLDPE and VLDPE geomembrane.

In Hakim tunnel project , PVC geomembrane with thickness and 1055m width along with signal layer (a white layer above geomembrane plate to show possible damages) according to ASTM-D 7176 quality standards was used.

#### **Grout injection pipes.**

In Hakim tunnel, injection pipes were considered for two goals:

##### **A) filling empty spaces.**

Because of curved figure of the tunnel crust as well as concreting from inside the section and concrete contraction , when concreting, an area of the tunnel crust will not be filled completely, and there will be empty space in the tunnel crust. So, to fill this empty space, before concreting, there were 3 injection pipes placed by 1 to 1.5 m distant in the tunnel crust connected to geomembrane these pipes have regular furrows on their length to be able to inject along the pipe length. In Hakim tunnel, these pipes are PVC pipes with 19mm diameter.

##### **B) Waterproofing**

Because there is a possibility that water leaks from waterproofing layers and passes from operational seams, contractional and expansional, two injection pipes are place on both sides of the seam throughout the waterproof band. These pipes have regular furrows on their length to be to inject along the pipe's length. Seam Creates a place in the concrete by high potential for leakage. Just when water leakage is observed from seam, injection operation will be performed in these pipes. Also, these pipes are capable of re-injecting so in case there is further water leakage, it will be possible to re-inject. In Hakim tunnel, these pipes are PVC pipes with 11,, diameter and capable of re-injecting.

#### **placement of waterproof band.**

In Hakim tunnel, PVC waterproof band with 50cm width along with median bubble was used in Hakim tunnel, waterproof band was placed inn the following positions:

\*operational longitudinal seam between tunnel floor and wall concreting.

\*contractual transversial seam between concreting blocks.

\*expansional transversial seam between concreting blocks.

\*operational seam between concreting of floor and emergency cabin wall.

\*contractual seam.

## CASE STUDY 2: NIAYESH TUNNEL

Niyaesh highway ends in Valiasr cross section and west-east traffic load enters Valiasr. Esfandiar streets and Moddares highway also east-west traffic load from sadr highway enters Moddares and Chamran highways and makes a heavy traffic in this region in order to solve traffic problem of this region, Niayesh tunnel by two round-trip tunnels (east-west) was designed. Final covering was reinforced concrete. The tunnel contains parts with two-line and three-line profiles. Fig 2. Shows a picture of Niayesh tunnel construction stage.

## CASE STUDY: TOHID TUNNEL

The length of 2136m, Tohid tunnel contains two adjacent tunnels each by 3 round-trip bands and as the first north-south tunnel of Tehran, it connects Chamran highway to Navab Safavi highway. Construction time of this tunnel ended in 30 months which is a record and it is the largest urban tunnel built in Iran. Unfortunately, there was no plan considered for Tohid tunnel waterproofing in construction time so in exploitation time, some plans for waterproofing were performed in two phases.

## POLYURETHAN MATERIAL INJECTION

The first method for Tohid tunnel waterproofing in exploitation time was injection method which was performed as the following.

\*identification of all concrete areas and seams, damaged by any cause.

\*demolishing the mortar between parts and damaged concrete.

\*making furrows between concrete parts and seams to perform waterproof mastics.

\*making a furrow with 5mm diameter in damaged concrete where water leaks or it's possible to leak in the future.

\*digging holes with proper diameter and depth (diameter from 8 to 20 mm and necessary depth to pass tunnel structure concrete and arrive to soil) to inject polyurethane material.

\*use of waterproof material considering leakage amount and place.

Injection resins used for waterproofing include, SLV, HA FLEX SLV, HA FLEX LV, HA CUT, HA CUT CFL, HA SOIL and bordering mastics produced by DENEFF company, Belgium. In the following, we briefly explain places where these materials are used.

\* HA FLEX LV: is used where seal has leakage from inside the concrete and needs high leakage.

\* HA FLEX SLV: is used where need soft viscosity by leakage capability or capillary cracks with 0.5mm tolerance by coordinatable drying order.

\* HA FLEX: is used after water leakage in expansion seams and repair of water stop or seams where filling material need flexibility.

\*HA CUT: is suitable for cutting high pressure and severe water flow and after drying gets a solid and hard form and is used in fixed and constant seams.

\*HA CUT CFL: is suitable for cutting water leakage with low to high severity and after injection gets semisolid form and is used in dynamic or stationary seams.

\*HA SOIL: is used to stabilize soil and fill soil layers porosity and soil stabilization and waterproofing.

## waterproofing surfaces with leakage potential (leakage happened currently and in the past).

Considering that the first waterproofing method couldn't address tunnel waterproofing problem, there were proposed and performed a second method using martars homogenous with concrete. This method is performed as follows:

\*washing concrete surface to eliminate pollutants on the concrete;

\*creating a drainage grid from concrete jackets in 30 cm depth with 45 cm width in an area at least 3 times larger than the area having leakage potential.

\*performing a layer of regrade and repair in above mentioned surfaces with polymer modified fiber mortar (Beton fix FB) if concrete surface is uneven.

\*performing a layer of crystalized material (Beton fix 300) with water on the repair mortar or concrete surface.

Generally, this method uses materials with commercial name such as :

\*HARDEN WW, BETON FIX 309, BETON FIX FB, BETON FIX RS, MARFLEX, SOLUZIONE RUGGINE that are explained in the following.

\*HARDEN WW: is a cement which dries fast and has a grey powder form. This product has a high mechanical resistance even under water. It should be combined with water and injected inside seams, gaps and holes.

\*BETON FIX 300 (crystalized material): this product is a ready to use mortar and has high adherence to considered surface. This product is used to waterproof structures and surface on which hydrostatic pressure is exerted (like swimming pools, tankers, water fills ...) as

well as in structures on which negative hydraulic pressure is exerted (like tunnels,...).

\* BETON FIX FB (repair mortar): is a hydraulic adhesive material without aggregation that could be used as mortar. This mortar has ticsotropic characteristic and contains artificial fiber. This material has high adherence and resistance against sulphates in concrete. It is used to repair reinforced concrete including piles, bridges, dumas and tunnels.

u.u. comparing waterproofing cost of Hakim and Miyesh tunnels. As said before in Tohid tunnel no waterproofing operation was performed during the construction that caused problems in exploitation. So, it was tried to waterproof Tohid tunnel by polyurethane in/ectionn methods as well as using fermenting mortars homogenous with concrete. Although Tohid tunnel waterproofing and Hakim tunnel waterproof layer performance were realized simultaneously, cost of waterproofing each m2 for Tohid tunnels was two times more than it for Hakim tunnel. Also calculations show that the cost of performing waterproof layer during construction was less than one-third of the current costs for waterproofing this tunnel, so these results confirm the necessity of performing waterproof layer during construction of urban tunnels.

## CONCLUSION

As mentioned before, tunnels are one of the essential underground spaces in sustainable urban development that there are many problems and challenges in their construction. Tunnel construction method, tunnel peripheral ground type and condition, slag, underground water condition, covering structure characteristics and tunnel maintenance system are of important factors causing challenge in tunnel construction. One of the most important among above factors is water leakage which can cause soil erosion and changes in

ground pressure. Scour excavations are part of tunnel peripheral soil made hollow because water leakage from covering cracks. Passing to tunnel, water scours soil particles and make them hollow. By time, this results in hollow and weak soil around covering cracks of tunnel. Holes in tunnel covering have consequences indifferent forms. Sometimes because of subsidence of these holes or redistribution of stress field, there are location displacements or subsidence in ground level. Pressure redistribution sometimes makes changes in forces working on covering. In the more serious cases where there are big holes built in tunnel peripheral, changes of distribution of these forces can cause ellipticity of tunnel. So, this paper tried to reduce damages caused by water entrance to minimum level. Finally, these factors and their solution were examined in a case study in Hakim and Niayesh tunnel. The results show that waterproofing during the construction is an essential work and shouldn't be ignored to avoid traffic problems in exploitation. It should be noted that precise anticipation of this factor has prevented such problems in Hakim tunnel.

### مراجع-6

- [1] معاونت مطالعات و برنامه‌ریزی امور زیرساخت و طرح جامع مدیریت مطالعات و برنامه‌ریزی امور فنی و عمرانی، استانداردسازی و مدیریت بحران، "روش‌های اجرای تونل‌های شهری و چالش‌های مرتبط"، 94
- [2] محمدرضا محوی، حسین مهري، منل‌های تخمین و زهکشی آب‌های ورودی به داخل عملیات معدنی - مطالعه موردی تونل انتقال آب قم رود (قطعه آو4)، اجلاس مهندسی معدن ایران-83
- [3] T.Seidenfuß, "Collapses in Tunneling", Master of Science Thesis, EPFL University, Lausanne, Switzerland, 2006
- [4] Sinha, R.S.; "Under ground structure Design and instrumentation", Elsevier, 1989 - Technology & Engineering - 480 pages 1989.
- [5] شرکت مهندسی مشاور سازه بن پروژه، "گزارش طرح و روش آبی‌بندی تونل حکیم، 94
- [6] Egaw, T.M.M.; "Tunnels: planning, Desing , Construction", Vol2, 1982.
- [7] Heuer, R.E.; "Estimating Rock Tunnel Water in Flow", 2001.
- [8] Todd., Keith, D.; "Ground Water Hydrology", 1998.
- [9] <http://www.shimibeton.com/fa/News/Detail/>.
- [10] <http://khatam.com/?part=menu&inc=&id=551>

## Importance of providing electrical harmony performance standards during use of hospital medical equipments

Hossein Shokrehoda

*B.S Electrical Engineering & M.A in Strategic Management, Islamic Azad University, Branch of SAVEH, IRAN*

### ABSTRACT

Obviously, increasing application of medical equipment result to serious advance of speed and adequacy of diagnosis and remedy processes in health care system. Many medical equipments involve advanced of high function and worth life cycle. So, power quality in hospital as hygienical medical centers needs special standards. Power quality involves broad meaning affecting electrical energy parameters. It should be noted that a little improper distribution in medical instruments circuits leads to damage of system's output function, error in instruments output, decrease of work life cycle and in cases instrument's impairment. Since any disorder in function of such instruments crucial effects on diagnosis or remedy processes of the patient, with recent developments in the field, the importance of their control standards increases. In this study, we examine electric energy parameters affecting power quality. Stressing suppressive and controlling functions in designing the applications (system design and positioning), we emphasize the necessary standards updating in line with the fast advances in designing and the need for adequacy increase as well as functional control of medical instruments such as surgical, radiologic, ventilation, monitoring systems because of used power quality.

**KEY WORDS:** MEDICAL EQUIPMENTS, STANDARD, FUNCTION, USED POWER QUALITY

### INTRODUCTION

Medical equipments are of essential instruments for prevention, diagnosis and remedy which increasingly diversified and functionalized and so, health care system reliance on the is increasing. Actually, adequacy and precision of diagnosis and remedy practices which

severely depend on medical equipments such as radiology, laboratory, surgical and special words equipments involving sophisticated electronic and digital circuits, guarantee proper condition supply process in medical science. Any disorder in their input electrical current may cause serious disorders in function, precision and work life cycle of the instruments and question their

#### ARTICLE INFORMATION:

\*Corresponding Author: [heyda.javadi@gmail.com](mailto:heyda.javadi@gmail.com)

Received 21<sup>st</sup> April, 2017

Accepted after revision 21<sup>st</sup> July, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal  
NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

efficiency. Therefore, quality improvement and increase of productivity in health care sector is highly affected by safety and maintenance of medical equipments, their correct function and calibration. So, proper use of such equipments needs supply of high quality power which is especially important in hospital as the center of health care services. (Ramos, M. C et al, 2009).

Hospital are of entities providing hygienic and remedy services that play important role in maintaining and security physical and psychological health of society, medical researches and training skilled force needed by health care sector by special facilities and possibilities (Hartungi, et al , 2010).

Medical equipment is of hospital special facilities playing important role in medical diagnosis, remedy and training. Actually, what guarantees correct process in medical diagnosis, remedy training is efficiency of advanced and precise medical equipments which are mostly used in diagnosis and remedy sections including diagnosis radiology, laboratory equipments, monitoring instruments, radiotherapy, nuclear medicine, laser medicine, anesthesia and surgical. Actually, quality medical equipments need sufficient skilled personal that provide hygienic care facilitates correct diagnosis followed by proper remedy processes. So, medical equipment maintenance in hospital by international standards as well as their proper function by trained personnel could result in their efficiency increase process and decrease. So, hospitalization time for patients.

Furthermore, hospital function improves, medical equipments work lifecycle increase and costs will decrease. So, health care is increasingly affected by medical instruments and equipments and negligence in their proper use will lead to error in their application, medical equipments improper output and result could be severely dangerous and even result in patient's death. Therefore, beside skilled man power, used power quality has effects on medical equipments system input and output. (Ghosh, A. et al, 2012).

Items like current and voltage fluctuations and harmony of input electrical current have effects on medical equipments. In addition to input power quality, disorder in equipment's system circuits is another challenge effecting used power quality, thus, power quality term includes a wide range of system disorders that cause lack of normal power current in medical equipments, (Bert 1997).

In a wide sense, used power quality would be questioned by any change in current frequency or voltage and in hospital medical equipments; this could cause weak disorders, loss of important data, and real damage for equipments and even life threat for patient. Therefore, to meet diagnosis needs, medical engineering faces serious challenges for supplying used power quality since it will be difficult to meet these conditions by

sophisticating circuits and increase of demands for small and portable medical equipments.

So, considering developments of medical equipments designing, there is a need for developing and applying special and effective standards for increasing as high as possible such instruments result and output confidence coefficient. For example, function and output of medical equipments including crystallography by X-ray electrical energy supply or even other medical equipments placed in the circuit in case of which there will be serious consequences for patient. Since used in special sectors in some equipments like heart monitoring, ventilator & plus oxymetry this has more severe effects on the patient and could even result in death. So (it's very important to) follow special standards in production and maintenance processes of medical equipments, (Moreno-Muñoz et al, 2006).

## CURRENT STANDARDS IN MEDICAL EQUIPMENTS

Although there are many standards for different electrical instruments or their installation, because of the sensitivity of the instruments used in hygienic-remedy sectors, special standards have been developed, for them such as NEC70 (National Electric Code) or NFPA70 which is the final reference in USA and provides important and crucial guide lines for remedy centers' engineers. This standard is revised on a 3-year basis. However it should be noted that considering increasing intricacy of electronically-digital circuits and the importance of precise output and function of medical equipments as diagnosis and remedy tools for human life and that there is a great demand for increase of confidence coefficient of such equipments, 3-year basis doesn't seem proper for revising and reviewing standards.

Other standards for such equipments, among others, are IEC 60601 and ISO 14971 standards which control production process of these equipments. International Electro technical Commission (IEC) develops related standards for providing safety and function of medical equipments including computer and electronically circuits.

IEC 60601 is the most well-known standards which was developed in 1977 with the aim of providing in production process by detecting and eliminating any electrical disorder in medical equipments including current drop and devising Ert connection in medical equipments. IEC 60601 doesn't test equipments and systems after they are in-use but its developed aiming at decreasing such deficiencies in equipment system designing in predefined standards condition. Therefore, periodic test to of medical equipments is very important. Considering development of medical equipments, recent IEC 62353 in 2007 concerns the crucial role of such standards in

guaranteeing medical equipment function and facilitates more effective and safe application of such equipments. On the other hand, IEC 60364 standards includes medical equipment installation in the buildings.

So, hospital power requirements include:

1. Safety and emergency power.
2. Safe power with stable & continuous voltage.
3. Stabilizer for compensating low fluctuation of power voltage aiming at providing stable voltage and electrical perfection by electromechanical mechanism.
4. Providing sufficient power and arranging condenser bank to correct power coefficient by minimum application and 20% confidence level.
5. Main and subordinate standard power board by current and voltage indicator, opened for future expansion.
6. Standard distribution network proper for any medical equipments placed in the circuit.
7. Ground connection (Ert) for the main board. Furthermore, this should be arranged independently for high-consuming equipments like angiography near its power board. In addition, in different sections, considering soil resistance, well digged, and used load of medical equipment setting. Ert should be arranged. Ert connection not only protects patients and personnel electrically but eliminates noises too.
8. Centers by 20 kv service line or power post should have distinctively well.
9. Isolated transducer: transducers used for electrical safety increase and prevention of undesired frequencies & voltages transmission to sensitive equipments.

Normal power by 220v A.C voltage and 50h frequency needs filtration and quality increase. Different kinds of disorders are possible in general power network and power failure is one of disorders which is resulted from used load and network disorders and events. In order to prevent power failure, emergency and safety power enters the circuit without any stop and power failure of the sensitive equipments. Safety power could be provided by UPS whose application in supplying continuous power protects systems against network power disorders. While emergency power supplied by diesel generator replaces normal power by getting the generator into the circuit.

By use of diesel generator emergency power, user has an uncontrollable and fluctuating output result from frequency and voltage changes caused by entrance and exit of an emergency power consumer to the system. So, use of emergency power is one of the main causes of the sensitive medical equipments damages. Therefore,

it's recommended to use support equipments such as electronically stabilizers, double conversion, motorized dynamics and online double conversion UPS for sensitive and expensive medical equipments. It should be ensured that above mentioned medical equipments, have proper support equipments like UPS before connecting to emergency power system.

Generally disorders are classified as two class of voltage and harmony disorder discussed below:

\*Power Sag: voltage short-term decrease including up to 80% of the normal power network disorders. Voltage over drop is caused by increase of used load in the network such that causes lack of voltage receiving could result in system off.

\*Power Surge: instant increase for one to few hundredths second in few successive cycles that could be happened during used load reduction of the network. It's caused by direct and indirect effects of magnetic fields. Power surge in long term could result in medical instruments and system impairment.

\*Under Voltage: is voltage reduction in long term. Voltage reduction causes current incensement in the system one minute causes serious consequences on system function.

\*Over Voltage: is voltage incensement for more than one minute that causes power incensement of condenser banks output. This could happened during thunderbolt and thunder and could cause system fire.

\*Harmonic Distortion: are voltage periodic and sinusoid fluctuations which eliminate sinus mode of voltage. These distortion cause input current fluctuation incensement and hence system parts and instrument impairment during heating up.

In addition to above mentioned issues, power quality is affected by:

\*Frequency Variation: is frequency change of the electromagnetic current input to the system. This could happen by use of generator for feeding instruments. Frequency fluctuation cause voltage instant changes and decrease system precision and affects its function.

\*Switching Transients: are instant and unwanted changes of frequency beyond defined range happened while application of semi-conductive elements by transistor feature the system.

\*Electrical Line Noise: accidental and irregular voltage changes are called noise which is made by interference of system electromagnetic surge with another electromagnetic field caused by distant power board or generator application.

Therefore, issues like voltage fluctuations or instant or permanent current because serious problems in electrical-digital medical equipment function referred as total harmonic distortion (THD) resulted by all kinds of fluctuation in for example voltage or current.

Therefore THD is an index representing several disorders. So, it's very important to monitor THD especially in expensive and important hospital equipments like magnetic resonance imaging (MRI), nuclear magnetic resonance imaging (NMRI), ultra sound machine, computerized axial tomography or CT scan, laser surgery equipment, X-ray machines, Gamma and etc. Since beside input current, environment effects and internal circuits including IT and data support system, UPS, surge radiation systems and their controllers, system speed coordination systems and horizontal and vertical mover cranks in medical equipments could somehow cause voltage or current disorder and affect THD negatively. Depending on disorder kind in fluctuation, value increase or decrease, disorder time and safety design of medical equipment, electric or electronic damage could be instant or gradual that have different error risk. For example, power surge from an AC generator by its own haven't any significant effect on internal voltage or system current incensement whereas THD disorder and several disorders could cause serious and vital effects on output and application of the medical equipments. So, in addition to used power quality, installation place of medical equipments to avoid and control disorders as high as possible has effects on THD disorder and generally on medical equipment function. Actually, the current trend in competition for design and production of modern medical equipments is to arrange proper design and measures for controlling as high as possible disorders causing THD and proving safe and precise condition in use of system that could increase system confidence coefficient and improve standard and prevent errors caused by output or information delete. So, currently design of power system stabilizers (PSS) by total harmony control function is very important and there are continuous efforts to improve in-time diagnosis capability.

## CONCLUSION

Finally it could be concluded that voltage fluctuation and current distribution harmony disorder in elec-

tronically systems have many different sources. These sources by little efforts have co-synergy effect and they could be sensed by such synergy effect considering used power quality, placement conditions of medical equipment and system primary designing. However, health care standards improvement needs as high as possible safeguarding functional high confidence coefficient of the medical equipments. So it's emphasized to identify and control fluctuations considering system condition in a way they don't make any disorder in system output while there is no relevant and precise standard for designing such equipment considering their growing complexity. Unfortunately, many medical errors relate to medical equipment application which haven't proper response and output while in use and could cause false diagnosis, improper treatment and in case, patient death. Because of serious consequences, these are ignored in field research and there isn't any significant statistic about them. In other words, confidence coefficient incensement of standard function of medical equipments is highly demanded and could be more improved.

## REFERENCES

- Bert, R. (1997). Power quality issues and the effects on medical equipment. *Journal of clinical engineering*, 22(1), 35-40.
- Hartungi, R., & Jiang, L. (2010). Investigation of power quality in health care facility. *RE&PQJ*, 1(8),996-1004.
- Ghosh, A., & Ledwich, G. (2012). Power quality enhancement using custom power devices. Springer Science & Business Media.460p.
- Moreno-Muñoz, Antonio, and Juan J. González. "Power quality in clinical facilities." *Journal of medical systems* 30.2 (2006): 71-81.
- Ramos, M. C., & Tahan, C. M. (2009). An assessment of the electric power quality and electrical installation impacts on medical electrical equipment operations at health care facilities. *American Journal of Applied Sciences*, 6(4), 638-645.

## Illness perception and self-care behavior in patients with myocardial infarction

Leila Ahmadi Ghahnaviyeh<sup>1</sup>, Reza Bagherian<sup>2</sup>, Awat Feizi<sup>3</sup>, Atefeh Afshari<sup>4</sup> and Firoozeh Mostafavi Darani<sup>5\*</sup>

<sup>1</sup>PhD Candidate of Health Education and Health Promotion, Department of Public Health, School of Health, Isfahan University of Medical Sciences, Isfahan, Iran

<sup>2</sup>Ph.D in Health Psychology, Assistant Professor, Department of Psychiatry, School of Medicine, Isfahan University of Medical Sciences, Behavioral Sciences Research Center, Isfahan, Iran

<sup>3</sup>Associate Professor, Department of Statistics, School of Health, Isfahan University of Medical Sciences, Isfahan, Iran

<sup>4</sup>PhD Health Education and Health Promotion, Department of Public Health, School of Health, Isfahan University of Medical Sciences, Isfahan, Iran

<sup>5</sup>Associate Professor, Department of Health Education and Health Promotion, School of Health, Isfahan University of Medical Sciences, Isfahan, Iran

### ABSTRACT

Heart attack is currently one of the most common diseases in different communities. Promotion of self-care behaviors after a heart attack helps patients control their daily life better and enables them to handle their social functions, thereby promoting their quality of life. Having illness perception may help promote this process. The present study was conducted to determine the correlation between illness perception and self-care behaviors in patients with myocardial infarction (MI) in Isfahan, Iran. The present cross-sectional descriptive-analytical study was conducted with 90 patients with MI presenting to hospitals in Isfahan, Iran. Based on the inclusion and exclusion criteria, the study population was sampled through convenience sampling. The Illness Perception Questionnaire and Self-care Behavior Scale were used to survey patients with MI. The Chi-square test was used to analyze the relationships between the independent and dependent variables and to determine the factors contributing to self-care behaviors in patients with MI. The mean score of self-care was  $24.53 \pm 6.45$  in the patients, and 7.2% of them demonstrated good self-care behaviors. The majority of samples (64.9%) had a desirable level of illness perception. The best self-care behaviors were associated with taking medications as prescribed, compliance with a low-salt regimen and regular exercise. Chi-square test also indicated a statistically significant relationship between illness perception and self-care behaviors in patients with MI ( $P \leq 0.0001$ ). Designing an organized educational program to enhance the level of illness perception in patients with MI can be effective and useful in the promotion of self-care behaviors.

**KEY WORDS:** SELF-CARE BEHAVIORS, ILLNESS PERCEPTION, PATIENT, MYOCARDIAL INFARCTION (MI), HEALTH EDUCATION PROGRAM

### ARTICLE INFORMATION:

\*Corresponding Author: [mostafavi@hlth.mui.ac.ir](mailto:mostafavi@hlth.mui.ac.ir)

Received 27<sup>th</sup> April, 2017

Accepted after revision 21<sup>st</sup> July, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

Cardiovascular diseases, stroke, cancer and diabetes are now considered the main causes of mortality in the WHO Eastern Mediterranean Region (EMRO). If the health authorities fail to implement an action for improving cardiovascular health, 25% of healthy life years will be lost to cardiovascular diseases by 2020 (Lim et al, 2007). Approximately 17.3 million people died due to cardiovascular diseases in 2008, comprising 30% of the world's total mortality rate (7.3 million of whom died due to coronary artery disease and 6.2 million to myocardial infarction). Based on estimates, almost 23.6 million people will die due to cardiovascular diseases and stroke by 2030, These two factors are predicted to remain as the only causes of death (Lim et al, 2007). Cardiovascular diseases are currently the main cause of death in people aged over 35 in Iran ( Mirhaghian Nasehi 2002, Schreurs and Ridder 1997). This disease is responsible for 46% of the total mortality rate and 27.2% of lost life years (Mirhaghian and Nasehi 2002 ).

The mortality rate associated with cardiovascular diseases is 18 per 10,000. Mortality statistics in 18 provinces of the country show that 46% of the total mortality and 27.2% of lost life years are caused by cardiovascular diseases (Schreurs and Ridder 1997).. In the province of Isfahan, the prevalence of cardiovascular diseases in those aged 30-79 was 19.4%, 21.9% of which pertained to women and 16% to men (Riegel and Carlson 2002). Moreover, 35,273 people died due to cardiovascular diseases between 2005 and 2009, comprising the highest disease-related mortality rate. Of the 35,273 people who died during this period, 19,614 (55%) were male and 659 (44%) were 15 female (Ni et al., 1999).

Myocardial infarction (MI) is one of the most prevalent diseases in many different societies. The incidence of MI has increased significantly in recent years. In the US, almost 650,000 new cases of acute MI and 450,000 cases of MI present to medical centers every year (Rashidi, Ghiyas and Ramesht 2003), MI is the most common cause of death in people aged over 35 in Iran (Kazemi et al , 2010), Kazemi et al 2011). Damage to the heart caused by any disease affects the patient's mental health in addition to causing physical disabilities and symptoms, and MI is no exception. MI is the main complication of coronary diseases and is given special attention due to its high mortality rate, complications, psychological problems, and negative effects on the patients' quality of life (Alonso et al, 2004; Andreoli et al 2010 ; Sharifirad 2006).

The heart and the psyche have always been deeply intertwined. Many studies have demonstrated the importance of improving the quality of life in these patients, quickly returning them to their normal life, planning

for reducing their anxiety and stress and treating their symptoms of depression and have emphasized the role of healthcare authorities and policy-makers in accomplishing these objectives (Hosseini 2011).

Self-care behaviors should be learned to promote quality of life and daily activities, reduce depression and anger, and increase the patient's awareness (Gafvels et al, 2006). Improvement of self-care behaviors helps patients control their daily life better and enables them to handle their social functions, thereby promoting their quality of life. Compliance with self-care behaviors and skills is crucial for patients with chronic diseases because it enables them to affect their well-being, functional abilities and disease processes (Sadeghi et al., 2010).

Self-care in chronic diseases signifies disease control, accepting the therapy, maintaining a healthy lifestyle, controlling the effect of illness on daily functions, and emotional and social relationships. Patient's participation and responsibility is an important self-care principle. Given the significant impact of chronic diseases on patients' lives, self-care behaviors can be adopted to control many of the disease complications. In recent years, supportive treatments and training heart failure patients have increasingly been addressed with efforts more concentrated on the treatment adherence and self-care behaviors (Sadeghi et al., 2010). Artinian et al. identified self-care level as a measure for quality of life improvement in patients with a history of myocardial infarction (Mirhaghian et al 2002), Heart failure patients need education and support concerning the medication, medication order, diet, activities and understanding symptoms that show exacerbation of heart failure in order to take appropriate actions when symptoms emerge (Raygan et al , 2009). Patient's awareness of self-care plays an important role in promoting their quality of life (Sadeghi et al., 2010).

Illness perception can improve (Goulding et al , 2010), the quality of life and affect chronic diseases through improving self-care behaviors ( The reason is that patients can adjust themselves, cope with the disease and improve their quality of life while avoiding depression or anxiety if they accept their illness. Illness perception means an organized cognitive representation of the illness by the patient. According to the theory of Leventhal et al. (1998), patients adjust their behaviors and emotional reactions to a disease based on their perceptions of the nature, causes, consequences, controllability, curability and duration of the disease. Illness perception comprises information in five dimensions: identity (labels and symptoms of the disease such as the nature or perception of the fatigue and weakness triggers), cause (the cause or an individual's perception of the disease duration), timeline (whether the disease is acute, periodic or chronic), consequences and findings

of an illness expected by an individual in terms of control, economic, social, psychological and physical effects and the efficacy of treatment (Broadbent et al, 2006).

Results obtained from the studies of Okranurak et al. in Thailand indicated that patients with chronic diseases who comply better enjoy a better quality of life (Lim et al, 2007), Patient's non-compliance with medication is a significant concern in disease control and prevention of drug resistance (Sadeghi 2010). Bandura believes that illness perception provides a pivotal framework for investigating patients' beliefs and the way its components affect health behaviors (Bandura 1997). Numerous studies have so far been conducted on the effects of illness perception on changes in the lifestyle of cardiovascular patients, but its effects on an individual's perception of their skills and abilities to perform health behaviors successfully after a cardiovascular event has not been studied yet (Cher-rington et al, 2004). Given the different illness perceptions in different sociocultural conditions and that illness perception in patients with myocardial infraction in Iran and its effects on self-care behaviors have not been so far investigated, the present study sought to determine the relationship between illness perception and self-care behaviors in patients with myocardial infraction presenting to hospitals in Isfahan in 2015.

## MATERIALS AND METHODS

The present descriptive-analytical and cross-sectional study was conducted with a population of 90 patients with myocardial infraction sampled through convenience sampling in Isfahan hospitals. The inclusion criteria were having a history of a heart attack for at least once, being older than 30, literacy, informed consent to participate, while exclusion criteria were having other physical disorders such as acute kidney diseases and cancers. The data were collected between June and January 2015.

## RESEARCH TOOLS

In addition to a demographic questionnaire, the following questionnaires were used in this study to collect the data.

- A. The European Heart Failure Self-care Behavior Scale (EHFSBS) consists of items on the self-care in patients with myocardial infraction. Each item is rated based on a five point Likert scale ranging from 'completely agree' (1 point) to 'completely disagree' (5 points). The overall score of an individual, which ranges from 9 to 45, is obtained by summing the scores of items. A score of 9-18 indicates a good self-care, 19-27 shows average self-cares and 28-45 denotes poor self-cares. Lower scores therefore signal more appropri-

ate self-care. The questionnaire was validated using content validity as it was submitted to 12 faculty members of Iran University of Medical Sciences, Tehran University of Medical Sciences and Tarbiyat Modares University. The suggestions were collected and necessary modifications were made to finalize the questionnaire. Internal consistency was used to confirm the questionnaire reliability. For this purpose, the questionnaire was completed by 15 eligible heart failure patients and Cronbach's alpha was calculated as 0.52 (Ni et al, 1999).

- B. The Illness Perception Questionnaire (IPQ) consists of nine items designed for the assessment of emotional and cognitive representation of the disease (Alonso et al, 2004). The questionnaire items measure the consequences, timeline (duration), personal control, treatment control, identity (nature), concerns, knowledge of the disease, emotional response and causes. The first eight items are scored from 1 to 10 while item 9 is open-ended and examines the three main causes of the disease. Each subscale should be analyzed separately in the final analysis. The questionnaire's Cronbach's alpha was reported as 80% and the test-retest reliability coefficient of the items was reported as 42-75% with an interval of six weeks. The concurrent validity assessment of the instrument with the revised IPQ in patients with asthma, diabetes and renal diseases shows the correlation between the subscales as 32-63% (Andreoli et al, 2010).
- C. Bazaziyan et al examined the construct validity of this questionnaire in Iran through confirmatory factor analysis. The results obtained showed the good fit of the model with the data and also indicated that the questionnaire is fit for measuring the intended variable in a sample of patients. The Cronbach's alpha calculated for the study subjects was reported as 53%, indicating the favorable internal consistency of the questionnaire in the samples (Andreoli et al, 2010).

The data analyzed in SPSS 20 were classified and summarized using descriptive statistics. Inferential statistics (chi-square test) was used to examine the significance of correlation of individual/social factors and illness perception with self-care behaviors.

## RESULTS

The study population comprised 90 samples, including 63 (68.5%) males and 27 (29.3%) females, with a mean age of  $55.6 \pm 9.4$ . The majority of the subjects had

Table 1. Mean and standard deviation of the study subjects in terms of compliance with self-care behaviors

No	Response Behavior	Mean ± Standard Deviation
1	I weigh myself everyday	3.1±1.32
2	If my dyspnea exacerbates, I go to a doctor, nurse or health center	3.08±1.5
3	When edema in my feet is more than usual, I go to a doctor, nurse or a health center	2.8±1.54
4	I visit a doctor, a nurse or a health center if I gain more than 2 kg in one week	3.3±1.52
5	I restrict my fluid intake to maximum 4-6 glasses per day	3.3±1.49
6	If I feel exhausted, I present to a doctor	2.8±1.4
7	I comply with a low salt diet	1.97±1.28
8	I take my medication as prescribed	1.68±1.04
9	I exercise regularly	2.3±1.32

a high school diploma (35.9%). In terms of hospitalization frequency, 5.4% had no prior hospitalization, 25% were hospitalized once and 67.4% had a hospitalization history of more than once. The best self-care behaviors were found to be taking medicines as prescribed, compliance with a low-salt regimen and regular exercise with a mean of 1.68±1.04, 1.97±1.28 and 2.3±1.32 respectively, while overweight of more than two kg, fluid restriction and daily weighing with a mean of 3.3±1.52, 3.3±1.49 and 3.1±1.32 respectively were the worst self-care behaviors [Table 1].

The mean score of self-care was 24.53±6.45, and 79.7% of the subjects presented a moderate level of self-care behaviors, while only 7.2% displayed good self-care behaviors. Furthermore, no statistically significant correlations were observed between demographic variables and self-care behaviors.

Findings also suggested that the majority of patients (64.9%) had an acceptable level of illness perception. In

terms of the relationship of underlying and confounding variables with illness perception, the chi-square test indicated the significant statistical relationship of illness perception with education level ( $P \leq 0.000$ ) and occupation ( $P \leq 0.016$ ). It also revealed a significant relationship between illness perception and self-care behaviors ( $P \leq 0.0001$ ) [Table 2].

## DISCUSSION

The present study found that the majority of the subjects (64.9%) had a desirable level of illness perception. Findings obtained by Cherrington *et al.* from a study titled 'Illness perception after myocardial infarction and its impact on treatment' indicated a mean illness perception of 124.08 in patients with myocardial infarction. The mean score of the illness perception tool was high (132), showing higher perception of the cardiovascular disease. The cause of a desirable illness perception seems to have been associated with the number of hospitalizations and receiving training on self-care.

The present study did not find a significant relationship between age and illness perception or sex and illness perception. The males' scores in the illness control subscale were however higher than the females', which might be attributed to the general attitude of men in the Iranian society, seeing themselves active in many fields; more comprehensive studies should however be conducted in this regard. Aalto *et al.* studied the contribution of illness perception and its corresponding factors to coronary artery disease in patients, revealing higher illness perception in 45-65 year old patients, the difference was statistically not significant though (Aalto *et al.*, 2005). One's understanding of a condition might get deeper with age and experience.

The present study found 7.2% of patients with good self-care behaviors, while the majority revealed moderate levels of self-care behaviors. Many factors affect self-care behaviors, including the lack of information, physical limitations, incompatibility with multiple therapies, emotional problems and disbelief in the positive effect of behavior on the symptoms (Riegel and Carlson 2002). Taking medications as prescribed by the doctor was the best self-care behavior in this study, which may

Table 2. Distribution of self-care behaviors in the study subjects in terms of illness perception

Self-care behaviors	Illness perception	Good self-care	Moderate self-care	Total	Result and type of the test
		Frequency (%)	Frequency (%)	Frequency (%)	
desirable		12 (20.3)	46(79.7)	58(100)	X <sup>2</sup> =1.121 P≤0.0001
undesirable		2 (7.2)	30(92.8)	32(100)	

be justified by the patient's belief in the effectiveness of medications. Moreover, many patients might have considered missing medicines once or twice a week as unimportant and had chosen a better response to this question.

It should be noted that the data collected in this study were based on the patients' statements and it was not possible for the researcher to observe their behaviors; different outcomes might therefore arise as a result of deeper and long term investigation. Ni *et al.* conducted a study aiming to investigate factors affecting knowledge and dependence on self-care behaviors in heart failure patients, and reported that 74% of the patients take their medications on time and as prescribed Artinian also investigated self-care behaviors in heart failure patients, reporting that patients most often comply with this behavior (Artinian *et al.*, 2002).

Our study revealed good self-care behaviors in patients with a high school diploma and higher, the difference was not statistically significant, though. Shojaei also found more appropriate self-care behaviors in those with high school diploma and higher education than in other groups. Abootalebi *et al.*, 2012 also observed significantly higher self-care ability in the study subjects as their education level (Abootalebi, Vosooghi *et al.* 2012).

Akyol attributes the effectiveness of higher education levels on people's self-care ability to providing better occupation opportunities and more income (Akyol *et al.*, 2007). This can be caused by the fact that patients with higher education are more capable of judging and making decisions for self-care behaviors.

In addition, the present study found higher levels of illness perception in patients with a history of receiving self-care training (30.32%) than those with no history of training for self-care behaviors. Cooper *et al.* found that patients with myocardial infarction who had participated in the educational program designed by the rehabilitation nurses in Auckland Hospital to improve the cardiovascular disease perception had a higher level of perception than that upon admission ( $P=0.05$ ) (Cooper *et al.*, 1999). The educational program and patient follow-up by the rehabilitation and health centers seem to affect the significance of the relationship between illness perception level of patients with myocardial infarction and the history of self-care training.

Finally, given few patients showed good self-care behaviors, it is suggested that the factors affecting self-care behaviors be investigated more deeply and effective measures be taken to control them. The initial perception of patients formed after diagnosis of cardiovascular diseases may make them more aware of their cardiovascular condition. A deeper insight and awareness may therefore cause them to reinforce self-care behaviors to adapt better to their situation in long term.

## CONCLUSION

Findings obtained from the present study therefore recommend considering training programs to enhance illness perception especially in patients hospitalized for the first time. In this regard, teaching patients the importance and the way of performing and promoting self-care behaviors and as a result, reducing the mortality and hospital costs are issues that should be addressed by healthcare authorities.

There is no conflict of authors.

## ACKNOWLEDGEMENTS

This study has been financially supported by the Vice Chancellor of Isfahan University of Medical Sciences with the project number (reference:394340.15/6/2015 ). Hereby, the authors would like to express their gratitude to all those who participated in the study, especially the personnel of Chamran, Al-Zahra, Khorshid and Shariati hospitals, as well as the study participants.

## REFERENCES

- Aalto AM, Heijmans M, Weinman J, Aro AR, (2005) Illness perceptions in coronary heart disease Sociodemographic, illness-related and psychosocial correlates. *Journal of psychosomatic Research*. Vol 58, issue 5, pg 393-402.
- Abootalebi GH, vosooghi N, Mohammadnejad E, Namadi M, Akbari M, (2012), Study of the self-care agency in patient with heart failure. *Iraninan Journal of Critical Care Nursing*. Vol 4, issue 4, pg 203-208.
- Akyol AD, Cetinkaya Y, Bakan G, Yarah S, Akkus S, (2007), Self-care agency and factors related to this agency among patient with hypertension. *Journal of Clinical Nursing*. Vol 16, issue 4, pg 679-687.
- Alonso J, Ferrer M, Gandek B, Ware Jr JE, Aaronson NK, Mosconi P. *et al.*, (2004), Health-related quality of life associated with chronic conditions in eight countries: results from the International Quality of Life Assessment (IQOLA) Project. *Journal of Quality of life research*. Vol 13 issue2 pg 283-298.
- Andreoli TE, Benjamin I, Griggs RC, Wing EJ, Fitz JG (2010), Andreoli and Carpenter's Cecil essentials of medicine: *Journal of Health Sciences*. pg 251-257.
- Artinian NT, Mgnan M, Sloan M, Lange P, Michigan D, (2002), Self-care behaviors among patient with heart failure. *Heart and Lung*. The *Journal of Critical Care*. Vol 31, pg 161-72.
- Bandura A, (1997), *Self-efficacy-The Exersice of Control*. San-francisco: W.H.Freeman Co.
- Broadbent E, Petrie K.J, Main J and Weinman J, (2006), The Brief Illness Perception Questionnaire. *Journal of Psychosomatic Research*. Vol60, pg631-637.
- Cherrington C, Moser D, Lennie T, Kennedy C, (2004), Illness Representation After Acute Myocardial Infarction: Impact

- On in-Hospital Recovery. *Journal of Advanced Research*. Vol13,issue 2,pg 136-145.
- Cooper A, Lio G, Weinman J, Jakson G, (1999), Why patient do not attend cardiac rehabilitation: role of intentions and illness beliefs. *Journal of Heart*. Vol 82, pg 234-236.
- Gafvels C, Wandell PE ,( 2006), Coping strategies in men and women with type 2 diabetes in Swedish Primary Care. *Journal of Diabetes Research and Clinical Practice*.Vol7<sup>1</sup>, pg 280-289.
- Goulding L, Furze G, Birks Y ( 2010) Randomized controlled trials of interventions to change maladaptive illness beliefs in people with coronary heart disease: systematic review. *Journal of Advanced Nursing*. Vol 66, issue 5 pg 946- 61.
- Hosseini S, Rezaei A, Keikhosravi Beikzadeh Z,( 2011), Social Support and Olders. *Journal of Women Social*.Vol2 issue 4, pg 143-62.
- Kazemi T, Sharifzadeh G,( 2010), Changs in risk factors, Medical care andrate of acute myocardial infeactions in Birjand (1994-2003). *Journal of Arya Atheroscler*.pg1-4.
- Kazemi T, Sharifzadeh GR, Zarban A, Fesharakinia A, Rezvani MR, Moezy SA,( 2011), Risk factors for premature myocardial infarction: a matched case-control study. *Journal of Research in Health Sciences*.Vol11 issue 2 pg77-82.
- Lim SS, Gaziano TA, Gakidou E, Reddy KS, Farzadfar F, Lozano R, et al, (2007), Prevention of cardiovascular disease in high-risk individuals in low-income and middle-income countries: health effects and costs. *The Lancet*.Vol370,issue 9604,pg 20-54.
- Mirhaghian L, Nasehi M, (2002), National Tuberculosis Program in Iran, Ministry of HealthTehran. *Journal of Health Science*. Vol 2 pg15-20.
- Ni H, Nauman P, Burgess D, Wise K, Cris Pell K, Hershberger RE,( 1999), Factors influencing knowledge of and adherence to self-care among patient with heart failure. *Journal of Archives of Internal Medicine*.Vol15,vissue9, pg1613-19.
- Rashidi M,Ghiyas M,Ramesht M,( 2003), Geographical epidemiology, mortality from cardiovascular disease in Isfahan. *Journal of Research in Health Science*.Vol13, issue2, pg 27-33.
- Raygan F, Khorasanifar H, Momen Heravi M, Arj A, Akbari H,( 2009), The association between acute myocardial infarction and anti helicobacter pylori antibody. *Zahedan Journal of Research in Medical Sciences*.Vol11, issue2, pg6-22.
- Riegel B. Carlson B, (2002), Facilitators and barriers to heart failure self-care. *Patient Education and Counseling*. *Journal of psychosomatic Research*. Vol46, pg287-295.
- Sadeghi M.Roohafza H. Aghdak P,Kelishadi R ( 2010) Prevalence of risk factors for cardiovascular disease in women of central Iran. *Isfahan Healthy Heart Program*. *Isfahan Cardiovascular Research Center*. *Journal of ARYA Atheroscler* pg1-4.
- Schreurs KM, Ridder DT(1997) Integration of coping and social support perspectives: implications for the study of adaptation to chronic diseases. *Journal of Clinical Psychology Research*. Vol17, pg 89-112.
- Sharifirad Ghr. Mohebbi S. Matlabi M. (2006)The relationship of physical activity in middle age and cardiovascular problems in old age in retired people in Isfahan. *Journal of Research in Health Science* .Vol 13 issue 2 pg 57-63.

## Evaluation of correlation between lower jaw and lip rate of paresthesia and inferior alveolar canal diameter changes after mandibular fracture

Anis Moradi<sup>1\*</sup> and Seyed Mehdi Hosseini<sup>2</sup>

<sup>1</sup>Department of Oral and Maxillofacial Radiology, School of Dentistry, Shiraz University of Medical Sciences, Shiraz, IR Iran

<sup>2</sup>Department of Oral and Maxillofacial Surgery, School of Dentistry, Shiraz University of Medical Sciences, Shiraz, IR Iran

### ABSTRACT

The objective of the study was to investigate the relationship between lip the rate of paresthesia in the lower jaw region and inferior alveolar canal diameter changes after mandibular body and angle fracture. In this cross-sectional study, 31 patients with maxillofacial injuries in the angle and body of the mandible, who underwent open fixation under general anesthesia were included. Thorough clinical (by two-point discrimination) and radiographic examination using cone beam computed tomography (CBCT) was performed for each patient. All patients had paresthesia in the lower jaw and lip before and one week after the operation, however, 6 months later, 18 patients had recovered normal sensation. Statistical analysis revealed that no significant association exists between paresthesia of the lower jaw and lip and mandibular canal's diameter change in CBCT scan. Based on the findings of the present study, there was no significant relationship between lower lip and jaw paresthesia and inferior alveolar nerve canal diameter.

### INTRODUCTION

About one third of injured patients suffered from face and jaw injuries (Mohajerani, Ebrahimzade safar, 2005). Amongst all face and jaw fractures, mandible fractures are the most common (Khodayari Namin 2003; Campbell et al, 1987). Therefore, treatment of these traumatic injuries are of considerable importance (Hendler 1998).

Amongst lower jaw fractures, about 18 to 30 percent belong to body and angel parts (Ellis et al,1985; Cabrini Gabrielli et al, 2003). Thus, mandibular body and angle fracture accounted for a large proportion of the lower jaw fractures.

On the other hand, mandibular body and angle parts contain mandibular canal where the inferior alveolar nerve routes. Trauma to these parts can cause nerve canal

#### ARTICLE INFORMATION:

\*Corresponding Author: [dranismoradi@gmail.com](mailto:dranismoradi@gmail.com)

Received 27<sup>th</sup> April, 2017

Accepted after revision 21<sup>st</sup> July, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal  
NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

and sensational disorder injuries in sensational area of these nerves. Various procedures can lead to mandibular canal injuries and morphological changes including removal of mandibular third molar, placement of dental implant, orthognathic surgery and mandibular angle and body trauma (Mran, Jacobs et al, 2003, Gassner et al, 2004). Thus, recognition of mandibular canal morphology and anatomy not only can prevent such injuries, but also in case of injury helps to correct them.

After mandibular trauma and subsequent mandibular canal injury, some sensational disturbance in lower jaw, lower lip and alveolar parts were observed. Paresthesia and other sensational disturbances can affect patient's physical and mental performance. In order to evaluate the disorder in lower jaw and lip, following inferior alveolar nerve injury, there are various methods, thus the most one includes two-point discrimination test (Schultze-Mosgau et al, 1999, Van Sickels et al, 1989) and thermal test (Blanas et al, 2004, Alpert et al, 2009).

Mandibular fractures are managed through either open or closed technique. The open approach involves extra oral and intra oral openings to access the fractured region which is then fixed with screw and plate. In the closed approach, with no opening, the fractured parts are drawn together as close as possible and held in the appropriate position. Adopting each of these techniques depends on the fracture region and the degree of dislocation. For instance, fracture within the mandibular body and angle ramus requires open treatment (Chrcanovic, 2013, Smith 2013).

In each of these treatment methods, the trauma-induced paresthesia might recover partly or remain permanently. As mentioned, the sensory problems widely influence the patients' lives (Al-Bishri 2004). Thus, recognizing the causes of sensory changes can help planning a more appropriate treatment through which the changes are reduced and the patient's life is positively affected.

Our hypothesis is that post-trauma and post-operative diameter of submandibular canal seems to be related with nerve performance status that decrease diameter of submandibular canal following fracture and decrease the paresthesia of lower lip and jaw than pre-operative.

Due to lack of research in this field, the present study aims to evaluate the diameter of mandibular canal change post-trauma and post-treatment after mandibular body and angle fractures, In order to assess the possible relationship between the rate of lower jaw and lip paresthesia and inferior alveolar canal diameter changes.

## MATERIALS AND METHODS

This study was approved by the ethical board of Shiraz University of Medical Sciences. In this analytical cross-sectional study was carried out in Shahid Rajaei

Hospital, Shiraz, for 24 months (October 2013-2015). We enrolled 31 patients suffering from maxillofacial injuries in the angle and body of the mandible, who underwent open treatment and fixation under general anesthesia.

To be included in the study, the following criteria were to be met:

- Fracture in the mandible between the ramus (the region behind the wisdom tooth and the vertical part of the mandible) and the mental foramen (where the inferior alveolar nerve travels through the canal).
- No history of trauma or injury to the inferior alveolar nerve.
- Reaching the fracture line through intraoral opening.
- Use of the arch bar (from the first molar to the first molar the front side) during surgery and open the arch bar after 8 weeks.
- Use the inter-maxillary fixation for patients for 2 weeks after surgery.
- 6-month follow-up possibility.
- The patient's physical and physiological ability to undertake coronal, sagittal, and axial CBCT scans for three times (before, right after, and 6-months after the surgery).
- The patient's physical and mental capability of evaluating the paresthesia and sensory changes of the lower lip and chin in two-point discrimination test.
- Having referred to the hospital from 2013 to 2015, and being operated in less than a week after the trauma.

Lack of above-mentioned conditions would have excluded the individual from the study.

Out of 65 patients with mandibular fracture, only 40 participants had isolated fracture in the mandible body or angle, 31 of which met the whole inclusion criteria and were enrolled in the study. The open fixation was performed on all patients by the same surgeon through intraoral opening under anesthesia and low blood pressure.

Having placed the teeth in the appropriate occlusion, each fracture region was mono-cortically fixed by using a four-hole mini-plate and screws of 1.8×7mm. The arch bar was inserted from the first molar to the next molar, and the teeth were tied together for inter-maxillary fixation (IMF). The appliances were removed after 8 weeks.

Each patient was subjected to both radiographic and clinical evaluation. In order to radiographically assess the size of canal diameter changes, coronal, axial, and sagittal CBCT scans were taken before, a week, and six months after the surgery. They were all taken by a single technician with the same device and similar calibration.

The obtained images were analyzed by Planmeca Romexis®3200 software which could reconstruct the shape of mandibular canal. The inferior alveolar canal diameter size was measured on three points including the fracture line, 1cm proximal and 1cm distal to the fracture line.

Moreover, the thickness of canal was measured on the three mentioned points. The obtained data was evaluated by using ANOVA with repeated measure to determine the changing of dimensions in over time.

Clinical evaluation carried out through two-point discrimination test. In this test, the patient should discern two nearby stimulators applied on skin. Since the distance between these two stimulators determines the normality or abnormality of the results, the two stimulators were less than 2mm distant at the beginning. The distance was increased gradually until the patient could distinguish the two points.

So, the distance between the two points was increased up to 10mm and decreased again until the patient could discern them as a single point. The average point, where the patient could distinguish the two distinct point was considered as sensitivity point, and was compared with the opposite side. This evaluation was done before, one week and 6 months after the surgery.

Furthermore, the patients were asked to wash their hands and touch the lower lip, labial vestibules, and the gingiva in that region with thumb and fore finger; and compare its sensitivity with the opposite side.

According to the results of the above-mentioned objective and subjective examinations, the patients were categorized in subgroups of sensory disturbance, and no sensory disturbance. Correlation coefficient was employed to determine the extent to which paresthesia of lower lip and chin was related to the diameter changes of mandibular canal.

## RESULTS

This study was conducted on 31 patients including 18 men and 13 women. All patients had sensory disturbance in the lower jaw and lip before and one week after the operation. However, 6 months later, 18 patients had recovered normal sensation. Paresthesia in the lower lip and chin was still present in 13 patients. Diameter of mandibular canal in fracture line in 1 week after surgery shows slight differences but a week after surgery to sixth month after surgery decrease so that after six-month significant decrease were observed ( $P < 0.001$ ). Mandibular canal diameter in 1cm proximal part and 1cm distal parts of fracture line showed similar changes. These changes and their precise size showed in following table and charts.

In order to study dimension change performance over time, multiple sample repeated measure variance analysis tests was used. According to above mentioned table, mean diameter of canal in three time intervals compared by post hoc bon-ferroni and one sample repeated measure variance analysis statistics. In inner group comparisons, one sample repeated measure variance analysis test was used.

As seen from diagram1, pre-operation dimension average shows highest average in all three time intervals (average and standard deviation  $3.72 \pm 0.65$ ) and finally, 6-month post-operation the dimensions reach minimum level (average and standard deviation  $3.39 \pm 0.73$ ). However, the same common aspects of all intervals in these dimensions in 3-time span declines and statistical differences of all dimensions were meaningful. ( $p < 0.05$ )

Thus, over times, canal's length decreased significantly following nerve remedy.

Assessment of relationship between the paresthesia of lower jaw and lip to mandibular canal's diameter size change amount in CBCT-Scan using spearman rho correlational coefficient showed that there isn't significant.

Diameter of mandibular canal in...	Time	Average+/- standard deviation	p-value
Proximal of fracture line	Pre-operation	$3.94 \pm 0.68$	<0.001
	A week post operation	$3.84 \pm 0.67$	
	6monthpost operation	$3.57 \pm 0.77$	
Fracture line	Pre-operation	$3.70 \pm 0.66$	<0.001
	A week post-operation	$3.62 \pm 0.64$	
	6monthpost-operation	$3.46 \pm 0.74$	
Distal of fracture line	Pre-operation	$3.51 \pm 0.64$	<0.001
	A week post-operation	$3.41 \pm 0.64$	
	6monthpost-operation	$3.14 \pm 0.74$	
Total	Pre-operation	$3.72 \pm 0.65$	<0.001
	A week post-operation	$3.62 \pm 0.64$	
	6monthpost-operation	$3.39 \pm 0.73$	

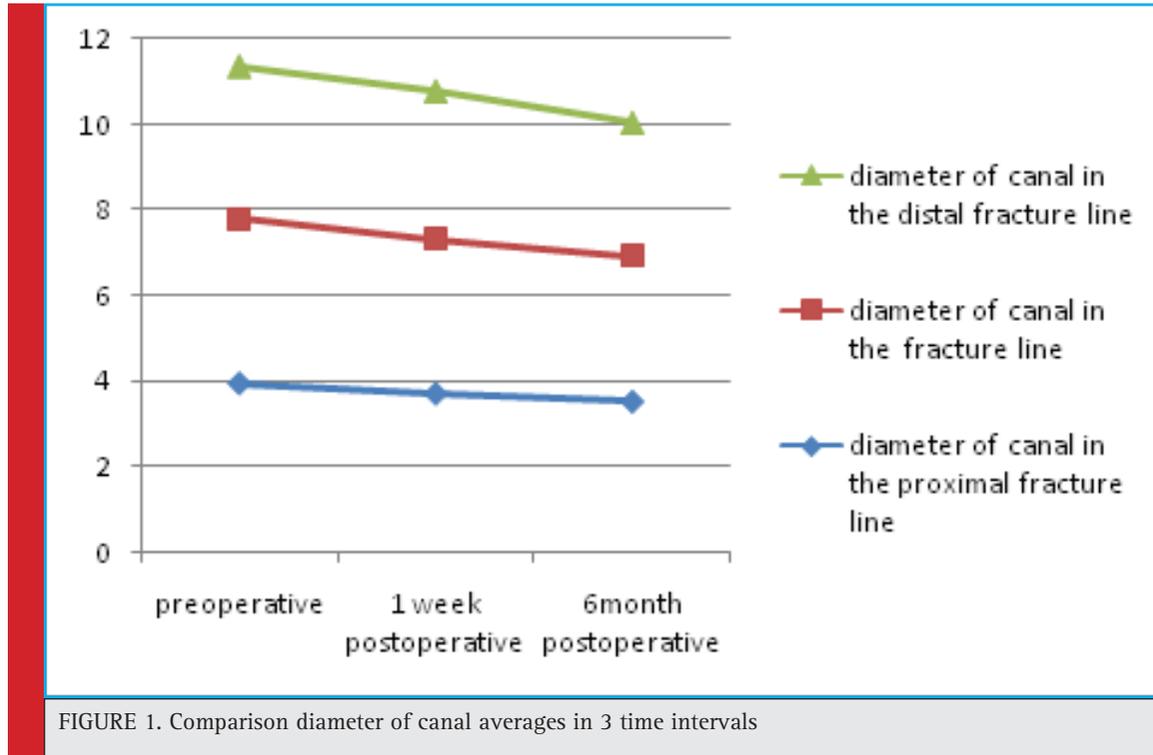


FIGURE 1. Comparison diameter of canal averages in 3 time intervals

Spearman rho correlation coefficient between lower jaw and lower lip paresthesia and mandibular canal diameter size change amount in total case study is  $-0/159$ (rvalue) and spearman correlations; test meaningful level is

$0/391$ (pvalue). Then, there isn't significant relationship between lower jaw fracture and lower lip paresthesia 6-month post-operation in whole sample ( $p>0.05$ ). Correlational coefficient results are as follow. (Table, 2).

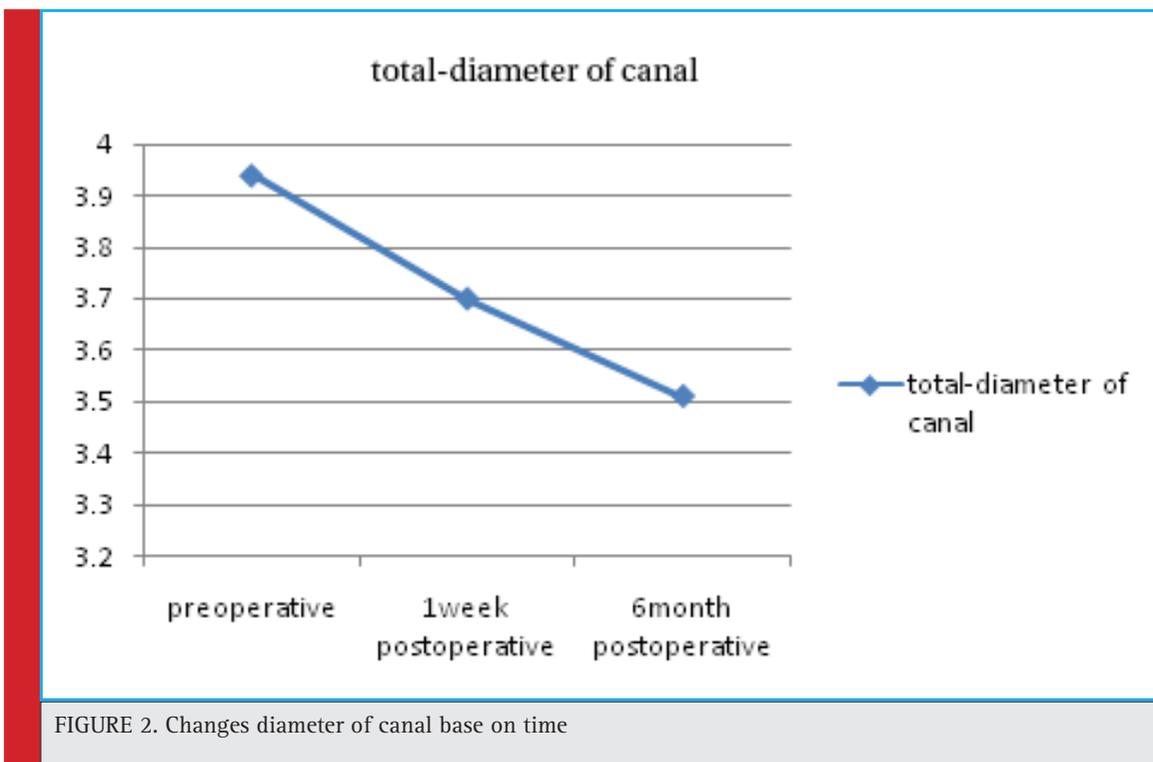


FIGURE 2. Changes diameter of canal base on time

Table 2. Result of the Correlational coefficient.

Correlations					
G			Diameter of canal- total	paresthesia	
Pre-operative	Spearman's rho	Diameter of canal- total	Correlation Coefficient	1.000	0
			Sig.(2-tailed)	0	0
			N	31	31
		Paresthesia	Correlation Coefficient	0	0
			Sig.(2-tailed)	0	0
			N	31	31
1 week post-operative	Spearman's rho	Diameter of canal- total	Correlation Coefficient	1.000	0
			Sig.(2-tailed)	0	0
			N	31	31
		Paresthesia	Correlation Coefficient	0	0
			Sig.(2-tailed)	0	0
			N	31	31
6 month post-operative	Spearman's rho	Diameter of canal- total	Correlation Coefficient	1.000	-.159
			Sig.(2-tailed)	0	./391
			N	31	31
		Paresthesia	Correlation Coefficient	-.159	1.000
			Sig.(2-tailed)	./391	0
			N	31	31

## DISCUSSION

In this study, the relationship between lower jaw and lip, the rate of paresthesia and canal diameter change after mandibular body and angle fracture investigated. It seems that there is more change in mandibular canal diameter, paresthesia increase too but from a statistical perspective such difference is not significant. In order to evaluate patients' post-operation paresthesia, it might use subjective and objective methods. In some studies, it was suggested that patient's self-assessment is the main criteria (Al-Bishri et al, 2004).

Chen & Blomqvist reported good agreement between subjective method and two-point discrimination of common clinical tests (Blomqvist et al, 1998; Chen et al, 1999). In our study both methods have been used. For subjective evaluation patients completed a question for clinical trials, two-point discrimination test was performed on patients. The subjective reports of the pain levels matched our objective results of two-point discrimination test. Clinical evaluations were done to ensure paresthesia of lower lip and chin. Radiological evaluations were carried out to check the canal diameter changes before, one week, and six months after the surgery.

All patients with fractures suffer from lower jaw and lower lip paresthesia during operation, pre-operation

and 1-week post-operation. However, in the following 6 months, 58% of patients recovered lower jaw and lower lip sensation significantly. In this group, lower canal diameter was lower than those with paresthesia pain. Thus, it seems that post-operation, mandibular canal diameter changed compare with pre-operation condition. This change might be a reaction to the environmental stress. The less canal diameter changes, the fewer low jaw and lower lip paresthesia.

Neural fibers are injured due to factors such as: strain, compression, edema or hypoxia in accidents or during operation (Becelli et al, 2004).

It seems that the greater the changes in canal shape after injury, the more likely it is to see an increase in paresthesia (Seckel, 1990). Thus, it is highly advised that mandibular canal shape and the status of lower jaw pre-operation are given specific attention to decrease the possibility of problems.

Abradovic et al reported that mandible canal diameter average in horizontal part is 2.6mm (Uchida et al, 2007; Obradovic 1993). Haghane et al reported 3.8 mm mandibular canal width average (Haghani et al, 2010). However, in our study, 6-month post-operation, the average canal diameter post- fracture treatment is 3.4 mm. which didn't show a significant difference with normal limit reported in previous studies. these numerical differences in normal anatomy are interpreted results of fac-

tors such as racial and age differences among patients, magnification of radiographic image different magnitude and measurement errors in current this research. Zagrofas et al suggested that there is no relationship between gender and canal types, but in our research the gender variable was never considered (Zografos et al, 1990). In our country, some researchers like Shaban et al reported that lower lip sensational temporary changes following Bilateral Sagittal Split Osteotomy (BSSO) over times, post-operation paresthesia decreased (Shaban et al, 2011).

As evident in our study, through times, paresthesia cases percentage decrease over times due to neural auto remedy. In Shultz study, most lower alveolar neural improvement occurs in 6 to 12 months post-operation (Becelli et al, 2002). However, according to Becelli of view, highest lower alveolar nerve automatic recovery rate occurred 6 most post-operations (Becelli et al, 2002), these differences in various studies might cause by various reasons like patient age, lower jaw movement rate, and neural intervention rate during operation (Schultze-Mosgau et al, 2001). Alsiabi in 2014 studied the patients with orthogenetic problems and found that the location of mandibular canal changed after 6 months, presumably as a response to physiological changes and environmental stresses (Alsibai et al, 2014).

Although that study revealed critical information on the response of mandibular canal to environmental stresses, it was focused on controlled stresses of bilateral sagittal split osteotomy surgeries (BSSO). Lower lip paresthesia is the most significant post BSSO operation findings. Most injuries to lower jaw alveolar nerve occurred following Neuro-apraxia BSSO. It can be inferred that trauma, as an environmental stress, can cause diameter changes in the mandibular canal, followed by neurosensory disturbances (Borstlap et al, 2004).

Trauma and fracture are two types of stresses; nonetheless, they differ greatly from the BSSO-induced stress in terms of degree and variety. The question here is how to evaluate the degree of trauma-induced stress. Several scholars have dedicated research to this issue.

Atta *et al.* reported less nerve damage in minor dislocation of the fracture line compared to severe dislocations (Atta et al, 2012). However, that could result in sensory disturbance in their qualitative assessment. Hence, it could not offer a precise degree for the dislocation. Finally, in 2014, Lone announced that sensory disturbances occurred in dislocations higher than 4mm (Lone et al, 2014).

However, in none of these researches, canal diameter measurement carried out in fractures of lower alveolar canal. In current study, by study of mandibular canal diameter change amount its relationship with inferior alveolar nerve paresthesia assess succinctly due to the fact that this issue never addressed in previous stud-

ies, this is the first research about pre- fracture and post- fracture canal diameter changes so that increase current research survey value in study of mandibular canal diameter changes. So that understanding canal changes and differences and other varieties in its shapes in order to prevent damage to inferior alveolar nerve during operation and using proper methods are significant, there is no relationship between lower jaw and lip paresthesia with mandibular canal diameter size change rate. It seems that the more pre-fracture and post-fracture canal diameter change, the more paresthesia occur but this relationship is not significant statistically.

Due to short time period of study, the patients were limited although the patient numbers are consistence with other research. It is suggested that further study will be carried out with larger sample size. The present research aims to study 6 months' post-operation paresthesia. As in some other researches, paresthesia is evaluated throughout years. Therefore, it is suggested that further research must be done in 1 year. Furthermore, other dimensions such as canal length change during trauma can be further studied.

## CONCLUSION

Based on the findings of the present study, there was no significant relationship between lower lip and jaw paresthesia and inferior alveolar nerve canal diameter. Further research is needed with greater sample size to precisely study this subject.

## REFERENCES

- Alsibai A, Shawky M, Elghareeb T. Position of mandibular canal and ramus morphology before and after sagittal split ramus osteotomy. *J of oral & maxillofacial surgery*. 2014; 5(2): 45-50.
- Atta R, Rbia N, Tariq A, Qiam D. Post traumatic inferior alveolar nerve impairment and recovery pattern in mandibular fracture. *JKCD*. 2012; 4(2):29-33.
- Alpert B, Tiwana PS, Kushner GM: Management of comminuted fractures of the mandible. *Oral Maxillofac Surg Clin North Am* 21(2): 185e192, 2009
- Al-Bishri A, Dahlbery G, Barghash Z, Rosenquist J, Sunzel B. Incidence of neurosensory disturbance after sagittal split osteotomy alone or combined with genioplasty. *Br J oral maxillofac surg* 2004; 42 (2):10 5-11.
- Becelli R, Renzi G, Carboni A, Cerulli G, Gasparini G. Inferior alveolar nerve impairment after mandibular sagittal split osteotomy: An analysis of spontaneous recovery patterns observed in 60 patients. *J craniofac Surg* 2002; 13(2):315-20.
- Becelli R, Fini G, Renzi G, Giovannetti F, Roefaro E: Complications of bicortical screw fixation observed in 482 mandibular sagittal osteotomies. *J Craniofac Surg* 15:64e68, 2004.

- Blanas N, Kienle F, Sandor GK. Inferior alveolar nerve injury caused by thermoplastic gutta-percha overextension. *J Can Dent Assoc* 2004; 70(6): 384-7.
- Blomqvist JE, Alberius P, Isaksson S. Sensibility following sagittal split osteotomy in the mandible: A prospective clinical study. *Plast Reconstr Surg* 1998; 102(2):325-33.
- Borstlap WA, Stoelinga PJ, Hoppenreijts TJ, van't Hof MA: Stabilisation of sagittal split advancement osteotomies with miniplates: a prospective, multicentre study with two-year follow-up. Part I. Clinical parameters. *Int J Oral Maxillofac Surg* 33: 433e441, 2004
- Cabrini Gabrielli MA, Real Gabrielli MF, Marcantonio E, Hochuli-Vieira E. Fixation of mandibular fractures with 2.0-mm miniplates: review of 191 cases. *J Oral Maxillofac Surg* 2003; 61(4): 430-
- Campbell RL, Shamaskin RG, Harkins SW Assessment of recovery from injury to inferior alveolar and mental nerves *Oral Surg Oral Med Oral Pathol* 1987; 64(5): 519-26.
- Chrcanovic BR: Open versus closed reduction: comminuted mandibular fractures. *Oral Maxillofac Surg* 17(2): 95e104, 2013
- Chen N, Neal CE, Lingenbrink P, Bloomquist D, Kiyak HA. Neurosensory changes following orthognathic surgery. *Int J Adult orthodon Orthognath Surg* 1999; 14(4):259-67.
- Ellis E, Moos KF, el-Attar A. Ten years of mandibular fractures: an analysis of 2,137 cases. *Oral Surg Oral Med Oral Pathol* 1985; 59(2): 120-9.
- Gassner R, Tuli T, Hachl O, Moreira R, Ulmer H: Craniomaxillofacial trauma in children: a review of 3,385 cases with 6,060 injuries in 10 years. *J Oral Maxillofac Surg* 62(4): 399e407, 2004
- Haghani J, Torabi M, Mehdizadeh MA. Evaluation anatomical position of the mandibular canal in the panoramic view in patients over 25y. *J Denfal school shahid Beheshti unive med sci*. 2010; 27(3):128-135.
- Hendler B. Maxillofacial Trauma. In: *Emergency Medicine: Concepts and Clinical Practice*. Rosen P, editor. Mosby-Year Book; 1998. p. 1093-103.
- Seckel BR. Enhancement of peripheral nerve regeneration. *Muscle & Nerve* 1990; 13:785-800
- Khodayari Namin A, Aframian F, Sarkarat F, Shahrokhi M. Epidemiology, etiology, complications treatment of injuries and adverse oral and maxillofacial injuries in hospital
- Taleghani. *J Denfal school shahid Beheshti unive med sci* 2001;19(1):9-15.
- Lone P, Kouser T, Gandral A. Response of inferior alveolar nerve to mandibular angle fractures. *JK Science* 2014;16(2):62-66
- Mohajerani 4, Ebrahimzade safar 2. The epidemiology of mandibular fractures in patients referd to oral and maxillofacial department of Taleghani hospital of Tehran , 1999-2003. *Beheshti unive Dent J* 2005;22(4)685-9
- Mran, Jacobs R, van steenberghe D, Quiryneum: clinical assessment and surgical implications of anatomic challenges in the anterior mandibular. *Chlin Dent Relat Res* 2003 S:219-225
- Obradovic O, Todrovica I, Pesic V, Pejkoivic B, Vitanovic V. Morphometric analysis of mandibular canal: clinical aspects. *Bull Group Int Rech Sci Stomatol Odontol*. 1993;38:109-113.
- Schultze-Mosgau S, Erbe M, Rudolph D, et al. Prospective study on post-traumatic and postoperative sensory disturbances of the inferior alveolar nerve and infraorbital nerve in mandibular and midfacial fractures *J Craniomaxillofac Surg* 1999; 27(2): 86- 93.
- Shaban B, Kazemian M. Evaluation of temporary neurosensory changes of lower lip following Bilateral Sagittal Split Osteotomy. *J Mash Dent Sch* 2011; 34(4):309-16.
- Schultze-Mosgau S, Kerms H, Ott R, Neukam FW. A prospective electromyographic and computer-aided thermal sensitivity assessment of nerve lesions after sagittal split osteotomy and Le Fort 1 osteotomy. *J oral Maxillofac Surg* 2001; 59(2):128-38.
- Smith JG, Elias LA, Yilmaz Z, Barker S, Shah K, Shah S, et al: The psychosocial and affective burden of posttraumatic neuropathy following injuries to the trigemin nerve. *J Orofac Pain* 27(4): 293e303, 2013
- Uchida Y, Yamashita Y, Goto M, Hamihara I. Measurement of anterior loop length for mandibular canal and diameter of mandibular incisive canal to avoid nerve damage when installing endosseous implants in the interforaminal region. *J Oral Maxillofac Surg*. 2007;1772-1779.
- Van Sickels JE, Zysset M, Nishioka GJ, Thrash WJ: A comparative study of normal sensibility of the inferior alveolar nerve and the infraorbital nerve. *Oral Surg Oral Med Oral Pathol* 1989; 67(3): 255-7.
- Zografos J, Kolokoudias M, Papdakis E. The types of the mandibular canal. *Hell Period Stomat Gnathopathoprosopike Chir* 1990; 5:17-20.

## Prevalence of tachydysrhythmia disorders in patients with acute cardiogenic pulmonary edema in Dr Heshmat Hospital of Rasht city, Iran

Seyyed Aboozar Fakhmousavi<sup>1</sup> and Seyyed Mahdi Zia Ziabari<sup>2\*</sup>

<sup>1</sup>Assistant Professor in Cardiology, Department of medical science, Guilan University of Medical Sciences, Rasht, Iran

<sup>2</sup>Assistant Professor in Emergency Medicine, Department of medical science, Guilan University of Medical Sciences, Rasht, Iran

### ABSTRACT

Prediction ability to induce ventricular tachycardia through clinical factors and conductivity ventricular to atrium makes easier identifying patients with high risk for ventricular tachydysrhythmia .on importance and impact of tachydysrhythmia disorders in patients with acute pulmonary edema and absence of any similar study, in this study evaluated the prevalence in hospitalized patients in Rasht Heshmat hospital. This retrospective study done based on archives medical records of patients admitted to hospital organs ward. The study population consisted of patients with acute pulmonary edema during one year were in the hospital. Information's from patient's files were collected through a form, which containing personal information, the underlying cause, symptoms, type and amount of drug addiction and electrocardiograms, then data entered in SPSS version 19 software and were analyzed. In our study 600 patients were evaluated, 354 patients (59%) were male and 246 patients (41%) were female. The mean age of the patients was  $68.88 \pm 11.91$  years. the most frequent tachydysrhythmia in early ECG was sinus tachycardia(38.2%), and then arterial fibrillation (22.2%), the lowest frequency was for arterial tachycardia (0.2%).The final status of patients shows that 89% of patients discharged and 11% were died. the highest mortality rate (100% of cases) were in wandering pace and PSVT. Our study results showed a significant correlation in smoking, drugs, alcohol and death in a variety of primary and secondary tachydysrhythmia. This information helps us for treatment and education programs, particularly in specialized heart centers and causes by more accurate view and better treatment planning and follow-up patients with tachydysrhythmia.

**KEY WORDS:** TACHYCARDIA, PULMONARY EDEMA

### ARTICLE INFORMATION:

\*Corresponding Author: Smzz5859@hotmail.com

Received 27<sup>th</sup> April, 2017

Accepted after revision 21<sup>st</sup> July, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

Heart failure is the most spread cause primer or second hospitalization of patients with their ages one more than 65 years (Schwartz et al 2003). This disease is generally applied for congestive heart failure and incapability of heart to pump enough blood and also oxygen of the organs and feed them

Although Heart failure is enough for occurring myocardial infraction. In this disease a problem in systole and diastole of heart occurs which leads to pulmonary edema or systemic (Braunwald 2005) similar to coronary artery. The risk for heart failure increase as the age increases, Although the coronary artery disease is decreasing these days, the heart failure disease is increasing.

About 5 million people in the US suffering from the disease and every year more than 1.5 million people are diagnosed that suffering from it (Smeltzer et al 2008). Acute pulmonary edema with heart problem origin is one of the main reason of acute respiratory failure. In the case of disease attack, patients have dyspnea shortness of breath. This experience is really terrible for patients and their associate patients usually feel pain in their thorax which is a very important symptom of heart attack. If patient suffers from a heart failure, diagnosis of the disease is very difficult. Acute pulmonary Adema intrupts the exchange of gas on the alveolus and causes pulmonary shunt and finally respiratory failure. So, management of respiratory failure in the patients suffering from acute pulmonary edema with heart problem origin is one of the main problems for them. In many cases, on time treatment and diagnosis and treatment of original reasons help to cure the patients completely.

Breath support in those patients performed by prescribing oxygen from nasal cannula and simple mask Medical treatment is one of the main treatments which enhance heart rate, blood pressure, decreasing the breathless feeling and prognostication of patients suffering from acute respiratory failure (Meduri 1998). In the study of Fujiki and also Stainier et al., It was reported that no new acute myocardial infarction (AnI) observed after oxygen therapy for patients suffering from acute pulmonary edema (Her, Duquesne Girou de Rosiere Le Conte, Renault et al, 2004).

Since, it takes time to prescribed medicine influence on dyspnea and increasing the number of breath continues, the patients need tracheal intubation and invasive ventilation which cause the side effects such as pneumonia hospitalization and sinusitis (Meduri 1998; Fujigaki et al, 2004). Patients with tracheal intubation feel pain and stress, and this can lead to prescribe sedative for them (Bellone A et al, 2004 ; Sartori C et al, 2007). Stress is one of the main problems of patients suffering from heart diseases which has some symptoms

such as increasing heart rate and blood pressure. Also, occurring heart dysrhythmia is probable (Nourdin 1999; Torres 1990). Cardiovascular disease is one of the most important causes of death in which the reason of about 40 percent of death in the developed country is cardiovascular disease (Burns 1979; Osman et al, 2002). About one third of the death caused by sudden cardiac death (SCD).

## METHODOLOGY

In this research, previous cases from the archive for patients hospitalized at emergency room of Heshmat Hospital since 15.04.1393 till 15.04.1394 have been studied. The research social include patients with diagnosis of acute pulmonary edema during this time.

The information from filled in with personal information, underlying cause, clinical factors, accelerating factors, amount and kind of medicine prescribed by assistants in the hospital. History and clinical symptoms of the patients were recorded according to the Patients cases. In their history, some information about background of acute cardiopulmonary edema, high blood pressure, diabetes, clinical symptoms, electrocardiogram, and also echocardiography results were recorded.

Tachycardia is an abnormal rhythm of heart which result in increase of heart rate up to 100 pulse per minute in the adults. tachydysrhythmia occurred by different mechanism which can be accelerated by automaticity return flow or abnormal flow and diagnosed after depolarization. Diagnosis of tachydysrhythmia performed with regard to the Distinguish between sinus and non-sinus rhythms and evaluating the width and order of QRS complex. ECG of patients was interpreted by assistants in accordance with follow algorithm. Then, these interpretations were confirmed by professors. After data collecting, SPSS program ver.19 was used to analyze them. In order to determine the connection between Sex Distribution, smoking, using drugs and alcohol and primer and final ECGs, Chi-square statistical test and fisher exact test were used. To compare the quantitative variables in the studied groups ANOVA was used and the meaningful level was considered about 0.05.

## RESULTS AND DISCUSSION

In this study, 600 patients has been evaluated. Among them, 354 patients (59%) were men and 246 patients (41%) were women. The average age of the studied patients was  $68.88 \pm 11.91$ . The highest age was 93 and the least was 25. The average hospitalization time was  $6.27 \pm 4.73$  days with 34 days as highest and 1 day as least. 158 patients have smoking background (26.3%),

151 patients (52.2%) had using drugs background, and 33 patients (5.5%) had drinking alcohol background, the most disease background was as follow: 204 patients for diabetes (34%), 162 patients for high blood pressure (27%), 18 patients for hyperlipidemia (3%), 17 patients for CKD (2.8%). Also, 10 patients (1.7%) suffering from asthma and 11 patients from hypothyroid. The result of primer ECG of patients suffering from acute pulmonary edema suggested that 229 patients had sinus tachycardia (38.2%), 192 patients had normal sinus rhythm (32%), 133 patients had Atrial fibrillation (22.2%), 19 patients had atrial flutter (3.2%), 10 patients had VF (1.7%), 6 patients had tachycardia-bradycardia syndrome (1%), the heart of 5 patients was blocked completely (0.8%), 3 patients had wandering pace (0.5%), 2 patients had PSVT (0.3%), 1 patient had atrial tachycardia (0.2%).

The result of atrial fibrillation suggested that 73 patients had rapid ventricular response (12.2%) and 60 patients had non rapid ventricular response (10%). There was not any meaningful relation between the sex of groups and the different kind of primer ECG, ( $P>0.05$ ).

However, there was a meaningful relation between smoking and primer ECGs. ( $P<0.05$ ). Also, there was a significant relation between smoking and primer tachydysrhythmia ( $P=0.0001$ ). The relation between using drugs had a significant effect on primer tachydysrhythmia ( $P=0.0001$ ).

Although, the relation between drinking alcohol and primer ECGs are meaningful ( $P>0.05$ ) (table 1). The disease background distribution according to primer ECGs of patients suggested that there was not meaningful different between them ( $P=0.125$ ). The highest frequency was for high blood pressure in 10 patients (52.63%) suffering from atrial flutter, 1 patient (33%) suffering from wandering pace, 4 patients (30%) suffering from VF, 57 patients (42.58%) suffering from normal sinus rhythm. The patients suffering from diabetes was 67 persons (29.25) with sinus tachycardia, 48 persons (36.09) with atrial fibrillation, 74 persons (38.54%) with normal sinus rhythm.

There was no significant difference between the age of primer group of dysrhythmia Patients ( $P=0.245$ ) There was not a meaningful relation between frequent distribution of group with different sex and final ECG ( $p>0.05$ ). However, there was a meaningful relation between different kind of final dysrhythmia and smoking ( $p=0.028$ ). There was also a meaningful relation between using drugs and primer ECGs ( $p<0.05$ ).

Using drugs had a significant effect on different kind of tachydysrhythmia. Although, drinking alcohol had not any significant effect on different kind of final tachydysrhythmia ( $p=0.104$ ). Frequent distribution of background disease in the final ECG of patients suggested that there was not a meaningful different between these distribution and ECG ( $p=0.65$ ). The frequency of high

blood pressure was 41.66% (5 patients) at atrial flutter, 21 patients (19.26%) at sinus tachycardia, 48 patients (15.18%) at normal sinus rhythm. There was not any meaningful relation between the age of patients and final dysrhythmia ( $p>0.05$ ). Also, there was not any significant relation between hospitalization time of final dysrhythmia groups ( $p=0.764$ ). The final status of patients with regard to different primer ECGs suggested that there was a meaningful relation between final status of patients ad tachydysrhythmia groups ( $p=0.0001$ ).

The most death frequency was related to wandering pace and PSVT (100% death). The final status of three patients who passed away in the final dysrhythmia was asystole and low voltage.

Occurring pectorals angina, acute heart attack from the epidemiologic aspect has been investigated. This investigation is based on risk factors, age, sex and race as per individual level, countries, regions, classes during different times(12). In this study, spreading from acute pulmonary edema has been investigated. In this study, totally 600 patients has been evaluated among them 354 patients (59%) were men and 246 patients (41%) were women. The average age of studied patients was about  $68.88\pm 11.91$ .

The limitations of this study were: 1. The information and primer diagnosis of the patients has not been recorded accurately in the emergency room of Dr. Hesmat hospital. 2. Archiving and recording of information in this hospital were not accurate for example PE was a code in their systems that refers to both pulmonary edema and effusion plural and also pulmonary embolism. 3. The cases have not included complete information or find ECG. 4. Some ECGs were illegible and unreadable. 5. All cases were not available in the achieve and they were dispersed in the financial, assurance or other departments.

It is recommended to study about different kind of tachydysrhythmia and the relations which found meaningful in this research in the future as a Cohort study with a follow up period. Also, according to our research there were some factors such as smoking and using drugs which had a significant effects on occurring different kind of dysrhythmia. So, it is recommended to study about the effect of background factors on different kind of tachydysrhythmia and prognosis in the patients. With regard to primer and final ECG of the patients, some patients with primer heart rate less than 100 pulses, had 15-30 lower pulse in the final ECG, these patients considered as normal sinus rhythm in our investigation, because according to our definition, the patients with heart rate more than 100 pulse considered as tachycardia. So, performing some studies about *relative tachycardia* and evaluating of those patients separately is recommended.

## CONCLUSION

In conclusion according to our study, it was observed that the most frequency of primer and final tachydysrhythmia is related to the sinus tachycardia and atrial fibrillation. However, there were not a meaningful relation between age, sex, hospitalization time and background disease and different kind of primer and final tachydysrhythmia. The most spreading background disease is related to the blood pressure and diabetes. On the other hand, it was observed in our study that there is a significant relation between smoking and using drugs and different kind of primer and final tachydysrhythmia. Also, it was reported that primer ECG had a meaningful relation with diagnosis of primer tachydysrhythmia. All of these information help us to have a better plan for treatment of patients suffering from tachydysrhythmia in the educational and treatment programs and to control the patients from tachydysrhythmia.

## REFERENCES

- Bellone A, Monari A, Cortellaro F, Vettorello M, Arlati S, Coen D. Myocardial infarction rate in acute pulmonary edema: non-invasive pressure support ventilation versus continuous positive airway pressure. *Crit Care Med*. 2004 Sep;32(9):1860-5.
- Braunwald E. *Heart Disease: A text book of cardiovascular medicine*. 7th ed. Elsevier Saunders, Philadelphia, 2005, pp: 555-559.
- Burns HP, Dayal VS, Scott A, Van Nostran ANP, Bryce DP. Laryngo-thoracic trauma: observation on its pathogenesis and its prevention following OT intubation in the adult. *Laryngoscope* 1979, 89:1316-1325.
- Fujigaki Y, Togawa A, Miyaji T, Suzuki H, Ohashi N, Fukasawa H, Yasuda H, Yamamoto T, Hishida A, Yonemura K. Rapid improvement of acute pulmonary edema with angiotensin converting enzyme inhibitor under hemodialysis in a patient with renovascular disease-*TherApher Dial*. 2004 Apr;8(2):148-52.
- L Her , Duquesne F, Girou E, de Rosiere XD, Le Conte P, Renault S, et al. Noninvasive continuous positive airway pressure in elderly cardiogenic pulmonary edema patients. *Intensive Care Med*. 2004 May. 30(5):882-8.
- Meduri GU. Noninvasive ventilation. In *Physiological Basis of Ventilatory Support*. Edited by marina J, Slutsky A. Series on lung biology in health and disease .Marseldeker, Inc: New York, 1998:921-998.
- Nourdin K, Combes P, Carton MJ, Beuret P, Cannamela A, Ducreux JC. Dose noninvasive ventilation reduces the ICU nosocomial infection risk?: a prospective clinical survey. *Intense Care Med* 1999, 25:576-573
- Osman F, Gammage M, Sheppard M, Franklyn J. Cardiac dysrhythmia and thyroid dysfunction: The hidden menace. *J ClinEndocrinolMetab* 2002;87: 963-967.
- Schwartz KA et al. Identification of factors predictive of hospital readmissions for patients with heart failure. 2003, *Heart & Lung*. 32(2) 88-99.
- Smeltzer S C et al. *Brunner and Suddarths Textbook of Medical-Surgical Nursing*. 11th edition. Philadelphia. Lipincott. (2008) P: 611-613.
- Sartori C, Allemann Y, Scherrer U. Pathogenesis of pulmonary edema: Learning from highaltitude pulmonary edema. *Respir-PhysiolNeurobiol* 2007; 4:25.
- Torres A, Aznar R, Gatell JM, et al. Incidence, risk and prognosis factors of nosocomial pneumonia in mechanically ventilated patients. *Am Rev Respir Dis* 1990, 142:523-528.

## Effect of HESA-A, a herbal-marine origin compound on quality of life among Iranian women with breast cancer: A clinical trial

Shahnaz Pouladi<sup>1</sup>, Roohollah Esmati<sup>2</sup>, Mohamadreza Yazdankhah Fard<sup>3\*</sup> and Niloufar Motamed<sup>4</sup>

<sup>1</sup>Assistant Professor, School of Nursing and Midwifery, Bushehr University of Medical Sciences, Bushehr, Iran

<sup>2</sup>Student Research Committee, School of Nursing and Midwifery, Bushehr University of Medical Sciences, Bushehr, Iran

<sup>3</sup>Faculty Member, School of Nursing and Midwifery, Bushehr University of Medical Sciences, Bushehr, Iran

<sup>4</sup>Department of Internal Medicine, School of Medicine, Bushehr University of Medical Sciences, Bushehr, Iran

### ABSTRACT

As a major factor, breast cancer (BC) causes disruption in balance and quality of life (QOL) in females. One of the favorable solutions in oncology is the use of herbal medicines in modulating whole body system. The purpose of this study was to investigate effect of HESA-A, the compound of herbal-marine origin, on quality of life among Iranian women with breast cancer. In this randomized controlled clinical trial, 72 women with breast cancer undergoing chemotherapy referred to chemotherapy centers in Bushehr, Iran, were selected by convenience sampling and divided randomly into two case and control groups. Quality of life of cancer patients in both groups were assessed before and 45 days and then 90 days after the intervention using EORTC QLQ-C30.V.3 and EORTC QLQ-BR23 questionnaires. Data were analyzed using chi-square test, independent t-test and repeated measures ANOVA using SPSS version 18. In the case group, changes in general quality of life scores before the intervention up to 90 days after the intervention had significant increase ( $p=0.001$ ), While changes in specific quality of life and overall quality of life before the intervention to 90 days after the intervention in both of the groups showed significant difference ( $p<0.05$ ). There was significant difference between case and control groups in terms of changes in three specific, generic and overall quality of life levels ( $p<0.001$ ). The mean change in QOL scores was significantly higher in the case group compared with the control group. HESA-A, the compound of herbal-marine origin, improves the quality of life in women with breast cancer. The use of this drug without any side effects alongside other conventional medical treatments has mitigation effects and can be useful tool for improving the conditions and quality of life of the patients.

**KEY WORDS:** BREAST CANCER, HESA-A, QUALITY OF LIFE, CLINICAL TRIAL

### ARTICLE INFORMATION:

\*Corresponding Author: [m.r.yazdankhah@bpums.ac.ir](mailto:m.r.yazdankhah@bpums.ac.ir)

Received 27<sup>th</sup> April, 2017

Accepted after revision 29<sup>th</sup> July, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

The global burden of cancer is growing, especially in low and middle-income countries (therefore, it is required to implement effective primary prevention strategies (Vineis P,2014).

Breast cancer is the most common cancer among women in developing and developed countries. According to the World Cancer Registry in 2012, it has been estimated that 1.67 million women with breast cancer have been diagnosed throughout the world (Allemani et al,2015, Salehi F et al,2015 Yan B et al ,2016). Evidence suggests that the incidence of the disease among Iranian women has increased from 1.97 per 100,000 people in 2006 to 2.45 per 100,000 people in 2010. By increasing life expectancy and aging populations in Iran, increased incidence of cancer is expected to rise in the coming years. The highest incidence rate of breast cancer has been observed among women in the age groups of 45-65 and 80-85 years (Rafiemanesh et al , 2015 Enayatrad et al 2015). Although chemotherapy is an important treatment modality in cancer patients, but its side effects on physical, mental and social functions and lack of its acceptance to complete the course of treatment, (Tolley et al,1995) affect the quality of life of these patients (Rahou et al, 2016).

Given the side effects of common medical treatments in cancer, it seems that conventional therapies have been focused primarily on the quantity of life of patients and focusing on the treatment complications has been weak on different aspects of life in patients with cancer (Musarezaie et al, 2012). Women with breast cancer undergoing chemotherapy after surgical removal of breast lump may experience side effects and reduced quality of life due to cancer, improper understanding from their body and sexual dysfunction compared to others (Rahou et al , 2016). Recently, herbal medicines have been used as one of the effective ways to treat cancer (Nie et al,2016).

HESA-A is a natural biological compound of plant-marine origin with anti-tumor effects. The drug has potent effects on cancer cells and weak effects on normal cells. HESA-A contains organic compounds (45%), minerals (50%) and water (5%). Minerals include magnesium sulfate, calcium carbonate, sodium sulfate, potassium and sodium phosphate (Vahabpour et al 2012). The HESA-A has strong cytotoxic effect on various cancer cells in humans with high metastasis (Jahanban-Esfahlan et al ,2014). The HESA-A drug use has led to improve clinical outcomes in oral cancer (Abbasi et al 2015). Therefore, we can expect that side effects observed in treatments such as chemotherapy and radiotherapy less occur in this kind of therapy.

The effects of HESA-A drug have not been investigated so far on quality of life; and most studies have reported the effects of massage therapy on quality of life (Shahr-

jerdi S et al ,2013) and physical self-management interventions (Dijck et al 2015) in patients with breast cancer.

Considering the aforementioned points, the quality of life has been considered as one of the important outcomes in the treatment of diseases and has been assessing as one of the decisive indices for the treatment (Baghaei et al 2013). Despite the different effects of diseases and treatments on quality of life, most of the breast cancer patients are able to continue active life with minimal restrictions providing that they can reach to desirable levels of life with appropriate therapeutic intervention. Considering the very low side effects of medicinal plants compared with medications used in classical medicine, availability of medicinal plants in the country, low cost and with knowledge of the anticancer effects of plant-marine HESA-A drug and because of the side effects of chemotherapy in the cancer patients, this compound is expected to be widely used in education field to enhance its effectiveness in patients with cancer. Hence, this study was designed to evaluate the efficacy of marine plant drug of HESA-A on the quality of life of Iranian women with breast cancer.

## MATERIALS AND METHODS

This single-blind controlled clinical trial was conducted on women with breast cancer undergoing chemotherapy referred to chemotherapy centers in Bushehr, Iran, in 2016. The patients were divided in two groups of 30, including case group (receiving HESA-A drug) and control group (receiving placebo). Inclusion criteria consisted of aged between 18 and 60 years, definite diagnosis of breast cancer by oncologist and pathologist (stages 3 and 4), history of at least one course of chemotherapy, no history of sensitivity to HESA-A drug.

Exclusion criteria included forgetting the taking HESA-A pills in five consecutive times or more, use of other drugs or treatment methods to reduce side effects other than common drugs prescribed by physician, risk of severe gastrointestinal complications during the study and unwillingness to continue participating in the study. The patients were subjected to the case group (receiving HESA-A drug) and control group (receiving placebo) by using convenience sampling, random allocation and random numbers generated by Excel program. The sample size was 30 patients in each group (totaly 60 cases) taking into account the 95% confidence level, test power of 80% and changes in the scores for each of the items studied (quality of life) in the case group (30%) and the control group (maximum 2%). Considering 20% sample attrition, finally 72 patients were enrolled in the study. Data collection tools in this study were standard questionnaires, including EORTC QLQ-C30 (v3.0) and EORTC QLQ-BR23.

The EORTC QLQ-C30 (v3.0) questionnaire belonging to European Organization for Research and Treatment of Cancer, in addition to demographic information, is generally used to assess the quality of life in cancer patients and entails five functional scales (physical, role, emotional, cognitive and social), nine symptom scales (pain, fatigue, nausea and vomiting, dyspnea, insomnia, appetite loss, financial difficulties, diarrhea, and constipation). The questionnaire with 30 questions in four scales (Very much, Quite a bit, A little and Not at all) evaluates the quality of life (Accessible in [http://groups.eortc.be/qol/sites/default/files/img/slider/specimen\\_qlq-c30\\_english.pdf](http://groups.eortc.be/qol/sites/default/files/img/slider/specimen_qlq-c30_english.pdf)).

The EORTC QLQ-BR23 as a specific questionnaire to assess quality of life in breast cancer patients investigates four functional scales (sexual functioning, sexual enjoyment, body image and future prospects) and four symptom scales (upset by hair loss, systemic side effects, breast symptoms and arm symptoms). The questionnaire with 23 questions in four scales (Very much, Quite a bit, A little and Not at all) particularly evaluates the quality of life of patients with breast cancer (Accessible in [http://groups.eortc.be/qol/sites/default/files/img/slider/specimen\\_br23\\_english.pdf](http://groups.eortc.be/qol/sites/default/files/img/slider/specimen_br23_english.pdf)).

The intervention was carried out after obtaining necessary approvals from the ethics committee of Bushehr University of Medical Sciences (Code: bpums.rec.1394.

23) and registering in Iranian Registry of Clinical Trials (IRCT2015112322466N8). In the case group, 50-mg HESA-A capsules (Osveh Pharma Co.) were administered after at least the second course of chemotherapy for three months under the supervision of traditional medical physician. In the control group, oncologists routinely treated the patients. Both case and control groups at this time were under nutrition therapy prescribed by the doctor (drugs lowering chemotherapy side effects such as dexamethasone, and anti-nausea/vomiting). The quality of life status was assessed in participants in both groups, before, 45 days and then 90 days after the intervention. The collected data were analyzed using SPSS version 18 software as well as the chi-square test, independent t-test and repeated measures ANOVA and where necessary non-parametric equivalent including the Mann-Whitney and Kruskal-Wallis in confidence interval of 95%. Kolmogorov and Smirnov test was used to determine the data normality.

## RESULTS

Of the 72 participants, seven people were excluded from the study due to lack of participation. Therefore, the analysis was done finally on 65 patients (32 members in the case group and 33 patients in the control group) (Figure 1). The mean and standard deviation age was

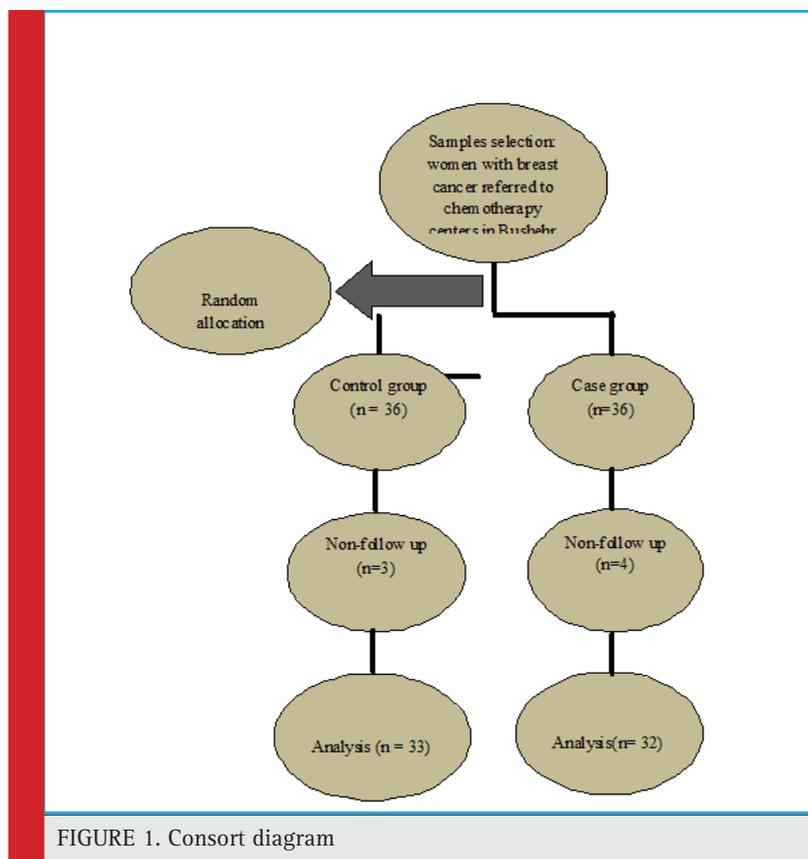


Table 1. Absolute and relative frequency distributions of demographic variables in both case and control groups				
Demographic characteristics		Frequency (percentage)		P- value
		Case group	Control group	
Marital status	Single	22 (68.8%)	27 (84.4%)	0.138
	Married	5 (15.6%)	5 (15.4%)	
	Widow	2 (6.3%)	0 (0%)	
	Divorced	3 (9.4%)	0 (0%)	
Residence	City	21 (70%)	20 (66.7%)	0.781
	Village	9 (30%)	10 (33.3%)	
Occupation	Employee	2 (6.7%)	2 (12.5%)	0.423
	Laborer	4 (13.3%)	0 (0%)	
	Self-employed	1 (3.3%)	0 (0%)	
	Housekeeper	22 (73.3%)	14 (87.5%)	
	Retiree	1 (3.3%)	0 (0%)	
Level of Education	Illiterate	1 (3.1%)	1 (3.8%)	0.193
	Primary	5 (15.6%)	0 (0%)	
	Low literate	4 (12.5%)	1 (3.8%)	
	High school	8 (25.0%)	12 (46.2%)	
	Associate Degree	7 (21.9%)	7 (26.9%)	
	Bachelor	7 (21.9%)	5 (19.2%)	
Economic situation	Weak	9 (27.3%)	3 (16.7%)	0.439
	Average	21 (63.6%)	13 (72.2%)	
	Good	3 (9.1%)	1 (5.6%)	
	Very good	0 (0%)	1 (5.6%)	

51.03 ± 10.056 and 46.76 ± 10.87 in the case and control groups, respectively.

The study findings based on chi-square test confirms that there was no significant differences between the case and control groups in terms of demographic characteristics, including marital status, place of residence, occupation, education and economic status ( $p > 0.05$ ) (Table 1).

According repeated measures ANOVA test, in the case group there was significant differences between the changes in general quality of life scores before interven-

tion to 90 days after intervention ( $P = 0.001$ ). This means that the general quality of life score in the case group, 45 and 90 days after intervention than before intervention increased; but the general quality of life score changes in the control group before the intervention to 90 days after intervention was not significantly different ( $P = 0.129$ ). Changes in specific quality of life scores before the intervention to 90 days after intervention in the case group ( $P = 0.001$ ) and in the control group ( $P = 0.020$ ) is a significant difference (Table 2). This means that specific

Table 2. Comparison of quality of life score before, 45 days and 90 days after intervention in both case and control groups						
Variable	Group	Stage		F	P- value	
		Before intervention	45 days after intervention			90 days after intervention
		Mean ± SD	Mean ± SD	Mean ± SD		
General quality of life	Case	84.48± 13.56	104.20± 1.62	111.86± 2.55	76.28	0.001
	Control	73.14±16.56	83.51± 1.84	73.32± 2.90	2.13	0.129
Specific quality of life	Case	58.70 ±12.86	71.34± 1.74	76.49 ±1.99	24.31	0.001
	Control	50.30± 13.92	59.95± 1.79	48.73± 2.05	4.52	0.020
Overall quality of life	Case	143.18± 24.11	174.64± 2.80	186.04 ±4.82	62.78	0.001
	Control	112.36± 38.74	142.41± 2.90	121.56± 4.99	6.65	0.002

Table 3. Comparison of two case and control groups in terms of quality of life, 45 and 90 days after intervention

Variable	Group	Stage		F	P- value
		45 days after intervention Mean $\pm$ SD	90 days after intervention Mean $\pm$ SD		
General quality of life	Case	104.20 1.62	111.86 2.55	206.56	< 0.001
	Control	83.51 1.84	73.32 2.90		
Specific quality of life	Case	71.34 1.74	76.49 1.99	115.86	< 0.001
	Control	59.95 1.79	48.73 2.05		
Overall quality of life	Case	174.64 2.80	186.04 4.82	138.22	< 0.001
	Control	142.41 2.90	121.56 4.99		

quality of life 45 days to 90 days after the intervention than before in the intervention groups increased; and in the control group specific quality of life scores 45 days after the intervention than before the intervention increased but in the 90 days after intervention decreased to 45 days after the intervention.

According to the study of changes in the overall quality of life score before the intervention to 90 days after intervention in the intervention group ( $p= 0.001$ ) and in the control group ( $p= 0.002$ ) is a significant difference. This means that the overall quality of life score in the case group 45 and 90 days after intervention than before intervention as well as 90 days after the intervention than 45 days after the intervention has increased; and in the control group 45 days after the intervention than before the intervention increased but 90 days after the intervention has been reduced to 45 days after the intervention. This result indicates that, overall quality of life in patients has increased, but after 45 days to 90 days, decreased. (Table2).

Based on findings between experimental and control groups in terms of changes general quality of life, specific related QOL and overall QOL 45 and 90 days after the intervention, significant differences exist ( $P < 0.001$ ) (Table 3).

## DISCUSSION

The findings of the present study showed that women with breast cancer had the mean age of 51.03 and 46.76 years in the case and control groups, respectively. The age of women with breast cancer who participated in the study was older than 45 years. It seems that most cases of breast cancer in Bushehr have occurred at older ages. The results of other studies such as Khassi *et al.*, Tran *et al.* and Ballinger *et al.* have expressed significant increase in breast cancer risk with age (Khassi K *et al.*, 2016; Tran P, Fentiman IS 2009; and Ballinger RS *et al.*, 2009). Also Rafeimanesh *et al.* reported the highest incidence of breast cancer in women aged 45-65 and

80-85 years (6). Cancer Research UK statistics in 2012 indicated that almost half (46%) of female breast cancer cases in the UK each year are diagnosed at older ages (65 years and over). It should be noted that case and control groups were matched in terms of age in this study.

The results show that the HESA-A drug probably plays an important role in improving the quality of life and sense of well-being in patients.

Regarding this result, it can be said that the HESA-A drug can be used as a combination therapy in patients under treatment with chemotherapy to avoid the side effects of chemotherapy, such as the decrease of the blood factors and increased liver enzymes. In addition, it can be effective in offsetting complications properly and in improving overall health under these conditions. Changes in overall health can lead to improved quality of life.

According to numerous animal and human studies, the HESA-A drug has anti-cancer properties (Vahabpour *et al.*, 2011, Abbasi *et al.*, 2015 and Namjoo *et al.* 2012) and a combination of zinc and magnesium. On the other hand, the effects of zinc and magnesium supplements have been proven on cancer and quality of life. In a study by Prasad and Kucuk, zinc supplementation has beneficial effects on cancer, and causes the reduction of angiogenesis and induction of inflammatory cytokines and increased apoptosis in cancer cells (Prasad 2009).

This means that HESA-A drug has been effective on quality of life according to certain mechanisms. It should be mentioned that the mechanism of HESA-A drug is not known well so far (13).

Of another perspective, HESA-A drug is a compound with marine origin (royal shrimps) and plant origin (celery and cumin from *Penaeus* family). Several studies have shown that the plants from Apiaceae family like *Foeniculum vulgare* and carvi and *Pimpinella anisum* similar to HESA-A drug reduce the malignant symptoms of cancer (Far 2013, Kadan 2013 Zaahkhouk *et al.* 2015 and Sutton *et al.*, 2014). In addition, the plants from the Apiaceae family such as *Foeniculum vulgare* and carvi

and *Pimpinella anisum* have influenced the quality of life of patients (Ghoshegir *et al* 2014 and Holtmann *et al* 2003).

Therefore, according to recent studies and having the same category and characteristics of HESA-A drug with Apiaceae family, it seems likely that the anticancer properties of HESA-A drug are approved in improving the quality of life in breast cancer patients.

Moreover, if HESA-A is considered as a drug in traditional medicine, so the findings of this study can be compared with other results in the field of traditional medicine effect on cancer. The results of Zhu *et al.*, Sun *et al.* and NIE *et al.* showed that the combination of Chinese herbal medicine with chemotherapy compared with chemotherapy alone can significantly enhance tumor response, decrease toxicity caused by chemotherapy in patients with breast cancer, reduce side effects caused by chemotherapy and radiotherapy and improve the quality of life and satisfaction in patients with cancer (Zhu, Li *et al* 2016; Sun *et al* 2016).

The similarity of this study is important because the Chinese herbal medicine and HESA-A drug are among the plants of the traditional medicine. Also, the findings of Chui *et al.* and Naja *et al.* demonstrated that complementary medicine as the intervention was not effective on quality of life in breast cancer patients during chemotherapy. Perhaps one of the reasons for this is that the complementary and alternative medicine has been common among breast cancer patients so that most of the patients have experienced it (Chui *et al* 2015 Naja *et al* 2015).

The results obtained in the part of the study showed significant difference among the mean quality of life score before the intervention with 45 days and 90 days after the intervention in the case group. The mean quality of life score was improved 45 days after the intervention than before the intervention in the case group. The reason for this difference is that the HESA-A drug made to strengthen and improve the quality of life, but no significant difference was observed among the mean quality of life score before intervention with 45 days and 90 days after the intervention in the control group because they had not received any intervention and was not significant their quality of life.

This result shows that the HESA-A drug as an intervention during a period of 45 days improved function and quality of life of women with breast cancer. The point obtained as a result of the present study is that there was no significant difference between the mean quality of life score 45 days and 90 days after the intervention in the case group. Nevertheless, it was also a significant difference between the mean quality of life score 45 days and 90 days after the intervention in the control group. This result means that the quality of life

of patients in the case group showed no significant changes 45 days after the first 45 days.

No studies have been done so far on the reason of this result. Alizadeh *et al.* examined the effect of different doses of HESA-A drug on the wound healing until day 18 on laboratory mice and showed that HESA-A drug improved the wound. Presumably, the patients felt HESA-A drug effects on their quality of life during the 45 days after the start of the study but such a perception was not observed after 45 days, perhaps due to loss of drug effect. It is noteworthy that more researches are required to be done in this area.

According to the results, it was found that the marine plant compound of HESA-A improves the quality of life of women with breast cancer. The main objective of such the studies is trying to improve the quality of life for patients with breast cancer as one of the important results of therapy in female oncology. Nowadays, they pay more attention to identify various aspects of life and find ways to effectively promote and improve the quality of life in these patients.

According to the results of this study, it can be said that the use of HESA-A drug without any side effects alongside the conventional medical treatments has the lowering effects. Based on this study, the use of traditional and herbal medicines due to being natural, low cost and the possibility of public access to these products are some considerable advantages. According to the current scientific approaches, maintain or increase the quality of life of cancer patients is of utmost importance, while systemic chemotherapy treatments often as the way to reduce mortality are associated with high morbidity. The HESA-A drug with natural origin, in addition to the therapeutic effects, is the means to improve the conditions and quality of life. According to the results, the use of HESA-A drug appears to be effective in improving the quality of life for women with breast cancer.

## CONCLUSION

Based on the results of this study, it can be concluded that the use of HESA-A drug without any complications alongside the conventional medical therapies has the lowering effects. The HESA-A drug with natural origin along with the therapeutic effects is the means to improve the conditions and quality of life and can be effective in improving the quality of life for women with breast cancer.

## ACKNOWLEDGMENTS

We hereby express our thanks and appreciation to all patients and staff in Department of Oncology at Persian

Gulf Martyrs' Hospital of Bushehr as well as professors from the Faculty of Nursing and Midwifery in Bushehr.

## AUTHOR DISCLOSURE STATEMENT

No competing financial interests exist

## REFERENCES

- Abbasi MM, Helli S, Monfaredan A, Jahanban-Esfahlan R. Hesa-A Improves Clinical Outcome of Oral Carcinoma by Affecting p53 Gene Expression in vivo. *Asian Pacific Journal of Cancer Prevention*. 2015;16(10):4169-72.
- Accesible [http://groups.eortc.be/qol/sites/default/files/img/slider/specimen\\_br23\\_english.pdf](http://groups.eortc.be/qol/sites/default/files/img/slider/specimen_br23_english.pdf)
- Accesible in [http://groups.eortc.be/qol/sites/default/files/img/slider/specimen\\_qlq\\_c30\\_english.pdf](http://groups.eortc.be/qol/sites/default/files/img/slider/specimen_qlq_c30_english.pdf)
- Allemani C, Weir HK, Carreira H, Harewood R, Spika D, Wang XS Global surveillance of cancer survival 1995-2009: analysis of individual data for 25,676,887 patients from 279 population-based registries in 67 countries (CONCORD-2). *Lancet (London, England)* 2015; 385 (9972):977-1010.
- Baghaei R, Sharifi M, Mohammadpour Y, Sheykhi N. Evaluation of the effects of educational package on controlling the complications of chemotherapeutic agents on symptom scales of quality of life in patients with breast cancer undergoing chemotherapy. *Journal of Urmia Nursing And Midwifery Faculty*. 2013 Dec 15;11(9):0.
- Ballinger RS, Fallowfield LJ. Quality of life and patient-reported outcomes in the older breast cancer patient. *Clinical Oncology*. 2009 Mar 31;21(2):140-55.
- Chui PL, Abdullah KL, Wong LP, Taib NA. Quality of Life in CAM and Non-CAM Users among Breast Cancer Patients during Chemotherapy in Malaysia. *PloS one*. 2015 Oct 9; 10(10):e0139952.
- Dijck S, Nelissen P, Verbelen H, Tjalma W, Gebruers N. The effects of physical self-management on quality of life in breast cancer patients: A systematic review. *The Breast*. 2016 Aug 31; 28:20-8.
- Enayatrad M, Amoori N, Salehiniya H. Epidemiology and trends in breast cancer mortality in iran. *Iranian journal of public health*. 2015;44(3):430-1.
- Far F.S, Zamanyan Azodi M, Heydari Kashel S, Azizye Jalileyan F. Evaluation of the Cytotoxic Effect of Cuminum cyminum essential oils on Human Colon Cancer cell line SW742 . *sjimu*. 2013; 20 (5) :138-148
- Ghoshegir SA, Mazaheri M, Ghannadi A, Feizi A, Babaeian M, Tanhaee M, Karimi M, Adibi P. Pimpinella anisum in modifying the quality of life in patients with functional dyspepsia: A double-blind randomized clinical trial. *Journal of research in medical sciences: the official journal of Isfahan University of Medical Sciences*. 2014 Dec; 19(12):1118.
- Holtmann G, Haag S, Adam B, Funk P, Wieland V, Heydenreich CJ. Effects of a fixed combination of peppermint oil and caraway oil on symptoms and quality of life in patients suffering from functional dyspepsia. *Phytomedicine*. 2003 Dec 31; 10:56-7.
- Jahanban-Esfahlan R, Abasi M, Sani HM, Abbasi MM, Akbarzadeh A. Anti-Proliferative Effects of Hesa-A on Human Cancer Cells with Different Metastatic Potential. *Asian Pacific Journal of Cancer Prevention: APJCP*. 2014 Dec; 16(16):6963-6.
- Kadan S, Rayan M, Rayan A. Anticancer activity of anise (*Pimpinella anisum* L.) seed extract. *The Open Nutraceuticals Journal*. 2013 Jan 24;6(1).
- Khasi K, khasi B, fakhri moradi aazam S, khademi N. investigate Frequency of Breast Cancer among Women in Kermanshah During 2004-2013. *Zanko J Med Sci*. 2016; 17 (52): 28-34.
- Musarezaie A, Momeni Ghaleghasemi T, Ebrahimi A, Karimian J. The Relationship between Spiritual Wellbeing with Stress, Anxiety, and Some Demographic Variables in Women with Breast Cancer Referring to the Specialized Cancer Treatment Center in Isfahan. *Iran. J Health Syst Res*. 2012;8:104-3.
- Naja F, Fadel RA, Alameddine M, Aridi Y, Zarif A, Hariri D, Mugharbel A, Khalil M, Nahleh Z, Tfayli A. Complementary and alternative medicine use and its association with quality of life among Lebanese breast cancer patients: a cross-sectional study. *BMC complementary and alternative medicine*. 2015 Dec 22; 15(1):1.
- Namjoo S, Nadali F, Kazemi A, Dargahi H, Rezaiezadeh H, Rostami Sh, Ostad SN. 2012. Effect of HESA-A on acute promyelocytic cell line (NB4). *Payavard-e salamat*, 3(6): 236-245.
- Nie J, Zhao C, Deng L, Chen J, Yu B, Wu X, Pang P, Chen X. Efficacy of traditional Chinese medicine in treating cancer (Review). *Biomedical reports*. 2016 Jan 1; 4(1):3-14.
- Prasad AS. Impact of the discovery of human zinc deficiency on health. *Journal of the American College of Nutrition*. 2009 Jun 1;28(3):257-65.
- Rafiemanesh H, Salehiniya H, Lotfi Z. Breast Cancer in Iranian Woman: Incidence by Age Group, Morphology and Trends. *Asian Pacific journal of cancer prevention: APJCP*. 2015 Dec; 17(3):1393-7.
- Rahou BH, El Rhazi K, Ouasmani F, Nejari C, Bekkali R, Montazeri A, Mesfioui A. Quality of life in Arab women with breast cancer: a review of the literature. *Health and quality of life outcomes*. 2016 Apr 27;14(1):1.
- Salehi F, Mohsen Zadeh F, Arefi M. Prevalence of anxiety of death in patients with breast cancer in Kermanshah, 2015. *Ir J of Breast Dis*. 2015; 8(4):36-40.
- Shahrjerdi S, Darvish Shafighi S. Effect of massage on serum cortisol levels, quality of life and mental health in women with breast cancer. *Arak Medical University Journal*. 2013 Dec 15;16(9):8-17.
- Sun X, Zhang X, Nian JY, Guo J, Yin Y, Zhang GL, Yu MW, Zhang Y, Wang XM, Yang GW, Yang L. 2016. Chinese Herbal Medicine as Adjunctive Therapy to Chemotherapy for Breast Cancer: A Systematic Review and Meta-Analysis. *Evidence-Based Complementary and Alternative Medicine*. Apr 10; 2016.

- Sutton KM, Greenshields AL, Hoskin DW. Thymoquinone, a bioactive component of black caraway seeds, causes G1 phase cell cycle arrest and apoptosis in triple-negative breast cancer cells with mutant p53. *Nutrition and cancer*. 2014 Apr 3; 66(3):408-18.
- Tolley K, Rowland N. Evaluating the cost-effectiveness of counselling in health care. Psychology Press; 1995. *BMJ*: 312-220.
- Tran P, Fentiman IS. Better treatment for breast cancer in older patients. *Expert review of anticancer therapy*. 2009 Aug 1;9(8):1081-90.
- Vahabpour R, Sadat SM, Zabihollahi R, Ahmadi A, Keivani H, Amini S, Siadat SD, Aghasadeghi MR. In vitro inhibitory effects of the herbal-marine compound HESA-A against replication of human immunodeficiency virus-1. *Jundishapur J. Microbiol*. 2012 Jan 1;5(1):315-9.
- Vineis P, Wild CP. Global cancer patterns: causes and prevention. *Lancet*. 2014; 383:549-57. [PubMed: 24351322].
- Yan B, Yang LM, Hao LP, Yang C, Quan L, Wang LH, Wu Z, Li XP, Gao YT, Sun Q, Yuan JM. Determinants of Quality of Life for Breast Cancer Patients in Shanghai, China. *PloS one*. 2016 Apr 15;11(4):e0153714.
- Zaahkoug SA, Aboul-Ela EI, Ramadan MA, Bakry S, Mhany AB. Anti carcinogenic activity of Methanolic Extract of Fennel Seeds (*Foeniculum vulgare*) against breast, colon, and liver cancer cells. *International Journal*. 2015;3(5):1525-37.
- Zhu L, Li L, Li Y, Wang J, Wang Q. Chinese Herbal Medicine as an Adjunctive Therapy for Breast Cancer: A Systematic Review and Meta-Analysis. *Evidence-based Complementary and Alternative Medicine : eCAM*. 2016; 2016:9469276. doi:10.1155/2016/9469276.

## Why industrial workers tend to choose unhealthy eating behaviors? Perceptions and experiences of Iranian workers

Ali Ramezankhani<sup>1</sup>, Mahnaz khalafenilsaz<sup>2\*</sup> and Parisa Amiri<sup>3</sup>

<sup>1</sup>Professor Department of Public Health, School of Health, Shahid Beheshti University of Medical Sciences, Tehran, Iran

<sup>2</sup>PhD candidate in Health Education and Promotion, Student s Research Office Center, Obesity Research Center, Research Institute for Endocrine Sciences, school of Public Health, Shahid Beheshti University of Medical Sciences, Tehran, Iran

<sup>3</sup>Obesity Research Center, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences

### ABSTRACT

Workplace is a key setting for implementing interventions to promote eating behavior in workers. In this study we focused on exploring why industrial workers tend to choose unhealthy eating behaviors. A grounded theory approach designed to analyze the participants' collection was conducted through 40 semi-structure interviews between 2015 and 2016. Participants were 40 men, aged 25-55 years, selected and recruited from an industrial complex. So, all semi structure interviews were audio recorded and then transcribed verbatim. Constant comparative analysis of the data was conducted with MAXQDA software according to the Strauss and Corbin analysis method. The study revealed that the most important reasons for unhealthy eating behaviors of workers included lack of motivation for healthy eating behavior. And it can be effective by: 1. undesirable stress and emotions 2. Lack of eating knowledge and skills 3. The influence of unhealthy patterns, and the lack of motivation for healthy eating can be against the background of an interrelated factor: social and environmental determinants can be a cause of unhealthy eating behaviors. It is concluded that awareness of these factors may help to design and implement an appropriate and better strategy towards interventions among workers.

**KEY WORDS:** GROUNDED THEORY, UNHEALTHY EATING BEHAVIORS, INDUSTRIAL WORKERS

### ARTICLE INFORMATION:

\*Corresponding Author: [nilsaz62@yahoo.com](mailto:nilsaz62@yahoo.com)

Received 27<sup>th</sup> April, 2017

Accepted after revision 29<sup>th</sup> July, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

Non-communicable diseases (NCDs) are leading causes of morbidity and mortality worldwide (World Health Organization, 2014). In Iran NCDs, including coronary heart diseases, cancers and type 2 diabetes impose a significant burden on the health system (Mousavi and Anjomshoa 2014). Studies have revealed that there is a consistent relationship between lifestyle changes especially eating behaviors and the emergence of a range of NCDs (Brown 2011). Following its rapid urbanization and socio-demographic changes, Iran is supposed to be in the midst of a nutritional transition. Based on existing data, over the last twenty years there has been a significant change in the food baskets of Iranian. This change is attributed to increase energy costs and a decrease in the quality of diet and increased obesity (Farahmand et al 2011). The findings also indicate an obesity trend in the Iranian industrial workplace. Many unhealthy food choices of workers include consumption of energy-dense, low-nutrient foods in conjunction with decreasing levels of physical activity (Boshtam et al, 2010; Hesmat 2015).

Since the workers spend a lot of time at their workplaces, it was logical that this place provides an opportunity for obesity causing and (NCDs) diseases, (Wierenga et al, 2012 ). Over the past 25 years, the number of organizations and companies that offer a health promotion program for their workers at the workplace has increased. They identified as a key element of (NCDs) disease prevention at the workplace (Maes et al 2012). Employers increasingly recognize that managing worker health behaviors with effective health promotion programs is a necessary part of a strategy to manage worker health benefit costs (Arena et al 2015).

Concurrent with health promotion development in the workplace, researchers continue to advance the role of dietary patterns to improve human nutrition and prevent chronic diseases like heart disease, diabetes, arthritis, and many forms of cancer (Brown 2011). For successful intervention of health promotions we need a clear understanding of behavior determinants including individual, physiological, and environmental factors. (Brug and Johannes 2008). In Iran, attempts at promotion of healthy eating behaviors restricted by traditional strategies which have focused on public campaigns, education, and biometric screening (Farahmand 2012). But promotion of healthy eating behavior will require change in the broader factors and addressing these factors is an essential part of any attempt to design and implement interventions to improve current unhealthy eating behavior (Brown 2011).

In Iran many studies have been conducted on diet and nutrition among children, women, and different

groups. But there aren't extensive studies on determinants of eating behaviors of workers. One of the most important studies has been conducted by Keshavarz. and her colleagues. (Keshavarz et al., 2011). The purpose of this study is to find the causes of why Iranian workers tend to choose unhealthy eating behaviors. So first we must identify their unhealthy eating and regarding their perceptions and experiences of unhealthy eating behaviors, can explain why industrial workers tend to choose unhealthy eating patterns. This grounded theory study was designed for unhealthy eating among workers participating in the industrial workplace that takes place in Tehran.

## MATERIAL AND METHODS

Methodology refers to a specific manner of thinking and researching phenomena. A qualitative approach permits the researcher to utilize the inner experiences of participants and study how findings are formulated through culture of a specific society (Strauss and Anselm 2008). Choosing a research problem to focus on and to develop research questions are important first steps to designing a study. Beginning with a broad topic, such as unhealthy diet and eating behaviors, then narrowing the field to promote healthy eating among a specific group of workers can lead to a variety of potential research questions. The study question conduct the methodological approach needed to carry out the study (Deliens 2014).

The question of why industrial workers tend to choose unhealthy eating because it is deeply influenced by their past culture, knowledge, and environment. Based on this research question, qualitative methods would generate data that would help us understand the process of unhealthy diets in workers. The purpose of the present qualitative study was to show why industrial workers tend to choose unhealthy eating behaviors. Creswell reports five approaches for conducting qualitative research: narrative, phenomenological, grounded theory, ethnographic, and case study (Deliens et al, 2014). Each approach has specific organizing styles. The grounded theory goes beyond explanation to comprehended or explain a concept; it is used to create a theory to explain a framework for another study. an important particular is that the theory development is generated information from participants that experienced the process (Strauss and Anselm,1998).

## PARTICIPANT AND DATA COLLECTION

To explore unhealthy eating behaviors from a bottom-up perspective, the population

Examined in the present study consisted of workers from an industrial complex with over 12,000 work-

Table 1. The study participant's characteristics

Total	number
Occupation	
Montage	8
Color	12
Trunk	6
Press	14
Age	
(20-30)	15
(30-40)	8
(40-50)	11
(50-70)	7
Work experience	
(5-10)	25
(15-30)	15

ers in the Regional Municipality of Tehran. Workers of different group (color, press, body, montage) of at the industrial complex identified the targeted population's demographic characteristics. The workers in the industrial complex were men. Using a maximum variation strategy, guided participant recruitment for the current study. Theoretical sampling is concept driven, allowing relevant discoveries to emerge that address the research problem. The average workers age was 35 years, employees ages ranged from 25 years to 55 years, and the average length of employment in the firm was 15 years (Table 1). The average worker's salary was \$500 a month. As a general guideline, sufficient sampling includes 40 individuals to form an in-depth theory.

## DATA ANALYSIS

This process of simultaneous qualitative data collection and analysis permits for constant comparison, which compares different segments of data or incidents for similarities and differences and identifies dimensions specific to categories/themes (Corbin,2008) reports that the researcher continues to gather data until reaching saturation and caution that arriving at the point of saturation is a complex process. They show that a saturated theory occurs when no more new categories appear and well-developed relationships exist among major categories with depth and variation. Application of diverse methods of data accumulation permits for collection of diverse facts about diverse situations. Therefore, to promote diversity, methods used in this inquiry include observation, interview, and document review. Study tools are applied as a testing device for measuring a given phenomenon, such as a paper and pencil test,

a questionnaire, an interview, or a set of guidelines for observation (Garten, Rebecca et al., 2009; Manen 2016).

Interviews are often used in qualitative study as tools to obtain in-depth information about subjects' attitudes. The semi-structured individual interview script was developed by the researcher. The interview protocol contained open-ended questions that were primarily guided by the findings from the document (Corbin, 2008). Interview designs vary in flexibility and structure and include informal Conversational interviews with no specific question types, a general interview guide to ask open-ended questions on specific topics, and standardized open-ended interviews with specifically worded questions. The open-ended interview questions encouraged participants to discuss their experiences with unhealthy eating behaviors. Probing and back-up questions allowed opportunities to elaborate upon their personal experiences Based on purposeful sampling, continued to collect and analyze data by interviewing new participants until reaching the point of theoretical saturation. Analyzed each interview transcript line by line during the open coding process and created a list of codes. Analysis of the transcripts showed that themes emerged after conducting 40 interviews, which suggested saturation. Five additional participants were interviewed and transcripts were coded. Many of the same ideas, or variations of similar ideas, were described by these participants. Data were analyzed conducted by constant comparative analysis (Crabtree, 2001).

In this study, data collection and analysis were done according to the grounded theory approach. During open coding, each transcript was reviewed by three authors and the data decrease to codes. Codes that were found to be conceptually related in meaning were grouped into subcategories. Interviewing was stopped when data saturation occurred .then emerged categories were "coherent". Based on other qualitative studies and previous experiences by other researchers with conducting interviews, it was expected that each interview would take approximately 45 to 60 minutes.

## DATA TRUSTWORTHINESS

In this study, credibility and conformability of the data were conducted by engagement with participants, and member checking. So that to confirm dependability, four faculty members conducted a second review. Results were also checked with some of the workers, who did not participate in the research and they confirmed the fitness of the results as well. All research details including procedures, actions and decisions were documented for audit purposes. Each interview transcribed within one weeks from the date it was conducted. While listening to the interview using a headset, and repeating the words

into a microphone, the words were transcribed with the voice recognition software. All transcribed individual interviews were converted from Word documents into Rich Text Format and imported into MAXQDA for analysis. MAXQDA is user-friendly, offers a student discount, and helps to systematically evaluate and interpret texts and develop theories.

## ETHICS

Ethics committee of the medical of science, Shahid Beheshti, Approved the study. Participants provided written informed consent before the beginning of interviews and explicit permission was sought for audio taping.

## RESULTS

The final study sample comprised of 40 individuals. A number of men were interviewed from an industrial workplace. Key themes and sub-themes identified. Participants are identified by their type of work and age only. Constant comparative analysis of the data was conducted with MAXQDA software according to the Strauss and Corbin analysis method. Results centered on five main themes that emerged from the data: 1. Lack of motivation for healthy eating behavior 2. Undesirable stress and emotions 3. Lack of eating knowledge and skills 4. conformity of unhealthy patterns and 5. Social environmental determinants for unhealthy eating behaviors. Lack of motivation for healthy eating behavior effects encompassed two subthemes: unwillingness to change unhealthy eating behaviors, not being able to make a right choice. Undesirable stress and emotions included three sub-themes: Impact of individual characteristics, Interpersonal and workplace stress due to eating behavior. Conformity of unhealthy patterns included three sub-themes: the Influence of family and society, the influence of organizational culture, prioritization for unhealthy food. Lack of eating knowledge and skills included four themes: Inadequate knowledge and information, limited access to sources of information about healthy food choices, poor communication skills, inadequate education for healthy eating behaviors, and finally social environment including two - sub them: limitation to helpful resources and the impact of social class.

### THEME 1: LACK OF MOTIVATION TO A HEALTHY EATING BEHAVIOR

Most participants in this study pointed out that their decision for eating behavior influenced by their motivation, which could directly affect toward their eating

patterns and shaping unhealthy eating habits, especially when they are working.

*"I don't believe I need to go on a healthy diet because I think I am a quite healthy person. So in my Workplace when I am exhausted and starving I usually eat fast and enjoy it and how it tastes"*

#### A) Unwillingness to change current eating habits

Most workers in this research had the desire to choose their food according to its taste more than its nutritional value. So they mentioned that have no desire or willing to follow any healthy eating behavior in the work place. The absence of desire to make a right choice could end the bad habit of unhealthy eating. Sometimes, taste and food preference are related to willing to do healthy eating behavior.

*"I don't like to follow a low fat diet, and I don't think I would ever choose to eat a healthy lunch. I prefer to eat kebabs, because it's very delicious and I need the energy".*

Sometimes previous food experiences for a person could cause the willingness to make a wrong food choice over the right one. Sometimes it makes people choose unhealthy food choices in the workplace.

*"Last week I ate spinach stew for my lunch in the workplace. I had never tried this food before. It was hard to choose it as a meal at work. I prefer to eat food that has already been tried in my house. I think we've had a good variety.*

Some participant mentioned they like to try new food instead of old fashioned ones. They are looking to diversify their eating. For example, some foods are dangerous to eat on a regular basis (Processed or junk food).

*"When we go out with friends for lunch, we order processed food, as of change, It can be frustrating to us, that we eat the same food every day".*

For most workers, their daily eating habits have been settled. They aren't eager to change it to a healthier eating pattern.

*"I am happy with my daily eating I like to eat what I like rather than follow others. I do not want to change their current situation I eat."*

#### B) Unable to decide a right choice.

Participants mentioned lack of will power over choosing right food.

*"I can't stop eating when I am full. Because I get used to eating my full plate. Sometimes.*

Some of workers mentioned they have no control over their eating habits which could cause over eating and obesity.

*“During lunch time we have lots of tendency to drink Pepsi. We don’t have any control on our behavior especially when we are thirsty or tired”.*

Sometimes persuasion is another reason workers to go against their will to choose a better eating habits.

*“Every time during my meal I decide to stop junk food in the workplace or home. But again I will say let’s do it next time “*

As result many workers felt frustrated at the lack of what they perceived Unwell power. In absent of will-power maybe they tendency to have an unhealthy choice diet or they postponed their safety behavior.

*“When you suppose your willpower is very low. There is very limited choice of Good choices’. And may you never take the decision to change your behavior and continue to eat foods full fat and calories”.*

In this study workers mentioned that there are a lot of factors could be effected by motivation to healthy eating behavior in the workplace.

## THEM 2: UNDESIRABLE STRESS AND EMOTIONS

Stressful events are associated with a variety of behavioral responses, and generally people utilize different coping strategies in order to deal with the stressor. Especially Undesirable stress & emotions effects people’s motivation on eating:

*“During daily life, for example when someone faces stress to reach to his destinations through traffic, stress from home and family, pressure from workplace all could effects ones eating habits”.*

### A) Impact of individual characteristics

Under pressure and emotion people temptation toward junk food under both general and specific stress will increases. They maybe consumption of food high in carbohydrates and fats increase in response to stressors.

*“I’m irritable character. When I fight someone at work It maybe I over consumed snack foods or eat more in the workplace”*

*“I am a low income worker with big family Not ....to afford a nice meal or go to any restaurant”*

Some workers comment that crowded environment always had major effect on their appetite, to some caused increase when for others had decrease on their appetite.

*“I m a calm person and rather eat very slowly without rush but my work environment doesn’t allow me to do”*

Food intake can have a remarkable effect on mood and most individuals will have their own food-associated, mood-related habits e.g. a cup of coffee to get going in the morning or eating sweet foods to reduce anxiety.

*“When I am happy or feel anxiety, it cause I overeat”.*

### B) Impact of Interpersonal stress

Interpersonal stress has also been implicated in eating behavior; examples of forms of interpersonal stress include ostracism and argument Family, financial problem are factors which can effect eating disorders in most of industrial workers.

### C) Impact of Workplace Stress on eating habit

One such workplace will encompass shift workers. We will assess the impact of workplace shift patterns on daily stress and eating behavior in a large group of men.

*“Some night I’m on night shift and maybe there is not a relief Because of this I eat too fast and anxiously”.*

Discontent and Lack of organizational support due to late and low payment had direct effect on person health. Absent of workers satisfaction due to late pay employers pressure on workers. Type of work and responsibility in work field also has direct impact on workers.

*“Respect in workplace, stress, pressure on workers due to employer expectations has negative effect on our diet”*

Fatigue and overwork was another important issue that was causing workers can enjoy a meal. There was a culture of not taking lunch because of time constraints and tight deadlines imposed upon workers as a result of volume of work expected.

*“Due to type of work I have in montage section I have lots of responsibility and pressure when I get home, lack of sleep and tension from daily work effects my eating and sleep time”*

*“There are people within the organization that work very hard and the demands and the pressures that are put on them, mean that they will often miss out On lunch and will work through’*

## THEM 3: CONFORMITY OF UNHEALTHY PATTERNS

### A) Family and society Unhealthy behavioral modeling

People’s customs are influence by home society and workplace, cultural background of each person had

direct deducted on the eating habits. Learning pattern-habits from home, society and workplace could effects on person's diet. Cultural behaviors of each person Has direct influence of food.

*"I learned my eating style from my parent 'Well, things have got to be prepared to come to work either in the morning or at night. As I said, the wife controls what I eat and it is sometimes probably inconvenient for her to make me food"*

*I have inheriting my eating habit from my parent the way my mom cooked the food and feed us is what I follow for my life habit.*

For those with young children being a good role model was important.

*"The biggest influence for me is having children. Being aware of what I have in the house".*

*"What I eat and what they eat. And it's made me think a lot more about what we all eat. And how easy it is to make unhealthy choices if you don't have healthy choices in front of you"*

Sometimes Cultural beliefs and religions has major effected on person eating habits.

*"I learned from my parent any food left in plate is sin then ended I eat a lot".*

Advertisement another factor which could influence people to try new fast and junk food. Distributing of food advertising at work please encourage workers to try new unhealthy fast food. One person felt that advertising food as being healthy

Wasn't positive as it made food sound as if it was a 'prescription' rather than being a social activity that should be enjoyed.

*"I think we are becoming in danger, in things like food and exercise, is some kind of prescription rather than some kind of enjoyment, which I think food should be and maybe just by making sure we*

*"Usually we order fast food (sausage/salami) for our breakfast in the workplace".*

## B) The influence of organizational culture

Family and society have a major effect on food habit which can create a pattern. Like over eating or full eat diet and people in workplace one influence by each other habits. Lunch menu selection by one worker could motivate another worker for this order for lunch. Everyone believes has an effect on what they eat in daily like and these beliefs can creation a work habit in their workplace.

*"You know they say you should eat your five fruit and veg, they did little competitions with all different sorts of fruit. Once they've gone, you can't get it. Because you go next day and say "Can I have some fruit like what they were doing" and it's not.*

Candidate in this research was believed they are under influence of them college when it comes to food selections. For example full fat food or overeating during lunch time.

*"Some days my colleagues and I go to restaurant together. In this situation selection impressed me. For example if they eat full fat food, I will selected it too".*

## C) Prioritization to unhealthy eating behavior

In addition to unhealthy behavioral modeling from tradition family and organization, our study participants have also revealed inappropriate prioritization as an important to unhealthy eating. An example is the inappropriate prioritization of the budget, where in limited resources are spent on items other than quality food.

*"I prefers to spend less for vegetable and fruit and more money for sandwich or pizza, indicating that vegetables is given lower priority than material belongings."*

## THEM 4: LAKE OF EATING KNOWLEDGE AND SKILLS

Lack of motivation to healthy eating behavior is associated with adequate knowledge of better food and nutrient intakes. Lack of knowledge influences on food choices.

*"Having a choice of healthy or diet food have been a problem for me"*

Lack of eating skills including "A complex, interrelated, person-centered set of skills necessary to provide and prepare safe, nutritious, culturally acceptable meals for all members of one's household.

## A) Inadequate eating knowledge and information

Lack of knowledge and information was an important reason to un healthy

Eating. Among workers, low awareness of nutrition and health is associated with better food and nutrient intakes. In the workers population, nutritional knowledge is intertwined with perceptions of healthy eating. As this study progressed, it became evident that a lack of food skills becomes an impediment to healthy eating because it:

*Every time I decided to eat a healthy food or a diet food I had problem of what to eat. Because I had no idea what is healthier.*

*I rather have something to fill my stomach no matters what I eat and I assume healthy food are not my appetite.*

As demonstrated by their inability to distinguish healthy foods

*"I usually use solid oil (saturated oil) in Preparing my foods because it is safer than liquid oil (unsaturated oils), which we don't know the exact ingredients of."*

*"It is not only sausage and salami that are considered unhealthy foods.*

*Since I am diabetic, the best vegetarian foods most probably will be considered unhealthy for my condition. I really have no idea what is good or bad for me."*

#### **B) Limited access to source of information healthy food**

Workers not only have insufficient and limited knowledge of healthy food but sometimes there information were inaccurate too. About healthy food and performing there source of information was problem in workplaces, Limited accesses to information about good diet and way of performing these sources of information was a major problem in work places.

*"Sometimes we have questions and problem about our food but we don't know how and to whom we should take it"*

#### **C) Poor communication skills**

Also lack of communication among workers of how and to whom should take their problem was another problem. Result of the research shows those workers who has insufficiencies knowledge about healthy nutrition were those who always had malnutrition or poor food balance. Lack of communicate in their workplace most workers they didn't know to whom and how speak of them problems.

*"Sometimes we have complain about our food but we don't know to who we should speak".*

#### **D) Inefficient Education**

Many workers believed that in the field of healthy eating less attention to their groups and educational institutions have seen most of the population.

*"I'm construction workers. I do not have time to attend classes. Of course here is more administra-*

*tive classes for more time and more time to consider important to the organization"*

This lack of motivation to healthy eating behavior understood can be against the background of an inter-related factor: social and environmental determinants of unhealthy eating behavior.

## **THEM 5: SOCIAL AND ENVIRONMENTAL DETERMINANTS OF UNHEALTHY EATING BEHAVIOR.**

According to gather information in this research lack of motivation could effects social and environment factors.

#### **A) Limitation to helpful resources**

There were two factors for workers of not having right eating diet: first limited access to healthy food. Second having tendency to try new unhealthy food in workplace.

*"I am interested in full fat food when I see it in lunch menu I rather order it for my lunch"*

Distance between workers resident and workplace reduces sufficient breakfast time for them

*"When I get to workplaces breakfast time is almost over and I can't eat a nice an enough meal"*

#### **B) The impact of social class**

"In addition to the important issue of physical access, the next important issue that could affect their eating, subject to economic conditions. That could be one of the important issues that greatly affect dietary behavior"

*The first important issue is the economic situation and the limitations of their impact on food and eating will be discussed*

In addition to the impact of the economic and social situation of the country and buy the company, the financial income and purchasing power of workers.

*"A lot of their workers protein by eating meat here you can provide food and other might not have bought meat*

Issues such as education and the lives of those factors closely related to eating habits in the workplace. Those who belong to the working class, the most voluminous foods were usually elected. And that they tend to be full, were more likely to choose the more unhealthy foods.

*"Most workers are from lower classes, eat voraciously food, however, a wide range of community that are not so rich. Nutritious foods and eat right, and not be able to afford a normal meal afford.*

## DISCUSSION

The purpose of the current study was to show why industrial workers tend to choose unhealthy eating behaviors in the workplace. The important findings from each of the themes identified in the study are discussed. The most prominent cause that faced Iranian workers were attributed to a lack of motivation for healthy eating behavior. Many studies have pointed to the important role of motivation in eating behavior. In another study conducted, important role of motivation and its impact on eating behavior has been described, (Brug, Johannes, 2008).

The workers also reported problems in lack of their motivation could be effected by unwillingness and unable to decide a right choice. In support of these findings, important theories of determinants of human health behavior, such as the Theory of Planned Behavior, Protection Motivation Theory and Social Cognitive Theory recognize behavioral decision or intention as the primary most proximal determinant of behavior. Intentions can be regarded as the consequence of motivation (Busch 2016).

In addition, other studies, attitudes, self-efficacy, and desirability or undesirability were identified as determinants of motivation that in close coordination with the concept of willingness in the present study (Brug, Johannes, 2008). Workers also reported that factors such as undesired stress and emotions, lack of knowledge and skills, conformity from unhealthy patterns could be affected on willingness. Consistent with previous findings, participants of this study believed that the workers inadequate knowledge, form healthy food and safe eating habits. These are the most important factors contributing to unhealthy eating behavior in workplace in current studies. Lack of access to educational Programs providing instructions for preparation of healthy meals (Grandner 2010; Kothe 2012).

Choosing correct food portion sizes, preparation methods, and healthy food was another important motivation-related choosing foods. They need a great deal of food knowledge and good arithmetic skills. Opportunities for objective self-assessment are lacking, people tend to compare their choice food to what they perceive 'others' do. Such social comparisons are liable to so-called optimistic bias resulting in the way people think that they already comply with dietary recommendations while they are not and a lack of motivation to change, (Vaismoradi et al.2013).

Studies have shown that unawareness of unhealthy eating habits is a strong positive Correlate of intentions to make dietary changes. Along with low nutritional awareness, one of the other causes was the lack of control of undesirable stress and emotions. The relationship between stress and eating behavior has been explored

from several different domains. The relationship between the two has been observed with eating behavior identified as susceptible to change as an emotion coping strategy (Scott et al, 2012).

The relationship between stress and eating behavior has been explored as part of a physiological and biological reaction and has, in particular, led to knowledge of the neuronal food reward and neuron-endocrine systems that influence eating behaviors. Such research has resulted in a growing body of evidence supporting the premise that stress influences health in two ways; directly through autonomic and neuroendocrine responses and indirectly through changes to health behaviors. Information obtained from this study confirmed previous findings this work was no exception psychological conditions (O'Connor 2008; Hammond 2015).

Lack of timely payment of salaries, sanctions and pressure from work fatigue could affect their eating behaviors and work was a source of a lot of daily stress. Many of them cannot handle this stress and emotions. Also in this study conformity the patterns of unhealthy at home, community and workplace can play a role in the formation of habits and eating behaviors at work was impossible. Many studies had pointed to this relationship (Logue 2014).

This behavior comes from a culture of motivation were impressed with the knowledge of the individual. According to the study findings also conformity the patterns of unhealthy food at home and society could be derived from customary practices and habits in society, religious doctrine, and advertising media. Many studies have pointed to the role of home and community on eating behaviors (Brug and Johannes, 2008). Also is another important issue was that an important role in the formation of personal belief in healthy nutrition in workplace. Many workers based on existing behaviors to emulate and model for their own and their coworker. Many of these models that were simply not healthy behaviors in advance.

According to our findings, the unhealthiest nutritional patterns in Iranian families are influenced by their workers food preferences. Existing data show that there is an increasing tendency among Iranian workers toward Western dietary patterns that are largely defined by the consumption of high calorie snacks and fast foods (Farahmand et al 2012). As in many other countries, the attractive and colorful packaging of these foods, despite their poor nutritional values, is one factor inducing change in Iranian workers unhealthy food choices. A change reflected in an increasing trend toward fast foods and high calorie snacks. Some of the possible impact of the physical environment, such as the availability of unhealthy foods in effect for unhealthy food patterns have pointed out.

The findings of this study, the role of social environment on eating behaviors at work mentioned. Income level and social class, as one of the most important factors in eating behaviors were compared to previous studies food behaviors was closely associated with income level. Especially the welfare and access in this study was also another important issue regarding food behavior (Farahmand M,2012). This loss motivation to healthy eating behavior understood can be against the background of an interrelated factor: social- environmental determinants.

The environment can be defined as everything and anything outside the person. Environments may make healthier choices easier choices or may even reduce the number of options or possibilities for unhealthy choices workers. Just as personal factors have been further subdivided in more specific determinant constructs and proposed pathways of mediation, so can and should the environment be further defined by means of distinguishing various environmental factors (Logue 2014, Tabak et al, 2015 ).

Results of this study also showed low income as an important factor that could affect food choices among workers. The relatively low cost of fast foods and high calorie snacks has made these foods more easily accessible to Iranian people (Azizi F,2013). Previous studies have similarly found cost to be one of the most important barriers to dietary adherence Time limitations to the preparation of healthy food is noteworthy, Access to unhealthy food and limited in time and distance. Several studies report findings similar to ours. This study was a qualitative study and the findings can Provide a deep understanding of workers perceptions of choose to UN healthy eating behavior among Iranian industrial, findings which could not be achieved through quantitative studies.

Variety in sampling was an advantage of the current study. Participants of the study belonged to different socio-economic backgrounds and different occupation groups. Voluntary participation made room for exclusion of the experiences of those who did not wish to participate in the study for any reason. Also, all participants were selected from a complex. The limitations of the present study include the small number of people interviewed, which may not be representative of the breadth of the workforce. All workers interviewed were men. Self-selection may also mean that those who volunteered to be interviewed were more interested in food and nutrition. And we didn't have any time for intervention in the workplace.

The present study, however, is unique because it has considered the viewpoints of a wide range of workers on food provision in industrial workplaces. Unlike other studies, workers felt that food provision and choice need

to change as workforce demographics alter, that the attitudes and behaviors of organization staff are important, and employers should promote healthy eating in the workplace. It has identified a complex picture of views and opinions about healthy eating in the workplace and the consequent challenge to design effective workplace healthy-eating interventions. Conclusions must be drawn with caution because the present study focused on a workplaces in Tehran. The findings may be appropriate to other workplaces in Iran, and possibly the rest of the Tehran.

## CONCLUSION

Results from this study have indicated why industrial workers tend to choose unhealthy eating behaviors in workplace by as a group of industrial workers, participants of Study. Performance of effective educational programs to increase nutritional knowledge and appropriate policy-making seem prerequisite to develop healthy eating patterns among Iranian workers. Findings of the study may help in the designing of healthy eating behavior programs in the future by providing a realistic perspective of the current situation.

## REFERENCES

- Arena R, Guazzi M, Lianov L, Whitsel L, Berra K, Lavie CJ, Kaminsky L, Williams M, Hivert MF, Franklin NC, Myers J. Healthy lifestyle interventions to combat noncommunicable disease—a novel nonhierarchical connectivity model for key stakeholders: a policy statement from the American Heart Association, European Society of Cardiology, European Association for Cardiovascular Prevention and Rehabilitation, and American College of Preventive Medicine. *European heart journal*. 2015 Jul 1;ehv207.
- Azizi F, Amouzegar A, Delshad H, Tohidi M, Mehran L. Natural course of thyroid disease profile in a population in nutrition transition: Tehran Thyroid Study. *Archives of Iranian medicine*. 2013 Jul 1;16(7):418.
- Brown RB. *Constructing a Grounded Theory of Worker Attitudes Toward Developing a Plant-Based Nutrition Intervention*. Northcentral University; 2011.
- Boshtam M, Sarafzadegan N, Zare K, Sadeghi S, Sajadi F, Rabii K, Boshtam M. Effects of 5-year interventions on cardiovascular risk factors of factories and offices employees of isfahan and najafabad: worksite intervention project-isfahan healthy heart program. *ARYA Atheroscler*. 2010 Dec 22; 6(3):93-100.
- Brug, Johannes. "Determinants of healthy eating: motivation, abilities and environmental opportunities." *Family practice* 25. suppl 1 (2008): i50-i55.
- Busch L. Individual choice and social values: Choice in the agri-food sector. *Journal of Consumer Culture*. 2016 Mar;16(1):124-43.

- Creswell, J. David, et al. "Does self-affirmation, cognitive processing, or discovery of meaning explain cancer-related health benefits of expressive writing?." *Personality and Social Psychology Bulletin* 33.2 (2007): 238-250.
- Crabtree, Benjamin F., WILLIAM L. MILLER, and Kurt C. Stange. "Understanding practice from the ground up." *Journal of Family Practice* 50.10 (2001): 881-881.
- Corbin, Juliet, and Anselm Strauss. "Basics of qualitative research 3e." (2008): 117-41.
- Deliens T, Clarys P, De Bourdeaudhuij I, Deforche B. Determinants of eating behaviour in university students: a qualitative study using focus group discussions. *BMC public health*. 2014 Jan 18;14(1):53.
- Farahmand M, Tehrani FR, Amiri P, Azizi F. Barriers to healthy nutrition: perceptions and experiences of Iranian women. *BMC Public Health*. 2012 Dec 10;12(1):1.
- Garten, Rebecca J., et al. Antigenic and genetic characteristics of swine-origin 2009 A (H1N1) influenza viruses circulating in humans. *Science* 325.5937 (2009): 197-201.
- Grandner MA, Kripke DF, Naidoo N, Langer RD. Relationships among dietary nutrients and subjective sleep, objective sleep, and napping in women. *Sleep medicine*. 2010 Feb 28;11(2):180-4.
- Hammond J, Keeney R, Raiffa H. *Smart choices: A practical guide to making better decisions*. Harvard Business Review Press; 2015 Jul 21.
- Feshmat R, Kelishadi R, Motamed-Gorji N, Motlagh ME, Ardalan G, Arifirad T, Rastad H, Asayesh H, Djalalinia S, Larijani B, Qorbani M. Association between body mass index and perceived weight status with self-rated health and life satisfaction in Iranian children and adolescents: the CASPIAN-III study. *Quality of Life Research*. 2015 Jan 1;24(1):263-72.
- Kothe EJ, Mullan BA, Butow P. Promoting fruit and vegetable consumption. Testing an intervention based on the theory of planned behaviour. *Appetite*. 2012 Jun 30;58(3):997-1004.
23. Scott C, Johnstone AM. Stress and eating behaviour: implications for obesity. *Obesity facts*. 2012 Apr 21;5(2):277-87.
- Logue AW. *The psychology of eating and drinking*. Routledge; 2014 Dec 3.
- Maes L, Van Cauwenberghe E, Van Lippevelde W, Spittaels H, De Pauw E, Oppert JM, Van Lenthe FJ, Brug J, De Bourdeaudhuij I. Effectiveness of workplace interventions in Europe promoting healthy eating: a systematic review. *The European Journal of Public Health*. 2012 Oct 1;22(5):677-83.
- Mousavi SM, Anjomshoa M. Prevention and Control of Non-Communicable Diseases in Iran: A Window of Opportunity for Policymakers. *Iranian journal of public health*. 2014 Dec; 43(12):1720.
- O'Connor DB, Jones F, Conner M, McMillan B, Ferguson E: Effects of daily hassles and eating style on eating behavior. *Health Psychol* 2008; 27:S20-S31.
- Strauss, Anselm, and Juliet Corbin. *Basics of qualitative research: Techniques and procedures for developing grounded theory*. Sage Publications, Inc, 1998.
- Tabak RG, Hipp JA, Marx CM, Brownson RC. Workplace social and organizational environments and healthy-weight behaviors. *PloS one*. 2015 Apr 28;10(4):e0125424.
- Van Manen M. *Phenomenology of practice: Meaning-giving methods in phenomenological research and writing*. Routledge; 2016 Sep 17.
- Vaismoradi M, Turunen H, Bondas T. Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. *Nursing & health sciences*. 2013 Sep 1;15(3):398-405.
- Wierenga D, Engbers LH, van Empelen P, Hildebrandt VH, van Mechelen W. The design of a real-time formative evaluation of the implementation process of lifestyle interventions at two worksites using a 7-step strategy (BRAVO@ Work). *BMC public health*. 2012 Aug 7;12(1):1.
- World Health Organization. *Global status report on noncommunicable diseases 2014*. World Health Organization; 2014.
- Keshavarz, Z., M Simbar, A.Ramezankhani, H. Alavi Magd. Factors for Performing Breast and Cervix Cancer Screening by Iranian Female Workers: A Qualitative-model Study. *Asian Pacific J Cancer Prev*;2011, 12: 1517-1522.

## Investigating the factors associated with Sexual satisfaction in women of different ages referred to health center of Shahid Beheshti University of Medical Sciences

Nahid Khodakarami<sup>1</sup>, Farzaneh Hosseini\*<sup>1</sup>, Mahyar Azar<sup>2</sup> and Alireza Akbarzadeh Baghban<sup>3</sup>

<sup>1</sup>MSc., Department of Midwifery, School of Nursing and Midwifery, Shahid Beheshti University of Medical Sciences, Tehran, Iran

<sup>2</sup>MD, Department of Psychiatry, School of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran

<sup>3</sup>Department of Biostatistics, Shahid Beheshti University of Medical Sciences, Tehran, Iran

### ABSTRACT

Sexual satisfaction as an important aspect of health is affected by many factors including one's own, early relationships, social and cultural complexity of the environment, sexual history, and his wife, past relationships, mental health, past medical problems and hormonal status. The purpose of current study was to identify factors associated with sexual satisfaction in women of different ages referring to Health Center of Shahid Beheshti University of Medical Sciences in Tehran in 2009. The method of research was descriptive and correlational type. The study population included all women referred to health centers affiliated to Tehran Shahid Beheshti University of Medical Sciences in 2009. The sample was composed of married women over 15 years. The study population included all women referred to health centers affiliated to Tehran Shahid Beheshti University of Medical Sciences in 2009. The sample was composed of married women over 15 years. The society has chosen sample of 380 people by multi-stage random sampling method and with the help of questionnaires, personal information or demographic (11 questions), the question of fertility (13 questions), questions related to cultural and social factors (16 questions), questions related to psychological factors (21 questions), questions related to factors related to health (12 questions) and sexual satisfaction were assessed (these questions were part of SCL90 questionnaire). To analyze the data, mean, standard deviation, analysis of variance, t-test, Pearson and Spearman correlation coefficient were used. The results showed that there was a significant relationship between age, personal factors, reproductive factors, cultural factors, attitudes and sexual relationships, mental / emotional, and sexual satisfaction. In other words, each of these can predict women's satisfaction amount. It should also be noted that activity and sexual function, of the things that changed in the different periods of life, as a result of preventive and care of their needs and goals change according to it and lack of attention to this issue has adverse effects on mental health, marital and couples and warm the heart of families.

**KEY WORDS:** AGE, CULTURAL/PSYCHOLOGICAL/SOCIAL FACTORS, MARITAL SATISFACTION, WOMEN, SHAHID BEHESHTI UNIVERSITY

### ARTICLE INFORMATION:

\*Corresponding Author: [Fhosseini2000@gmail.com](mailto:Fhosseini2000@gmail.com)

Received 27<sup>th</sup> April, 2017

Accepted after revision 31<sup>st</sup> July, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

One of the most important human needs and desires, is sexual instinct which makes the survival and reproduction and its authors have been accepted as a base for a family and are very important to satisfy it (Nejati, 2001). Motivation and sexual desire like other fundamental human motivations, forms an integral part of the biological and psychological nature, it is clear that quality to satisfy this motivation plays a very important role in individual and social health and achieve peace and comfort (Boyd, 2002). If this instinct is not satisfied properly, physical and mental pressures that are brought to the wrong person, in his health, and lowers interfere with his ability and creativity (Azar and Nouhi, 2003). So satisfactory sexual performance is an important factor for strengthening the family and the basis for obtaining and facing a family firm culture (Jahanfar, 2001). Having satisfying sex, reduce stress and causes an increase in daily life. People who have sexual satisfaction report significantly higher quality of life than those who do not consent (McInnes, 2003). The people in their relationships with their husbands, love and intimacy report higher (Sprecher, 2002).

On the other hand, although the lack of sexual satisfaction and no positive sexual experience, not a disease but it is a precursor to many problems (Jahanfar, 2001). Various statistics about the prevalence of sexual satisfaction or non-satisfaction there. The overall prevalence of sexual dysfunction in America 43 percent for women and 31% have been reported for men (Basson, 2000). In Iran, the prevalence of sexual dissatisfaction is expressed from 45 to 65 percent (Ozgoli *et al.*, 2003, Rezaei Pour *et al.*, 2003). Lack of sexual satisfaction and sexual dysfunction is closely associated with social problems such as crime, sexual assault, mental illness, betrayal and socialize secret and can affect the behavior of children (Jahanfar, 2001).

It is observed that 50 percent of children who have grown up in families with marital discord, will experience in the future inconsistencies in their marriage and married life (Nejati, 2001). In fact, it can be important that healthy sexual relationship is the most important

causes of happiness in marriage and it is necessary for a healthy society (Nejati, 2001). Therefore, understanding the factors associated with sexual satisfaction and the role that they play in this regard as the solution to create and strengthen healthy sexual relationships, it seems necessary (Henderson *et al.*, 2009). According to the researcher said the study sought to examine factors associated with sexual satisfaction in women of different ages.

## RESEARCH METHODS

This study was a descriptive correlational. The study population consisted of all women referred to health centers affiliated to Shahid Beheshti University of Medical Sciences in Tehran in 2009. The sample was composed of married women over 15 years. In this study, the research environment, health centers affiliated to Shahid Beheshti University of Medical Sciences in Tehran in three regions of East, North and Shemiranat. The society has chosen sample of 380 people by multi-stage random sampling method and with the help of questionnaires, personal information or demographic (11 questions), the question of fertility (13 questions), questions related to cultural and social factors (16 questions), questions related to psychological factors (21 questions), questions related to factors related to health (12 questions) and sexual satisfaction were assessed (these questions were part of SCL90 questionnaire). To analyze the data, mean, standard deviation, analysis of variance, t-test, Pearson and Spearman correlation coefficient were used.

## RESEARCH FINDINGS

The highest percentage (45) are in the age group 15-30 years the research unit and the lowest percentage (21.1) in patients older than 45 years old. The mean age of participants was 33.59 years and a minimum of 18 and highest age was 56 years. The highest percentage (77) subjects were housewives, and the lowest percentage (2.4) were employed at home. 67.4 percent of women born in Tehran and 32.6 percent of those born in the

Table 1. Examining the relationship between sexual satisfaction and trouble in the genital examination, the type of problem and type of hormone therapy in women

Variable	Test type	P	Test result
Kind of problem in the gynecological examination	ANOVA	0.872	Without meaning
The problem in gynecological examinations	T-test	0.682	Without meaning
Hormone Therapy	T-test	0.524	Without meaning
taking medication	T-test	0.661	Without meaning
Disease type	ANOVA	0.431	Without meaning

Table 2. Statistical indicators of sexual satisfaction research units in terms of having mental problems

Having depression	Number	Mean	Standard deviation	SCL 90
does not have	377	67.21	15.19	P < 0.001
have	10	63.3	-	
Having stress	Number	Mean	Standard deviation	P < 0.001
does not have	375	66.2	13.98	
have	7	56.4	19.25	

city. During the common life in the highest percent (28.4) of subjects had less than 5 years and the lowest (7.6%) were 15-20 years old. The average length of marriage was 12.32 years. Minimum of 1 year and a highest of 37 years. 96.6 percent and 4.3 percent of the units had been married once they were married two or more times. Education of highest percent (56.7) of subjects were high school and the lowest percentage (5.2) were the primary. The highest percentage (55) of subjects 21-25 years of

age first pregnancy, the lowest percentage of them (2.1) at the age of 30 years and 1.8 percent of subjects had no history of pregnancy.

The average age of first pregnancy was at 22.13 years in the present research. Age at first marriage greatest percent (46.8) of subjects was 21-25 and the lowest percentage (10.6) were married at the age of 25 years. Average age at first marriage was 3.21 in the subjects. 3.2% of subjects had no history of pregnancy. Most percent

Table 3. Comparison of individual factors and percentage breakdown of the age groups studied satisfaction

Age Category	Variable	Test type	Correlation coefficient	P value	Test result
15-30 years old	Wife age	Pearson	0.01	0.90	Without meaning
	Job	ANOVA	-	0.282	Without meaning
	Jobs wife	ANOVA	-	0.02	Meaningful
	Place of birth	T-test	-	0.901	Without meaning
	During marriage	Pearson correlation	-0.033	0.66	Without meaning
	Number of marriages	T-test	-	0.256	Without meaning
	Education	ANOVA	-	0.009	Meaningful
	Wife education	ANOVA	-	0.029	Meaningful
30-45 years old	Wife age	Pearson	0.118	0.182	Without meaning
	Job	ANOVA	-	0.527	Without meaning
	Jobs wife	ANOVA	-	0.756	Without meaning
	Place of birth	T-test	-	0.083	Without meaning
	During marriage	Pearson	-0.127	0.152	Without meaning
	Number of marriages	T-test	-	0.151	Without meaning
	Education	ANOVA	-	0.02	Meaningful
	Wife education	ANOVA	-	0.230	Without meaning
Over 45 years	Wife age	Pearson	-0.275	0.013	Meaningful
	Job	ANOVA	-	0.042	Meaningful
	Jobs wife	ANOVA	-	0.171	Without meaning
	Place of birth	T-test	-	0.210	Without meaning
	During marriage	Pearson	-0.248	0.027	Meaningful
	Number of marriages	T-test	-	0.273	Without meaning
	Education	ANOVA	-	0.035	Meaningful
	Wife education	ANOVA	-	0.290	Without meaning

Table 4. Comparison of the relationship between fertility and percentage breakdown of the age groups studied women's sexual satisfaction

Age Category	Variable	Test type	Correlation coefficient	P value	Test result
15-30 years old	Age at first pregnancy	Pearson	-0.145	-0.135	Without meaning
	Age at first marriage	Pearson	+0.091	0.239	Without meaning
	Parity number	Spearman	-0.152	0.047	Meaningful
	The number of births,	Spearman	-0.146	0.056	Without meaning
	Type of delivery	ANOVA	-	0.005	Meaningful
	Abortion	Spearman	-0.051	0.006	Meaningful
	Infertility	Spearman	-0.048	0.535	Without meaning
	Contraceptive method	ANOVA	-	0.261	Without meaning
	Hormone Therapy	-	-	-	-
	Menopause	-	-	-	-
30-45 years old	Age at first pregnancy	Pearson	+0.089	0.316	Without meaning
	Age at first marriage	Pearson	+0.154	0.082	Without meaning
	Parity number	Spearman	-0.265	0.002	Meaningful
	The number of births,	Spearman	-0.111	0.212	Without meaning
	Type of delivery	ANOVA	-0.326	0.313	Without meaning
	Abortion	Spearman	1	0.532	Without meaning
	Infertility	Spearman	-	0.257	Without meaning
	Contraceptive method	ANOVA	-	0.123	Without meaning
	Hormone Therapy	-	-	-	-
	Menopause	-	-	-	-
Over 45 years	Age at first pregnancy	Pearson	0.015	0.897	Without meaning
	Age at first marriage	Pearson	0.109	0.337	Without meaning
	Parity number	Spearman	-0.312	0.005	Meaningful
	The number of births,	Spearman	-0.269	0.016	Meaningful
	Type of delivery	ANOVA	-	0.129	Without meaning
	Abortion	-	-	-	-
	Infertility	Spearman	-0.246	0.028	Meaningful
	Contraceptive method	ANOVA	-	0.153	Without meaning
	Hormone Therapy	T-test	-	0.524	Without meaning
	Menopause	T-test	-	0.009	Meaningful

(38.6) of a pregnancy and the lowest percentage (0.8) had 6 times of pregnancy. The average number of pregnancies in the sample was 2.3. 3.6% of subjects were not delivered. 41.3 percent and 0.3 percent of pregnant women have their first birth 6. 3.6% of subjects had a history of childbirth. Highest percent (44.9) of them were vaginal births and the lowest percentage (2.8) of both vaginal delivery and cesarean respectively. The lowest percentage of subjects (1.3), 6 children, most of them (41.6), had one child. 87.9 percent of subjects had no history of abortion. The rest of them, the highest per-

centage (8.4) of an abortion and the lowest percentage (1.6) have a history of abortion. 89.2 percent of patients had no history of infertility and 10.8 percent had a history of infertility 1 to 3 years.

The highest percentage of subjects (28.2) had used a condom and the lowest percentage of them (0.4) were using the pill breast-feeding. 7% of subjects were postmenopausal and 93% of them were postmenopausal. The lowest percentage (1.3) of the study were hormone therapy and hormone therapy was 98.7% of them were not. The highest percent (56.4) research units have difficulty

Table 5. Comparison of sexual satisfaction study factors related to health and percentage breakdown of age groups			
Age Category	Variable	P value	Test result
15-30 years old	Feel good and healthy	0.001	Meaningful
	Feeling sick	P < 0.001	Meaningful
	Strengthening drugs	P < 0.001	Meaningful
	Specific disease	0.529	Without meaning
	Disease	0.170	Without meaning
	Women surgery	0.799	Without meaning
	Surgery	0.843	Without meaning
	The problem in gynecological examinations	0.164	Without meaning
	Kind of problem	0.242	Without meaning
30-45 years old	P < 0.001	P < 0.001	Meaningful
	Feeling sick	P < 0.001	Meaningful
	Strengthening drugs	P = 0.001	Meaningful
	Specific disease	0.027	Meaningful
	Disease	0.825	Without meaning
	Women surgery	0.008	Meaningful
	Surgery	0.066	Without meaning
	The problem in gynecological examinations	0.536	Without meaning
	Kind of problem	0.902	Without meaning
Over 45 years	Feel good and healthy	0.02	Meaningful
	Feeling sick	0.004	Meaningful
	Strengthening drugs	P < 0.001	Meaningful
	Specific disease	0.032	Meaningful
	Disease	0.970	Without meaning
	Women surgery	0.207	Without meaning
	Surgery	0.429	Without meaning
	The problem in gynecological examinations	0.808	Without meaning
	Kind of problem	0.999	Without meaning

in sexual relations with their husbands in other cases, the highest percent (19.3) of the unwillingness of women and the lowest percentage (0.3) of sexual problems or unwillingness his wife, as the cause of the problem was posed in sexual relations. The highest percent (55.8) of subjects of 17-20 have the lowest score (4.5) they have less sexual satisfaction score of 10. The highest percent (50.9) management units had love before sexual intercourse. And the lowest (18) of them did not make love before having sex. The highest percent (55.4) of subjects

had married of their own accord and the lowest percent (21.4) of them were married to your liking.

The highest percentage (41) of participants were familiar before marriage. And the lowest percent (25.8) of them familiar enough not to get married. 9.7% of subjects were addicted husband and 89.2 did not addiction. Most percent (64.7) of subjects had a separate bedroom and the lowest percent (35.3) of them had no separate bedroom. The lowest percentage (6.2) of subjects had a relationship with another woman's husband and the

Table 6. Comparison of socio-cultural factors and percentage breakdown of the age groups studied women's sexual satisfaction

Age Category	Variable	P value	Test result
15-30 years old	Make love before having sex	P < 0.001	Meaningful
	Antipathy towards sexual relations	0.024	Meaningful
	Choose your option wife	0.005	Meaningful
	Enough familiarity with the spouse before marriage	0.045	Meaningful
	Marriage and dating	0.016	Meaningful
	Negative perceptions about men, especially your spouse	0.005	Meaningful
	When your spouse consider sexual contact	0.015	Meaningful
	Informed and conscious of sexuality in adolescence	0.009	Meaningful
	Do embarrassment and shame prevents sexual contact	0.006	Without meaning
	Marriage similar to that of a teenager did you think	0.197	Meaningful
	Drug addiction wife	0.015	Without meaning
	Your spouse consume alcoholic beverages	0.283	Meaningful
	Partner relationship with another woman.	P = 0.001	Meaningful
	Separate bedroom	0.002	Meaningful
30-45 years old	Make love before having sex	P < 0.001	Meaningful
	Antipathy towards sexual relations	P < 0.001	Meaningful
	Choose your option wife	0.061	Without meaning
	Enough familiarity with the spouse before marriage	0.214	Without meaning
	Marriage and dating	0.466	Without meaning
	Negative perceptions about men, especially your spouse	0.061	Without meaning
	When your spouse consider sexual contact	0.001	Meaningful
	Informed and conscious of sexuality in adolescence	P < 0.001	Meaningful
	Do embarrassment and shame prevents sexual contact	0.09	Without meaning
	Marriage similar to that of a teenager did you think	0.658	Without meaning
	Drug addiction wife	0.097	Without meaning
	Your spouse consume alcoholic beverages	0.067	Without meaning
	Partner relationship with another woman.	P < 0.001	Meaningful
	Separate bedroom	0.035	Meaningful
Over 45 years	Make love before having sex	P < 0.001	Meaningful
	Antipathy towards sexual relations	P < 0.001	Meaningful
	Choose your option wife	0.002	Meaningful
	Enough familiarity with the spouse before marriage	0.003	Meaningful
	Marriage and dating	0.601	Without meaning
	Negative perceptions about men, especially your spouse	0.002	Meaningful
	When your spouse consider sexual contact	0.262	Without meaning
	Informed and conscious of sexuality in adolescence	P < 0.001	Meaningful
	Do embarrassment and shame prevents sexual contact	0.821	Without meaning
	Marriage similar to that of a teenager did you think	0.442	Without meaning
	Drug addiction wife	0.065	Without meaning
	Your spouse consume alcoholic beverages	0.152	Without meaning
	Partner relationship with another woman.	P < 0.001	Meaningful
	Separate bedroom	0.038	Meaningful

Table 7. Comparison of relationship due to difficulties in sexual relationships and sexual satisfaction of women studied, the percentage breakdown of age groups

Age Category	P value	Test result	
15-30 years	P < 0.001	Meaningful	Fear of getting pregnant noted with satisfaction average of 55 percent due to difficulties in sexual relations.
30-45 years	P < 0.001	Meaningful	Unwillingness (39.19) percent mentioned the most common cause of sexual problems in the relationship.
Over 45 years	P < 0.001	Meaningful	Unwillingness and lack of place, the right time was the highest (4.8) percent due to difficulties in sexual relations.

highest percentage (79.5) of them had no relationship. 17.9 percent were unaware. The lowest percent (15.8) of subjects had a lot of felt and the lowest percentage of their health (28.4) felt they had low health. 82.4 percent of subjects were not patients. Of those who were sick, the lowest percentage (0.5) of patients with illness and the highest percentage (5.8) they have mentioned other diseases. Most percent (88.7) had a history of surgical research unit. In other cases, the highest rate (9.2) was related to pelvic surgery and the lowest percentage (0.5) was related to breast and ovarian removal.

There was no significant association between genital examination problem, a problem in gynecological examinations and hormone therapy, and percentage of satisfaction. Also a significant association was observed between disease and drug consumption and the percentage of sexual satisfaction.

Using t-test and  $P < 0.001$ , there was a significant relationship between depression and stress and the percentage of sexual satisfaction.

## DISCUSSION AND CONCLUSION

The purpose of current study was to identify factors associated with sexual satisfaction in women of different ages referring to Health Center of Shahid Beheshti University of Medical Sciences in Tehran in 2009. Sexual satisfaction is generally achieved 67.13 in separate age groups, 15-30 year-old age group (73.69 percent), 30-45 year-old age group (66.21 percent) and 45-year-old age group up (56.20 percent), respectively.

In the present study there was a significant relationship between age and sexual satisfaction percentage ( $0.001 > P$ ) and increase with age, the percentage of sexual satisfaction declined. The highest percentage of sexual satisfaction (73.69) were in the age group 15-30 years and the lowest percentage of sexual satisfaction (56.20) were in the age group over 45 years. Apart from age, other demographic factors that were examined in this study, age was a significant relationship between wife and husband's age of sexual satisfaction. In general with increasing age wife, sexual satisfaction declined.

There was no significant relationship between job satisfaction of women and sex while there was a significant correlation between sexual satisfaction and the highest percentage of jobs wife and sexual satisfaction in women whose husbands were self-employed. Level of education in general (male and female) was observed significant correlation ( $P < 0.001$ ) with sexual satisfaction and sexual satisfaction with the level of education increases.

There was a significant correlation between the length of cohabitation and sexual satisfaction. With increasing duration of marriage, the percentage of sexual satisfaction decreases. There was no significant relationship between place of birth and marriage plays. In the relationship between the individual and the sexual satisfaction of the separation of age groups, the 15-30 year-old age group studied of all the individual variables were significant correlation between occupation mate  $P = 0.02$ , educated woman,  $P = 0.009$  and Education wife  $P = 0.029$  and sexual satisfaction. In the age group 30-45 years, education  $P = 0.02$  meaningful and significant relationship was observed in the age group above 45 years of age, wife, job, marriage and education during sexual satisfaction. In the present study there was a significant correlation between sexual satisfaction and frequency of pregnancy, a healthy child and abortion.

There was a significant correlation between age at first pregnancy and sexual satisfaction, but no significant relationship between age at first marriage and sexual satisfaction. There was a significant association between infertility and sexual satisfaction. There was a significant relationship between mode of delivery and sexual satisfaction, overall sexual satisfaction was higher in people who had no experience of childbirth. Among those who have experienced childbirth, those who had normal delivery reported less sexual satisfaction. Method of contraception is another variable that showed significant correlation with satisfaction, satisfaction was highest in those who used condoms.

In reproductive and sexual satisfaction factors to the breakdown of age groups, the 15-30 year-old age group there was a significant relationship between all variables between parity, mode of delivery and abortion

with sexual satisfaction. In the 30–45 year old age group there was a significant relationship between the number of pregnancies and sexual satisfaction in older than 45 years was a significant relationship between parity, parity, infertility, menopause and sexual satisfaction. In relation to socio-cultural factors, one of which was the cause and type of sexual problem in women. More participants' lack of desire for sexual relations in their sexuality was the cause of the problem. In relation to socio-cultural factors, make love before having sex and having sexual desire was significantly associated with satisfaction ( $P < 0.001$ ).

There was a significant correlation between the type of marriage and dating before marriage and sexual satisfaction percentage. In those practices were married matchmaking least satisfaction and the highest percentage of satisfaction were those who like premarital sex was observed. In the case of alcohol, there was no correlation between these factors and sexual satisfaction. There was a significant correlation between sexual satisfaction and a separate bedroom. Another factor that has examined the relationship between wives and other women that showed significant association with sexual satisfaction. In the present study, about 40 percent of the participants had a positive attitude towards sexuality, about 50 percent had no opinion and 10% negative attitude towards sexuality.

In the age group 15–30 years were discussed almost all cultural and social factors significantly associated with sexual satisfaction. In the age group 30–45 years, love and hatred and aversion to sexual relations, awareness of gender issues, a separate bedroom and wife relationship with another woman the factors that showed significant association with sexual satisfaction. In the age group over 45 year relationship with another woman's husband, a separate bedroom, awareness of sexuality, dating and mate selection and make love before having sexual relations with sexual satisfaction. In examining the causes of depression and stress-related psychological variables were studied. 3.5% of the population suffering from depression and about 1.5 percent had stress and significant relationship between stress and depression and sexual satisfaction.

In examining factors related to health was a significant relationship between a person's general well-being (health, disease, drugs reinforcement) and sexual satisfaction. There was a significant correlation between the disease and the type of surgery and surgery with sexual satisfaction. Compare health-related factors in the breakdown of age groups, the 15–30 year-old age group was statistically significant overall feeling of health and sexual satisfaction. In the age group 30–45 years, the overall feeling of wellness, disease, and surgery was sig-

nificantly associated with sexual satisfaction and in the age group over 45 years also an overall feeling of health, disease specific, significant association with sexual satisfaction. The findings of this study are consistent with findings of other researchers, including research (Henderson *et al.*, 2009); (Cheung *et al.*, 2008); (Bahrami *et al.*, 2006); (Boyd, 2002); (Rezaei Pour *et al.*, 2003); (Deeks and McCabe, 2001) (Yekkeh Fallah, 2006); (Ilana, 2006); (Beigi, 2008); (Beth *et al.*, 2007).

## REFERENCES

- Azar Mahyar, Nouhi Sima. Instructions for treatment of sexual dysfunction. First Edition. Moein Publications. 2003.
- Bahrami Nasim, Sattarzadeh Niloufar, Ranjbar Koochaksarai Fatemeh, Ghojazadeh Morteza. Examining the relationship between depression and sexual satisfaction in fertile and infertile couples. *Journal of Reproduction and Infertility*. 2007.
- Basson, R (2000). The female sexual response: a different model. *Journal Of Sex Mar Ther*. 26 (4): 51-56.
- Beigi Marjan, Fahami Fariba, Hassanzahraei Roshanak, Arman Sarvar. Sexual dysfunction in menopause. *Isfahan Medical School*. 2008, 26: 300-294.
- Beth A, Rosenthal SL, Biro FM, Bernstein DI, Zimet GD (2007). Predictors of sexual satisfaction in an adolescent and college population. *Journal Pediatr Adolesc Gynecol*. 20 (1): 25-28.
- Boyd M (2002). *Psychiatric nursing, contemporary practice*. 2th edition. Lippincott. New York
- Cheung MW, Wong PC, Liu KY, Yip PS, Fan SY, Lam T (2008). A study of sexual satisfaction and frequency of sex among Hong Kong Chinese couples. *The Journal Of Sex Research*. 45 (2): 129-139.
- Deeks A, McCabe M (2001). Sexual function and the menopausal women: the importance of age and partner sexual function. *Journal Of Research*. 38 (3): 219-225.
- Henderson AW, Lehavot K, Simoni JM (2009). Ecological models of sexual satisfaction among lesbian / bisexual and heterosexual women. *Arch Sex Behav*. (38): 50-65.
- Ilana B, Stephan K, Christina L, Wasselfyr MS, Brown JS, Thom DH (2006). Sexual activity and function in middle aged and older woman. *Obstet Gynecol*. 107 (4): 755-764.
- Jahanfar Shayesteh, Molaei Nejad Mitra. *A course on sexual dysfunction*. First Edition. Bizheh. 2001.
- McIness, R (2003). Chronic illness and sexuality. *Mental Journal*. 179 (3): 263-266.
- Nejati Hossein. *Marital psychology*. Fifth Edition. Bikaran. 2001.
- Ozgoli Giti, Tork Zahrani Shahnaz, Khushabi Katayoun, Valaei Nasser. Satisfaction and attitudes towards sex in women referred to health centers affiliated to Shahid Beheshti Uni-

versity of Medical Sciences researcher of 2000. (Journal of Shahid Beheshti University of Medical Sciences), 2003, 2: 127-131.

Rezaei Pour Afsar, Taghizadeh Ziba, Faghihzadeh Soghra, Ayazi Rozita. Examining a study of marital satisfaction in women referred to health centers in Arak. Journal of Tehran University of Medical Sciences. 2003, 19: 110-114.

Sprecher S (2000). Sexual satisfaction in premarital relationships: association with satisfaction, love, commitment and stability. The Journal Of Sex Research. 39 (2): 190-196.

Yekkeh Fallah Leili, Goudarzi Mohammad. Prevalence and risk factors of sexual dysfunction in men and women in Qazvin in 2006. The Journal of Qazvin University of Medical Sciences. 2008, 13: 50-55.

## Living with infertility: A descriptive phenomenological study

Nahid Khodakarami<sup>1\*</sup>, Farzaneh Hosseini<sup>1</sup>, Somayeh Hashemi<sup>1</sup>, Sediqeh Sediq<sup>1</sup>, Mostafa Hamdiyeh<sup>2</sup> and Robabeh Taheri Panah<sup>3</sup>

<sup>1</sup>MSc., Department of Midwifery, School of Nursing and Midwifery, Shahid Beheshti University of Medical Sciences, Tehran, Iran

<sup>2</sup>MD, Department of Psychiatry, School of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran

<sup>3</sup>MD, Infertility and Reproductive Health Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran

### ABSTRACT

Fertility is highly regarded in majority of cultures of human communities and having children is among the most important deriving forces of life. If attempts to acquire fertility failed, it would be a destructive emotional experience for individuals. According to WHO, 80 million people around the world grapple with the failure in attempts to acquire fertility. Infertility wields a negative effect on daily lives of men and women, exposing them to emotional and psychological problems. Physical, financial, and psychological challenges in getting fertility services also affect the young couples. Attempts to acquire fertility lead to costly and frustrating medical treatments, and losing hope in successful treatment would shake the foundations of married life of the couples. Although different research has demonstrated the importance of the association of psycho-physical problems and infertility, its different aspects have not been the subject of much research. With this in mind, the present qualitative study focuses on living with infertility, with the objective to explore the infertile couples' experiences. 11 infertile couples were interviewed about their experiences in living with infertility in Infertility and Reproductive Health Research Center in Shahid Beheshti University of Medical Sciences. The interview content was recorded and transcribed with consent and permission of those interviewed and significant statements were analyzed by Colaizzi's Method of Analysis. Within the transcribed interviews, six themes and 11 subthemes were revealed. Our findings indicated that infertility influenced couples' emotional and sexual relations and that couples' relationship with others underwent changes in reaction to people's perception of infertility. We also found that couples developed special expectations from the medical personnel which, at times, would not be fulfilled, thus leading couples to experiment with other unusual methods other than the present treatment. The extracted themes within the transcribed interviews revealed that infertility could wield extended impact over couples' whole life. It seems that providing psychological and midwifery counselling services to affected couples and their family in relevant centers would be of help for these couples.

**KEY WORDS:** PHENOMENOLOGY, LIFE EXPERIENCES, COLAIZZI'S METHOD, PSYCHOLOGICAL COUNSELLING, QUALITATIVE STUDY, INFERTILITY

#### ARTICLE INFORMATION:

\*Corresponding Author: [khodakarami@sbmu.ac.ir](mailto:khodakarami@sbmu.ac.ir)

Received 27<sup>th</sup> April, 2017

Accepted after revision 1<sup>st</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

Fertility is highly revered in the majority of human cultures, and desire to have children is a main driving force behind any human quest. If attempts to acquire fertility failed, it would be a destructive emotional experience for individuals (Ryan Kistner 1990). According to WHO, 80 million people around the world grapple with the failure in attempts to acquire fertility (Vayena 2002). One in four Iranian couples experience initial infertility during married life and 3.4 per cent of them face infertility in whole course of their life (Vahidi *et al.*, 2006). Today the demand for infertility treatment has risen around the world. In US, almost 1.3 million couples receive medical counselling. Of all couples seeking treatment, half succeeds in getting pregnant and the other half accepts that they could no longer have biological children (Cousineau and Domar 2007).

Facing infertility drastically affects the lives of men and women, posing psychological and emotional problems to affected people (Mohammadi *et al.*, 2001). Physical, financial, and psychological challenges in the way of using fertility methods affect them as well such that infertility problems in second and third decades of married life would bring the couples to the brink of emotional collapse (Monga *et al.*, 2004). Attempts to acquire fertility leads to costly and frustrating medical treatments, and losing hope in successful treatment would even endanger the married life (Bahrami *et al.*, 2007). Although several bodies of research have demonstrated the importance of the association of psycho-physical problems and infertility, its different aspects have not been the subject of much research (Cwikel *et al.*, 2004).

A dominant method used in the literature to investigate infertile couples is self-reported, semi-structured questionnaires which are easy to use (Cousineau and Domar 2007); but the method only makes possible to examine what individuals report; while what the individuals do may be quite different than what they report. To attain success in treatment of these patients and to improve their quality of living, the researchers should find a deep insight into their unusual experiences and what they face in daily life. Through qualitative phenomenological study, the researcher develops a better understanding of the lives of infertile couples, since phenomenological study provides a description of experiential meanings exactly in the way we deal with them in real life (Abdsaeidy *et al.*, 2005). Much research has been conducted on infertile couples.

In Domar *et al.*'s study, infertile women reported equivalent levels of anxiety and depression (Domar *et al.*, 1993). In a qualitative study of Indian urban infertile women, Widge revealed that infertility is deeply feared, women's status and security are affected, and they experience

stigmatization and isolation; the process of ART (Assisted Reproductive Technology) is physiologically, emotionally and financially stressful (Widge, 2005). Mullah-Nejad *et al.* found that infertile couples suffer varied degrees of stress and almost half of them (46 per cent) would not adopt to such lifestyle (Mollaiy *et al.*, 2000). Coping with infertility depends on different cultural factors; in some cultures, people prefer traditional treatment methods through using magic and the occult, thus resisting modern medical treatments. These cultures would seek the solution in social networks to tackle the problem of infertility through child adoption, divorce, and remarriage (Evens 2004).

However, research has demonstrated the importance of the links between physical and psychological challenges and infertility; yet little research has explored the different aspects of the issue. The present study focuses on life experiences with infertility, with the purpose being exploration of infertile couples' lived experiences in seeking treatment. A qualitative study was conducted where the researchers drew upon phenomenology on delving deep into the heart of the experiences in the lives of infertile couples; since to succeed in treatment of such patients and bringing improvement to their daily lives, a deeper insight into their life experiences seemed all but necessary.

## METHOD OF STUDY

The research was a qualitative phenomenological study; phenomenology is the knowledge of studying, describing, and interpreting phenomena of life with an emphasis on experiences. In a phenomenological study, experiences, perceptions, and emotions of individuals are examined (Abdsaeidy *et al.*, 2005). The participants were sampled through purposive sampling and characterized by: being Iranian and speaking Persian; by definition, they were infertile and they reported seeking treatment for their infertility as cause of their coming to medical center; they did not suffer from a chronic disease; they were within 2 years of diagnosis and did not get pregnant; they were willing to participate in research and filled out the consent form for participation in a research study.

The research hub was Infertility and Reproductive Health Research Center in Shahid Beheshti University of Medical Sciences. We started to collect data in June 2008 and continued to October. Then we embarked on transcribing the interviews and extracting main themes by the end of January 2009. Semi-structured interviews provided the tool to collect information; first, we interviewed the couples individually and with their consent, we recorded the interview. After each interview, it was

listened to twice by the researchers and then was transcribed. The main question of the interview was the couples' living experiences with infertility.

To reach an acceptable level of reliability, peer-review and researcher-review methods were employed; the transcribed text and the recorded audio was thoroughly examined by two experts and then used for analysis through Colaizzi's seven-step approach of: formulating meanings for these significant statements; categorizing the formulated meanings into clusters of themes that are common to all participants; integrating the findings into exhaustive description of the phenomenon being studied; validating the findings by returning to some participants to ask how it compares with their experiences; and, incorporating any changes offered by the participants into the final description of the essence of the phenomenon.

## FINDINGS

The females averaged  $30.8 \pm 4.4$  and males averaged  $34.2 \pm 5.9$  years in age. They also averaged  $9.8 \pm 1.6$  years in marriage age and  $7.9 \pm 2.1$  years of seeking treatment of infertility. In terms of education, one female had PhD, one had BA, four had high school diploma, two had middle school education, and 3 had grade school education. Among male participants, two had PhD, one had BA, 2 had high school diploma, two had middle school education, and four others had grade school education. The analysis of interviews produced six themes and 11 subthemes given in Table 1 below.

### Infertility and couples' emotional relationship

Infertility affects the couples' relationship in different ways, often as negative impacts on their lives and sometimes contributing to their positive emotional relationship. Infertility as a threat to couples' emotional relationship: when couples feel deprived from getting something from their married lives, their relationship is affected in the first place. Emotions wetted by the feeling of infertility often works to ruin the mutual understanding between couples. For example, men would blame the causes of infertility on their wives without knowing the possible factors behind it. A 24-old woman seeking treatment for 5 years gives an account of her suffering: "lives of likes of us who has been stigmatized by infertility are difficult; as if we were different than others and we ourselves were responsible for not bearing children; my husband thinks I am to be blamed, and if he married his cousin, he would have children by now, while doctors say his sperm is weak." However, her husband said "it's true that doctors say this, but bearing no child has led me to think that people would blame the thing on me; would deem me as incompetent, and being a fire-

less hearth sinks into my heart and she would regularly reprimand me when we quarrel."

Living with infertility is difficult for couples. In cases where couples find that they would never have children, they react to the situation with seeking distance from each other. Psychological stresses from infertility bring infirmities to the foundation of the family and sows discord between couples or even would bring them to the verge of separation. On the other hand, as times passes, the family environment becomes boring due to the absence of children, rendering home uninhabitable and spiritless for couples. In most of the occasions, infertile couples lose the equanimity, which negatively affect their relationship and even may lead them to avoid verbal communications. An infertile interviewee gives an account of the spiritless and boring environment of the home: "the current problem in my home is that we have nothing to speak about; life is dreary and monotonous; we have lost the zeal; we have lost the nerves, and soon we would become angry."

At times, psychological stress gets such dimensions as to lead infertile individual to interpret any reaction by their husbands or wives, or by other family members as motivated by his or her infertility. An infertile female participant explains her case as this: "when I come here, he says that it is late. Well, it fills me with stress. He may not mean any harm; however, since I know this is my fault, I take it as intended to harm."

Infertility as improving couples' relationship: infertility, nevertheless, sometime brings positive changes into couples' relationship. Some couples report that infertility helped develop an intimate relation and better mutual understanding so as to lead them to prefer speaking together, and this would rules out many problems from surfacing. A female participant relates her experiences with infertility: "infertility has a boon for our relations, bringing better mutual understanding and support for both of us."

Perhaps, some people regard their partner highly and would not allow damage on their married lives, or they would not want be a cause of distress for their partners. A male infertile participant gives an account of his relations with his wife: "I loved having child before, and the absence of child would even have made me greedier; however, her weariness even affects me. When she is bored with the situation, I think if she had child, everything would be different. I would not say that I do not want child, but not so much when the issue of married life is at stake."

### Infertile couples and their families

The problem of infertility in the context of Iranian society takes on even wider scope given the peculiar nature of the dominant culture. Over time, couples' families and

kin become quite inquisitive of couples' condition. The feeling of being under stress by family and friends and their occasional offer of support affects their life, thus raising different reactions from infertile couples, *inter alia*, avoiding family holidays and parties and concealing the fact of their impotency.

Family and friend interference: when a couple procrastinate becoming pregnant, family and friends become more meddlesome in couple's life, thus bringing them with unease. Their inquisitiveness and unwelcome commentary become more and more, and they usually ask for pregnancy test results. This situation provokes couples' reaction and feeling of uneasiness. They would unsuccessfully conceal their going to the doctor, avoiding making acquaintance with new individuals, or ending their connections with friends to avoid their unwelcome and disturbing inquisitiveness.

A female participant relates her experience with such a situation: "we dare not to appear outside home; they would ask frequently about the thing; they know well that we would no longer bear children; nevertheless, they would ask anyway. They say 'well, go to doctor to become pregnant. Present conditions make us uneasy.'"

Another female who feels the unease of inquisitive and meddlesome behaviour by family and friends, complains about the situation: "our friends and family disturb us; they call, greet, and ask for the result of our seeking treatment; recommend us to seek doctors' help. However, I love being told that I have the best living condition. When they invite, we prefer not to appear in their holidays and parties."

Under pressure by family and friends: the way family and friends handle the couples wields considerable effect on couples' life, putting them under significant levels of stress. In some occasions, with delayed pregnancy, family and friends' words become bitter and more loaded with contempt. Pressures from couples' family and immediate community are among the important source of disturbance and resentment for infertile couples. In some families, the pressure source is by the kin; in other cases, others outside the family circle is the source of pressure. A male participant, who is extremely disgruntled because of family pressures, gives an account of his case: "loneliness and words of people. Words of people. People who are not strange; they are your family members. My cousin told me that a woman who could not be pregnant had no use. My wife's brother-in-law told me to divorce."

Some family members would limit their communications with the infertile couples, have little motivation to and interest in engaging in with them. This measure is quite disturbing for childless couples. Supportive role of family and friends: providing support by family and friends gives couples solace, especially offer of finan-

cial support and their occasional recommendations to go to doctor to treat the impotency provides couples with encouragement. Infertile couples understand and appreciate the sympathy and humane feelings of their family and friends and sometimes, their support would prevent their married life to fall apart. It seems that positive feeling and support by family and friends affect the males more than females. A male participant says: "our family would ask us what happened; they would even refer us to doctor; they would say this doctor is better." Another male participant says: "our friends would act out of humane feelings and care, recommending us to immediate measures. Sometime ago, we quarrelled about separation and divorce. My sister and my mother, even my brother, told me to stop quarrelling; they told me that I was living with this woman for 20 years; no other woman would prove to be a woman fit for living; go and see a doctor."

#### Sexual relations and infertility

Sexual orientation affects person's individual and social life more than any other issue. Openly speaking about sexual desire is usually an embarrassing situation for person; however, many of couples have pointed to the impact of infertility and seeking treatment on their sexual relations with their partners.

Infertility effects on sexual relations: Since sexual pleasure is more a product of mind than of the body, it is expected that it would be influenced by infertility implications such as feeling of frustration and depression, which would interfere with the ability to feel the pleasures of sexual activity. A female participant says about the effect of infertility on her sexual desire: "when I am dispirited, or think of bearing a child, have no sexual desire. In general, infertility has deprived me of feeling the true pleasures of sex, festive occasions, and parties I would otherwise feel. Infertility is felt as an arrow in my heart. You know, I love bearing baby."

In most of the occasions, infertility has a deep impact on couples' sexual relations. In such circumstances, sex is a hopeless pursuit and spiritually tormenting, no longer a pleasurable activity; because for many couples, pregnancy and bearing child is a perceived outcome of sex, and since this end is not achieved for infertile couples through sex, they would feel over time that they are on a futile job, and a feeling of doing a useless activity brings despondence to couples.

In a couple's remarks about their sexual relations, wife first gives her account: "you know, infertility brings a series of frustrations; over time you resort to quarrel; you feel resentment. After a while, I do this so that a child comes to my life. I would continue the relation so that a child comes and it may be a solution to the problem," and her husband says: "we should not see everything in

sex. You do a job to achieve something. The situation is like when you have done the job and they say they would not pay you for that,” and his wife continues: “when there is no child, relations become discouraging. When we are unable to speak to each other, it affects us anyway. Perhaps if we had a child, we would not go on such extremes as to seek distance. Then, our relations would be for natural needs, but now it is focused on bearing child.”

Infertility treatment effects on sexual relations: often in the process of treatment, couples are recommended to follow a timetable in their sexual relations. This timetable poses problems for couples. For some couples the timetable interferes with their other activities, and the number of sex rises only due to recommendation of their doctor and for getting pregnant. A female participant who has problems with a timetable for sex, gives an account of the situation: “times specified by our doctor would be difficult to adhere to; since we would be in a nightly party; we would host parties, etc. the number of our relations has only risen due to recommendations by doctor.”

During treatment, sexual relation becomes frustrating for couples. Often they reported their relations were forced, having an unwelcome nature. A female participant pointed to this fact: “they frequently would tell us that engage in sexual activity every 3 or 4 nights. This is really frustrating. Sometime, I would even not speak to my husband; however, since doctor recommends the relation, I feel forced to pursue the relations. This is as if they pushed you on the relation.” Her husband also have a similar view: “if the relation is forced, it will definitely be discouraging for us.”

#### Psychological pressures of infertility

Parents are the connecting rings of generations, and it can be said that the strongest desire for individuals in life is having children to continue their generation. However, failure to achieve and fulfil this desire poses different pressures on the couples; a sense of guilt would strike them, and they would envision a dark future for themselves.

Feeling guilty: when all hopes are gone for bearing children, the response surfaces as experiences of heavy psychological pressures and negative feelings. In addition to emotional and psychological concerns over infertility, the guilty person, either female or male, feels himself or herself to blame for the problem, thus striking themselves with a sense of guilt. Even call of conscience would inflict them with higher-level guilt complex. A male participant reveals such a feeling of guilt: “because I am responsible for the impotency, I feel remorse. I wish we could knew before marriage through medical tests, and if there were any problem, we would act accord-

ingly. If I knew I had this problem, I would treat myself first and then I would marry.”

Infertility brings the individuals in such extremes as to cast doubt on their spiritual integrity. They could feel that they have committed a sin, and the punishment has come from the God in the form of deprivation of the person from having child, which is a highly regarded blessing. A male participant says this: “I have been working as a mason. My income is above average, but larger part of it has been spent for treatment. I pray to God what sin I have committed to deserve such retribution. I feel as if I was not human, or a pious person. I wonder what I have done God punishes me as such.”

An uncertain future: man only perpetuate his generation through bringing children, and no doubt that an ultimate end for any man and woman sought in marriage is bearing children, so that their generation would continue. The philosophical view of leaving a good generation when one passes away has always been an important goal in life. Couples who have lost hope to bear children deem themselves as intestate; the prospect that their lifelong efforts would be inherited by others than their own offspring is bitter for impotent couples. This bitter feeling is manifest in the remarks of a female participant: “I saw one of my childless kin died and their whole lifelong material achievements was inherited by their nephew. We live for decades; a time comes when you have no child and your whole belongings is inherited by a stranger not your own child. This is disturbing.”

For infertile couples, passing of the time brings new worries for them. Women are exposed to more severe psychological damages than are men; especially since remarriage, separation, and divorce would have devastating effects on women. Fear of an uncertain future after a failed attempt to treat impotency and its implications are quite tormenting for infertile women. A female participant reveals this theme in her remarks: “when thinking of the future, I wonder whether I would live the normal life since I do not have children, or perhaps I would face dare conditions. Or if I bear child, whether I am the right person to parent and rear children.”

#### Infertility treatment expenses

The high costs of infertility treatment medical services, the insufficient insurance coverage, and the need to repeat the same treatment are among the factors the infertile couples seeking treatment would face.

*Financial difficulties:* some couples spend larger part of their income to infertility treatment. With longer treatment period, these couples would experience no improvement in their income; since for years, they dedicated their income to treat infertility. Attempts to make an income to be allocated to their treatment costs frustrate them. They even seek loans from banks and credit

institutions so that they afford to pay for treatment expenses. A female participant says this: “my husband was working hard; I myself was working on rug weaving. We spent all that made in treatment; all was spent in doctors’ office. I no longer would go on this.”

A male participant also points to similar concerns: “sometimes, we had no money for hospital. We had to borrow some. I have paid much money as interest for borrowed money. In an occasion no one, even my father and brother refused to lend money. Then, I was forced to borrow high-interest money to pay for IUI catheter. My wife became pregnant, however she had an abortion. I think that money was unhealthy money, hence we were punished for spending that.”

#### Non-medical treatment

Non-medical treatment for infertility: many of infertile couples look for something beyond medical treatments, often unscientific medications such as herbal remedies prescribed by local experts. Even they resort to magic and mantra, despite their apparent disbelief of such measures, thus providing the sorcerers and mantra-writers with a source of income. Such a woman seeking these sort of treatment for her infertility says: “we married ten years ago. During these ten years, we underwent many treatments including traditional herbal treatments; we even sought mantra.”

Another woman says: “first we went for doctor; then we went for mantra-writers and sorcerer; we went for any doctor people told us he or she was expert; we sought treatment so-called ‘good magicians or sorceress’ as well.”

Drawbacks and implications of traditional medications: sometimes the non-medical treatments bring huge financial and psychological costs; they even bring about health implications on infertile couples. As an infertile man gave his account: “we sought treatment from a doctor prescribing herbal treatment. My wife took in the medication; but some scars appeared in her face. We wanted to sue the doctor; however, we abandoned since she was only an old woman. That time, 1995 or 1996, we spend a lot of money, about \$ 250. Then, we were blamed on the loss of money and not getting pregnancy by the family and friends.”

## DISCUSSION

Analysis of reports made by these couples indicates that infertility has significant impact on their life. When the couple feel themselves barren a deprived of the fruit of their married life, their intimate relations are the first to be affected. Dejected and angry by the sense of guilt, despair, and anguish, these couples become very reluctant to communicate their case with each other. They

actually would not show their suffering and hopelessness to each other. Their sense of intimacy dwindles over the time, thus plunging them into a feeling of loneliness and isolation and the sense of being misunderstood (Mohammadi *et al.*, 2001).

We found that infertility wielded impact on the couple’s relations through two main paths: 1. Broken relations; and 2. Improving relations. Given the difficulty of being infertile for the couples, they would immediately face extensive pressures when they realize that they would no longer bear children; thus, significant changes in their conduct and behaviour appear, distancing the couples, (Abbasi Shavazi *et al.* 2005) held that in societies like Iran where bringing children is an integral part of the female social role and identity, and having children provides her with a source of social influence and power, women face higher degrees of family denunciations than men do; in addition, males would actually feel females are to blame on the problem, thus making their intimate relations disintegrate.

In second sense, different conditions rise. Some couples feel they need more love and affection by their partners. They would attempt to save and improve the current intimate relations and seek more understanding of the situation. Since many couples assume that pregnancy is an outcome of sexual relations, when they do not get pregnant, sexual relations loses its appeal as a futile pursuit and couples are less interested in engaging in sexual activity. Because they do not easily get pregnancy, couples would assume they have sex just for getting pregnant, forgetting the fact that sexual relations would be a response to a natural desire and need. Given the broken intimacy between couples, these changes in sexual behaviour seem inevitable. Hormonal intake and body temperature would impact negatively love and affection and hence, dissatisfaction about sexual activity. So, sexual activity brings about feeling of fear, failure, and incompetence, or it takes the form of a forced pursuit. The collection of these factors ultimately causes sexual disorders such as failure in reaching orgasm and sexual fatigue (Mohammadi *et al.*, 2001).

Iran is among the societies where bringing children is regarded highly in terms of social and cultural values (Abbasi *et al.* 2005) and infertility even takes in more extensive dimensions in Iran’s specific context of culture and tradition. The role of family and friends is crucial in the couples’ lives, with both negative and positive implications.

In Iranian context, sometime after marriage, public curiosity about couple’s pregnancy begin to grow. In reaction to such curiosity, most couples would avoid family parties to disguise the fact of their impotency, since they would deem the problem a flaw of character. Younesi *et al.* believe that infertility would resonate its

negative impact bringing couples to the brink of social isolation (Younesi 2002).

In most cases, the problem takes additional and more complex turn. Bitter references to their impotency and infertility by others and couples' reaction to that as avoiding public gathering disturbs the couples. Mollaiy *et al.* quoted (Mollaiy *et al.*, 2002) that in most societies, women are assigned with the responsibility of infertility, and she is to blame by the husband's family on the failure of the couple to produce a child, and the fact that this would be a legitimate pretext to divorce the woman and seeking another wife by the husband. But not all members of couple's family impact negatively their life. Some even prevent breaking the couple's relations through providing spiritual, psychological, and financial support. This reveals that providing information to these family members would be of great help for the affected couples.

When all hopes are squandered to produce a child, the individuals who are impotent, would feel guilty, perhaps they would assume that they deprive their partners of their natural right, that is, having children, and since at the same time, they would not prefer to divorce their partners. Some of these individuals think they are being punished for their flaw. They envisage a dark prospect for themselves; since the prospect of a broken relation and not producing an heir disturbs them. Clinical examinations indicate that reaction to infertility shows itself in fits of hysteria including dejection, depression and feeling of guilt and incompetence (Farahani 2001).

Problems in treatment are also a source of additional issues to be attended by couples. A common problem is the cost of infertility treatments. Since evaluation and treatment of infertility is a time-consuming and costly, it poses great financial distress for couples, and they would dedicate major part of their income to treatment costs and expenses; they even would seek loans and borrowings, while they are covered by insurance policies, they would not be able to use such insurance policies, since infertility is usually not covered. This raises the prospect that many of couples would not afford to seek treatment from health clinics due to high expenses, thus living a life of unfulfilled expectation of having a child. This issue clearly shows the importance of providing support for this cohort. Some authors believe that infertile couples have suffered from psychological, social, and economic problems (Dafei and Dehghani 2002).

When medicine is found incapable of treating infertility, and when individual face huge problems in the way of seeking medical treatments, they would easily be lured into unmedical treatments such as herbal remedies and sorcerers and mantra-writers. However, this depends on their belief on such treatments which falls into a spectrum of herbal and traditional medications and seeking mantra. In phenomenology, man is deemed an

integral part of his environment, which shapes human life, and human, in turn, impacts the environment. The individual's world is unique for him or herself; thus, the more the number of individuals with shared perceptions of a phenomenon, the more real will be their perceptions (Abdsaeidy and Akbari 2005). Given this fact, however our results were aggregation of the motives, interview with more couples would contribute to the precision of the results.

## DISCUSSION AND CONCLUSION

Our findings indicated that infertile couples face significant problems. Their relations are challenged and affected the most by their relations with their family and friends. In most cases, financial problems often confounds the situation, aggravating already tense relations between couples. In phenomenological study, the individual experiences are considered as they are perceived in real life, thus giving more extensive insights into the internal lives of humans (Abdsaeidy and Akbari 2005).

The present study, to some extent possible, is indicative of facts couples face, which have gone unnoticed by the authorities regulating and deciding on policy in health sector. A deeper look into what these infertile men and woman account invites support from their family and friends, the health and insurance sector and the government. Problems inherent in seeking treatment especially the long process of treatment affects negatively the lives of thousands of infertile couples. More than 2 million couples suffer infertility (Vahidi *et al.*, 2006) in a population of 72 million, thus making a significant ratio of the individuals striving to solve their problem. This issue requires public attention. It is highly recommended that infertility clinics establish counselling and especial services centres for infertile couples where competent midwives provide valuable advice to the infertile couples and answer their questions. Also, providing necessary educations for families would also help greatly the couples in reducing psychological pressures of the infertility.

## ACKNOWLEDGEMENTS

This research was conducted in Infertility and Reproductive Health Research Center, Shahid Beheshti University of Medical Sciences, Tehran. The researchers feel obliged to thank all infertile couples participating in the research and express hopes that their homes will be some day bright with birth of a newborn baby. The researchers are also thankful to the authorities and personnel of the Infertility and Reproductive Health Research Center, especially Mrs. Jahanshahi, Yazdan, and Hassanpour.

## REFERENCES

- Abdsaeidy J, Amir Ali Akbari P. [Medical research method]. 2nd ed. Tehran: Abrang; 2005. 45.
- Abbasi-Shavazi MJ, Asgari-Khanghah A, Razeghi H. [Women and infertility experience: A case study in Tehran]. *J Women Stud.* 2005;3(3):91-114.
- Bahrami N, Sattarzadeh N, Ranjbar Koochaksariie F, Ghोजazadeh M. [Comparing depression and sexual satisfaction in fertile and infertile couples]. *J Reprod Infertil.* 2007;8(1): 52-9.
- Cwikel J, Gidron Y, Sheiner E. Psychological interactions with infertility among women. *Eur J Obstet Gynecol Reprod Biol.* 2004;117(2):126-31.
- Cousineau TM, Domar AD. Psychological impact of infertility. *Best Pract Res Clin Obstet Gynaecol.* 2007;21(2):293-308.
- Dafei M, Dehghani A. [Assessment of the relationship of coping strategies with religious beliefs and social activities in infertile couples attending the Infertility Center of Yazd]. *J Shahid Sadoughi Univ Med Sci Health Serv.* 2002;10(3): 80-6.
- Domar AD, Zuttermeister PC, Friedman R. The psychological impact of infertility: a comparison with patients with other medical conditions. *J Psychosom Obstet Gynaecol.* 1993;14(Suppl):45- 52.
- Evens E. A global perspective on infertility: an under recognized public health issue. *Univ N C News Lett.* 2004;18:1-39.
- Farahani MN. [Psychological aspects of coping and adjustment of infertility and role of psychologist]. *J Reprod Infertil.* 2001;2(4):53-7.
- Ryan KJ, Kistner RW. *Kistner's gynecology and women's health.* 7th ed. Michigan: Mosby; 1999. 660.
- Mohammadi MR, Khalaj Abadi Farahani F. [Emotional and psychological problems of infertility and strategies to overcome them]. *J Reprod Infertil.* 2001;2(4):34-8.
- Monga M, Alexandrescu B, Katz SE, Stein M, Ganiats T. Impact of infertility on quality of life, marital adjustment, and sexual function. *Urology.* 2004;63(1):126-30.
- Mollaiy nezhad M, Jaferpour M, Jahanfar SH, Jamshidi R. [Infertility related stress and marital life in Iranian infertile women who referred to Isfahan infertility treatment clinic]. *J Reprod Infertil.* 2000;2(1):26-39.
- Vayena E. Current practices and controversies in assisted reproduction: report of a meeting on "Medical, ethical and social aspects of assisted reproduction" held at WHO headquarters in Geneva. Switzerland: World Health Organization; 2002. 396.
- Vahidi S, Ardalan A, Mohammad K. [The epidemiology of primary infertility in the Islamic Republic of Iran in 2004-5]. *J Reprod Infertil.* 2006;7(3):243- 251.
- Widge A. Seeking conception: experiences of urban Indian women with in vitro fertilization. *Patient Educ Couns.* 2005;59(3):226-33.
- Younesi J. [Stigma and infertility in Iran – coping skills]. *J Reprod Infertil.* 2002;3(4):74-86.

## An investigation into the relationship between efficiency and competition among banks listed in Tehran Stock Exchange

Ghodrat Farahi<sup>1</sup> and Seyed Ali Reza Mousavi<sup>2</sup>

<sup>1</sup>MA Student, Department of Financial Management, Islamic Azad University of Firouzabad, Fars, Iran

<sup>2</sup>Assistant Professor, Department of Financial Management, Islamic Azad University of Firouzabad, Fars, Iran

### ABSTRACT

An efficient banking system refers to an effective means for economic development of country. Banks are the pulse of financial activities and the situation governing them can have a significant impact on other economic sectors of a society. Banks by organizing and conducting receipts and payments have facilitated trade exchanges and have caused expansion of markets and economic development. This issue is of great importance especially in Iran in which there is no market for debt. In Iran, banks act as providers of funds which their sustainability refers to the most important challenge to financial system of country. The main purpose of the present research is to examine the relationship between competition and efficiency among banks listed in Tehran stock exchange. Statistical population consists of all the banks and financial and credit institutions listed in Tehran stock exchange during 2006-2014; due to limited population, sample group is not selected and the entire population is examined. The research hypotheses were determined as follow: there is a positive significant relationship between efficiency and growth of banks listed in Tehran stock exchange and there is a positive significant relationship between competition in industry and efficiency of banks listed in Tehran stock exchange.

**KEY WORDS:** COMPETITION, EFFICIENCY, ECONOMIC DEVELOPMENT, BANKING SYSTEM

### ARTICLE INFORMATION:

\*Corresponding Author: [Ali\\_mosavi75@yahoo.com](mailto:Ali_mosavi75@yahoo.com)

Received 27<sup>th</sup> April, 2017

Accepted after revision 31<sup>st</sup> July, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

Setting banking rules and financial structure of country will be of great importance. According to most of empirical research, a positive strong relationship between economic growth and competition in banking industry has been confirmed (Levine et al. 2000). Findings of some recent research have shown that effect of competition on banking industry likewise effect of competition on other industries is not clear. Researchers in the studies on competition in banking system and systematic stability (Allen & Gale, 2004; De Jonghe & Vander Vennet, 2008) and efficiency and productivity of banking system (Berger & Hannan, 1998; Maudos & Guevara, 2007) have not reached to certain results. The efficiency ending with maximizing outcome takes place by organization or economic enterprise, associated with the concepts such as effectiveness and productivity and differed from these concepts.

Effectiveness comes to realize through the extent to which determined aims have been achieved, indicating to which extent attempts from the expected outcomes have taken place. Indeed, effectiveness relates to performance and satisfaction with the attempts, but efficiency relates to proper exploitation from resources. Productivity refers to a combination of efficiency and effectiveness, encompassed both. In summary, effectiveness depends on goal, efficiency depends on economic enterprise and productivity depends on production factors (Gharib and Nejad, 2015; Shui et al. 2015;).

In the present research, an attempt is made to retest Efficient Structure Hypothesis, for which data of the banks listed in Tehran stock exchange is used. With regard to Efficient Structure Hypothesis proposed by Demsetz(1973), efficient companies can succeed in competition and growth under pressure of competition at market, thus these companies become larger and gain more share of market and ultimately gain higher profit. Under these hypotheses, the more an industry becomes competitive, it will become more efficient and centralized. Therefore, decentralized actions raise unnecessary changes and distractions in economy. To test these hypotheses, empirical studies tested the relationship between criteria of efficiency of company and performance of market (Weiss, 1974; Smirlock, 1985; Berger, 1995 Mergaerts & Vennet, 2015).

In contrast to this approach, the considered method in this study is focusing on core and more efficient features of Efficient Structure Hypothesis. For instance, this idea which says companies succeed in competition and growth is the major hypothesis proposed by Demsetz(1973) combined of the hypotheses which assume a causal relationship between efficiency, growth and structure of market. In the present research, the relationship

between efficiency and growth is examined which is a key part in the Efficient Structure Hypothesis. In addition, Quiet-Life Hypothesis is also tested. This hypothesis has been proposed by Homma et al. (2014).

With regard to Quiet-Life Hypothesis, in centralized market due to inadequate management efforts, lack of profit-maximizing behavior, wasteful spending to gain and maintain monopoly power and retention of inefficient managers, companies have not taken action to minimize costs (Berger & Hannan, 1998). To test this hypothesis, the relationship between competition and efficiency is examined. With regard to what mentioned above, the questions below are asked in the present research:

1. whether a significant relationship exists between efficiency and growth of banks listed in Tehran stock exchange?
2. whether a significant relationship exists between competition in industry and efficiency of banks listed in Tehran stock exchange?

## LITERATURE REVIEW

In his study, Bourke (1989) describes a positive relationship between bank profitability and capital ratio, as higher the capital ratio the more will be the bank profitability. In the same way the banks which are sound capitalized are more cost-effective as compare to others in USA described by (Berger, 1995). Significant link between the capital ratio and profitability is not restricted to USA local banking industry as a study of 18 countries from 1986-1989 explained that Capital ratio impacts bank profitability positively even though such association restricted to state own banks. Prasad and Harler)1997( conducted a research entitled “testing role of Information Technology in productivity and profitability of banking industry” made an attempt to define role of modern technologies in increasing profitability of mentioned banks. The results from their study indicated that investment in information technology systems has not affected productivity of banks, but labor spending has a positive effect on productivity of bank.

This study is associated to subject of research. Barr conducted a research entitled “DEA software tools and technology” and stated that today’s DEA practitioners and researchers have a wide range of solution technology choices. Clearly, software is no longer an impediment to the incorporation of DEA into decision-support systems and benchmarking processes. This is evidenced by the availability of interoperable tools with a variety of user interfaces, advanced modeling options, and the power to evaluate large-scale data sets on inexpensive computing platforms. This survey describes and critiques

prominent DEA software packages, both commercial and non-commercial, and summarizes the current state of the art. Hadian & Azimi (2004) conducted a research and examined status of 10 commercial banks during 1997-1999. Their method has been grounded on DEA under constant and variable returns to scale to calculate economic and technical efficiency of Iran's governmental banks.

The results from this research indicate that specialized banks have outperformed commercial banks in terms of technical and economic efficiency. This study is consistent with the subject of research. Bagheri (2006) in a study entitled "analysis of factors affecting profitability of commercial banks(case study: Bank Refah)" concluded that efficient cost management is a dispenser for high profitability of bank. In addition, control assets and commitment management have a significant effect on profitability. Among external factors, economic growth has a positive effect on profitability of bank; on the other hand, inflation rate has had an inverse effect on profitability.

This study is consistent with the subject of research. Goudarzi & Zobeidi (2008) conducted a study entitled "effect of Spread of e-banking on profitability of commercial banks across Iran". The results from their study indicated that increasing number of ATM in each bank has had a positive effect on profitability of that bank, which this effect has increased when the bank joined to the ATM. In this regards, it can conclude that expansion of e-banking has a positive significant effect on profitability of commercial banks in Iran. This study is consistent with the subject of research. Ranjbar et al.(2009) have measured cost management of branches of bank Tejarat in Isfahan and factors affecting it. The results from data fitness indicated that Cost-effective mean of branches of bank Tejarat in Isfahan equaled to 87.61%. Further, cost efficiency of branches has a direct relationship with ratios of credit facilities to total asset and pretax profit to assets of branch and has an inverse relationship with ratios of cash asset to asset and long-term deposits to total assets of branches. This study is consistent with the subject of research.

## RESEARCH METHOD

The present research is an applied study since the results from it can be used in managers' and investors' decisions. Further, it is a correlation study, because regression techniques will be used to discover the relationship between research variables. Statistical population consists of all the banks and financial and credit institutions listed in Tehran stock exchange during 2006-2014; due to limited population, sample group is not selected and the entire population is examined.

## RESEARCH HYPOTHESES

1. there is a significant relationship between efficiency and growth of banks listed in Tehran stock exchange
2. there is a significant relationship between competition in industry and efficiency of banks listed in Tehran stock exchange

### Research models and variables

To test the first hypothesis, the model below is used:

$$\text{GROWTH}_{i,t} = \gamma_0 + \gamma_1 \text{EF}_{i,t-1} + \gamma_2 \text{INF}_t + \gamma_3 \text{GDP}_t + \gamma_{i,t}$$

Where

#### Dependent variable

$\text{GROWTH}_{i,t}$  = growth of bank i at year t which represents assets at year t minus assets at year t-1 divided by assets at year t-1.

#### Independent variable

$\text{EF}_{i,t-1}$  = efficiency of bank at year t-1 which equals to ratio of their operating income to operating costs.

#### Control variables

$\text{INF}_t$  = inflation rate of country at year t which equals to cost of goods and services announced by central bank at year t.

$\text{GDP}_t$  = growth of GDP at year t.

To test the second hypothesis, the model below is used.

$$\text{EF}_{i,t} = \gamma_0 + \gamma_1 \text{CONC}_{t-1} + \gamma_2 \text{INF}_t + \gamma_3 \text{GDP}_t + \varepsilon_{i,t}$$

where

#### Dependent variable

$\text{EF}_{i,t}$  : efficiency of bank at year t which equals to ratio of operating income to operating costs

#### Independent variable

$\text{CONC}_{t-1}$  : centralization in banking industry at year t-1 which The Herfindahl-Hirschman is used to measure it.

$$\text{HHI}_t = \sum_{i=1}^N (\text{Sales}_{i,t} / \sum_{i=1}^N \text{Sales}_{i,t})^2$$

Where

$\text{HHI}_t$  = HHI refers to banking industry at year t and  $\text{sales}_{i,t}$  refers to income of services at bank i at banking industry at year t. the more Herfindahl-Hirschman, income centralization in industry will be more and competition will be less.

**Control variables:**

$INF_t$ : inflation rate of country at year t which equals to cost of goods and services announced by central bank at year t.

$GDP_t$  = growth of GDP at year t.

**Hypotheses testing**

Firstly Chow test and F-Limer Statistics were used to detect the homogeneity or heterogeneity of data.

The hypotheses are as follow:

$H_0$ =Pooled Data

$H_1$ =Panel Data

$H_0$  has been grounded on lack of observable individual effects and  $H_1$  has been grounded on existence of unobservable individual effects. If  $H_0$  is accepted, the model will lack unobservable individual effects; thus it can be estimated through pooled regression model; yet if  $H_1$  is accepted, unobservable individual effects will exist in the model. If results from this test are grounded on use of data, it should use one of Fixed effects model (FEM) or random effects model (REM) to estimate model. Hausman test should be performed to select one of two models below:

$H_0$ =Random Effect

$H_1$ =Fixed Effect

Hausman hypothesis has been grounded on appropriateness of random effects model to estimate regression models of panel data.

**The first research hypothesis testing**

Concerning estimation of coefficients of model relating to the first research hypothesis testing, Chow

test and F-Limer Statistics were used to detect the homogeneity or heterogeneity of data. The results from this test have been proposed in table 1.

With regard to what seen in table 1, result from Chow test indicates that the probability obtained for f-statics is greater than 5%, thus pooled regression model is used to test this model. Result from testing the model above using pooled regression model has been proposed in table 2.

With regard to the results from table 2, since t-value of bank efficiency has been greater than +1.965 and sig has been under 0.05, there is a direct significant relationship between efficiency and growth of banks listed in Tehran stock exchange. In this regards, this result will be consistent with the first hypothesis under a significant relationship between efficiency and growth of banks listed in Tehran stock exchange. Yet, there is no significant relationship between control variables of GDP and inflation rate and dependent variable. Durbin-Watson value equals to 2.293 which is between 1.5 and 2.5. it should be noted that use of autoregressive process has been targeted in resolving autocorrelation problem in research model. Further, sig of f-statistics equals to 0.008 which has been under 0.05, indicating significant of model. Another significant point in table 2 is adjusted determination coefficient of model.

Value of adjusted determination coefficient equals to 17%, indicating almost 17% of the changes in dependent variable can be explained via independent and control variables which is an acceptable value. It should be noted that sig of Arch test is greater than 0.05 thus there is not the problem of Heteroscedasticity Model in the model. The values of variance inflation factor for the research variables are under 5 and close to 1, indicating lack of collinearity problem in the research model.

Table 1. Results from Chow test			
Null hypothesis	F-statics	Sig	Result from <i>Chow test</i>
<i>pooled regression model</i>	208/1	315/0	null hypothesis is not rejected

Table 2. Results from estimation of the first research model					
Variable	Coefficients	Standard error	t-statics	Sig	VIF
Fixed value	159/0	194/0	821/0	415/0	-
Efficiency of bank	035/0	014/0	449/2	017/0	164/1
GDP of country	345/0-	332/1	259/0-	796/0	632/1
Inflation rate of country	0004/0-	006/0	074/0-	94/0	787/1
Autoregressive process (1)	418/0	144/0	901/2	005/0	173/1
f-statistics		808/3		Determination coefficient	233/0
Sig of f-statistics		008/0		Adjusted Determination coefficient	172/0
Sig of Arch test		527/0		<i>Durbin-Watson value</i>	293/2

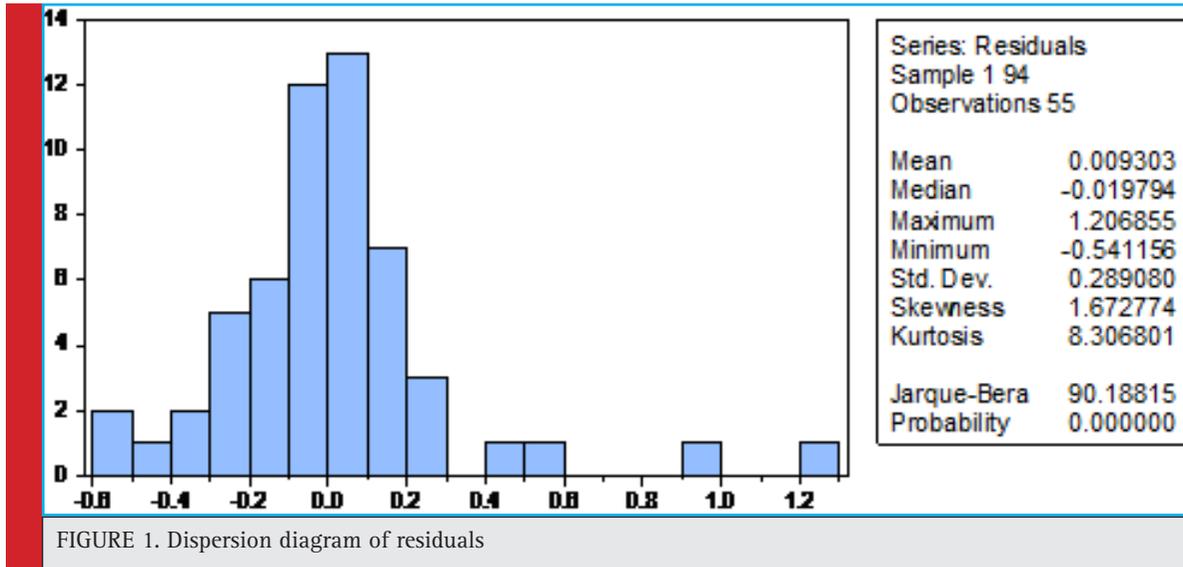


Diagram of Model residuals has been proposed in figure 1. However result from Jarque and Bera test indicates non-normality of residuals, the diagram representing its values has dispersion similar to normal distribution, thus there is no serious problem on this.

**The second research hypothesis testing**

Concerning estimation of coefficients of model relating to the second research hypothesis testing, Chow test and F-Limer Statistics were used to detect the homogeneity or heterogeneity of data. The results from this test have been proposed in table 3.

With regard to what seen in table 3, result from Chow test indicates that the probability obtained for f-statics is under 5%, thus pooled regression model is used to test this model. Result from testing the model above using pooled regression model has been proposed in table 4.

With regard to table 4, sig of Hausman test is greater than 0.05, thus the random effects model must be used to estimate coefficients of model. Result from testing the model above using random effects model and Estimated Generalized Least Squares (EGLS) has been proposed in table 5.

With regard to the results from table 5, since t-value of centralization in industry has been greater

than +1.965 and sig is under 0.05, there is a significant relationship between centralization in industry and efficiency of banks listed in Tehran stock exchange. In this regards, this result will be associated to the second hypothesis under a significant relationship between competition in industry and efficiency of banks listed in Tehran stock exchange. Control variables of GDP and inflation rate have not a significant relationship with dependent variable. Durbin-Watson value equals to 1.9 which ranges from 1.5 to 2.5. Further sig of f-statistics equals to 0.000 which has been under 0.05., indicating significance of model. Another significant point in table 5 is adjusted determination coefficient of model. Value of adjusted determination coefficient is 22%, indicating 22% of changes in dependent variable can be explained via independent and control variables which is an acceptable value. It should be noted that use of Estimated Generalized Least Squares (EGLS) results in resolving Heteroscedasticity of probable variance. Diagram of Model residuals has been proposed in figure 2. However result from Jarque and Bera test indicates non-normality of residuals, the diagram representing its values has dispersion similar to normal distribution, thus there is no serious problem on this.

Table 3. Results from Chow test			
Null hypothesis	F-statics	Sig	Result from <i>Chow test</i>
<i>pooled regression model</i>	193/11	000/0	null hypothesis is not rejected

Table 4. Results from Hausman test			
Null hypothesis	Chi-square statistics	Sig	Result from test
Random effects model	693/0	874/0	Null hypothesis is not rejected

Table 5. results from estimation of the second research model				
Variable	Coefficients	Standard error	t-statics	Sig
Fixed value	053/0-	712/1	031/0-	975/0
Centralization in industry	807/9	093/3	17/3	002/0
GDP	692/13	183/9	491/1	141/0
Inflation rate	083/0	047/0	752/1	085/0
f-statistics		885/6	Determination coefficient	262/0
Sig of f-statistics		000/0	Adjusted Determination coefficient	224/0
<i>Estimated Generalized Least Squares (EGLS)</i>			<i>Durbin-Watson value</i>	9/1

### DISCUSSION AND CONCLUSION

To explain the result from the first research hypothesis testing under significant relationship between efficiency and growth of banks listed in Tehran stock exchange, it should be noted that regarding Efficient Structure Hypothesis proposed by Demsetz(1973), efficient companies can succeed in competition and growth under pressure of competition at market, thus these companies become larger and gain more share of market and ultimately gain higher profit. Concerning the result from the second research hypothesis testing under a significant relationship between increase in centralization in industry and efficiency of bank, it should be noted that banks due to their important functions in financial system are considered as important components of financial system.

In Iran, this role regarding Notification of Article 44 of the Constitution, Capital market imperfection and need of economy to empowerment of private sector has become more sensitive. Indeed, banking sector in economy of Iran as the most important linkage way between monetary and real sectors is important so far as any

imperfection in structure of this sector raises the areas for disorder in other sectors (Taleb lu & Bahman pour, 2011). On the other hand, competition refers to an issue regarded as a way for economic growth and optimal use of economic resources by economic experts. Increase of competition and efficiency at banking market can increase quality and diversity of banking services and decrease exchange costs.

With regard to role of banks in economy, their competitiveness can indicate ability of banks in influence on economy. Detection of competitive status of banking market at country can assist the politicians and planners of banking system to conduct the banking system to competitiveness and efficiency. Without information on banking network structure of country, rise of structural changes to progress banking system of country to further efficiency and competition might have been inefficient (Hamidian, 2014).

In a developed country like Iran, banking credits are the most important funding source, mentioned that the expected benefits from improvement in competition conditions have special importance. Increase of competition

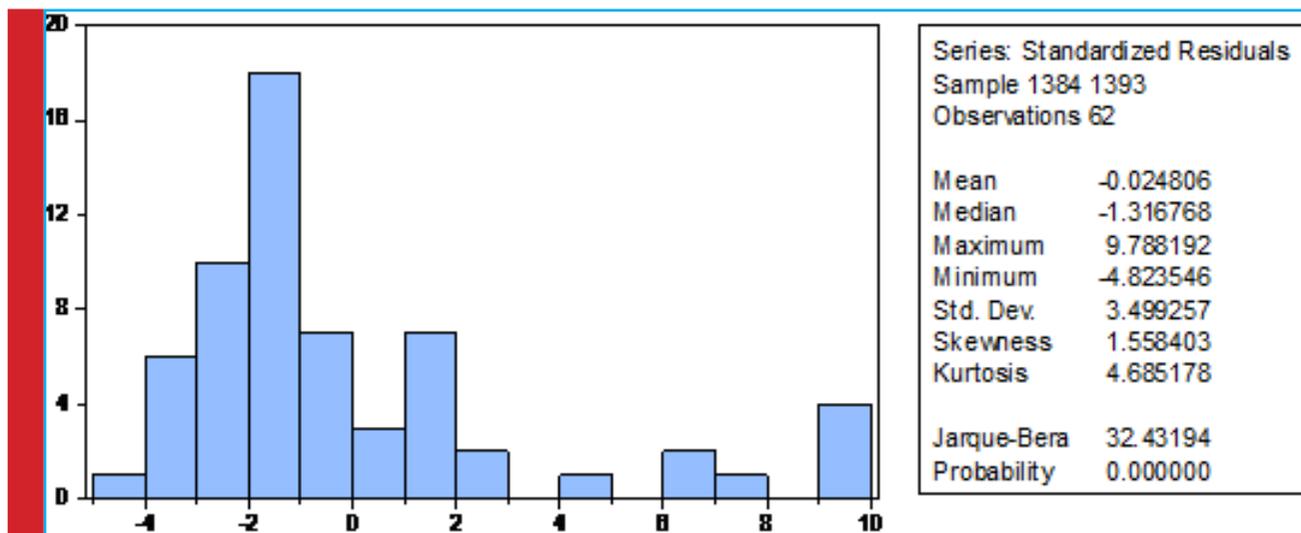


FIGURE 2. Dispersion diagram of residuals

persuades the banks to reduce operating costs, thus inefficiencies are resolved in banking industry. Yet, the results from studies indicated that increase of centralization in banking industry and decrease of competition in banking industry have been followed by improvement of criteria of banks' performance. To explain the obtained results, it should be noted that the criterion used to measure efficiency has been ratio of operating income to operating costs, it seems reasonable under banks' inattention to increase of competition and lack of necessary efficiency in their executive and administrative systems that increase of competition in banking industry undermines ability of banks in acquisition of deposits. To sum up, increase of competition in banking industry causes the banks' major efficiency indicators are undermined.

**Suggestions:** In the present research, ratio of operating income to operating cost was used as a criterion to measure efficiency, so that it can use other existing criteria such as ratio of profitability, economic value added and so forth in future research and compare the results. In the present research, Herfindahl – Hirschman index was used to measure competition in banking industry, which it can use other existing criteria such as inverse number of banks available in banks in future research. In the present research, the linear relationship between variables of centralization in industry, growth and efficiency in banks listed in Tehran stock exchange was examined, thus it is suggested to consider non-linear relationship between mentioned variables in future research.

## REFERENCES

- Bagheri, Hassan. (2007). Analysis of factors affecting the profitability of commercial banks (Case study: Bank Refah). *Financial Research*, pp. 3-26.
- Ranjbar, H, Foroutan, F. Rajabi, M. (2009). The estimated cost efficiency of Tejarat Bank in Isfahan and factors affecting it. *Quarterly economic modeling*, 3 (3), 105-134.
- Goudarzi, A. Zobeidi, Haidar. (2008). Examine the effect of electronic banking on the profitability of commercial banks in Iran. *Iranian Economic Research Journal*, 10 (35), 111-140.
- Hadian, I. Azimi, Anita. (2006). The banking system's efficiency using data envelopment analysis. *Quarterly economic preceding studies*, 20, 1-25.
- Allen, F. & Gale, D. (2004). Competition and Financial Stability. *Journal of Money, Credit, and Banking*, 36, 453-480
- Barr, Richard, S. (1987). DEA Software Tools and Technology, A State of –the- Art Survey. Department of Engineering Management, Information, and Systems, Southern Methodist University, Dallas, TX 75275, USA.
- Berger, A. N. & Hannan, T. H. (1998). The Efficiency Cost of Market Power in the Banking Industry: A Test of the 'Quiet Life' and Related Hypotheses. *Review of Economics and Statistics*, 8, 454-465.
- De Jonghe, O. & Vander Vennet, R. (2008). Competition versus efficiency: What Drives Franchise Values in European Banking. *Journal of Banking and Finance*, 32, 1820- 1835.
- Demsetz, H. (1973). Industry structure, market rivalry, and public policy. *Journal of Law and Economics*, 16, 1-9.
- Gharib, A.H. and Nejad, K.G. (2015). Evaluation of efficiency of electricity distribution company. Using modified DEA approach in Fuzzy environment Case study: Electricity Distribution Company of Fars Province. *Journal of Fuzzy Set Valued Analysis*, 1, 45-56.
- Levine, R., Loayza, N. & Beck, T. (2000). Financial intermediation and growth: Causality and causes. *Journal of Monetary Economics*, 46, 31-77.
- Maudos, J. & Guevara, J. F. (2007). The Cost of Market Power in Banking: Social Welfare Loss vs. Cost Inefficiency. *Journal of Banking and Finance*, 31, 2103- 2125.
- Mergaerts, F., & Vennet, V. (2015). Business models and bank performance: A long-term perspective. *Journal of Financial Stability*, <http://dx.doi.org/doi:10.1016/j.jfs.2015.12.002>.
- Prasad, B. and Harler, P.T. (1997). Examining the Contribution of information technology toward productivity and profitability in U.S. Retail Banking, Working Paper No. 97-90. Financial Institutions Centre, The Wharton School.
- Shui, H., Jin, X. and Ni, J. (2015). Manufacturing productivity and energy efficiency: a stochastic efficiency frontier analysis. *International Journal of Energy Research*, 39 (12), 1649-1663.
- Smirlock, M. (1985). Evidence of the (Non) relationship between concentration and profitability in banking. *Journal of Money, Credit, and Banking*, 17, 69-83.
- Weiss, L. (1974). The concentration–profits relationship and antitrust. In: Goldschmid, H.J., Mann, H.M., Weston, J.F. (Eds.), *Industrial Concentration: The New Learning*. Little Brown & Co, Boston, MA.

## Fear or genius: Camouflage tactics recognition of cuttlefish, *Sepia officinalis* living in the Persian Gulf of Kish Island

Sara Asadi Gharabaghi

*Master of Marine Ecology, Tehran Azad University, North Branch, Marine Biology Group, Tehran, Iran*

### ABSTRACT

No field study has been conducted to the date on observance and analysis of camouflage behavior of in the Persian Gulf species in coastal waters of Kish Island. In this study, 61 samples of cuttlefish in Persian Gulf have been evaluated by the project executor using photography method using professional diving camera. The recorded images have been analyzed later and the camouflage patterns are identified and are compared due to the contrast of the environment. During the study, it was found that regardless of the surrounding background, the cuttlefish uses all types of camouflage tactics such as burial tactic, disruptive tactic, background matching tactic and Masquerade tactic and recognized color changing patterns and the contrast of environmental elements has no effect on selecting this pattern.

**KEY WORDS:** SCUBA, BURIAL, DISRUPTIVE, BACKGROUND MATCHING, MASQUERADE

### INTRODUCTION

Cuttlefish, similar to other Cephalopods, is among the mollusks with bilateral symmetry. Head is clear in this fish and it has special sensory and motor organs. The head has 8 arms and 2 tentacles, helping movement and feeding and reproduction. The mouth of this fish includes two beak-shaped appendages and chitin appendages called radula in the arms. In this regard, one or two arms called Hecto Chotylus are specified to transfer the

Spermatophore (Wilbur, Karl M.; Trueman, E.R.; Clarke, M.R., eds., 1985). Shell is gnawed in this living thing and is completely coated by mantle and causes mantle cavity in stomach, which has way to outside throughout the siphon. The most important properties of cuttle fish shell could be existence of chambers including two gas (mostly azote compounds) and liquid phases. Through regulating the gas amount, the fish can control appropriate depth for swimming (Wilbur et al. 1985). Light is one factor that affects immersion control. With the

#### ARTICLE INFORMATION:

\*Corresponding Author: [heyda.javadi@gmail.com](mailto:heyda.javadi@gmail.com)

Received 1<sup>st</sup> May, 2017

Accepted after revision 4<sup>th</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

increased intensity of light, the immersion is decreased and gets rest inside the sediments. At night, with the decreased intensity of light, appropriate immersion is obtained and the cuttlefishes begin to swim and feed (Mäthger & Hanlon 2007). Moving around is done in two forms including directly moving by the wave movement muscles along the body and rapid missile movement created as a result of alternating longitudinal and circular muscle contraction and relaxation of mantle cavity and rapid withdrawal of water through a siphon (Cuttlefish Basics, 2003). In terms of feeding, this living thing is predator and carnivorous and uses crustaceans and small fishes and other Cephalopods. It lives usually at the sea floor and are fed shrimp and crabs and other invertebrates.

The hunters of this animal are grouper fish, dolphins and sharks (Cuttlefish Basics, 2003). The defense in this fish is limited to pour ink and quick escape. The ink is produced in a pear-shaped gland in back of the body. This gland has two upper and lower parts. In lower part, a gland tissue is existed that is responsible for producing pigments and other required secreting substances. When the gland tissue cells are filled by sufficient amount of pigments, they are ruptured and the pigment is combined with other secretive substances and creates the ink. The ink is concentrated in the gland and is poured out under stressful conditions.

Special pigments in the body of Cuttlefishes could make them enable to change the color of their body and take same color of surrounding area. Their color is changed rapidly for several times while mating and when they become angry, they become white. The lifetime of cuttlefish is about 1 or 2 years. The patterns and colors expressed by cephalopods could be a result of different layers of colorful cells, which are lined as some pockets. The colorful pockets could be divided to several groups (Mäthger & Hanlon 2007), (Mäthger et al., 2004) and (Young and Arnold 1982): Chromatophores, Iridophores and Photophores.

Other creatures need more time for camouflage. They should be placed in an appropriate bandore environment, evaluate the environment slowly and then hide themselves. However, highly detailed vision and complex skin of cephalopods could enable them to change their physical pattern rapidly based on the environment.

One of the complicated and wonderful behaviors of these creatures is changing physical color to match with the habitat and this action is known as Camouflage. This behavior can mainly lead to optical illusion of the enemies and can help more survival of these animals.

Among the aquatic creatures, the cephalopods use camouflage significantly. Over the years, camouflage behavioral patterns of octopuses and cuttlefishes as the most professional aquatic living things in using various

camouflage tactics have been studied by many scientists in scientific fields of marine biologists, ecologists, Neurophysiologists and even Bio-materialists. This issue that how cephalopods can be hid from vision of the hunters through using absolutely efficient and matched tactics with the environment has been the research subject of many experimental and field studies for more than 3 decades. These living things could change their physical patterns rapidly on the environmental background and the questioned challenge is that how these living things have various choices to change the physical pattern and how can select a logical and true pattern? The physical pattern change needs having a sense of advanced vision, so that it can evaluate visual landscapes of surrounding area rapidly and the best physical pattern is formed through sending motor messages.

Other creatures need more time for camouflage. They should be placed in an appropriate bandore environment, evaluate the environment slowly and then hide themselves. However, highly detailed vision and complex skin of cephalopods could enable them to change their physical pattern rapidly based on the environment (Mäthger et al., 2008), (Mäthger, & Hanlon 2007). The speed of changing physical pattern is a mechanism with the mediation of neuron control, in which message is transmitted from visual systems to the brain and the neural message is sent to chromatophore organs. These organs are pockets with flexible property filled by pigments. Around each pocket, the muscles are placed in radial form. These muscles include some neurons that their commendation center is located in lower motor centers of the brain. Maybe one reason for rapid change in physical pattern is that neurons sending motor messages to the muscles around the chromatophores can pass the transmission path continuously and with no synapse (Mäthger & Hanlon 2007).

Physical pattern of cephalopods is not only changed with change in color and color composition, but also it includes also a 3-D change, which is correlated to visual data. By the help of existence of Papilla in the skin of cephalopods, the operation is under control of central neurons.

It has been specified that types of physical change patterns of cephalopods could be divided to 3 main groups including uniform, mottled or disruptive groups respectively. Another effective behavior of camouflage of cephalopods is background matching. In this behavioral pattern, cephalopods use the abovementioned patterns and are affected by the surrounding environment and change themselves in form of environmental elements like a piece of rock or coral. Hence, they can trick hunters or enemies (Mäthger et al., 2006), (Hanlon 2007), (Cuttlefish Change Color, 2010).

This issue that cephalopods use what factors of the environment of triple patterns or background match-

ing has been focus point of many studies. Among these factors, the visual factors in terms of contrast between environmental elements have been mostly referred. For example, if cephalopod is placed at the environment that the environmental elements are not different significantly in terms of contrast, the uniform pattern is mostly used. On the contrary, if the animal is places in an environment with high contrast among the exiting elements of the environment, disruptive pattern is mostly used to trick the enemy/hunter (Hanlon 2007), (Cuttlefish Change Color, 2010), (Hanlon et al., 2009) and Mäthger et al., 2007). The main purpose of this study is to identify the tactics used by cuttlefish in Persian Gulf waters.

## MATERIALS AND METHODS

In this study, descriptive-correlative method is used. In this study, the author and the data collector has taken measure to identify the cuttlefish through diving with scuba equipment in waters around the Persian Gulf around Kish Island I the determined station. Then, the author has observed the camouflage pattern of cuttlefish including *S.pharanois*, *S.arabica* and *S.omanica* and photography was done. The procedure has been as follows: the diving team including 2 divers with scuba equipment entered to the sea from a corner of sea and coastal line that was previously signed by a flag in 10 am and observed the signed area from the coast to the location of buoys. While the observation of camouflaging cuttlefish, the sample was photographed. It should be mentioned that in this study, to reduce the error in results, only the cuttlefishes with mantle size of 20-30cm were photographed and the reason was matching in photography of cuttlefishes in an age range, since age of cuttlefishes is predictable based on their mantle size. A photo was taken of ach camouflaging cuttlefish.

The first photo was taken with observance of the distance of 2m from the cuttlefish from the body of cuttlefish through zooming on its body. This photo is existed to identify the camouflage tactic. The second photo was taken with similar angle to the first photo with the difference that it was taken without zooming and with opener mode. As a result, the amount of contrast of the pattern color selected by the cuttlefish to the environment could be shown.

The time to take each diving was determined in form of 2times per day on 12:10 and 03:01. The conditions were continued for one month in April of 2014. During one month, the useful days of diving regardless of the diving operations under inadequate marine conditions and the days that the conditions were not provided for photography because of inadequate climate conditions

were estimated to 21 days (Hanlon 2005), (Williams et al., 2009) and (Hanlon and Messenger 1988).

It should be mentioned that in this study, based on studied references and analyzing them by the statistical expert and due to the concentration of the studied species in studied waters compared to areas of similar researches in America and Australia, it was announced that the results could be notified through studying 53 cuttlefishes and this number is considered regardless of number of research days. It means that these studies have just emphasis on number of fishes and not the number of days of completing the project. However, because of declining number of errors in the research, the author has tried to do the photography in least time period and in certain time (Hanlon and Messenger 1988).

After completion of the diving operations in each day, at the end of the operations, the photos were copied on the computer and were classified by the author separated for each day in separated files. After completion of the diving and completion of photography operations and gaining desired sample size determined by the author before starting the project, the files of each day were studied. After identification of cuttlefishes photography in each day analyzed in terms of species, the relevant photos of the major specie were separated from others and the rest of investigations were done on them with largest size. All photos were analyzed by the author and relevant professors and by the Professor Roger Hanlon, by guidance of whom the project was begun. Then, the author took measure to identify the camouflage tactics used by cuttlefishes.

The results were delivered to the statist after recording each tactic in separate folders to conduct statistical processes, so that they could be analyzed by Excel and MATLAB software.

Chi-squared ( $\chi^2$ ) test is used in this study, because this test is among statistical and nonparametric tests and could be used to evaluate consistency of the nominal variables. This test is the only existing solution for consistency test of nominal scale variables with more than 2 categories.

## RESEARCH AREA

In the distance between Simorgh Coast and the Nautilus Diving Site related to Big Krall Diving Site (E 431 04054 N 7972926), an area with length of 100m is selected. The distance is specified through installation of 2 flags at the coast. Moreover, the research area was advanced from the coast to sea with the width of 100m and some buoys were embedded at the sea by diving team using scuba and skin equipment in depth of 7m. Hence, the area of the station was specified using two buoys inside the sea with the space of 100m from each other and from the sea.



## RESULTS

During the 21 days, 85 cuttlefishes were photographed. After analyzing the photos and identification of the species by the experts in field of cephalopods and identification keys, the cuttlefishes were classified as follows: *Sepia pharanois*: 61, *Sepia arabica*: 15 and *Sepia omanica*: 9. As 53 cuttlefishes were at least required to identify the tactics, the tactics used by *S. pharanois* strain as the dominant strain in studied site was studied and the results are presented as follows: The camouflage tactics used by the studied strain were divided to 4 main groups, along with the sub-groups and the results are as follows:

### BURIAL TACTIC

Burial tactic is used when the cuttlefish covers its mantle surface by sands and is buried in the beneath of a concentration of sands. In some cases, the cuttlefish can use this tactic, along with other tactics such as masquerade or 3-D change by arms. According to burial of the cuttlefish in beneath of sands, this fish needs special skill while using this tactic and under the water. 6 samples in this study used this tactic out of total number of 61 samples (55.6%) used the tactics in this study.



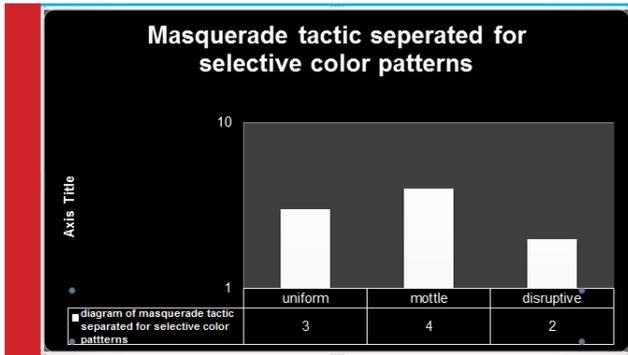
### DISRUPTIVE TACTIC

The disruptive tactic is an irregular tactic; meaning that the pattern used by the cuttlefish to cover its mantle uses no special order and is irregular or disruptive pattern and the colors and forms used in this pattern are not repeated continuously and using a special color or form. cuttlefishes using this tactic have apparently differentiated themselves from the background, at which they are placed through using this pattern and using this color compared to background color and form. 7 samples used this tactic out of total number of 61 cuttlefishes (8.9%) used tactics in this study.



### MASQUERADE TACTIC

Masquerade tactic is also known as 3-D camouflage tactic. In this tactic, cuttlefish uses its arms and changes the color of back of the mantle just as the object beside it like moss. In order to use this tactic, the cuttlefish should use two abilities simultaneously and one of them is same changing the mode of its arms skillfully and the other one is using different color patterns in its body. As it is obvious, these color patterns are classified in 3 groups: the first group is the uniform pattern; meaning that the body of fish is just changed to a single color like uniform brown without observance of highlight spots on its body. The second group is mottle color pattern, in which the body of cuttlefish is covered by dark and light spots with special order along the mantle and the last color pattern is known as disruptive pattern, in which the body of cuttlefish is covered by different colors with no order. As a result, according to same classification, masquerade tactic is here divided to several subsets. Out of 9 samples used this tactic, 3 samples have used uniform color pattern as an equivalent to 33%. 4 samples out of the 9 samples (44%) used mottle pattern and 2 out of 9 samples (22%) used disruptive pattern. In general, 9 out of 61 samples (75.14%) have used this tactic in this study.

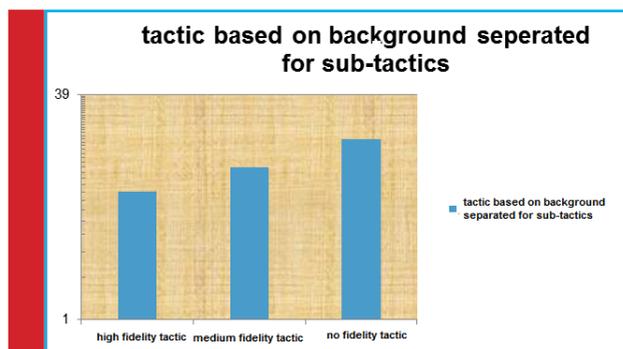
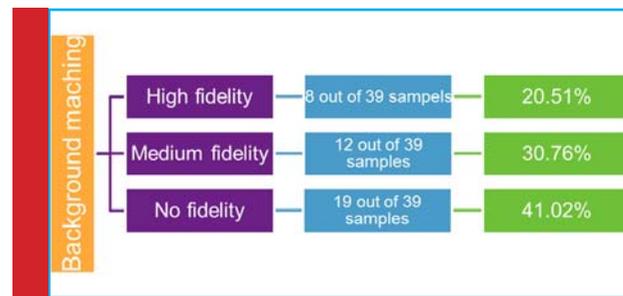


### BACKGROUND MATCHING TACTIC

Background matching tactic refers to becoming a part of the ground using any trick. In this tactic, the cuttlefish tries to become a part of the environment for purpose of camouflage; for example, it may change its physical appearance to a piece of rock on the sands. As this tactic is for purpose of matching with the background to be hidden from the vision of hunter and other fishes, it should be done in an elegant way. Hence, in some cases, the cuttlefish is seen by the hunter in an intelligent manner that although the hunter sees the cuttlefish clearly, it never imagines that the observed object is the same hunt, for which it is looking. In fact, using this technique, the cuttlefish is hid at the same time that is observable due to the physical appearance and form considered by it. In fact, it could be mentioned that the cuttlefish has followed a different target in this tactic contrary to other tactics; meaning that although other tactics used to be applied to be hidden from looks of the hunter, this tactic is designed to be observed, but wrong observations.

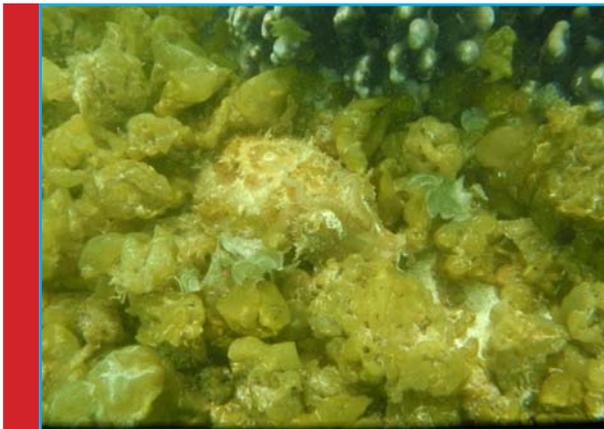
Hence, it is right that the hunter sees the cuttlefish in sea floor, it is a piece of rock or a coral branch in its eyes and it seems nothing strange or special and the hunter has no reason for hunting it. Hence, the cuttlefish uses different methods to achieve such elegance in implementation of this tactic and uses also color patterns and scholars believe that this is the most cunningly camouflage tactic used by cuttlefish (Hanlon R.T., Chiao C-C., Mäthger, L.M., Barbosa A, Buresch K.C., & Chubb, C, 2009) and it has gained such elegance by simultaneous use of several abilities. Hence, this camouflage tactic has been divided to several subsets including high fidelity, medium fidelity and no fidelity (Mäthger et al., 2009), (Hanlon et al., 2009).

In the study, 39 out of 61 samples (93.63%) used this tactic. However, in order to divide the tactic to the above sets, it should be mentioned that the background matching tactic (background matching vs. high fidelity) is used by 8 cuttlefishes. Moreover, the background matching vs. medium fidelity is used by 39 samples and the background matching vs. no fidelity is used by 19 samples.



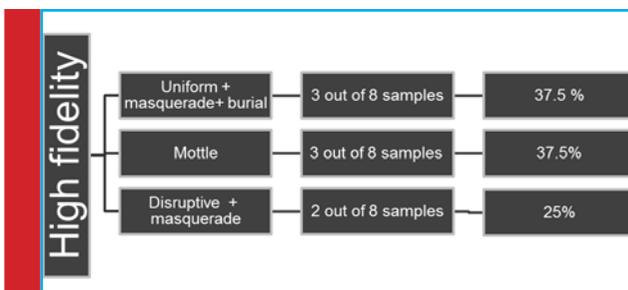
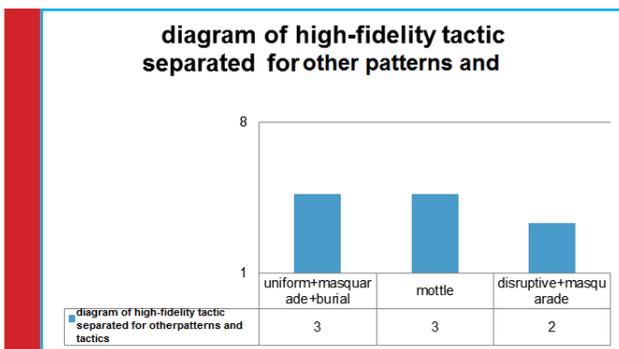
### HIGH FIDELITY TACTIC

As it is obvious from its title, in this tactic, the cuttlefish becomes a part of the background, whether by the mediation of color pattern or by the mediation of using other tactics referred before this. In this sub-tactic, the cuttlefish does its best to be shown same as the background; for example a surface coated by yellow alga or sitting on a Brown Staghorn coral. In general, 8 cuttlefishes used this tactic and in this study, 3 cuttlefishes used uniform color pattern and masquerade tactic and coating their mantle by the sands. 3 other samples used only the mottle tactic and achieved this tactic and 2 remained samples used disruptive pattern and masquerades simultaneously and could be placed in this subset and these results are presented in the diagram in summarized form.



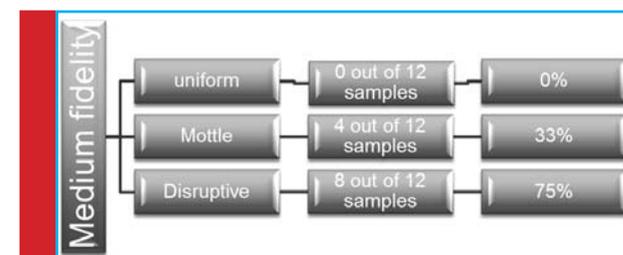
For example, in the figure showing this tactic, the cuttlefish has tried to make itself as an element in the environment, so that at one may is not informed at the first that this refers to the background matching tactic; although it could be found after exact scanning that the cuttlefish has not changed its appearance absolutely as sand or alga and has hidden itself between the two elements. However, the color pattern selected by the cuttlefish is also irregular and disrupted; it means that it has may selected a pattern that seems not a good option for hiding; although it has used such elegance in choosing colors for the disrupted pattern that in some parts, the color is similar to sands and in some parts, it is like the alga and the cuttlefish is hidden in the boundary of sand and alga.

12 samples (76.30%) in the background matching group used this tactic compared to other two sub-tactics. Out of the 12 samples, 4 cuttlefishes used mottle color pattern and 8 cuttlefishes used disruptive color pattern.



### MEDIUM FIDELITY TACTIC

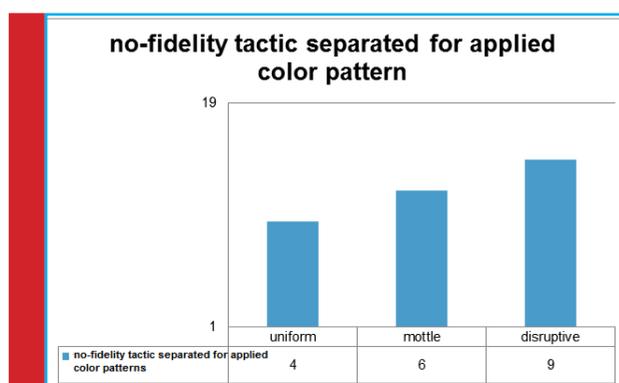
As it is obvious from its title, this tactic is a tactic, in which the cuttlefish tends to show itself as a part of the background, but not in same way of the high fidelity to the background form and color. For example, despite to the previous sub-tactic that the cuttlefish used to change itself completely same as the background through using color pattern or using masquerades, here the cuttlefish tries to be just a part of the background; although it still chooses a color pattern due to the background but not absolutely similar to the background and it is said that although the cuttlefish is a part of environment, it has used medium fidelity. It means that it has not high fidelity and is not also absolutely different from the background and is something between the two tactics, (Hanlon et al., 2009), (Athger et al., 2007) and (Hanlon 2005).



### NO FIDELITY TACTIC

The no fidelity tactic is one of the subsets of tactics, in which the cuttlefish tends to change its appearance same as a part of the environment, at which it is placed (Hanlon et al., 2009). In this tactic that is the most intelligent tactic of camouflage, cuttlefish observes all elements in the environment and tries to change its appearance similar to one of the elements with the assumption that it creates no commitment to become absolutely similar to the element

(Mäthger, et al., 2007). In this tactic, at the same time that the cuttlefish chooses a part of sea floor (e.g. 3m<sup>2</sup>) for sitting and hiding itself, it is informed that there may be other objects and elements such as coral, rocks, algae and other objects. Although the sea floor is covered by white sands, seeing a brown rock that is even significantly different from other sands is not interesting for the hunter. Hence, the hunter believes that it is nothing to hunt. It means that the cuttlefish chooses a significantly different color from the background. Although it could be hidden in sea bed and seems nothing strange, it is hidden from the eyes and tricks the hunter to say another object. As using this tactic needs no fidelity and background matching to be changed into one of the environmental elements, it is logical to use color pattern that is absolutely different from the background. Hence, out of 19 samples (02.41%) using this tactic, 4 samples used uniform color pattern; although 6 samples used mottle color pattern and 9 samples used disrupted color pattern.



## DISCUSSION AND CONCLUSION

In this study, types of camouflage patterns of *S.pharanois* cuttlefish in studied natural habitat are investigated. Using the identified patterns in previous

studies in abroad (Stuart-Fox and Moussalli, 2009), (Bavendam and Fred 1995), (Williams, et al., 2009) and (Hanlon 1988), types of camouflage in cuttlefishes are identified and classified. As this is the first time that such study is conducted in natural habitat and on the strains of Persian Gulf in Kish Island, it is a unique example in this field. In this study, as all diving and photography operations are conducted in certain time in terms of season and day and night hours, the effect of ecological factors such as changes in water temperature, light of the natural environment, seasonal variations, changes in geographical latitude and longitude has been insignificant on choosing the camouflage pattern (Williams et al., 2009). It could be mentioned that squ cuttlefish id has the ability of camouflage from the early days of birth instinctively. However, there are a few studies available about comparing the ability of camouflage in different age ranges (Hanlon and Messenger 1988). Hence, to omit the effect of age on ability and tactics of camouflage, this study is conducted on samples in similar age range, so that a 1-year *S.pharanois* cuttlefish has a length about 30cm; although the infants of cuttlefish have length less than 10cm and they were excluded from the research. The recent study shows that in the studied natural habitat, the Persian Gulf cuttlefish uses all camouflage tactics reported in previous studies (Stuart-Fox and Moussalli 2009), (Bavendam and Fred 1995), (Williams et al., 2009), (Mäthger et al., 2008), (Hanlon et al., 2009), (Mäthger et al., 2007) and (Mäthger et al., 2009).

The percent of using camouflage tactics like background matching, burial, masquerading and disruptive tactics are different from each other. The mostly used tactic in this study is background matching tactic. The present study shows that in the studied natural habitat, Persian Gulf cuttlefish has used all camouflage tactics reported in previous studies equally (Stuart-Fox and Moussalli, 2009), (Bavendam and Fred 1995), (Williams et al., 2009), (Mäthger et al., 2008), (Hanlon et al., 2009), (Mäthger et al., 2007) and (Mäthger et al., 2009).

## REFERENCES

- Mäthger, L.M., Chiao, C-C., Barbosa, A, Buresch, K., Kaye, S., & Hanlon, R.T. 2007. Disruptive coloration elicited on controlled natural substrates in cuttlefish, *Sepia officinalis* J. Exp. Biol. 210: 2657-2666.
- Bavendam, Fred (1995) "The Giant Cuttlefish Chameleon of the Reef". National Geographic, pp. 94-107.
- Chiao, C-C., & Hanlon, R.T. 2001. Cuttlefish camouflage: visual perception of size, contrast and number of white squares on artificial substrata initiates disruptive coloration. J. Exp. Biol. 204: 2119-2125.
- Cuttlefish Change Color, Shape-Shift to Elude Predators. News. nationalgeographic.com (2010-10 Retrieved on 2013-09-18

- Hanlon R.T., Chiao C.-C., Mäthger, L.M., Barbosa A, Buresch K.C., & Chubb, C. 2009. Cephalopod dynamic camouflage: bridging the continuum between background matching and disruptive coloration. *Philosophical Transactions of the Royal Society B* 364: 429-437
- Hanlon, R.T. 1988. Behavioral and body patterning characters useful in taxonomy and field identification of cephalopods. *Malacologia* 29(1): 247-264.
- Hanlon, R.T. 2005. Disruptive body patterning of cuttlefish (*Sepia officinalis*) requires visual information regarding edges and contrast of objects in natural substrate backgrounds. *Biological Bulletin*. 208: 7-11
- Hanlon, R.T., Messenger, J.B. 1988. Adaptive coloration in young cuttlefish (*Sepia officinalis* L.): The morphology and development of body patterns and their relation to behaviour. *Phil. Trans. R. Soc. Lond. B* 320: 437-487.
- Hanlon, R.T. 2007. Cephalopod dynamic camouflage. *Current Biology* 17 (5): 400-404.
- Mäthger, L.M., Barbosa, A., & Hanlon, R.T. 2009. Cuttlefish use visual cues to control 3-dimensional skin papillae for camouflage. *Journal of Comparative Physiology A* 195: 547-555.
- Cuttlefish Basics. Tonmo.com (2003-02-12). Retrieved on 2011-09-18.
- Mäthger, L.M., Denton, E.J., Marshall, J., & Hanlon, R.T. 2008. Mechanisms and behavioral functions of structural coloration in cephalopods. *Journal of the Royal Society Interface* 6: S149-S164.
- Mäthger, L.M., & Hanlon, R.T. 2007. Malleable skin coloration in cephalopods: selective reflectance, transmission and absorbance of light by chromatophores and iridophores. *Cell and Tissue Research* 329: 179-186.
- Mäthger, Lydia M.; Barbosa, Alexandra; Miner, Simon; Hanlon, Roger T. (May 2006). "Color blindness and contrast perception in cuttlefish (*Sepia officinalis*) ?? determined by a visual sensorimotor assay". *Vision Research* 46 (5): 1746-1753. doi:10.1016/j.visres.2005.09.035. PMID 16376404. Retrieved 9 December 2013.
- Mäthger, L. M., Collins, T. F. T. & Lima, P. A. 2004 The role of muscarinic receptors and intracellular Ca<sup>2</sup> in the spectral reflectivity changes of squid iridophores. *J. Exp. Biol.* 207, 1759-1769.
- Stuart-Fox, D. and Moussalli, A. (2009). "Camouflage, communication and thermoregulation: Lessons from colour changing organisms". *Philosophical transactions of the Royal Society of London. Series B, Biological sciences* 364 (1516): 463-70
- Williams, S.B., Pizarro, O., How, M., Mercer, D., Powell, G., Marshall, J., & Hanlon, R.T. 2009. Surveying nocturnal cuttlefish camouflage behaviour using an AUV. *IEEE International Conference on Robotics and Automation*: 214-219
- Williams, S.B., Pizarro, O., How, M., Mercer, D., Powell, G., Marshall, J., & Hanlon, R.T. 2009. Surveying nocturnal cuttlefish camouflage behaviour using an AUV. *IEEE International Conference on Robotics and Automation*: 214-219.
- Wilbur, Karl M.; Trueman, E.R.; Clarke, M.R., eds. (1985), *The Mollusca, 11. Form and Function*, New York: Academic Press, ISBN 0-12-728702-7
- Wilbur, Karl M.; Clarke, M.R.; Trueman, E.R., eds. (1985), *The Mollusca, 12. Paleontology and neontology of Cephalopods*, New York: Academic Press, ISBN 0-12- 728702-7
- Young, R. E. and J. M. Arnold. 1982. The functional morphology of a ventral photophore from the mesopelagic squid, *Abralia trigonura*. *Malacologia*, 23: 135-183.

## Detection and molecular identification of avian metapneumovirus in commercial flocks of Qazvin

Saman Jabbari Zahirabadi<sup>1</sup>, Gita Akbariazad<sup>2</sup>, Hossein Hosseini<sup>2</sup>, Majdedin Ghalavand<sup>3</sup>, Mahdi Tat<sup>3</sup>, Mohammad Sadegh Hashemzadeh<sup>4</sup> and Ruhollah Dorostkar<sup>4</sup>

<sup>1,2</sup>*Department of Clinical Sciences, Faculty of Veterinary Medicine, Islamic Azad University, Karaj branch, Karaj, Iran*

<sup>3,4</sup>*Applied Virology Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran*

### ABSTRACT

aMPV is known as a virus associated with respiratory disease of poultry, which is usually accompanied by secondary bacterial infections which causes reduced growth and increased mortality and decreased egg production, especially in the turkey. In this research, to investigate the infection of commercial broiler chicken farms in Qazvin province with aMPV, tracheal swabs was taken of birds from 20 broiler chicken farms that had respiratory diseases complex (three swabs from each farm). The samples tested by RT-PCR for the presence of aMPV. Results obtained indicated that 13 flocks out of 20 flocks were infected with aMPV, which accounted for 65% infection rate of the flocks. As seen from sample, aMPV was high and significant in Qazvin province, indicating importance of identify this virus.

**KEY WORDS:** AMPV, RESPIRATORY COMPLEX, MOLECULAR IDENTIFICATION

### INTRODUCTION

Currently, one of the problems of the poultry industry is respiratory complexes. In commercial poultry units, different viral and bacterial agents and managerial factors are involved in these complexes. One of the viruses that cause and exacerbate the likelihood of these complexes is pneumovirus, which belongs to the family of paramyxo viridae and metapneumovirus species (Pringle

1998) and infection with the virus is found in poultry and turkey, which causes acute infection that is highly contagious and affects upper respiratory tract in poultry flocks. The virus can cause significant economic damage, especially in combination with other pathogens (Miller et al., 2010) , In the past, respiratory disease caused by aMPV were known as avian rhinotracheitis or swollen head syndrome, the virus that causes the highly contagious disease affecting upper respiratory tract of poultry.

#### ARTICLE INFORMATION:

\*Corresponding Author: R.Dorost@yahoo.com

Received 30<sup>th</sup> April, 2017

Accepted after revision 31<sup>st</sup> July, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

In turkey, this virus is the cause of a condition known as turkey rhinotracheitis. These names are coined after the type of the injury and its clinical manifestations. However, all these clinical symptoms and conditions are not only due to aMPV, but can occur both in acute stages and in other stages due to association of the virus with other such as microbial symptoms such as ORT, *Bordetella avium*, Smallpox, *Escherichia coli*, *Listeria monocytogenes* and other respiratory pathogens (Cook *et al.*, 1991 & Kherna & Jones 1999 & Naylor *et al.*, 1992). According neutralization patterns and sequence analysis, aMPV is currently divided into four separate groups: A, B, C, D (Ba *et al.*, 2000)

In poultry, aMPV is always accompanied with symptoms of swollen head syndrome, yet more presence of aMPV in the flock lacks obvious clinical symptoms. (Droual & Woolcock 1994) Cases of reduced production in the flock of laying chickens infected with the virus have been reported. Despite sporadic laboratory confirmation of the presence of these infections in broiler flocks of the province, no citation and published evidence is available. Thus, given damages and high prevalence of the disease, effective measures to identify and prevent it are necessary and help specify the role of vaccination at level of affected provinces. Qazvin province is strong in terms of the production of commercial boiler flocks and because of the farms concentration, they are facing respiratory problems in most seasons.

Therefore, study of presence or non-presence of this virus and its prevalence in the province can help identify factors involved in respiratory complexes and choose control and prevention solutions. This research can be confirm the hypothesis that other farms in which other respiratory disease cause damages are also infected with aMPV.

## MATERIALS AND METHODS

**Time of the study:** Fall and winter 2014-2015 **The geographical location of the study:** Qazvin province-iran **Sampling** In this study, of 20 flocks, 180 samples in form dried tracheal swabs was taken from the flocks of broiler chickens (more were Ross) in Qazvin province. Their history showed that they had respiratory complex, but its nature was unknown. Clinical signs and necropsy finding of aMPV suspected birds include upper and lower respiratory tract involvement and presence of fibrin casts and mucopurulent at the bifurcation of the trachea and secondary bronchi, which were used to detect aMPV. 9 swabs were collected from each flock. Every three swaps were pooled and was recognized as a sample. As a result, 3 samples were taken from every birder and a total of 60 samples were used for PCR.

## PCR

**RNA Extraction:** RNA extraction process is as follows: swabs collected were placed in PBS fluid in triplex form and after having been vortexed, 200 ml of the liquid was transferred to a micro tube. RNA extraction was conducted using kit (Cinnapure RNA KIT CinnaGen Co., IRAN) according to the manufacturer's instructions. For purification of all the RNA of the sample took approximately 15 minutes. After the samples were prepared, RT-PCR

The APV detection primers used in this study were previously evaluated by Bayon-Auboyer *et al.* (1999) and are listed in Table 1. The screening of flocks was performed with the primer pair Nd/Nx. the APV molecular typing primers used in this study are listed in Table 1. The Ga-G2-, Ga-G12 primers are specific for APV subtypes A and B respectively (Ba *et al.*, 2000). RT-PCR program were performed as described above except for the annealing temperatures. Primers specific for each subtype, their annealing temperature, and the expected band size are listed in Table 2.

Reverse transcription was done by using Random Hexamer with Revert Aid first strand cDNA synthesis Kit (Fermentas Co, Canada). The PCR was carried out in a 50- $\mu$ l reaction volume consisting of 5  $\mu$ l 10x PCR buffer, 1  $\mu$ l 10 mM dNTPs, 1.25  $\mu$ l of each primer (10 pmol/ $\mu$ l), 0.25  $\mu$ l Taq DNA polymerase (5U/ $\mu$ l), 1.5  $\mu$ l 50 mM MgCl<sub>2</sub>, 33.75  $\mu$ l of dH<sub>2</sub>O, and 6  $\mu$ l cDNA dilution, and was programmed as following condition: 94°C for 3 min followed by 35 cycles of 95°C for 30 sec, different annealing temperature (Table 2) for 30 sec, 72°C for 60 sec, and a final extension at 72°C for 15 min. A 5  $\mu$ l aliquot of the PCR reaction mixture was loaded onto a 1% agarose gel and electrophoresed for 40 min in TAE buffer containing 0.5 mg/mL ethidium bromide

**cDNA synthesis (RT reaction)** After RNA extraction, for center cDNA synthesis, random primers were used. These primers bind to RNA in non-specific fashion and therefore the whole RNA is converted to cDNA. The advantage of these primers is that they allow you to redo the tests on the cDNA and also to identify other RNA viruses in cDNA. It is necessary to use RNase-free equipment to ensure synthesis of RNA occurs properly and fully and to this end, disposable gloves, DEPC water, and RNase enzyme inhibitors are used. For cDNA synthesis, the kit made by Revert Aid First Stand cDNA Synthesis was used (Hesami *et al.*, 2013).

## ELECTROPHORESIS

To identify and visualize PCR product, electrophoresis of samples in gel and TBA buffer was used; for this purpose, first 0.8 g of agarose gel was added to 40 ml of TBA buffer and, it was heated using boiling water

Table 1. Polymerase chain reaction primers used for avian pneumovirus molecular detection and typing (1)

Primer Name	Gene Name	Sequence (5'-3')
Nd	N	AGC AGG ATG GAG AGC CTC TTT G
Nx	N	CAT GGC CCA ACA TTA TGT T
Ga	G	CCG GGA CAA GTA TCT CTA TGG
G2	G	CCA CAC TTG AAA GAT CTA CCC
G12	G	CAG TCG CCT GTA ATC TTC TAG GG

Table 2. Polymerase chain reaction primer pairs used for (APV) molecular detection and typing, annealing temperature, and expected band size (1)

Primer	APV type	Annealing temperature	Band size, bp
Nd/Nx	All	51	115
Ga/G2-	A	54	504
Ga/G2-	B	54	312

bath. Heating was continued until complete dissolution of the agarose. After cooling to a temperature of about 60 degrees centigrade, it was poured in gel carefully and slowly so that no bubble is formed. Then, we placed the comb inside the gel and let it be at room temperature until it became solid. Then the comb was removed and gel was placed in electrophoresis and TBA solution was poured in the tank until the surface was completely covered. 8 ml of the PCR product was mixed with 1 ml of loading buffer and placed in the gel well.

Having loaded samples, electrodes were connected to power supply and gel was exposed to fixed electricity of 100 volt for an hour. Then, the gel was placed in coloring specific container containing 0.5 mg/ml of ethidium bromide. Gel was removed from the container and transferred to a container containing distilled water and was left there for 20 min until complete elimination of its excess ethidium bromide content. Then, the resulting gel was then exposed to UV light and presence or absence of expected specific bands was recorded (Darce *et al.*, 2005).

## RESULTS

Results are as follows: of 20 flocks including 20 farms, 180 swaps were taken (9 per flock) and of these, 13 flocks were declared positive, indicating 65% of flocks were infected. Of a total of 60 swaps taken, 26 swaps (43% of the swaps) was positive. Results for 20 flocks tests in Qazvin, Buin Zahra and Takestan are provided in detail in table 3

Infection rate: The results indicate the severity of aMPV infection in farms in Qazvin province. Of the total infection in Qazvin Province, Takestan had the highest rate at approximately 84 %. Thence in second place was Qazvin at 50 % meaning that half of the sample of Qazvin was aMPV positive. The lowest rate related to Buin Zahra with no positive sample.

1. Takestan 84 %
2. Qazvin 50%
3. Buin Zahra 0%.

## DISCUSSION

It was not accurately verified if this virus was primary pathogenic agent in the commercial flocks in Qazvin province. However, attempts to identify its role in respiratory complexes in this province have a significant role.

Very strong role of Qazvin province in production of chicken and the problems of the province including high concentration of the farms have caused a serious need for study of respiratory problems in this province. The results proved that infection with aMPV occurred many farms that referred to the vets due to respiratory problems. But the sobering fact is that in a flock of twenty flocks that had a negligible number of casualties, the aMPV was the sole virus detected. The methodology of the study, namely, has always been viewed as the most sensitive method to detect the virus. Findings of Ongor and colleagues in 2010 also support the accuracy of this issue. (Ongor *et al.*, 2010).

In his research, a number of positive flocks were tested using cell culture methods, in which a number of the positive cases were declared negative cell culture that this finding suggests the weakness of this technique is to identify the virus. The reason was the low titer of virus of samples or presence of dead or disabled viruses. The further results of this research would be to determine the distribution of the virus in different parts of the province. In this study, we rarely encountered flocks in which main cause of the damage was aMPV or in which just the aMPV was isolated from the sample sent. And this is inconsistent with findings of the Chacon *et al.*

No.	Date of sampling (solar year y/m/d)	Place	Age at infection (days)	Result
1	3/11/2014	Takestan	9	Negative
2	4/11/2014	Qazvin	44	Positive
3	9/11/2014	Takestan	44	Positive
4	16/11/2014	Qazvin	41	Negative
5	22/11/2014	Qazvin	49	Negative
6	15/01/2015	Takestan	47	Positive
7	18/01/2015	Takestan	25	Positive
8	1/02/2015	Takestan	43	Positive
9	10/02/2015	Qazvin	32	Positive
10	12/02/2015	Takestan	19	Negative
11	15/02/2015	Takestan	40	Positive
12	27/02/2015	Buin Zahra	36	Negative
13	29/02/2015	Qazvin	16	Negative
14	2/03/2015	Takestan	42	Positive
15	6/03/2015	Takestan	33	Positive
16	7/03/2015	Takestan	30	Positive
17	17/03/2015	Takestan	35	Positive
18	24/03/2015	Takestan	31	Positive
19	27/03/2015	Buin Zahra	21	Negative
20	28/03/2015	Qazvin	28	Positive

(2007) who attempted to check the existence of aMPV in commercial egg laying hen flocks with no history of vaccination against aMPV in which all positive samples were tested for the differential diagnosis of infectious bronchitis, Newcastle disease and infectious laryngotracheitis and MG bacteria as their research merely detected aMPV. (Chacon *et al.*, 2007).

Earlier in 2010, Dr. Sheikhi used ELISA test to report that the aMPV infection was found in the ancestry of commercial broiler and layer hen flocks in some centers in West Iran. But the method he used had disadvantages compared to pcr, including occurrence of false positive in ELISA test. (Sheikhi 2010) The results of this study can be typed in another study its type a, b can also be identified. Also, viruses sequence can obtained to draw its phylogenetic tree. Contamination with ampv is identified more in old flocks that can show us A significant relationship Between age and susceptibility to the disease. also The time intervals between sampling can demonstrate that the presence of the disease in the region is a permanent presence( table3) Because in all the time of sampling There was positive samples. The amount of infection with these virus can create a new protocol of vaccination and treatment, that can be benefits of this research. So far, few would have predicted such a large amount of infection in the region. Perhaps cause of failures in the treatment of infected farms in Qazvin be lack of awareness of the prevalence of virus.

first molecular epidemiology study on APV in Iran was in 2012 by Dr.Hoseini. that study also suggested Another study to determine the distribution area. Their findings also Insisted on necessity of positioning the virus in Herds vaccination programs, (Hosseini *et al.*, 2012).

## REFERENCES

- Ba ˆyon-Auboyer, M.H., Arnauld, C., Toquin, D. & Eterra-dossi, N. (2000). Nucleotide sequences of the F, L and G protein genes of two non-A/non-B avian pneumoviruses (APV) reveal a novel APV subgroup. *Journal of General Virology*, 81, 2723/2733
- Chacon,J.L., Brandao,P.E., Buim, M., Villarreal, L., Ferreira, A.J.(2007), Detection by reverse transcriptase-polymerase chain reaction and molecular characterization of subtype B avian metapneumovirus isolated in Brazil.*J.Avian Pathol.* 36:383-387.
- Cook, J.K.A., Ellis, M.M. & Huggins, M.B. (1991). The pathogenesis of turkey rhinotracheitis virus in turkey poults inoculated with the virus alone or together with two strains of bacteria. *Avian Pathology*, 20, 155/166
- Darce, R.C. *et al.* Subtyping of new Brazilian avian metapneumovirus isolates from chickens and turkeys by reverse transcriptase-nested-polymerase chain reaction. (2005), *Avian Pathology*, v.34,n.2, p.133-136.
- Droual, R. & Woolcock, P.R. (1994). Swollen head syndrome associated with E. coli and infectious bronchitis virus in the Central Valley of California. *Avian Pathology*, 23, 733-742

- Hosseini H & Ghalyanchi-Langeroudi A (2012) Detection and Molecular Characterization of Avian Metapneumovirus in Iran: The First Report ,Iranian Journal of Virology 2012;6(2): 26-31
- Hesami G, Seyfi Abad Shapouri. MR, DVM. PhD, Mayahi M. DVM. PhD (2013), Detection of avian Metapneumovirus infection in broilers by nested RT-PCR Departments of Pathobiology and Clinical Sciences, School of Veterinary Medicine, Shahid Chamran University, Ahwaz, Iran Online Journal of Veterinary Research, Volume 17, 159-166.
- Kherna R.S. & Jones R.C. (1999). - In vitro and in vivo studies on the pathogenicity of avian pneumovirus for the chicken oviduct. Avian Pathol., 28, 257-262
- Naylor, C.J., Al-Ankari, A.R., Al-Afaleq, A.I., Bradbury, J.M. & Jones, R.C. (1992). Exacerbation of *Mycoplasma gallisepticum* infection in turkeys by rhinotracheitis virus. Avian Pathology, 21, 295/305
- Ongor, H., Karahan, M., Bulut, H., Cetinkaya, B. (2010), Detection of avian metapneumovirus subtypes in turkeys using RT-PCR. J.Vet. Rec. 163,363-366.
- Pringle CR. (1998). - Vims taxonomy - San Diego, 1998. Arch. Virol, 143, 1449-1459
- P. J. Miller, E. L. Decanini, and C. L. Afonso, (2010) "Newcastle disease: evolution of genotypes and the related diagnostic challenges," Infection, Genetics and Evolution, vol. 10, no. 1, pp. 26- 35,
- Sheikhi, N (2010), Record of presence of antibodies against metapneumovirus in birds in Iran. 2<sup>nd</sup> International Veterinary Poultry Congress, 20-21 February, Tehran, Iran, P: 115.

## Phylogenetic analysis of *Alternaria raphani*, *A. arborescens* and *A. brassicicola* from canola in Iran

Reza Mahmoudi<sup>1</sup>, Masoud Shams-Bakhsh<sup>2</sup> and Naser Safaie<sup>2</sup>

<sup>1</sup>Department of Agricultural Biotechnology Faculty of Agriculture Tarbiat Modares University

<sup>2</sup>Department of Plant disease Faculty of Agriculture Tarbiat Modares University

### ABSTRACT

Many *Alternaria* morphological species are composed of complex species and need to be revised by molecular tools. Internal transcribed spacer 1 (ITS1), 5.8S ribosomal DNA, and ITS2 region of the ribosomal DNA from 20 isolates of *Alternaria* from canola which were morphologically identified as *Alternaria arborescens*, *A. raphani*, and *A. brassicicola* were sequenced. Phylogenetic analysis was performed by neighbor joining method using above mentioned ribosomal sequences. The isolates categorized into five distinct groups. The isolates of small spore species, *A. arborescens* which are related to species group of *alternata*, had no diversity. Isolates of *A. raphani* and *A. brassicicola* placed in different clades. Isolate A.raph10 from *A. raphani* which made independent clade was too similar to *A. infectoria* and the two isolate A.raph8 and a.raph7 were close to *Ulocladium*. The result of this study showed that ITS sequences could separate different isolates of *A. raphani* and *A. brassicicola*. Moreover the result indicated that *A. raphani* is not a monophyletic species.

**KEY WORDS:** PHYLOGENETICS, *ALTERNARIA*, RIBOSOMAL DNA, ITS

### INTRODUCTION

*Alternaria* is one of the most abundant fungi across all over the world which includes plant pathogens and saprophytes causing diseases on a variety of crops and destroying agricultural products (Strider, 1963). The genus *Alternaria* was introduced for the first time in 1816 by Nees as *Alternaria alternata* (a synonym of *A.*

*tenuis*). Due to the lack of a known sexual state for the majority of species of *Alternaria* (*Ascomycota: Pleosporales*), this genus is usually referred as mitosporic (imperfect) fungi. The main taxonomic feature of this genus is producing large, multicellular, dark and branched spores. The extent of damage on crop differs among the species. Majority of species are plant pathogens that cause a range of economically noteworthy infections on

#### ARTICLE INFORMATION:

\*Corresponding Author: heyda.javadi@gmail.com

Received 30<sup>th</sup> April, 2017

Accepted after revision 2<sup>nd</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal  
NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

a variety of crops worldwide. Several species are saprophytes and capable of producing several toxic metabolites in infected plants which can contaminate foods and feeds and elicit adverse effects in humans and animals. Some species are pathogens of human and other animals and some are among the most important airborne agents of allergic disorders (Rotem, 1994). According to the records, *Alternaria* is the tenth pathogenic fungi among 2000 genus. Also the species of *Alternaria* are common pathogens of post-harvest agricultural products and have been destroyed 20–40% agricultural crops (Farr *et al.*, 1989; Queiroz *et al.*, 2000; Rotem, 1994; Strandberg, 1992). Several species of *Alternaria* have been reported as useful biological control agents against weed and plant pathogenic fungi (Green *et al.*, 2001; Masangkay *et al.*, 1999; Walker, 1982).

The genus *Alternaria* comprises about 100 species of dematiaceous hyphomycetes that occur all over the world in a diversity of habitats (Joly, 1964; Ellis, 1971, 1976; Simmons, 1992). In the genus *Alternaria*, the species specified primarily based on conidial features such as septation, pattern of catenation and size of beak (Joly, 1964; Ellis, 1971, 1976; Simmons, 1992). *Alternaria* species encompass morphological diversity and several sub-generic groups have been suggested that comprise species with homogeneous conidial features (Elliot, 1917; Joly, 1964; Ellis, 1971, 1976; Neergard, 1945). Simmons (1992) has classified *Alternaria* species into a number of species group. Each species-group specialized by an explanatory species. For example *porri* species-group entails large, long-beaked noncatenate spores and *alternata* species-group includes species with small catenate spores such as *A. alternata*.

Genera like *Ulocladium*, *Macrosporium* and *Stemphylium* encompass phaeodictyosporic conidia (Elliot, 1917; Wiltshire, 1933; Simmons, 1967). Conidia of these genera are homogeneous to those of *Alternaria* species. Similarities in conidial characteristics among these genera have placed classification of some species in a complicated situation. The complexity of classification of these fungi is manifested by the fact that some typical species phylogenetically placed into more than one genus. This taxonomic problem perused by Wiltshire (1933, 1938). He introduced improved topics for classification of *Alternaria* and *Stemphylium*, and located *Macrosporium* in *nomine ambigua*, and many atypical species were located in *Pseudostemphylium*, a subgenus of *Stemphylium*. Joly (1967), however, placed most of these atypical species in the genus *Alternaria*. Simmons (1967) studied genera *Alternaria*, *Stemphylium* and *Ulocladium*, and deduced many of these species must be classified in genus *Ulocladium*.

Advances in the techniques of molecular biology in the 1980s particularly in gene cloning, nucleic acid

sequencing and polymerase chain reaction and development of high speed computer with calculation ability improving programs of molecular evolution analysis, have led to development of studies of relationships, phylogeny and evolution of different organisms, including fungi at the molecular level (Sugiyama *et al.*, 1996). These methods in the 1990s, led the systematics of fungi to molecular taxonomy (Bruns *et al.*, 1991; Hibbet, 1992). These methods have been used to identify taxa, determining evolutionary relationships among species, and describing evolutionary pathways in the fungi (Sugiyama, 1998).

Ribosomal ITS sequences within the genome have several copies, and its amplification and sequencing, is relatively easy, and illustrates the variation between fungal species (Lwen *et al.*, 2002). ITS analysis of the genus *Alternaria* has led to identify major species groups, but often has been failed to differentiate very close isolates (de Hoog and Horre, 2002).

Studies have shown that some species of *Ulocladium* are closely related to the species of *Alternaria* by using ITS sequences, and are located within *Alternaria* groups (Chou and Wu, 2002; deHoog and Horre, 2002; Pryor and Gilbertson, 2000). The sequences in this section, do not have the significant diversity for separating the small spore species in the genus *Alternaria*, and cannot be used as a criterion for distinguishing these species (Chou and Wu, 2002; deHoog and Horre, 2002).

The purpose of this study was to investigate phylogeny of *A. raphani*, *A. arborescens*, *A. brassicicola* and also to evaluate phylogenetic relationship among *A. raphani* and other related fungi based on ITS DNA sequences. This study was performed on the basis that *Alternaria* species especially *A. raphani* have morphological diversity and are complex species.

## MATERIALS AND METHODS

**Fungal isolates:** Twenty-one *Alternaria* isolates separated from canola were cultured onto potato dextrose agar (PDA) medium (200g potato, 20g dextrose, 16g agar). Then a 2 mm plug of each isolate inoculated into potato dextrose broth (PDB) medium (200g potato, 20g dextrose) and incubated at 23 °C and 100 rpm in darkness. After 5 days fungal mycelia harvested using vacuum filtration.

**DNA Extraction, Amplification, and Sequencing:** Genomic DNA (gDNA) was extracted from fungal biomass using Safaie *et al.*, 2005 method. Twenty nanogram of gDNA was amplified in 20 µl PCR reaction mixture including 14.5 µl deionized water, 2 µl PCR buffer, 0.6 µl MgCl<sub>2</sub> (50 mM), 0.4 µl dNTPs solution (containing 2.5 mM of each dNTPs), 0.5 µl *Taq* DNA Polymerase (5

unit), 1 µl of each primers (ITS1: 5'TCCGTA GGTGAAC-CTGCGG3' and ITS4: 5'TCCTCCGCTTATTGATATGC3') (10 pM), and 1 µl of gDNA (20 ng).

The PCR reaction was set up as followed: initial denaturation at 94 °C for 5 min, followed by 35 cycles of denaturation at 94 °C for 1 min, annealing at 57 °C for 1 min, extension at 72 °C for 2 min and final extension at 72 °C for 10 min in an Eppendorf thermocycler.

PCR products were examined by electrophoresis at 80 v for 1.5 h in 0.8% (w/v) agarose gel in TAE buffer. PCR products were purified and sequenced one strand by BioNeer Company.

**Phylogenetic Analysis:** The alignment of sequences was performed by Clustal X2 software. Adjustments were made by eye where necessary. Phylogenetic analyses were conducted with Mega5 software on ITS sequences using Neighbor Joining (NJ) method and 500 bootstrap repeats.

## RESULTS AND DISCUSSION

A fragment of ribosomal DNA sequences including ITS1, 5.8S and ITS2, obtained in 20 isolates of four species of genus *Alternaria* together with 17 sequences from rel-

evant species deposited in NCBI database were used for phylogenetic analysis.

The size of the ribosomal ITS sequences in species ranged from 508 to 575 bp. Average length of amplified sequences in *A. arborescens* isolates were 537 bp, in *A. raphani* isolates were 550 bp and in *A. brassicicola* isolates were 555 bp. Species *A. raphani* had the highest diversity in the ITS sequences. This difference is evident in the image of electrophoresis gel, so that the two isolates A.raph9 and A.raph10 sized 575 and 567 bp, respectively, which are relatively higher than other bands in the electrophoresis gel. Length of 5.8S fragment was stable and showed no significant difference in all sequences. This sequence has 8 variable sites which all variables were substitution; no addition or deletion (indel) in this fragment was observed. ITS1 and ITS2 sequences were more diverse than the 5.8S sequence; variation in the ITS1 and ITS2 sequences indicated both substitution and indel.

Among the 20 isolates used, six isolates belonged to the species *A. arborescens*, 10 isolates belonged to the species *A. raphani* and 4 isolates belonged to the species *A. brassicicola*. Phylogenetic analysis using NJ method, grouped the isolates in five clades: *A. arborescens* group, *A. raphani* group, *A. brassicicola* group, *Ulocladium* group, and *A. infectoria* group.

Table 1. Isolates of *Alternaria arborescens*, *A. raphani*, and *A. brassicicola* sequenced in this study

No.	Species name	Isolate name	Location
1	<i>A. arborescens</i>	A.arb1	Golestan
2	<i>A. arborescens</i>	A.arb2	Khuzestan
3	<i>A. arborescens</i>	A.arb3	Khuzestan
4	<i>A. arborescens</i>	A.arb4	Khuzestan
5	<i>A. arborescens</i>	A.arb5	Esfahan
6	<i>A. arborescens</i>	A.arb6	Esfahan
7	<i>A. raphani</i>	A.raph7	Esfahan
8	<i>A. raphani</i>	A.raph8	Khuzestan
9	<i>A. raphani</i>	A.raph9	West Azarbeijan
10	<i>A. raphani</i>	A.raph10	West Azarbeijan
11	<i>A. raphani</i>	A.raph11	West Azarbeijan
12	<i>A. raphani</i>	A.raph12	West Azarbeijan
13	<i>A. raphani</i>	A.raph13	West Azarbeijan
14	<i>A. raphani</i>	A.raph14	Golestan
15	<i>A. raphani</i>	A.raph15	Khuzestan
16	<i>A. raphani</i>	A.raph16	Khuzestan
17	<i>A. brassicicola</i>	A.brass17	Golestan
18	<i>A. brassicicola</i>	A.brass18	Golestan
19	<i>A. brassicicola</i>	A.brass19	Golestan
20	<i>A. brassicicola</i>	A.brass20	West Azarbeijan

Table 2. List of <i>Alternaria</i> and relevant species obtained from NCBI		
No.	Accession No.	Species
1	JX241641	<i>A. arborescens</i>
2	JX500715	<i>A. arborescens</i>
3	AF229474	<i>A. japonica</i>
9	JN654465	<i>A. japonica</i>
5	ARU05200	<i>A. raphani</i>
6	AY781078	<i>A. brassicicola</i>
7	AY781076	<i>A. brassicicola</i>
8	AY781074	<i>A. brassicicola</i>
9	AF229489	<i>A. longissima</i>
10	Y17067	<i>A. infectoria</i>
11	AJ549824	<i>A. infectoria</i>
12	AF081456	<i>A. infectoria</i>
13	AF229480	<i>Lewia infectoria</i>
14	AF229488	<i>Ulocladium chartarum</i>
15	FJ266489	<i>U. septosporum</i>
16	AF229485	<i>U. alternariae</i>
17	FJ266482	<i>U. consortiale</i>

### MORPHOLOGICAL STUDIES

The morphology of these isolates have been reported by nourani *et al* (2008)

*A. arborescens*: colonies of this species on PCA medium are brown, dark brown and olive. The surface of the spores is spotted or warty. Morphologically spores are oval or egg-shaped and brown. It also contains 1 to 5 transverse and 1 to 2 Longitudinal Sections in wide part

of the spore. Spores dimentions range 6-16 × 12-44 μm. This species due to long conidiophore and formation of branched chains, is distinguished from other species.

*A. brassicicola*: colonies of this species on PCA medium are dark brown-black. Spores are branched long chain and primary spores are larger than the terminal spores. Spores have no tip but have secondary single cell conidiophores in dimensions of 4 × 5 in the end of spores. Initial spores are larger and elliptical, with 5-7 transverse and rarely 1-2 longitudinal strap in the wide part of the spore. Spores dimentions range 12-16 × 32-40 μm. Smaller spores are ovoid with 1-3 transverse strap and have no longitudinal strap. This apores dimentions range in 4-6 × 12-28.

*A. raphani*: colonies of this species on PCA medium are brown to gray. Usually spores form in 2 to 5 numeric chains. But it may also be individually. Spores are ovoid and spore wall is mired in transverse sections. Chlamydo spores grow both on the surface and within the medium. Chlamydo spores are initially sprocket and then become irregular mass. Chlamydo spores color is light brown to dark brown. Spores dimentions range 16-20 × 35-65 μm.

Accurate identification of *Alternaria* species morphologically, requires the use of special methods. Typically, the strains of this genus have grown and studied in uncontrolled conditions on sugar-rich environments, in darkness circumstances. These conditions stimulate the production of a large amount of aerial none spore mycelium and number of spores are few that formed individual. In these conditions, spore dimensions and sometimes relationship with host are used as the diagnostic character to distinguish species. Because it was the only measurable trait. For this reason, many of the specific species that

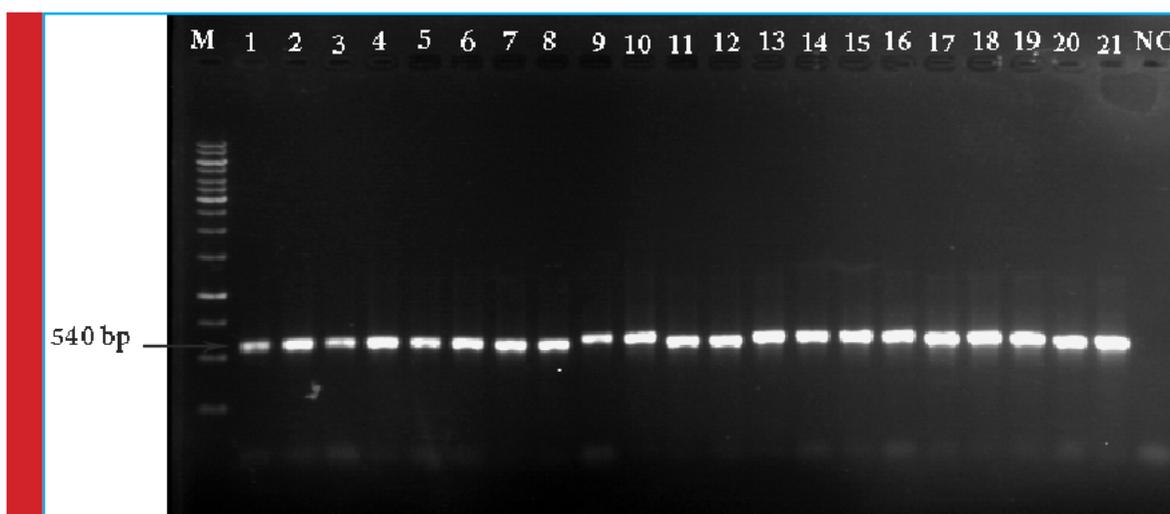


FIGURE 1. Agarose gel of ITS fragment amplified in studied *Alternaria* isolates. M: marker, 1-6: *A. arborescens*, 7-16: *A. raphani*, 17-20: *A. brassicicola*, and 21: *A. alternata*, NC: negative control

are separable from one another, are listed as synonyms, cause the taxonomy of this genus more confusion and more complex (Akamatsu, *et al.*, 1999; Nishimura, *et al.*, 1978; Rotem, 1994). On the other hand, Environmental conditions can affect the morphology of spores, therefore, descriptions of species based on field samples in different climatic conditions and different growth stages cannot be valuable. Due to the effect of environmental factors on the morphology of the spores, the dimensions measured in different places and under uncertain environmental conditions can not be the basis for comparisons. For identifying species, a combination of different characteristics such as patterns of spore formation, spore shape and size, frequency of transverse and longitudinal phalanx formation, existence or absence of the secondary ascus and its length, spore surface ornamentation, presence or absence of clamydospore and the formation of aerial hyphae to be examined, none of these traits alone are not enough to describe the species.

Usually more than one species isolated from one spot during isolation of fungus from leaves or stems of plants. For this reason, the description of the species based on the studied isolates in natural conditions is questioned. In microscopic samples, diversity is observed in spore morphology that isolated from the leaves and stems in natural conditions, that indicates the existence of different species in one spot (Simmons, 2000, 2002). So using phylogenetic methods for finding taxonomic position of isolates is necessary. With the advent and development of molecular methods, using these methods was prevalent in taxonomic studies.

In this study due to using molecular data on species and determine the phylogenetic relationships between different species of *Alternaria* genus and the close genera, a part of the rDNA include ITS1, ITS2 of 5.8s in 20 strains of various species of the genus was used

Genetic analysis of ITS and 5.8S of different species placed them in several groups. This grouping with few exceptions, had full coordination with the specified groups, based on their morphological characteristics.

All isolates of *A. arborescens* with A.raph11, A.raph12 and A.brass20 formed a large clade. The results of the analysis showed that, ITS sequences of the Small spore species group are not able to separate isolates of these species group. classification of Small spore species group of *alternata* is still controversial. Because few morphological characteristics clearly differentiate the taxonomic units and these properties are strongly influenced by environmental conditions. Research on small spore species of the genus *Alternaria* suggested that all variants of the pathogen be identified as variants of the species *A. alternata* but they should be distinguished in terms of host specialization as pathotype. Some researchers tried to classify the species of this group using the metabolite pattern, colony

appearance, and chain branching pattern. Molecular phylogenetic studies on genetic Loci that are typically used in fungal systemic, indicating a very low diversity or lack of diversity in this species (Simmons, 2002; Simmons and Roberts 1993; Anderson *et al.*, 2001; Roberts, 2005).

Ribosomal DNA sequence data from the ITS and mitochondrial small subunit (mtSSU) did not show any distinction between these taxa (Kang *et al.*, 2002; Chou and Wu, 2002; Pryor and Gilbertson, 2000). Sequence of ribosomal ITS region are so conserved that it cannot differentiate the small spore species of *Alternaria* (De Hoog and Horre, 2002). Small spore species are very close together, that it seems unreasonable that the low diversity of the ITS region use to illustrate the diversity of these species (Roberts *et al.*, 2000). It is possible that the small spore species have a high evolution rate and the opportunity to accumulate mutations in their ITS regions do not exist, so the variation in the ITS region is not sufficient to separate these species.

In this study, three groups of strains *A. raphani*, *A. arborescens* and *A. brassicola* were segregated into different clades. Comparison of rDNA sequences of ITS1 and ITS2 segment indicated that it could separate species *A. brassicola*, *A. brassicae*, *A. raphani* and *A. alternata* (Jasalavich *et al.*, 1995).

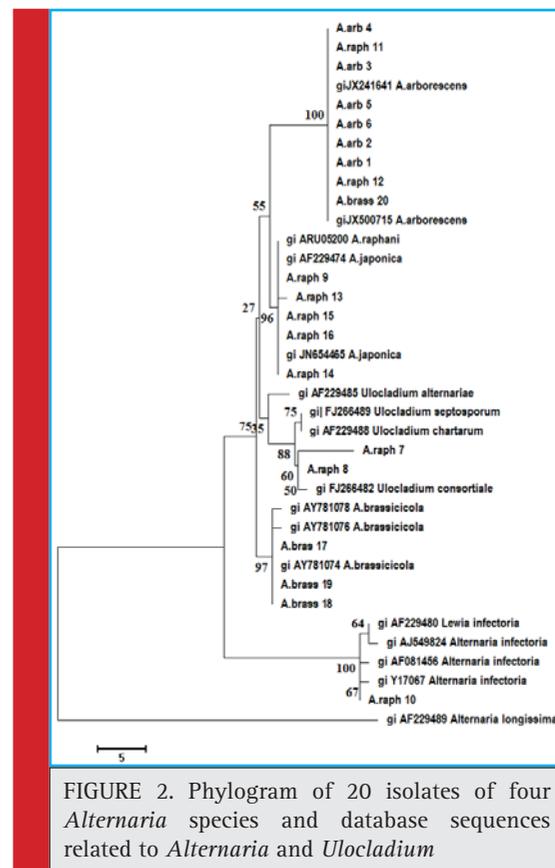


FIGURE 2. Phylogram of 20 isolates of four *Alternaria* species and database sequences related to *Alternaria* and *Ulocladium*

The isolates A. raph7 and A. raph8 were very similar to the species *Ulocladium septosporum*, *U. chartarum* and *U. consortiale*. Placing some strains of *A. raphani* with *A. brassicicola* and *Ulocladium* not correspond with morphological classification. species *A. raphani* due to the formation of many chlamyospore and larger spores is distinguished from *A. brassicicola* and *Ulocladium*. But grouping *A. brassicicola* and *A. raphani* with together correspond with ecological groupings and their pathogenicity that both species are primarily pathogenic on Brassicaceae plants.

*Ulocladium* species grouped within the genus *Alternaria* that represents the close relationship they have with *Alternaria* species. Phylogenetic studies conducted by the researchers shows the closeness of the relationship between the two genera *Alternaria* and *Ulocladium*, and many reports have shown that there are similarities between the two genera (Chou and Wu, 2002; Pryor and Bigelow, 2003).

Phylogenetic studies conducted by Chou and Wu (2002) on isolates of *Alternaria* spp and *Ulocladium* represented high similarity among *A. japonica*, *A. raphani*, *A. brassicicola* and *Ulocladium*, so that species such as *U. alternariae*, *A. japonica* and *A. brassicicola* were in a group. Phylogenetic relationships of some species of *Alternaria* and some close fungi, based on nuclear ITS and mitochondrial ribosome small subunit (mt SSU) sequences is illustrated that, many species of *Alternaria* and *Ulocladium* come together in a group (Pryor and Gilbertson, 2000). *Ulocladium* described traits for distinguish from *Alternaria* (including the formation of spores without tip and oval shape) are synapomorphic characteristics.

And may not represent the phylogenetic relationship among these fungi. So it seems that a comprehensive taxonomic study is needed on *Ulocladium* species, so as to the relationship between the species of this genus and its relationship with *Alternaria* species to be determined.

Species *A. arborescens* had not variability in the ITS1-5.8S-ITS2 sequences. As previously mentioned, small spore species group of *alternata* shows little variation using molecular data. But the most Highlighted result of this study is the complexity of *A. raphani*. However, some strains grouped in *Ulocladium* clade and some in *A. infectoria* clade. In *A. raphani* there was considerable variation within species.

Nourani, *et al* (2008) studied these isolates and indicated that *raphani* isolates are morphologically different. *raphani* isolates from khouzestan have more aerial hyphae and few chlamyospore, but those isolates from West Azarbaijan have few aerial hyphae and more chlamyospore. Results of this study Strongly suggest that more molecular researches is needed to Determine the

taxonomic condition of *raphani* species and its relationship with *Ulocladium*.

## REFERENCES

- Bruns, T. D., Wihte, T. J. and Taylor, J. W. 1991. Fungal Molecular Systematics. Annual Review of Ecology and Systematics, 22: 525-564.
- Chou, H. H. and Wu, W. S. 2002. Phylogenetic analysis of internal transcribed spacer regions of the genus *Alternaria* and the significance of filament-beaked conidia. Mycological Research, 106: 164-169.
- de Hoog, G. S. and Horre, R. 2002. Molecular taxonomy of the *Alternaria* and *Ulocladium* species from humans and their identification in the routine laboratory. Mycoses, 45: 259-276.
- Elliot, J. A. 1917. Taxonomic characters of the genera *Alternaria* and *Macrosporium*. American Journal of Botany, 4: 439-476.
- Ellis, M. B. 1971. Dematiaceous Hyphomycetes. Commonwealth Mycological Institute, Kew, England. 608 pp.
- Farr, D. F., Billis, G. F., Chamuris, G. P. and Rossman, A. Y. 1989. Fungi on plants and plant products in the United States. APS Press, St. Paul, Minnesota
- Green, S., Bailey, K. L. and Tewari, J. P. 2001. The infection process of *Alternaria crisinoxia* on Canada thistle (*Cirsium arvense*) and host structural defense responses. Mycological Research, 103: 344-351.
- Hibbet, D. S. 1992. Ribosomal RNA and fungal systematics. Transactions of the Mycological Society of Japan, 33: 533-556.
- Jasalavich, C. A., Morales, V. M., Pelcher, L. E. and Seguin-swartz, G. 1995. Comparison of nuclear ribosomal DNA sequences from *Alternaria* species pathogenic to crucifers. Mycological Research, 99: 604-614.
- Joly, P. 1967. Key for determination of the most common species of the genus *Alternaria* (Nees) Wiltsh. emend. Joly. Plant Disease Reporter, 51: 296-298.
- Kang, J. C., Crous, P. W., Mchau, G. R. A., Serdani, M., Song, S. M. 2002. Phylogenetic analysis of *Alternaria* spp. associated with apple core rot and citrus black rot in South Africa. Mycology Reserch, 106 (10):1151-1162.
- Masangkay, R. F., Mabbayad, M. O., Paulitz, T. C. and Watson, A. K. 1999. Host range of *Alternaria alternata* f.sp. *sphenocleae* causing leaf blight of *Sphenoclea zeylanica*. Canadian Journal of Botany, 77: 103-112.
- Neergaard, P. 1945. Danish species of *Alternaria* and *Stemphylium*. Munksgaard. Copenhagen. 560 pp.
- Nourani, S. L., Minasin V., and Safaei, N. 2008. identification, pathogenicity and distribution of *Alternaria* SPP. From canola in Iran. 137-154.
- Pryor B. M., Bigelow D. M. 2003. Molecular characterization of *Embellisia* and *Nimbya* species and their relationship to *Alternaria*, *Ulocladium* and *Stemphylium*. Mycologia, 95:1141-1154.
- Pryor, B. M. and Gilbertson, R. L. 2000. Molecular phylogenetic relationships amongst *Alternaria* species and related

- fungi based upon analysis of nuclear ITS and mt SSU rDNA sequences. *Mycological Research* 104: 1312-1321.
- Rotem, J. 1994. The genus *Alternaria*: biology, epidemiology, and pathology. APS Press, St. Paul, MN. 326 pp.
- Safaei, N., Alizadeh, A., Saidi, A. and Adam, G. 2005. Molecular characterization and genetic diversity among Iranian populations of *Fusarium graminearum* the causal agent of wheat headblight. *Iranian journal of plant pathology*. 41(2): 171-189.
- Simmons, E. G. 1967. Typification of *Alternaria*, *Stemphylium* and *Ulocladium*. *Mycologia*, 59: 67-92.
- Simmons, E. G. 1986. *Alternaria* themes and variations (22-26). *Mycotaxon*, 25: 287-308.
- Simmons, E. G. 2002. *Alternaria* themes and variations (305-309). *Lewia/Alternaria* revisited. *Mycotaxon*, 83: 127-145.
- Simmons, E. G. and Roberts, R. G. 1993. *Alternaria* themes and variations (73). Morphology and toxigenicity of *Alternaria* associated with black spot disease of Japanese pear. *Mycotaxon*, 48: 109-140.
- Strandberg, J. O. 1992. *Alternaria* species that attack vegetable crops: biology and options for disease management. pp. 175-208 In: J. Chelkowski and A. Visconti (eds). *Alternaria* Biology, Plant Disease, and Metabolites. Elsevier, the Netherlands.
- Strider, D. L. 1963. Control of *Alternaria* blight of carrot. *Plant Disease Reporter*, 47: 66-69.
- Sugiyama, J. 1998. Relatedness, phylogeny and evolution of the fungi. *Mycoscience*, 39: 487-511.
- Sugiyama, J., Nagahma, T. and Nishida, H. 1996. Fungal diversity and phylogeny with emphasis on 18S ribosomal DNA sequence divergence. pp. 41-51. In: R. R. Colwell, U. Simidu and K. Ohwada (eds). *Microbial Diversity in Time and Space*. Plenum Press, New York.
- Walker, H. L. 1982. Seedling blight of sicklepod caused by *Alternaria cassiae*. *Plant Disease*, 66: 426-428.
- Wiltshire, S. P. 1933. The foundation species of *Alternaria* and *Macrosporium*. *Transactions of the British Mycological Society*, 18: 135-160.

## Study and hybrid simulation of enhanced oil recovery (EOR) and asphaltene precipitation in injection of carbon dioxide in one of the oil reservoirs

Yousef Amraei Astani and Roohollah Taghizadeh\*

*Department of Petroleum Engineering, Gachsaran Branch, Islamic Azad University, Gachsaran, Iran*

### ABSTRACT

Asphaltene precipitation is one of the problems created for oil industry during the process of production, transfer and refining of oil. During natural production, pressure drop in oil tanks could be a cause of formation of asphaltene and the processes of enhanced oil recovery (EOR) is an inevitable solution to prevent decrease in production in these reservoirs. On the other hand, taking these EOR processes, which gas injection is one of the most common ways, could lead to problem of asphaltene precipitation. Therefore, this study has been conducted with the purpose of studying and hybrid simulation of EOR and asphaltene precipitation in carbon dioxide injection in one of the oil reservoirs. For this purpose, Eclipse-300 simulation is used. A reservoir model sector is used to simulate carbon dioxide gas. For simulation, a 5-point model sector is used. Because of complexity and time-consuming nature of simulation, those processes available in reservoir are considered. Carbon dioxide simulation has been taken with injection rate of 5000cu ft per day. Asphaltene precipitation could cause numerous problems with production from the reservoir. The factors affecting formation of asphaltene include changes in temperature, pressure, fluid composition and electrokinetic effects. Existence of asphaltene could result in reduction of recycling coefficient. With change in fluid components of reservoir as a result of injection of carbon dioxide, the soluble asphaltene in oil becomes unstable, so that it could lead to increase in viscosity and formation of precipitated asphaltene particles. According to simulation results, with the precipitation of asphaltene on surface of pores of reservoir rock, oil production is reduced and this is because of changing in permeability toward oil-wet and negative effect on relative permeability.

**KEY WORDS:** RECOVERY, ASPHALTENE PRECIPITATION, CARBON DIOXIDE INJECTION, OIL RESERVOIRS

### ARTICLE INFORMATION:

\*Corresponding Author: [taghizadeh@gmail.com](mailto:taghizadeh@gmail.com)

Received 30<sup>th</sup> April, 2017

Accepted after revision 1<sup>st</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

Asphaltene precipitation is one of the problems caused for the oil industry during the processes of oil production, transfer and refinery. During natural production, pressure drop in oil tanks could be a reason for formation of asphaltene precipitation and applying the processes of EOR could be one of the inevitable solutions to prevent drop in production in these reservoirs. On the other hand, taking the EOR processes, which gas injection is one of the most common EOR method, could lead to the problem of asphaltene precipitation. The precipitations could result in blockage of porous space, well span and wellhead equipment and meeting these problems is costly. Hence, experimental researches and modeling are required to predict formation of asphaltene precipitation in production process in these reservoirs to provide conditions to prevent problems caused by formation of asphaltene in the reservoir and finally, highest oil recovery could be achieved. In oil reservoirs that fluid contains heavy compounds such as asphaltene, the asphaltene precipitation in the tank and well column could be a main challenge for oil production. The most important factors affecting asphaltene precipitation in tanks could be change in pressure and temperature of tank and changes in reservoir fluid composition.

Asphaltene is the heaviest component of crude oil and could be defined as polyaromatics with high molecular weight, which could be soluble in aromatics such as toluene and benzene and in normal linear chains of alkanes such as normal pentane and normal heptane. Precipitation of asphaltene could lead to creation of fundamental problems of production during natural discharge and during EOR processes and it has been considered as an important issue from this perspective. The solid phase is precipitated mainly in porous area around the well and could result in damage in formation around the well and could finally lead to significant reduction of permeability of reservoir around the well and reduction of oil production. Iran Oil Industry is also involved in this problem.

With the reduction of reservoir oil pressure to the threshold of asphaltene precipitation, the problem of asphaltene could be removed. However, the precipitation is continuously increased from the threshold pressure to bubble pressure. Pressure discharge by itself could lead to instability of asphaltene and could be usually the main reason for precipitation in the opening of pipes. With the reduced oil density (because of pressure drop), the interaction of oil components on asphaltene is reduced and this could strengthen the interaction of asphaltene particles and this could cause precipitation. Prediction of problems caused by asphaltene precipitation could be very important because of natural reservoir depletion.

The experimental results show that the highest amount of precipitation happens in pressure close to bubble and when the pressure reaches lower than the bubble, some asphaltene sediments are again solved in oil.

Common methods of removing asphaltene precipitations include chemical, mechanical and thermal methods. As all of the said techniques are expensive and have not high efficiency, prevention of asphaltene precipitation could be the best option to solve the problem. As a result, an acceptable and efficient prevention strategy is needed to reveal the mechanism of asphaltene precipitation and parameters affecting that. Hence, conducting various experiments of natural depletion and EOR processes on oil seems necessary. Using the experiments, better view could be provided about the phenomenon of asphaltene precipitation and how to prevent or postpone it.

## LITERATURE REVIEW

Wiehe (1999) has considered temperature as a factor to increase precipitation. However, Burke et al (1990) have claimed that temperature is a factor to reduce precipitation. Hong et al have found that effect of temperature in 60-300°C could lead to increase in amount of soluble asphaltene in oil.

Compared to carbon and hydrogen volume in structure of asphaltene, underlying changes could occur in amount of oxygen and sulfur. The amount of oxygen varies from 0.3 to 4.9% and the sulfur varies from 0.3 to 10.3%. On the other hand, the concentration of nitrogen in structure of asphaltene has lower degree of variations and it is in limit of 0.6-3.3%. However, with the exposure of asphaltene to the air its volume is changed and through exposure of oil to the air or exposure of both of them to this condition, the amount of sulfur and oxygen is changed. Moreover, maximum volume of oxygen and sulfur varies significantly more than nitrogen under such conditions (Speight, 2004).

Andersen and Speight (1999) proposed a thermodynamic model to predict stability and precipitation of asphaltene.

Thermodynamic models to predict asphaltene precipitation are divided to 3 groups: the group of Activity Models and Equation of State (EOS). Asphaltene as one or more solid component provides thermodynamic balance between liquid phase (oil) and solid phase and it is then modeled.

Bagheri et al (2011) studied the process of asphaltene precipitation during different states of production experimentally. In this study, scenarios of natural production, gas injection and carbon dioxide injection have been studied.

Lawal et al (2012) has conducted an experimental study on asphaltene precipitation in capillary flow. Vari-

ous experiments have been conducted on investigation of effects of injection rate, particle concentration and asphaltene precipitation properties. The results showed that precipitation is increased with the decrease in number of carbons; although injection rate has not effect on it.

Moradi et al (2012) studied asphaltene precipitation during gas injection and modeled it experimentally. The results showed significant effect of Methane gas on asphaltene precipitation.

Zendehboudi et al (2013) studied asphaltene precipitation in oil reservoirs using dynamic tests and modeling. They used artificial intelligence methods including neural network and imperialist competitive algorithm optimization and aggregation to estimate the melting point and precipitation of asphaltene. B.Ju, T.Fan,Z. Jiang (2013) studied the flow behavior and asphaltene precipitation modeling in carbon dioxide flooding process for EOR. The results of reduction of permeability by a one-dimensional numerical simulation method of carbon dioxide injection were in consistent with the experimental results. Asphaltene precipitation led to increased rate of permeability inside the swept area by carbon dioxide.

Nasrabadi et al (2016) developed a multi3-phase hybrid model for asphaltene precipitation during carbon dioxide injection using CPA-EOS state equation. The model had the ability to predict saturation of asphaltene phase and was appropriate to predict asphaltene precipitation.

## MATERIAL AND METHODS

### SIMULATION METHOD

For this study, Eclipse-300 simulation is used. A reservoir model sector has been used to simulate carbon dioxide gas. Firstly, the data of one of the Iran's oil reservoirs are used to make a reservoir model sector with average properties and random properties. Then, in a 5-point model, carbon dioxide injection is simulated. Fluid model modeling containing asphaltene is done using fluid compound of reservoir using PVTi software. In this software, according to the Equation of State and through entering the fluid combination, temperature, pressure and fluid examinations, fluid model is provided for hybrid simulation. In the sector, the simulated model of asphaltene is activated and the properties of asphaltene and the modeling process are determined by Eclipse-300 simulator. Then, carbon dioxide gas injection is simulated in the model. Effective factors such as injection rate, precipitation rate and reduction of permeability are measured and the results are analyzed and appropriate scenario for EOR through carbon dioxide gas injection is provided.

### SIMULATION SCENARIOS

For purpose of simulation, a 5-point model sector is used. Because of complexity and time-consuming nature of simulation of process in fluid of asphaltene reservoir,

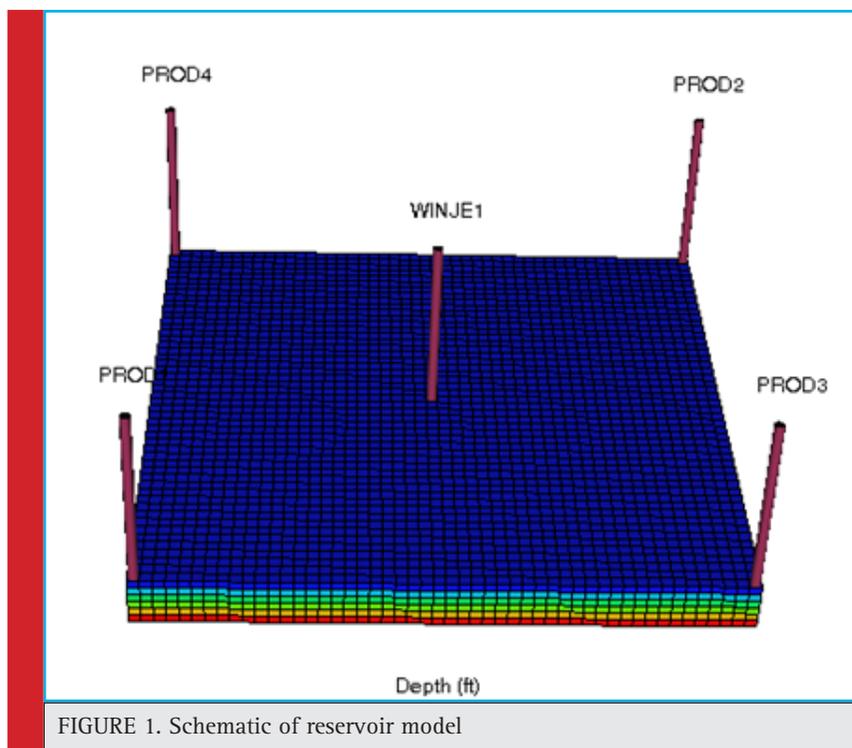
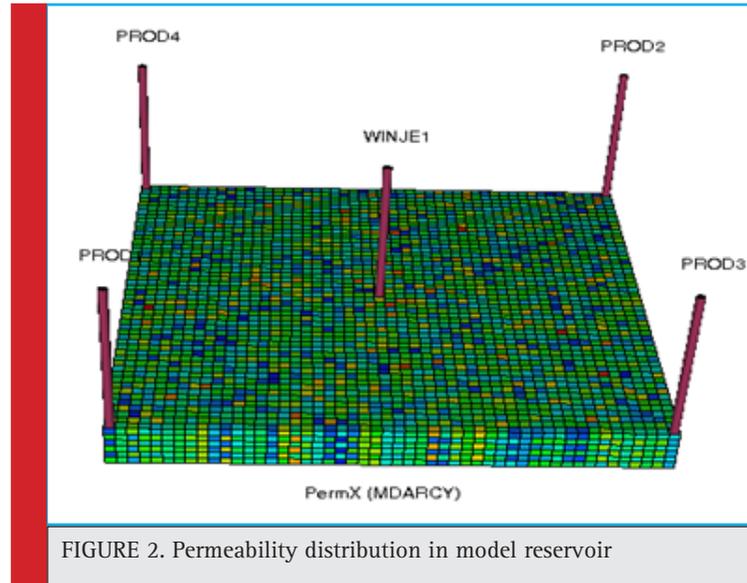


FIGURE 1. Schematic of reservoir model



some structural simplifications are done like lack of entering the fault.

The schematic of applied model is illustrated in figure 1. The depth from the ground level to the first layer of reservoir is equal to 9000ft.

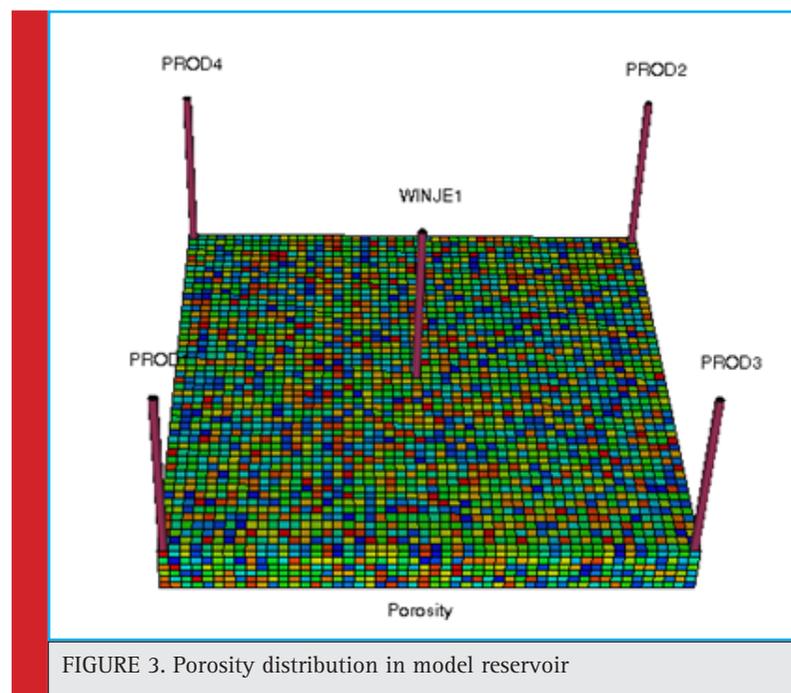
The distribution of permeability has been illustrated in the schematic in figure 2. The permeability rate has varied in range of 275 to 525MDARCY.

The distribution of porosity values in range 15-30% has been illustrated in the schematic in figure 3.

Oil saturation distribution to 84% is considered same in whole model and is illustrate din figure 4.

The initial pressure of reservoir in base depth of 9052ft is equal to 4757ft. The contact surface of water and oil is in depth of 11813ft.

In this model, in injection well and 4 production wells are used in form of 5-point pattern of carbon dioxide injection to enhance oil recovery of aphaltene-contained reservoir. The combination of injected gas includes only carbon dioxide gas. The simulation scenarios to inject



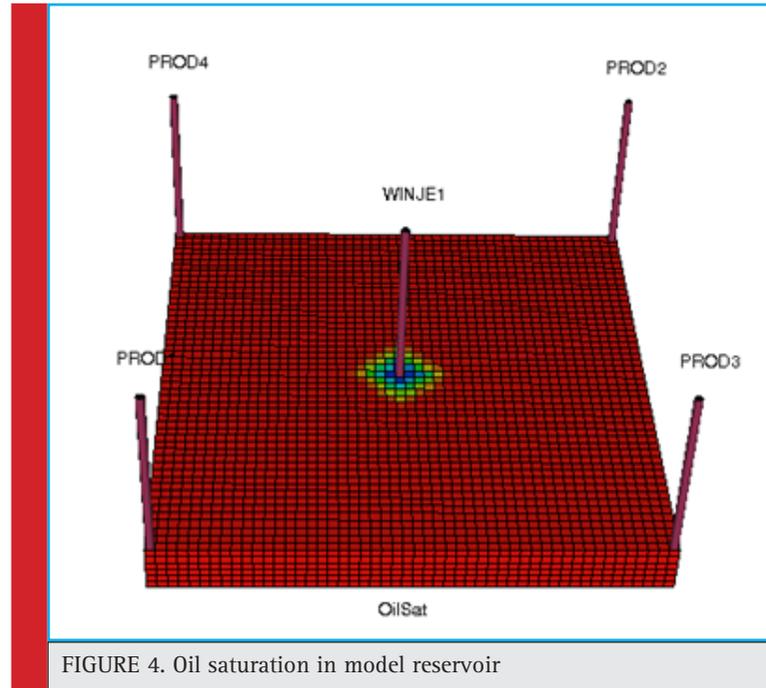


FIGURE 4. Oil saturation in model reservoir

the carbon dioxide with regard to effect of asphaltene are as follows:

- Injection of carbon dioxide gas
- Change in carbon dioxide injection rate
- Change in asphaltene precipitation parameters

### THEORY OF ASPHALTENE MODELING

Asphaltene modeling in porous area mainly based on 3 phenomena including Surface Adsorption, Trapping and Plugging and Entrainment of asphaltene particles could describe the amount of asphaltene precipitated in porous area. The three processes respectively in form of 3 parameters of  $\alpha$ ,  $\beta$  and  $\gamma$  could control the amount of precipitated asphaltene.

Applied equation in Eclipse software could show the correlation between precipitated asphaltene and the above mentioned parameters as follows:

$$\frac{\partial \varepsilon_i}{\partial t} = \frac{\alpha}{d} \phi C_a + \gamma |F_{oi}| C_a - \beta (|U_{oi}| - U_{cr})^+ \varepsilon_i$$

Where;

- $\varepsilon$ : accumulative percent of asphaltene in time  $t$
- $\alpha$ : surface adsorption coefficient ( $T^{-1}$ )
- $d$ : dimension of the problem (1, 2 or 3)
- $\phi$ : current porosity
- $F_{oi}$ : Darcy Flux
- $C_a$ : volume concentration of asphaltene conglomerate
- $\lambda$ : plugging coefficient ( $L^{-3}$ )
- $\beta$ : entrainment coefficient of asphaltene ( $L^{-1}$ )

$U_{oi}$ : oil phase velocity

$U_{cr}$ : critical velocity of asphaltene entrainment

The above presented equation is formed of 3 terms and the final result could be based on volume percent per time. Accordingly, the flow unit is cc/hour and the time unit is hour. The plugging unit according to the equation is  $L^{-3}$ , which is  $1/cm^3$  in lab unit. To convert the unit from lab unit system ( $1/cm^3$ ) to field unit system ( $1/ft^3$ ), the plugging coefficient ( $\lambda$ ) should be multiplied in the coefficient 28316.85 and multiplied in Darcy coefficient finally, which is different per grid.

### ASPHALTENE SIMULATION IN ECLIPSE SOFTWARE

In simulation of asphaltene by the software, reduced porosity and reduced permeability as a result of asphaltene precipitation on reservoir rock are considered. Reduced porosity as a result of asphaltene precipitation could be modeled as follows:

$$\phi = \phi_o - \int_0^t \frac{\partial \varepsilon}{\partial \phi_o} dt$$

Where;

- $\phi_o$ : initial porosity (before precipitation of asphaltene)
- $\varepsilon$ : volume component of asphaltene precipitation

Moreover reduced permeability as a result of asphaltene precipitation using asphaltene software as measured using the following equation. If there is a correla-

tion between porosity and permeability, parameters of power-law equation could be used to measure permeability as follows:

$$\frac{k}{k_o} = \left(1 - \frac{\varepsilon}{\phi_o}\right)^\delta$$

Where;  $K_o$  is the initial values of permeability per mm Darcy.

## RESULTS

### SIMULATION RESULTS

Simulation of carbon dioxide gas with injection rate of 5000ft3 per day is done in 2 modes. In first mode, it has been performed regardless of asphaltene (blue diagram) and in second mode with regard to asphaltene (green diagram). The EOR coefficient diagram is illustrated in both modes.

As it is clear, through considering asphaltene in reservoir fluid during the simulation process (green diagram), the recovery actor is low. The recovery factor in this mode is 6% lower than the other mode and this could be because of precipitation of asphaltene and damage of formation.

Precipitation of asphaltene, along with reduction of porosity and permeability and change in rock permeability to oil-friendly mode could damage the formation. During precipitation of asphaltene on reservoir rock, the pores of porous area are blocked and this could reduce permeability and porosity.

The diagram of oil production rate in two modes with and without considering asphaltene in simulated model is presented in figure 6.

Through considering asphaltene, it could be observed that oil production rate is reduced rapidly that could be because of precipitation of asphaltene. However, after a while with precipitation of asphaltene and isolation of heavy molecules from oil reservoir, viscosity is reduced and has led to improvement of oil production rate.

The diagram of gas to oil ratio is illustrated in figure 7 and in the mode without asphaltene, gas to oil ratio in long-term is more than the other mode.

It could be observed that in the mode without asphaltene, the gas to oil ratio (GOR) is more than the other mode, since in this mode, the gas phase has more freedom than the other phase because of lack of permeability of reservoir rock by asphaltene and could be produced easier.

The diagram in figure 8 illustrates reservoir permeability in the mode with asphaltene. With the precipitation of asphaltene, the permeability is failed and is reduced. Variations in permeability are considered based on partial volume of precipitation of asphaltene.

In grids near the injection wells, because of large variations of reservoir fluid, there is more precipitation of asphaltene and as a result, the failure of formation and permeability is also high.

Figure 9 has illustrated changes in oil viscosity in various grid blocks. It could be observed that oil viscosity is changed as a result of precipitation of asphaltene.

As a result of injection of carbon dioxide to the reservoir and its solution with oil, viscosity has firstly decreased around the injection wells and has been

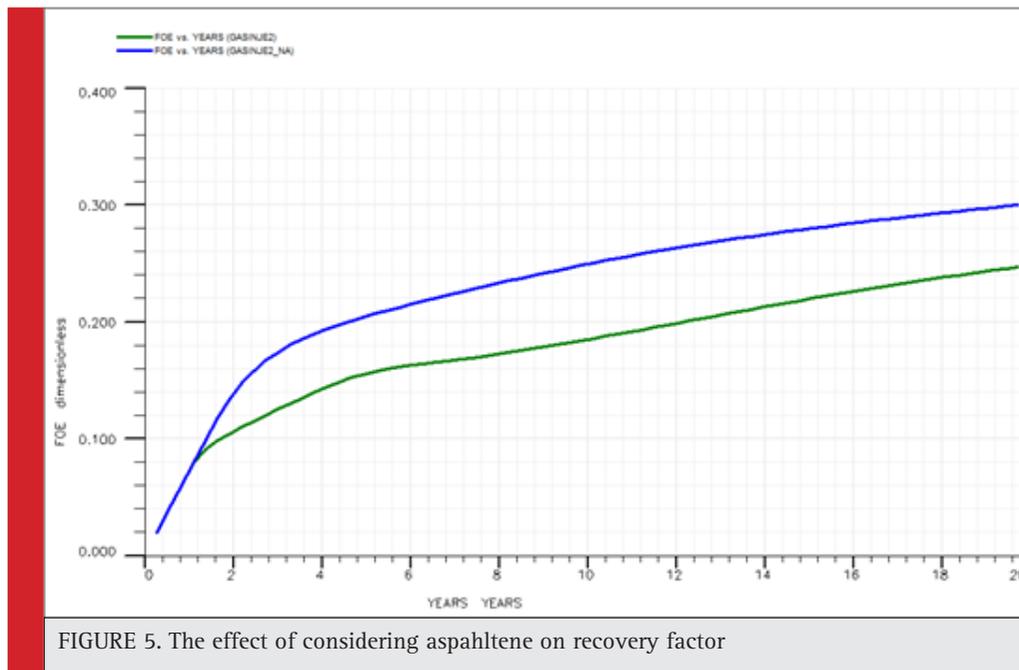


FIGURE 5. The effect of considering asphaltene on recovery factor

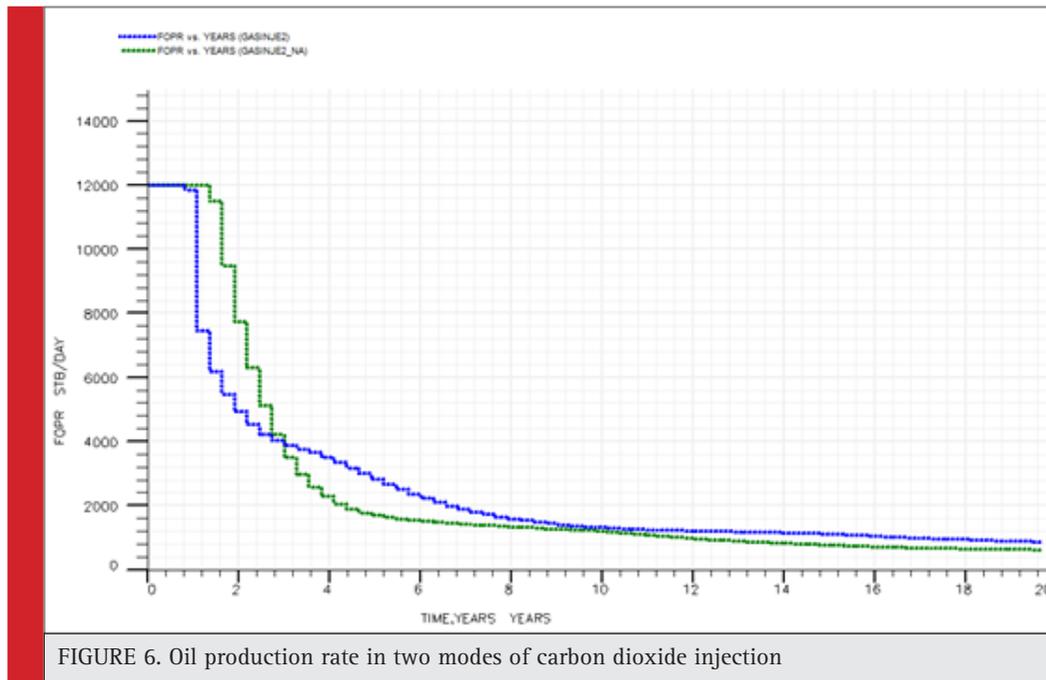


FIGURE 6. Oil production rate in two modes of carbon dioxide injection

increase after a while. The increase in viscosity around the production wells could be because of more thermodynamic variations of reservoir fluid and asphaltene precipitation. The effects could occur in short-term and they are decreased in long-term.

### INJECTION OF CARBON DIOXIDE WITH DIFFERENT RATES

In figure 10, the recovery factor is illustrated for the injection rates of 500, 1000, 5000 and 10000ft<sup>3</sup> per day.

With the increase in injection rate of carbon dioxide, the recovery factor is increased and this is because of mechanisms of carbon dioxide injection method such as reduction of viscosity, oil swelling and gas solution drive.

The recovery factor is obtained to 10.6% for injection rate of 500; to 13% for injection rate of 1000; to 24% for injection rate of 5000 and to 29.4% for injection rate of 10000ft<sup>3</sup>/day. In general, increased injection rate of carbon dioxide has increased the production rate.

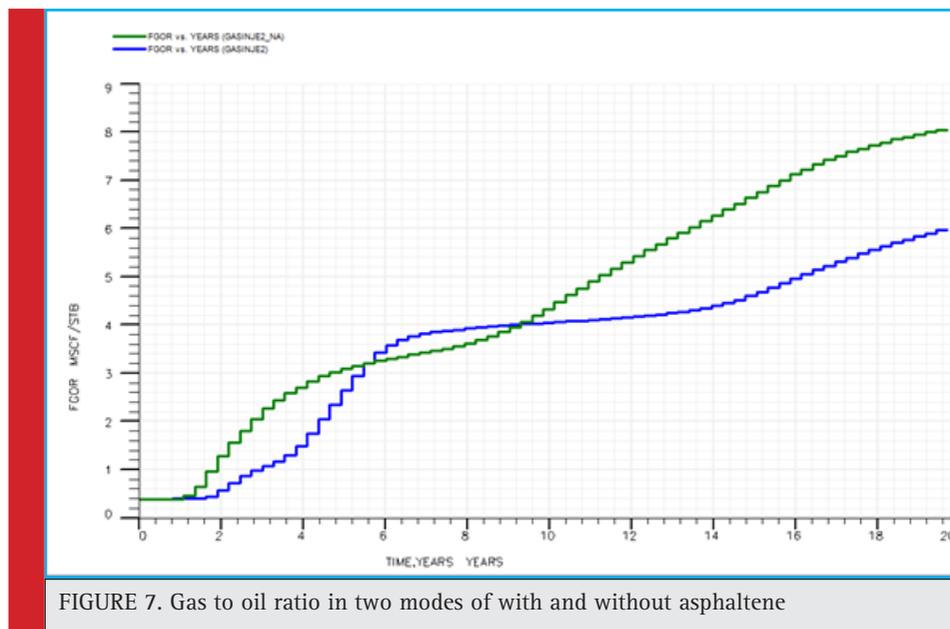


FIGURE 7. Gas to oil ratio in two modes of with and without asphaltene

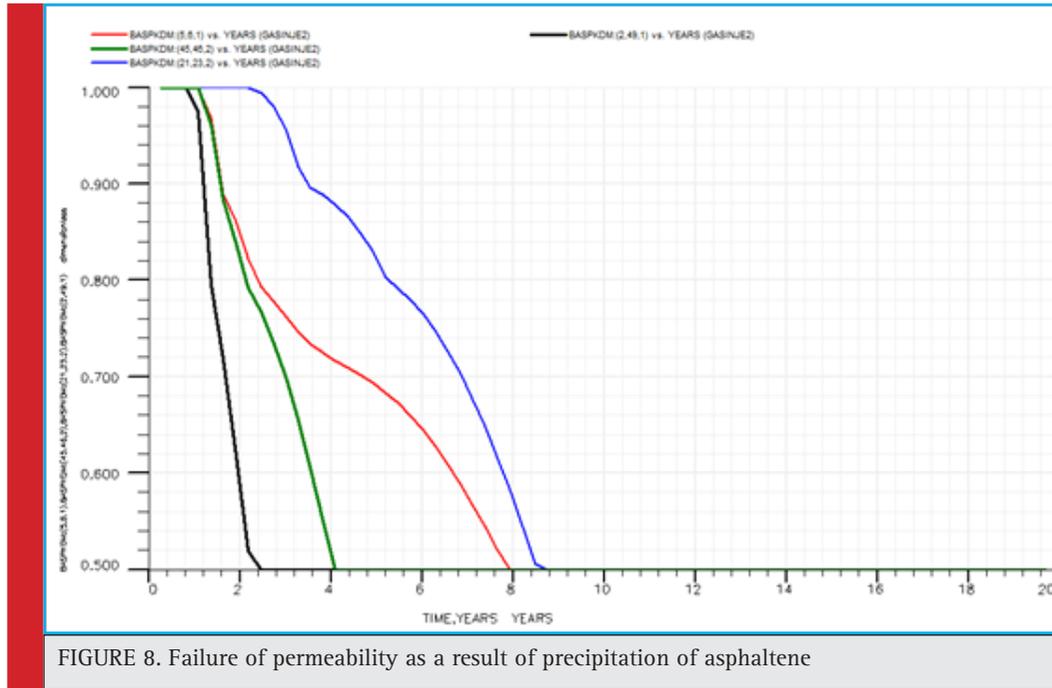


FIGURE 8. Failure of permeability as a result of precipitation of asphaltene

The oil production rate for all 4 states is presented in figure 11. The production drop process in higher rates is faced less reduction.

Carbon dioxide injection in higher rates could lead to enhanced oil recovery because of different mechanisms such as oil swelling and gas solution drive. However, the enhanced oil recovery is not significant in long-term,

since asphaltene precipitation could have negative effect on enhanced oil production.

In figure 12, the gas to oil ratio (GOR) is illustrated for different rates of carbon dioxide injection.

With the increased rate of carbon dioxide injection, the GOR is increased. As a result of more gas injection, thermodynamic balance of reservoir fluid is disturbed

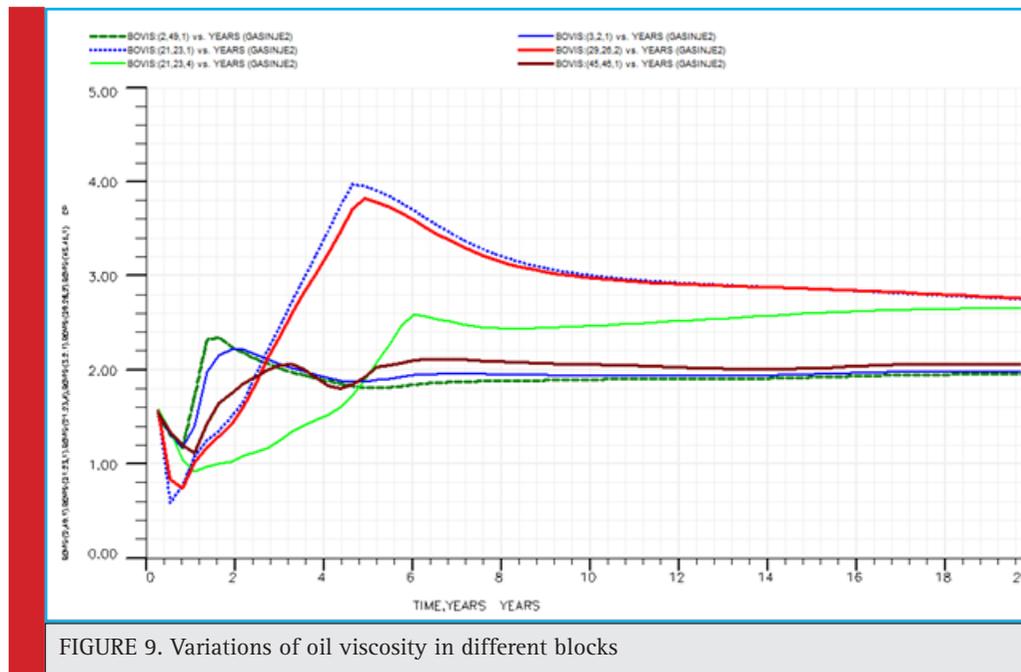


FIGURE 9. Variations of oil viscosity in different blocks

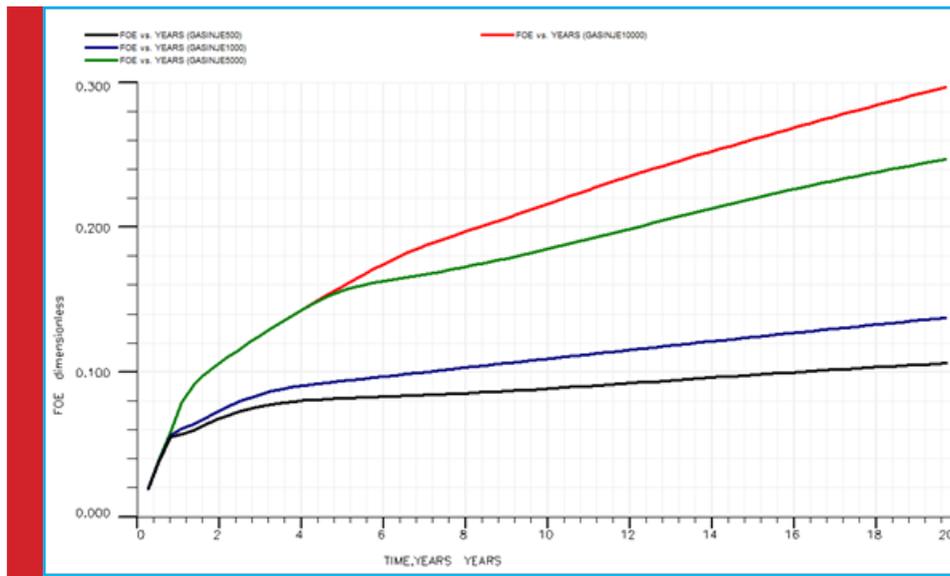


FIGURE 10. Recovery factor in different injection rates

and asphaltene precipitation is occurred. Moreover, the GOR ratio is increased. In high injection rates, the effect of carbon dioxide injection on oil recovery is reduced.

### ANALYSIS OF THE EFFECT OF PRECIPITATION

In this scenario, increased asphaltene precipitation and its surface adsorption on rock surface is analyzed. To this end, 3 states with different surface adsorption levels are entered from low to high. The diagram in figure 13 shows the effect of increased surface adsorption

level of asphaltene on the rock on factor of oil recovery (FOR).

Increased adsorption of asphaltene on the surface of rock in the model has led to reduced recovery coefficient, since surface adsorption of asphaltene could change the permeability towards being oil-friendly. Change in reservoir rock permeability by asphaltene precipitation could affect relative permeability and reduce oil recovery.

With the precipitation of asphaltene, asphaltene molecules are included as Colloid in oil phase and could change viscosity of shifting phase.

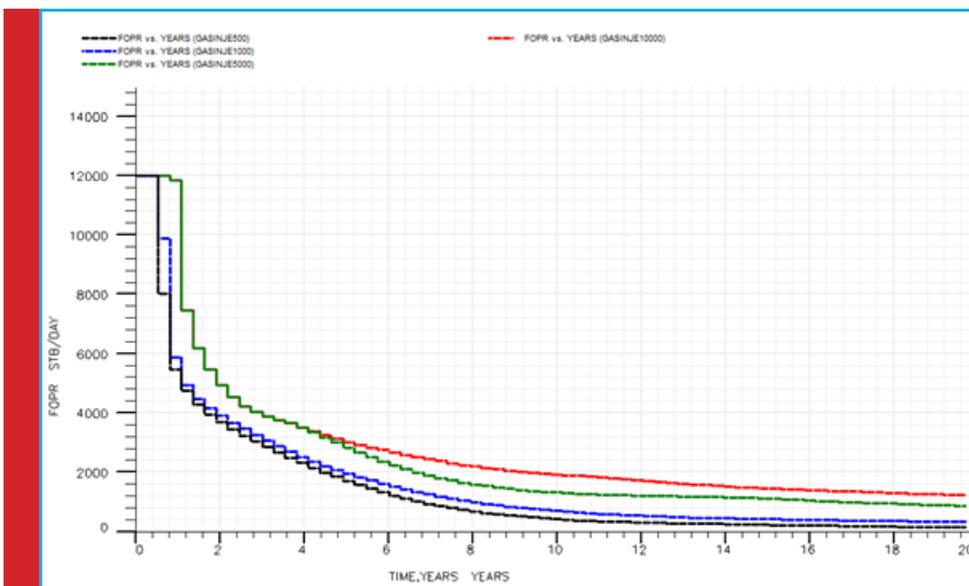


FIGURE 11. The diagram of production rate in different injection rates

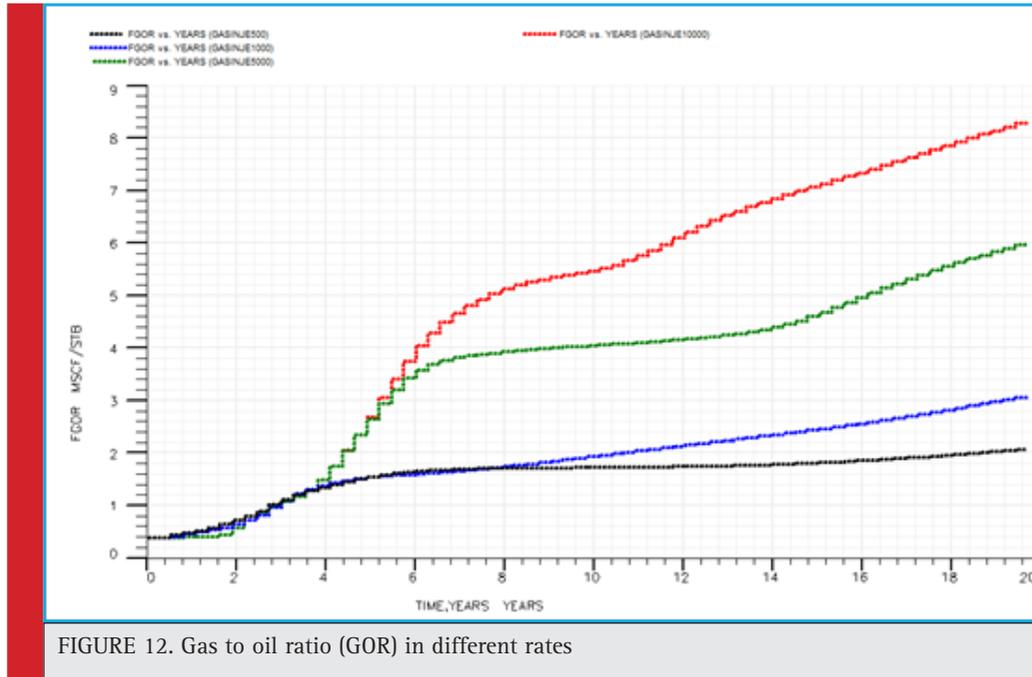


FIGURE 12. Gas to oil ratio (GOR) in different rates

The diagram of oil production rate in this state is illustrated in figure 14. With the increased rate of asphaltene adsorption, oil production is also decreased.

It could be observed that increased rate of surface adsorption of asphaltene of reservoir rock could have negative effect on production rate. Although it is impossible to enter real adsorption ratio because of existing challenges in numerical simulations, the negative effect of that could

be recognized. Hence, for better modeling of the effect of asphaltene adsorption on oil recovery, numerical simulators should be developed by credited companies.

### ASSESSMENT OF THE EFFECT OF BLOCKAGE

Asphaltene precipitation in the reservoir could result in blockage of throat of the pores and this could have

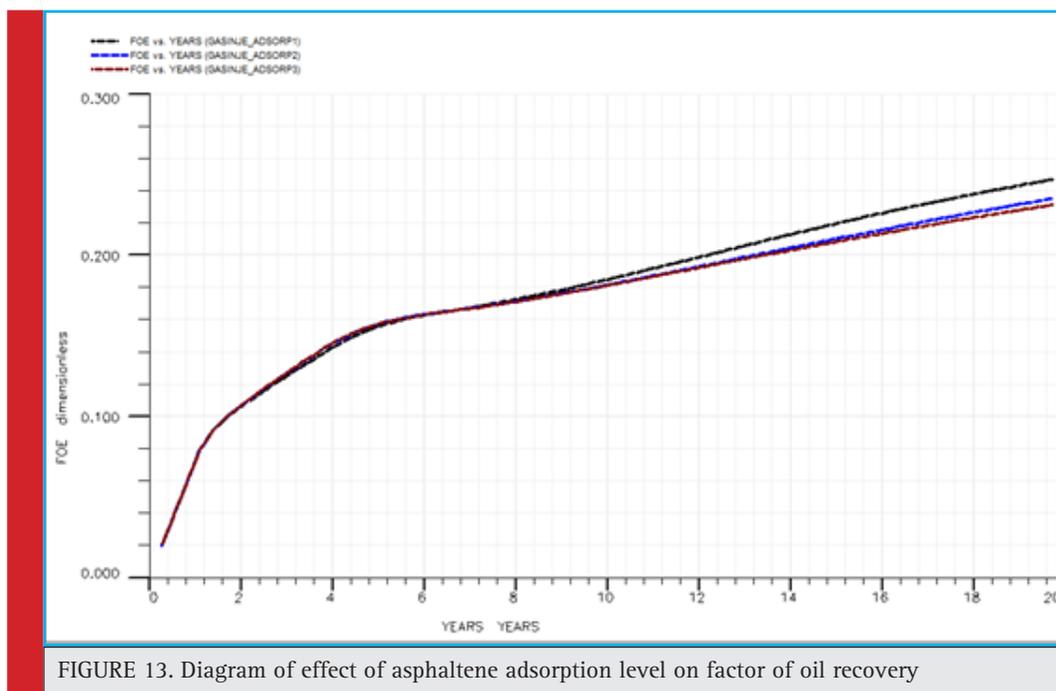


FIGURE 13. Diagram of effect of asphaltene adsorption level on factor of oil recovery

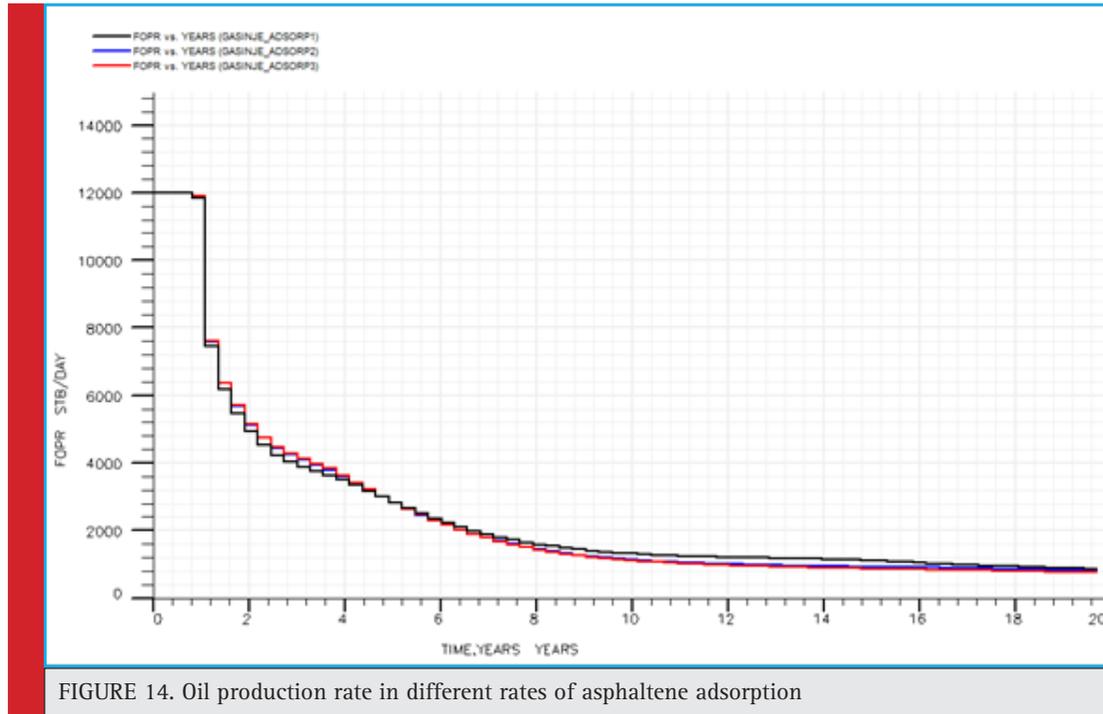


FIGURE 14. Oil production rate in different rates of asphaltene adsorption

significant effect on permeability and porosity of the reservoir. Increased blockage of pores could reduce permeability and porosity of reservoir rock. In figure 15, the effect of blockage parameter is asphaltene modeling during carbon dioxide injection is illustrated.

With the increase in blockage parameter as a result of asphaltene, factor of oil production is reduced to 2%. However, filed reality, the blockage has higher significant effect and needs improvement of Eclipse asphaltene model.

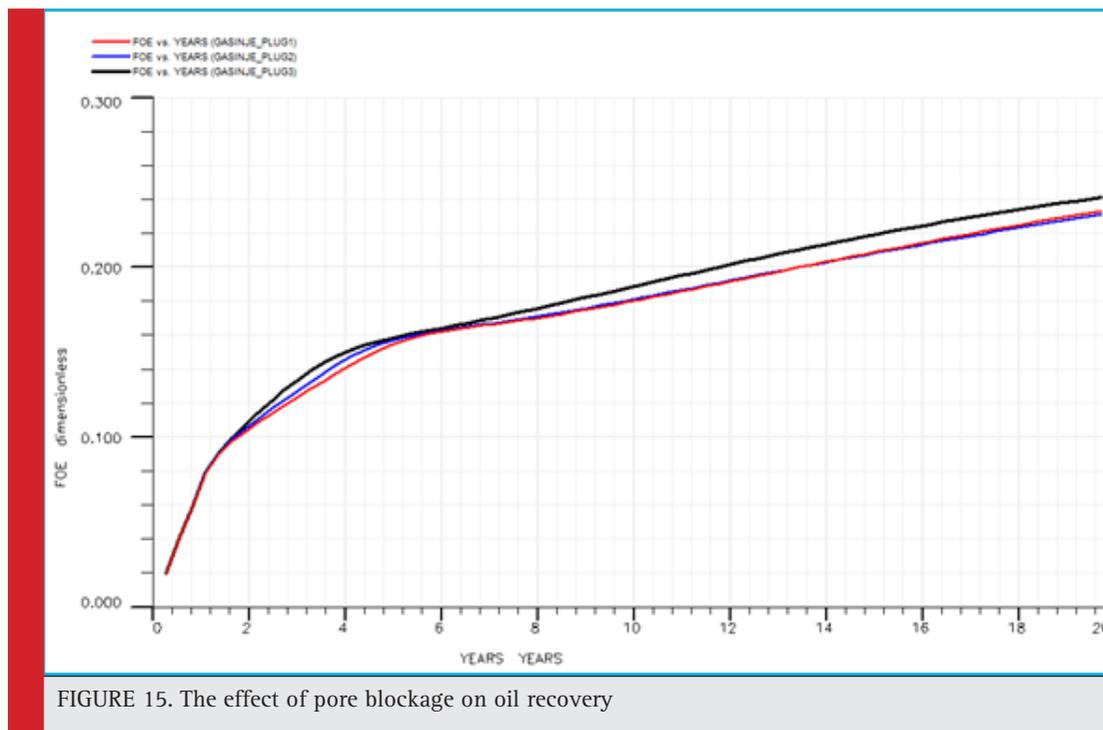


FIGURE 15. The effect of pore blockage on oil recovery

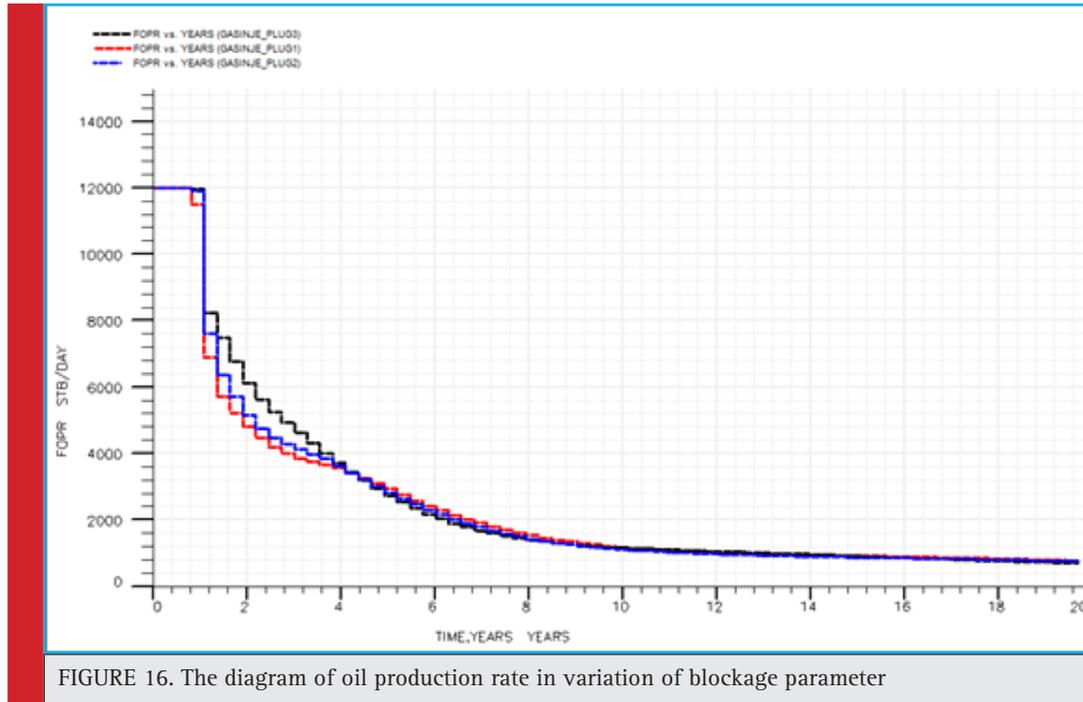


FIGURE 16. The diagram of oil production rate in variation of blockage parameter

Figure 16 illustrates the oil production rate in different states of blockage parameter.

Increase in blockage parameter in asphaltene simulation during carbon dioxide injection could reduce oil production rate in short-term. However, after a few years, because of incremental mechanisms of carbon dioxide injection, its negative effect is reduced.

#### DAMAGE OF POROSITY AND PERMEABILITY

Asphaltene precipitation could cause damage in reservoir and affect the fluid flow in reservoir. Asphaltene precipitation in reservoir could reduce fluid volume.

In this scenario, the effect of changes in permeability damage is assessed by two different states of modeling

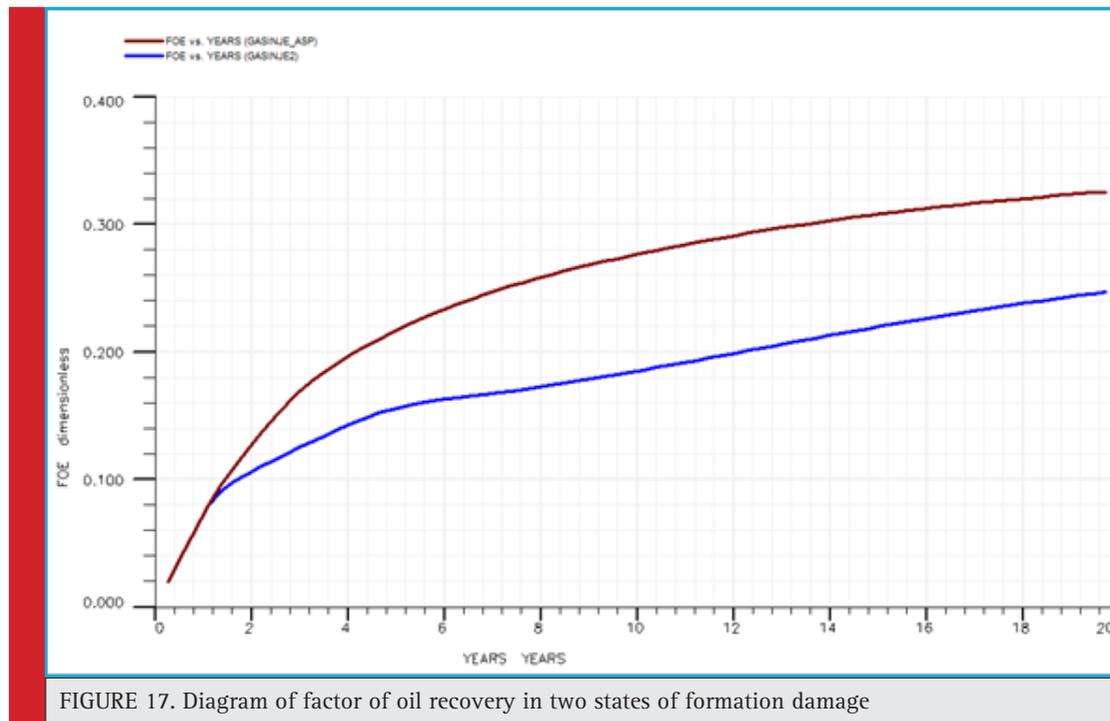


FIGURE 17. Diagram of factor of oil recovery in two states of formation damage

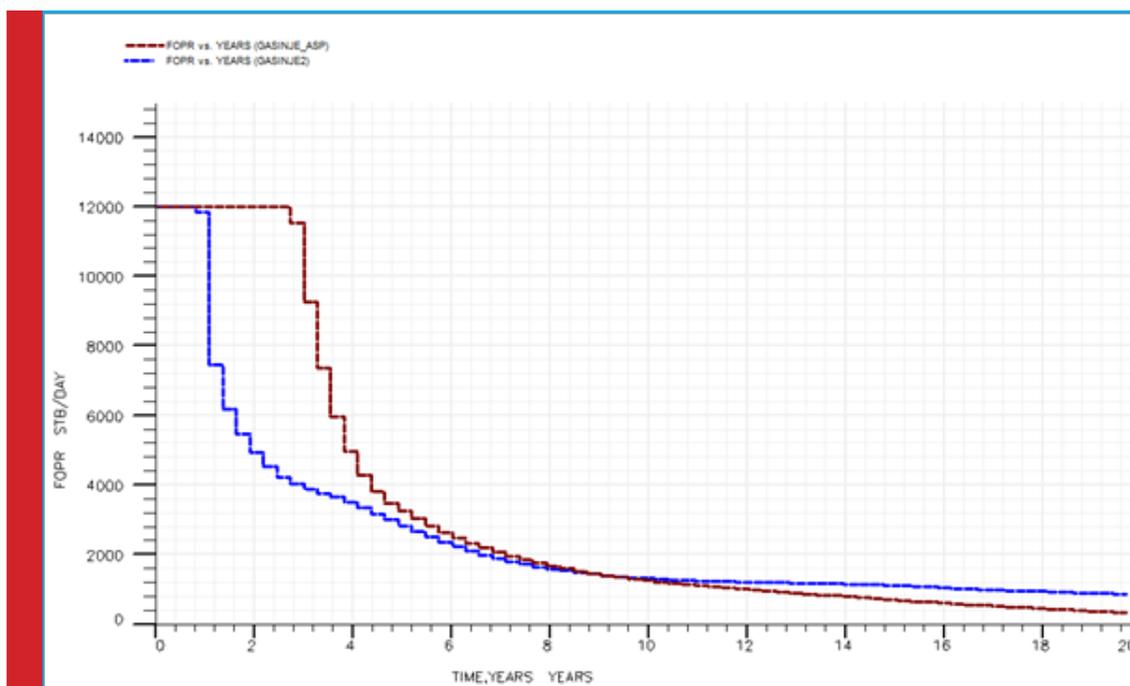


FIGURE 18. Diagram of oil production rate in both states o modeling permeability damage

in simulation. In first state, the permeability is associated with variations of porosity and in second state; damage of permeability is attributed to the partial volume of asphaltene precipitation. In both states, viscosity changes have been modeled using Einstein parametric model.

In figure 17, the factor of oil recovery is illustrated for both states of modeling permeability damage.

In the state of modeling the permeability damage associated with porosity changes, the factor of recovery is equal to 32.2% in second state that permeability damage is attributed to partial volume of asphaltene, the factor of oil recovery is equal to 24.2%. Hence, according to simulation results, permeability damage as a result of partial volume variations of asphaltene precipitation has more negative effects.

The oil production rate for both states is illustrated in figure 18.

In the state of permeability damage associated with partial volume of asphaltene precipitation, oil production rate has had fast drop. However, in long-term, the production rate in this state has been fixed in higher rate that could be because of reduction of asphaltene precipitation over the time.

As the main purpose in EOR methods is enhancement of factor of factor of recovery to a few percentages, preventing reduction of recovery as a result of asphaltene precipitation could have high economic value. Moreover, in case of injecting carbon dioxide and increase in

asphaltene precipitation, the method could face challenge. On the other hand, carbon dioxide injection could increase recovery and the less the effect of asphaltene precipitation is, the better the results of carbon dioxide injection would be. In the studied reservoir, carbon dioxide injection could enhance oil recovery and precipitation of asphaltene was not a serious problem. Hence, it the method of carbon dioxide injection could be applied to enhance oil recovery in this reservoir.

Moreover, due to weaknesses of Eclipse simulator in simulating precipitation of asphaltene during carbon dioxide injection, experimental tests should be implemented for more careful assessment of the reservoir.

## CONCLUSION

Asphaltene precipitation may cause numerous problems with production from the reservoir. The factors affecting formation of asphaltene precipitation include change in temperature, fluid composition or electrokinetic effects. The solid phase is precipitated mainly around the well and could cause formation damage around the well and this could lead to severe reduction of permeability of reservoir in surrounding areas of the well and reduced oil production. Existence of asphaltene could reduce factor of oil recovery. With change in fluid components of reservoir as a result of carbon dioxide injection, the soluble asphaltene in oil become

instable, so that it could increase viscosity and formation of asphaltene precipitation particles. The dominant mechanism of precipitation in carbon dioxide injection could be surface precipitation and blockage of throat of reservoir rock pores and this could cause damage of formation and as a result, reduced oil recovery. According to simulation results, with the precipitation of asphaltene on surface of reservoir rock pores, the oil production is reduced and this could be because of change in permeability towards oil-friendly mode and negative effect on relative permeability. Asphaltene precipitation could lead to overall or partial blockage of pores of the porous area. The blockage of pores could reduce reservoir permeability and reduced oil production. Increase in carbon dioxide injection rate could increase factor of oil recovery; although it could increase the gas to oil ratio (GOR) and asphaltene precipitation. In this reservoir, although injection of carbon dioxide has led to precipitation of asphaltene, it is adequate for EOR and could enhance factor of oil recovery. Hence, in this study, the EOR method by carbon dioxide injection is implemented.

## REFERENCES

- Andersen S.I., Speight J.G., Thermodynamic models for asphaltene solubility and precipitation, *J. Petrol. Sci. Eng.* (1999), 22, 53 – 66.
- Ju, B., T.Fan, Z.Jiang. 2013. Modeling asphaltene precipitation and flow behavior in the processes of CO<sub>2</sub> flood for enhanced oil recovery. *Journal of Petroleum Science and Engineering* 109(2013)144–154
- Lawal M. et al. 2012. Experimental Investigation of Asphaltene Deposition in Capillary Flow, [dx.doi.org/10.1021/ef201874m](https://doi.org/10.1021/ef201874m). *Energy Fuels*
- M.B. Bagheri, R. Kharrat, C. Ghotby. 2011. Experimental Investigation of the Asphaltene Deposition Process during Different Production Schemes. *Oil & Gas Science and Technology – Rev. IFP Energies nouvelles*, Vol. 66 (2011), No. 3, pp. 507-519.
- Moradi, S., D.Rashtchian, M.Ganjeh Ghazvini, B.Dabir, 2012, Experimental Investigation and Modeling of Asphaltene Precipitation due to Gas Injection ran. *J. Chem. Chem. Eng.* Vol. 31, No. 1, 2012
- Nasrabadi, H J.Moortgat, A. Firoozabadi. 2016. New Three-Phase Multicomponent Compositional Model for Asphaltene Precipitation during CO<sub>2</sub> Injection Using CPA-EOS. *Energy & Fuels*. American Chemical Society. [pubs.acs.org/EF](https://pubs.acs.org/EF)
- Speight J.G. (1999), “The Chemistry and Technology of Petroleum”, New York, Ed. Dekker.
- Speight J.G. (2004), “Petroleum Asphaltenes Part 1 Asphaltenes, Resins and the Structure of Petroleum”, *Oil & Gas Science and Technology*, 59(5), 467-477.
- Wiehe I.A. (1993), “A phase separation kinetics model for coke formation”, *Ind. Eng. Chem. Res.*, 32, 2447-2454
- Zendehboudi, S L.A. James, A. Bahadori, and M.A. Ahmadi. 2013. Asphaltene Deposition In Petroleum Reservoirs: Dynamic Test & Connectionist Modeling. the International Symposium of the Society of Core Analysts held in Napa Valley, California, USA, 16-19 September, 2013.

## The effect of resistance exercise on vascular diameter and some physiological factors in elderly men

Hasan Sanian<sup>1</sup>, Hassan Matin Homae<sup>2\*</sup> and Maghsoud Piry<sup>3</sup>

<sup>1</sup>Department of Physical Education, Tehran Central Branch, Islamic Azad University Tehran, Iran

<sup>2</sup>Associate Professor, Faculty of Physical Education, Tehran Central Branch, Islamic Azad University Tehran, Iran

<sup>3</sup>Faculty of Physical Education, Tehran Central Branch, Islamic Azad University Tehran, Iran

### ABSTRACT

Inactive lifestyle along with age increasing is a known risk factor for cardiovascular diseases. A certain level of physical activity that becomes the individual's habit is also closely related to the mortality causes. Aging is a chronic condition that can lead to atherosclerosis and blood pressure. Nowadays, it is proved that this disease is not just as a result of aging, but inactivity can also affect it. The present study was aimed at investigating the effect of resistance exercises on vascular diameter and physiological factors affecting it in elderly men. The present experiment was quasi-experimental study with a pretest-posttest design. Twenty elderly men were randomly assigned into a control group (n=20, age: 55±5) and a resistance exercise group (n=10, age: 55±5). The exercises were carried out for 3 months, 3 sessions per week, and each session lasted 60 minutes. The resistance exercise group conducted a weight-lifting program with 40-65% of 1MR. Before and after the exercises, the participants' vascular diameter were measured. The results of the present study showed that moderate resistance exercises led to a significant increase in vascular diameter and endothelin-1 ( $p \leq 0.05$ ). However, they had no significant effect on nitric oxide ( $p \geq 0.05$ ). According to the results of the present study, it can be stated that resistance exercises can cause significant change in vascular diameter and endothelin-1. Therefore, this type of exercise can be considered as an effective non-pharmacological method for better performance of arteries and prevention of cardiovascular diseases.

**KEY WORDS:** RESISTANCE EXERCISES, VASCULAR DIAMETER, ENDOTHELIN-1, NITRIC OXIDE, ELDERLY MEN

### ARTICLE INFORMATION:

\*Corresponding Author: [hasanmatinhomae@gmail.com](mailto:hasanmatinhomae@gmail.com)

Received 30<sup>th</sup> April, 2017

Accepted after revision 1<sup>st</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

Age increasing changes some physiological factors in the body. As a result of age increasing, for instance, the vascular wall is affected and will experience hardness and poor performance. It is natural that vascular diameter that is correlated with age increasing and hardening of the arteries is also affected and decrease (Marsh and Keyrouz 2010; Roger et al , 2012). At present, cardiovascular diseases account for about 30% of deaths in the world, and approximately 17 million deaths in the world are caused by them. According to the latest reports and statistics, over 38% of deaths in Iran are related to cardiovascular diseases.

It is predicted that cardiovascular will be the cause of over 50% of deaths in the world by 2020 (Azizi 2008). With an increase in age, the structure of the vascular walls change, and this change is different in different arteries of the body. The most common of these changes is atherosclerosis which is characterized by intima thickening, proliferation of muscle cells and connective tissue components, and accumulation cholesterol in muscle cells and macrophages at the lesion site (Baqarabadi et al, 2012). In fact, endothelium plays the pivotal role in covering the whole vascular system, and its dysfunction (endothelial dysfunction) is an indication for the onset of atherosclerosis. Different stimuli, such as exposure to oxidized lipoproteins, high homocysteine, high homocysteine levels, accumulation of inflammatory advanced cytokines, glycation end products, and aging, negatively affect endothelial cells and vascular function (Blair et al., 2001 ). Physical inactivity is an important factor in development of chronic diseases like heart diseases, cardiovascular diseases, and metabolic diseases, and lack of adherence to the correct principles while carrying out physical activities can lead to an increase in the incidence risk of such diseases (Johannsen et al , 2008).

Maintaining favorable physical conditions with age increasing can have a good effect on vital physiological changes and maximum aerobic capacity. Age increasing leads to a decrease in functional capacity in elderly people, and in turn, the capacity to carry out some physical tasks in such individuals drops (Tanaka et al, 2003). Since a large number of researchers have stated that many risks threaten elderly individuals, some scholars have examined the effect of exercise on inflammatory markers in the elderly (Dabidi and Jolanzadeh, 2009). Gnasso A et al, (1997) stated that both physical readiness and regular intense exercise lead to formation of nitric oxide (NO) in healthy individuals. Results indicated that there is a positive relationship between physical readiness and formation of NO at rest. Moreover, a training session can cause a sharp increase in NO forma-

tion. A positive relationship between physical readiness and NO formation was observed, which can help explain that physical exercises have a positive effect on cardiovascular health. Maximum oxygen consumption can increase as a result of aerobic exercises; however, this effect is regulated and changes through different factors like age, the initial level of aerobic fitness, and intensity, frequency and duration of exercise (Atkinson 2008).

Carrying out exercises causes functional compatibility in the heart, which is different from pathological compatibilities and improves the heart function. In a study aimed at determining the effect of combined aerobic-resistance training on 16 patients with diabetes 2, the exercises lasted 8 weeks and were progressively carried out from the second week. The results of that study indicated that carrying out the exercises led to an improvement in indicators of glycemic control, aerobic exercise tolerance, and an increase in resistance of arteries expanding endothelial (Barton et al, 2003).

In another study conducted by Baghrabadi et al (2011) (Padilla1 2010), the effect of regular aerobic training on endothelin-1 in older women was examined, and it was concluded that endothelial function is disrupted with age. On the other hand, exercise improves vascular endothelial cell function. Since most studies have referred to the positive effect of training and physical activity on vascular function and because there are few studies focusing on the effect of resistance exercise on vascular diameter, it seemed necessary carry out the present study in order to investigate the effect of resistance exercise on vascular diameter in elderly men (Baqarabadi, et al, 2012).

## MATERIAL AND METHODS

The present study was an applied quasi-experiment. The study sample consisted of 20 male employees of Islamic Azad University who had no special problem or disease. They were selected by a convenience sampling method. The participants were randomly assigned into a control group (n=10, heartbeat:  $82.6 \pm 2.0$ , age:  $55 \pm 5$ ) and a resistance exercise group (n=10, heartbeat:  $82.7 \pm 3.0$ , age:  $55 \pm 5$ ). After the level of their physical readiness was evaluated, the exercise group carried out the assigned exercises in 60-minute sessions, three times a week, for 3 months. The exercise program included 10-minute warm-up with a variety of stretching and then conducting exercises that strengthen the large muscles of the quadriceps, back of the thigh, buttocks, pectoral muscles, large dorsal muscle, shoulder muscle, and abdominal and fillet muscles with 40-65% of 1MR. Vascular diameter factor was measured by Doppler ultrasound method 48 hours before starting the exercises

and 48 hours after the last session. In order to carry out Doppler ultrasound, linear multi frequency probe (with a range of 5-15 MHz) was carried out by an experienced radiologist while the participants lay face upwards and held their hands beside their body.

## STATISTICAL METHOD

In order to describe the collected data, statistical indices such as mean, standard deviation, minimum, and maximum were employed, and for inferential statistics, Kolmogorov-Smirnov test and dependent t-test were utilized. It should be noted that in all cases, the error rate was set at 5%. Moreover, all statistical operations were carried out through SPSS 18.0.

## RESULTS AND DISCUSSION

In the present study, in addition to vascular diameter, other physiological factors like nitric oxide and endothelin-1 were also measured, which can be observed in Table 1.

According to Table 1, the mean vascular diameter on the pretest and posttest was respectively  $9.05 \pm 0.5$  and  $8.9 \pm 0.6$  in the control group and  $8.2 \pm 0.7$  and  $9.0 \pm 1.1$  in the resistance exercise group. It was concluded that

vascular diameter of elderly men increased as a result of resistance exercise. The mean nitric oxide on the pretest and posttest was respectively  $103.8 \pm 9.6$  and  $105.5 \pm 7.0$  in the control group and  $101.1 \pm 16.4$  and  $109.6 \pm 17.3$  in the resistance exercise group. It was also concluded that the inactive elderly individuals' NO increased as a result of resistance exercise. The mean endothelin-1 on the pretest and posttest was respectively  $94.4 \pm 0.9$  and  $96.5 \pm 4.7$  in the control group and  $127.8 \pm 1.8$  and  $107.9 \pm 9.1$  in the resistance exercise group. It was also concluded that the inactive elderly individuals' endothelin-1 decreased as a result of resistance exercise.

For the vascular diameter variable, since t value is -2.843 and the p-value is 0.015, it can be concluded that resistance exercise for 8 weeks had a significant effect on vascular diameter. For the nitric oxide variable, since t value is -0.889 and the p-value is 0.395, it can be concluded that resistance exercise for 8 weeks did not have a significant effect on nitric oxide. For the endothelin-1 variable, since t value is 7.025 and the p-value is 0.000, it can be concluded that resistance exercise for 8 weeks had a significant effect on endothelin-1.

The results of the present study, which can be attributed to one of the following reasons. In the abovementioned studies, one of the reasons for increased vascular diameter was blood pressure that presses the vascular walls. When physical activity is carried out, blood pressure rises, which is in fact liquid hydrostatic pressure on the walls and leads to an increase in vascular diameter. Another reason for increased vascular diameter is the decrease in the thickness of the vascular inner wall which is caused by loss of minerals that deposit inside the vascular walls as a result of inactivity. Another cause of increased diameter of arteries can be an increase in the size of endothelial cells. As a result of increased blood flow, more oxygen and food reach the cells and the cell size rises. Another reason for increased vascular diameter can be the increased concentration of nitric oxide which

Table 1. Descriptive data of vascular diameter, nitric oxide, and endothelin-1

Variable	Group	SD $\pm$ Mean	
		Pretest	Posttest
Vascular diameter	Control	$9.0 \pm 0.5$	$8.9 \pm 0.6$
	Resistance	$8.2 \pm 0.7$	$9.0 \pm 1.1$
Nitric oxide	Control	$103.8 \pm 9.6$	$105.5 \pm 7.0$
	Resistance	$101.1 \pm 16.4$	$109.6 \pm 17.3$
Endothelin-1	Control	$94.4 \pm 0.9$	$96.5 \pm 4.7$
	Resistance	$127.8 \pm 1.8$	$107.9 \pm 9.1$

Table 2. The results of independent t-test for the resistance exercise group (N=10)

Comparing vascular diameter of the elderly men in the control and resistance exercise groups				
Variable	Group	SD $\pm$ Mean	t	Sig.
Vascular diameter changes	Control	$-0.08 \pm 0.04$	-2.843	0.015*
	Exercise	$0.81 \pm 0.09$		
Comparing nitric oxide of the elderly men in the control and resistance exercise groups				
Variable	Group	SD $\pm$ Mean	t	Sig.
Nitric oxide changes	Control	$1.8 \pm 0.5$	-0.889	0.395
	Exercise	$8.4 \pm 2.3$		
Comparing endothelin-1 of the elderly men in the control and resistance exercise groups				
Variable	Group	SD $\pm$ Mean	t	Sig.
Endothelin-1 changes	Control	$2.1 \pm 1.2$	7.025	0.000
	Exercise	$-19.9 \pm 8.0$		

is a stimulus for increased vascular diameter. Another reason is decreased level of endothelin-1 which is one of the causes for vascular hardening and thus decreased vascular diameter. In the present study, resistance exercises led to an increased in blood pressure, which caused vascular diameter to increase. One of the reasons for disagreement between the mentioned studies and the present one can be the training protocol. Probably, the training program was not long and intense enough to cause necessary changes in the vascular walls, or the participants were not of the same gender or age. It is also possible that the method of measuring the vascular diameter was not the same as the present.

The results of the present study indicated that there was no significant difference between the two groups in terms of nitric oxide, i.e. resistance exercises had no significant effect on nitric oxide were in agreement with those of the present study, which can be attributed to the similarity between the exercises employed for the participants or the fact that blood flow increases as a result of physical activity and more oxygen combines with nitroguanidine end of L-arginine enhances the production of nitric oxide, which can be due to some reasons. One of the reason is the difference between the types of the participants (i.e. in some studies, animals were used instead of humans). Another reason can be the dissimilarity between the type, length, and intensity of the exercises or the participants' gender. The recovery period after exercise is considered as effective factors in NO concentration. Moreover, if the effect of supplements are measured along with the exercises, NO can be affected. Furthermore, the sampling time can influence the results (Green et al, 2004).

The results of the present study showed that the two groups were significantly different in terms of endothelin-1 as a result of resistance exercise. However, which can be attributed to the fact that those studies focused on patients while healthy individuals participated in the present study, or that the participants in the present study consumed no medicine, and endothelin-1 is a factor that increase with age. It is possible that the participants in those studies were not of the same age as the participants of the present study, or the training protocol in those studies was not intense or long enough to cause the necessary changes, or the level of physical readiness was not the same as the present study.

## CONCLUSION

The results of the present study showed that resistance exercise causes a significant increase in vascular diame-

ter leads to no significant rise in nitric oxide, and results in a significant decrease in endothelin-1 in elderly men. Therefore, regular resistance exercises can have a positive effect on vascular diameter and other effective factors in preventing cardiovascular diseases.

## REFERENCES

- Azizi, F. (2008). Prediction of mortality and burden of disease in Iran and the world. *research in medicine*.
- Atkinson J. (2008). Age-related medial elastocalcinosis in arteries: Mechanisms, animal models, and physiological consequences. *J Appl Physiol*; 105: 1643 – 1651.
- Barton M, Traupe T, Haudenschild CC. (2003). Endothelin, hypercholesterolemia and atherosclerosis. *Coron Artery Dis*; 14:477-90.
- Baqarabadi, V., Hejazi. S.M., Piri, M., Nejatpour, S. (2012) impact of regular resistance training on the Level of endothelin - 1 levels of older women vessels participating in the Ofogh healthy center of Mashhad city. Ofogh knowledge Center.
- Blair SN, Cheng Y, and Holder S. (2001). Is physical activity or physical fitness more important in defining health benefits? *Med Sci Sports Exerc* 33: S379-S399
- Dabidi Roshan, V, Jolanzadeh, G. (2009). The effect of continuous and intermittent aerobic training sessions per week on some key indicators of heart health in menopausal rats. *Journal of School, Mazandaran University of Medical Sciences*.
- Gnasso A, Irace C, Carallo C, De Franceschi MS, Motti C, Mattioli PL, et al. (1997). In vivo association between low-wall shear stress and plaque in subjects with asymmetrical carotid atherosclerosis. *Stroke*;28:993e8.
- Johannsen DL, DeLany JP, Frisard MI, Welsch MA, Rowley CK, Fang X, Jazwinski SM, Ravussin E; (2008). The Louisiana Healthy Aging Study. Physical activity in aging: comparison among young, aged, and nonagenarian individuals. *J Appl Physiol* 105: 495-501, 2008. First published June 12.
- Marsh JD, Keyrouz SG. (2010). Stroke prevention and treatment. *J Am Coll Cardiol*, 56:683-691.
- Padilla J, Simmons G. H., Bender S. B., Arce-Esquivé A. A., Whyte J. J., Laughlin M. H. (2010). "Vascular Effects of Exercise: Endothelial Adaptations Beyond Active Muscle Beds," NIH Public Access.
- Roger VL, Go AS, Lloyd-Jones DM et al: (2012). Heartdisease and stroke statistics--2012 update: a report from the American Heart Association. *Circulation*, 125:e2-e220.
- Tanaka, Hirofumi, and Douglas R. Seals. (2003). Invited Review: Dynamic exercise performance in Masters athletes: insight into the effects of primary human aging on physiological functional capacity. *J Appl Physiol* 95: 2152-2162, 2003;10.1152/jappphysiol.00320.

## Comparative effect of atropine and hyoscine premedication in patients with major depression treated by electroconvulsive therapy

Mahshid Ghasemi<sup>1</sup>, Mostafa Hamdieh<sup>2\*</sup>, Faranak Behnaz<sup>3</sup>, Elham Memary<sup>4</sup> and Ali Kheradmand<sup>5</sup>

<sup>1</sup>M.D., Assistant Professor of Anesthesiology Taleghani, Hospital Anesthesiology Research center Shahid Beheshti University of Medical Science, Tehran, Iran

<sup>2</sup>M.D, Associate Professor of Neuropsychiatry, Taleghani Hospital Research Development Committee, Psychosomatic ward, Shahid Beheshti University of Medical Sciences, Tehran, Iran

<sup>3</sup>Assistant Professor Anesthesiologist, Shohada Hospital, Shahid Beheshti University, Tehran, Iran

<sup>4</sup>Asistant Professor, Anesthesiologist, Imam Hosein Hospital, Shahid Beheshti University, Tehran, Iran

<sup>5</sup>M.D., Assistant Professor of Psychiatry, Taleghani Hospital Research Development Committee, Behavioral Sciences Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran

### ABSTRACT

Electroconvulsive therapy (ECT) is a highly successful treatment for severe depression. ECT needs general anesthesia, Choosing a suitable anesthetic agents during ECT is effective on the quality and outcome of patient treatment. This study was performed to compare haemodynamic status after Atropine and Hyoscine Premedication for electroconvulsive therapy in major depression patients. This study was randomized, prospective study. 102 patients for ECT, from an academic hospital with major depression were randomly selected and divided into three groups. Group-I received atropine, group-II received Hyoscine and group-III received no premedication. Prior to, immediately, 5 minutes, 10 minutes, and 15 minutes after ECT heart rate and blood pressure were measured. Data were analyzed using SPSS software, version 20. The results showed that systolic blood pressure, heart rate and Rate Pressure Product of patient during injection, 5 minutes and 10 minutes after ECT in the group receiving atropine was significantly higher than the other two groups. Based on the findings of present study using hyoscine as Premedication make more hemodynamic stability after ECT compared with atropine.

**KEY WORDS:** ATROPINE PREMEDICATION, HYOSCINE PREMEDICATION, ELECTROCONVULSIVE THERAPY, MAJOR DEPRESSION

### ARTICLE INFORMATION:

\*Corresponding Author: [Mostafa\\_Hamdieh@yahoo.com](mailto:Mostafa_Hamdieh@yahoo.com)

Received 30<sup>th</sup> April, 2017

Accepted after revision 2<sup>nd</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

Depression is one of the most common mental disorders that are classified as mood disorders (First, and Pincus, 2014). Depression is a mood state that sometimes continuous and sometimes unstable that can include many aspects of life and interfere with it. Mood change means severe to so mild grief, sadness and irritability, feelings of sadness, lack of pleasure and disappointment that in this case the person is not able to sense a winsome (Blatt 2004). Depression is one of the most important causes of disability in all countries and the most common mental disorders show off as a global health problem in all cultures. Few people who have never experienced depression during their lives (Persons et al. 2001). Statistics indicate that 420 million people in worldwide (Mathers et al., 2008) and about 20 percent of the United States of America are suffering from depression (Gotlib, and Hammen, 2008). Studies in Iran showed high prevalence of depression in Iran, especially among women (Farhoudian, et al., 2007; Mohammadi et al., 2006; Dejman, 2010; Mohammadi, et al., 2005). Severe depression is a common disorder that is recurrent expensive and has a high mortality and morbidity (Sullivan et al., 2014).

The World Health Organization estimates that severe depression will be the second largest cause of disability in the world by 2020 (Michaud et al., 2001). Severe depression can reduce quality of life and increase mortality due to suicide. Risk of suicide in people with depression during their life are 6 to 15 percent. Also, severe depression can increase the risk of other diseases such as heart diseases (Lisanby, 2007). There are several ways to treat severe depression, including pharmacotherapy, cognitive-behavioral therapy and electroconvulsive therapy. Since the release of Electroconvulsive therapy (ECT), passed more than 60 years. This method is still an important, effective and safe therapy in the treatment of neuropsychiatric disorders (Lisanby 2007). Electroconvulsive therapy in patients with severe depression who do not respond to drug therapy, and also in cases that the desire to commit suicide or severe symptoms or lack of adherence to treatment, there is a good choice (Warner-Schmidt and Duman, 2007). Electroconvulsive therapy versus corresponding treatments is effective treatment of severe depression (Sackeim et al., 1993).

Numerous studies were expressed the effectiveness of electroconvulsive therapy in the treatment of severe depression (Association 2008). Approximately 70-80% of patients who respond to drug treatments and 50% of patients who do not respond to drug treatments for depression, were responded effectively to treatment with ECT (Shahjahan et al., 2005). In 1940 and 1950, ECT were used for treatment of all psychiatric disorders, including schizophrenia, but nowadays, ECT were used

primarily for patients with severe depression that do not respond to antidepressants and commit suicide based on extensive research (Association, 2008). ECT is faster, safer and more effective drug treatment and has fewer side effects (Lisanby, 2007).

ECT is passing 70 to 150 V of motive electrical current from the patient's brain for one second to one-tenth of a second to produce a large convulsion. This situation is so carefully adjusted that can make the convulsion in the whole of the brain for certain time (Association 2008). Shallow depth anesthesia are used for ECT and two electrodes are placed on both sides of the skull. Electrodes must be applied to the gel for better contact with the skin. Then electrical stimulation takes place using a device, this electrical current that is connected less than a second can cause the extensive fire in nerve cells of the brain and create an attack like that great epilepsy that generally takes seconds 35 to 80. Convulsion caused great changes in the central and peripheral nervous system (Sackeim et al., 1993). Performing ECT requires general anesthesia, therefore, prior to ECT all patients should be examined for the potential risks of anesthesia and to be examined in terms of possible interactions between drugs, anesthetic drugs and ECT. All patients will not be intubated routinely but should be ventilated with an oxygen mask (Folk et al, 2000). General anesthesia for the surgery is different from treatment with mentioned ECT. Many anesthetic drugs such as barbiturates and benzodiazepines have anti-convulsion effect and is effective on the threshold and during the convulsion. These drugs directly affect the results of ECT, so selection of appropriate anesthetic drugs during treatment with ECT, affect the quality and result of patient treatment (Folk et al, 2000; Ding and White 2002; Yu et al 2011).

ECT response often associated with severe hemodynamic responses even in patients who do not have a history of cardiovascular disease. Initial response after the parasympathetic vagal nerve stimulation may occur immediately after ECT that can lead to hypoxia, bradycardia, asystole moment, and aberrant contractions of ventricular or atrial or combination of them (Ding, and White 2002; Yu et al, 2011). Sympathetic response caused quickly after the initial response of the parasympathetic that show itself as tachycardia, hypertension, and aberrant contractions of ventricular and ventricular tachycardia rarely. Tachycardia usually remains up to 2 minutes after ECT and often reduce by self-controlling ( Yu et al, 2011; Cristancho et al. 2008). Therefore, Atropine drug is used before ECT to reduce dysrhythmias caused by the evacuation of mediators causing parasympathetic response, although Atropine may raise heartbeats and work (Wyant, and MacDonald, 1980).

In fact, Atropine should be used during ECT as a treatment to prevent asystole, bradycardia and decrease

in saliva (Lisanby, 2007). Atropine also reduces the number of aberrant atrial contraction (Ding and White, 2002). Pretreatment with atropine cause tachycardia by mediating anti-cholinergic effect that in addition to severe sympathetic response after ECT, leading to myocardial greater workload (Shahjahan, et al., 2005). However, some studies did not report favorable results after pretreatment with atropine (Mayur, et al. 1998). Hyoscine is alkaloid which is considered part of anticholinergic drugs and competitively inhibits acetylcholine muscarinic receptors. This drug acts as non-selective antagonist of muscarinic receptor. Hyoscine also have peripheral anticholinergic and central effects (Renner et al., 2005).

Hyoscine among the anticholinergic drugs due to positive chronotropism and shorter duration can be make better hemodynamic stability, especially in people over 45 years (Mirakhur et al., 1979). Hyoscine can be a persuaded replacement for other anticholinergic drugs in surgery that is used to reduce bradycardia (Mirakhur et al., 1979), which showed that there was not any significant difference between Atropine and Hyoscine drugs for reduction of saliva (Mirakhur, 1978). Hyoscine and Atropine are similar in many respects, such as effectiveness and side effects so that including the effects of these two drugs can be affect the rhythm and heartbeat number and changes in the pressure of systolic oxygen gas and including the side effects of the drug can be noted dizziness, nausea, vomiting, reduction in amount of saliva production (Shutt, and Bowes, 1979). Since all patients should receive general anesthesia at the time of ECT performing and given the importance of consumption of the premedication before ECT performing and considering that no study have not been conducted to compare the effectiveness and side effects of Hyoscine and Atropine as premedication in ECT, therefore, the researchers carried out the present study aimed to compare the effectiveness and side effects of Atropine and Hyoscine drugs as a premedication when performing ECT in patients with severe depression.

## MATERIAL AND METHODS

This study was single-blind clinical trial that was performed on patients with severe depression nominated for ECT which referred to psychiatry department of Taleqani hospital related to Shahid Beheshti University from 2012 to 2014. In this study, 102 patients were selected by continuous and simple sampling method and divided into three groups by random numbers table. The control group, recipient of Atropine premedication group and recipient of Hyoscine premedication group.

The inclusion criteria included: participation in the study, the risk of severe depression with the approval of

psychiatry, the necessity of ECT performing with certified psychiatrist, aged between 18 and 70 years, lack of beta blockers drugs consumption, no history of smoking, hookah, Naswar, tobacco, drugs and alcohol, placement of patients in Group 1 and 2 according to the American Society of Anesthesiologists (ASA) physical status classification system that was patients with severe depression are healthy or have mild systemic disease, lack of diabetes, without obesity, lack of pregnancy, without any broken bones, no history of convulsions, without any injury to the brain, lack of ICP and IHD, no history of recent stroke or heart attack, high blood pressure or tachycardia.

Ethical considerations of this study includes permission from the ethics committee of Shahid Beheshti University Medical Sciences, Faculty of Medicine and research deputy of university Shahid Beheshti University Medical Sciences. After patient selection, informed consent form was given to each patient and after the study was completed. If the patient was not able to study the form, it was read by a patient's family members for the patient. The survey questionnaire was a researcher-made that this questionnaire was included demographic information (age, gender, height and weight of the patient, disease duration, medication type, and history of electroconvulsive therapy, heartbeats, blood pressure and the number of vomiting). All patients were examined in terms of the potential risks of general anesthesia one day before the ECT performing and were told to patients do not use any premedication and be NPO at the night before ECT. Anesthesia for all patients were done by 2 mg.kg<sup>-1</sup> of Thiopental and 0.5 mg.kg<sup>-1</sup> of Suxamethonium drugs. Patients were ventilated with 100% oxygen through the mask and intermittent positive pressure ventilation. The status of cardiovascular (systolic and diastolic blood pressure), the heartbeats number of patients, and saturation of the blood Hemoglobin of SPO<sub>2</sub> for patients were recorded and evaluated by automatic cardiac monitor (Datex-Ohmeda), second lead of EKG, and probe connected to the monitor, respectively. Intermittent positive pressure ventilation and 100% oxygen still were ventilated as long as breathing of patients be started spontaneously and regularly during the convulsion arising from an electroconvulsive therapy.

Colleague of researcher completed the questionnaire without the knowledge of the type of premedication before electroconvulsive therapy, and then immediately, 5, 10 and 15 minutes after electroconvulsive therapy measured heartbeats of patients and their blood pressure. In this study, 0.5 mg Atropine was injected intravenously for patients who were in the Atropine drug group five minutes before ECT performing and 0.5 mg Hyoscine was injected intravenously for patients who were in the Hyoscine drug group five minutes before

ECT performing. Both groups took the electroconvulsive therapy by one device and one specialist. The duration of electrical shock, voltage and placement of the electrodes were similar in both groups. Any kind of unwanted reactions such as dysrhythmias, tachycardia, bradycardia, asystole, and aberrant ventricular and atrial beats was checked and recorded. It can be pointed out that the most important limitation of this research was inability to measure the gastrointestinal side effects such as nausea and the amount of saliva due to patients received general anesthesia, the researchers were not able to measure the two cases. Data were analyzed by using the SPSS software version 20, chi-square test, ANOVA and Mann-Whitney test.

## RESULTS AND DISCUSSION

Results showed that the average age in the Atropine group, Hyoscine group and control group were 52.3, 46.9 and 48.7 years, respectively. The results revealed that there were not significant difference between patients for age and gender traits in three groups receiving Atropine, Hyoscine and control group. Other demographic characteristics of patients is expressed in Table

1. ANOVA and chi-square test demonstrated that there were no significant difference between the groups for age, gender, marital status, education level, employment status, diseases duration and having a history of shock therapy. The results revealed that there were no significant difference for baseline systolic blood pressure, patients pulse number (pulse per minute) and the amount of SPO<sub>2</sub> at the beginning of the study.

Systolic blood pressure significantly ( $P>0.05$ ) was higher than the other two groups during the injection of premedication ( $122 \pm 15.7$ ), 5 minutes ( $121.2 \pm 13.6$ ) and 10 minutes ( $124.1 \pm 13.4$ ) after the ECT performing in the group receiving Atropine. Whereas the systolic blood pressure did not have significant difference among the three groups 15 minutes after ECT. Heartbeats of patients significantly ( $P>0.05$ ) were higher than the other two groups 5 minutes ( $101 \pm 9$ ) and 10 minutes ( $100 \pm 7$ ) after the ECT in the group receiving Atropine. Blood pressure changes and heartbeat numbers are inserted in Table 2 and 3 and Figure 1 and 2. SPO<sub>2</sub> amount during the injection of premedication and SPO<sub>2</sub> amount during ECT in the group receiving Atropine significantly ( $P>0.05$ ) were higher than the other two groups. Whereas the SPO<sub>2</sub> amount did not have significant difference among three

Characteristics		Patients receiving atropine		Patients receiving hyoscine		Patients without any premedication		Test result
		Number	Percent	Number	Percent	Number	Percent	
Gender	Woman	15	44.1	10	29.4	13	38.2	P=0.730
	Man	19	55.9	24	70.6	21	61.8	
Marital status	Single	7	20.6	6	17.6	8	23.5	P=0.239
	Married	27	79.4	28	82.4	26	76.5	
Education level	Illiterate	18	53.1	17	50	5	14.7	P=0.217
	Primary	3	8.9	5	14.7	9	26.5	
	Junior high	8	23.4	5	14.7	8	23.5	
	High school	3	8.9	5	14.7	8	23.5	
	University	2	5.9	2	5.9	4	11.8	
Occupation	Office employee	2	5.9	7	20.6	4	11.8	P=0.221
	Labor worker	7	20.9	1	2.9	6	17.6	
	Unemployed	4	11.8	4	11.8	6	17.6	
	Self-employed	9	26.8	11	32.3	9	26.8	
	Home maker	10	29.4	9	26.8	8	23.5	
	Student	2	5.9	2	5.9	1	2.9	
Time of affliction with illness	> 6 month	15	44.1	13	38.2	14	41.2	P=0.907
	6-12 months	10	29.4	13	38.2	7	20.6	
	12 months	9	26.5	8	23.6	3	38.2	
History of shock therapy	Yes	8	23.5	6	17.6	7	20.6	P=0.12
	No	26	76.5	28	82.4	27	79/4	

Table 2. Changes in systolic blood pressure in the three groups of patients receiving atropine, hyoscine and without premedication							
Variable \ Group	Patients receiving atropine		Patients receiving hyoscine		Patients with no premedication		Result of test
Base systolic pressure	± 14.1	107.8	± 12.2	105.3	± 8.3	104.6	P=0.340
Systolic blood pressure during injection of premedication	± 15.7	122.4	± 13.8	112.3	± 8.3	104.7	P*=0.001
Systolic blood pressure during ECT	± 12.6	96.1	± 8.5	91.5	± 10.1	98.7	P=0.065
Systolic blood pressure 5 minutes after ECT	± 13.6	121.2	± 9.3	115.2	± 11.8	109.3	P*=0.021
Systolic blood pressure 10 minutes after ECT	± 13.4	124.1	± 11.1	116.2	± 11.3	110.0	P*=0.001
Systolic blood pressure 15 minutes after ECT	± 12.9	123.2	± 10.4	116.0	± 11.4	109.4	P=0.207

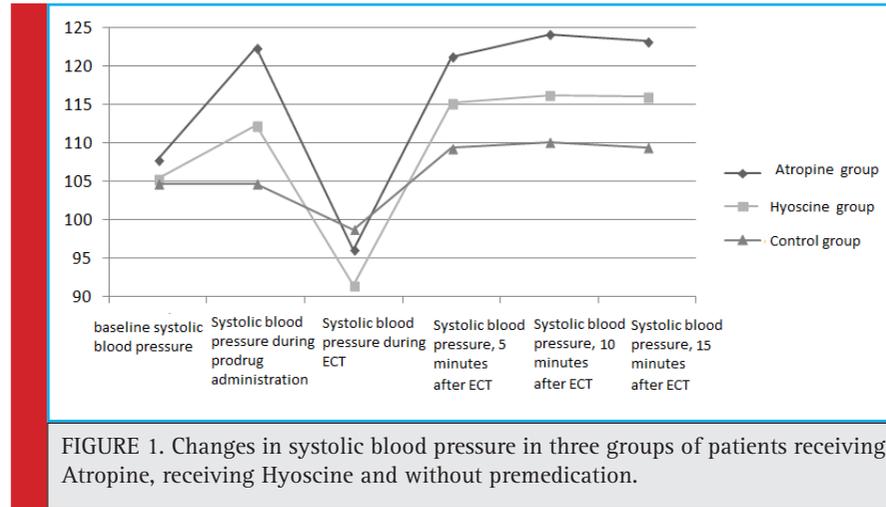
Table 3. Changes in heart rate in the three groups of patients receiving atropine, hyoscine and without premedication				
Variable \ Group	Patients receiving atropine	Patients receiving hyoscine	Patients without premedication	Result of test
Base heart rate	86 ± 5	86 ± 5	86 ± 7	P= 0.340
Heart rate during injection of premedication	108 ± 9	98 ± 9	91 ± 8	P= 0.079
Heart rate during ECT	74 ± 7	72 ± 9	73 ± 7	P= 0.065
Heart rate 5 minutes after ECT	101 ± 9	92 ± 7	90 ± 4	P*= 0.021
Heart rate 10 minutes after ECT	100 ± 7	91 ± 12	87 ± 7	P*= 0.001
Heart rate 15 minutes after ECT	96 ± 10	89 ± 7	87 ± 7	P= 0.207

groups 5, 10 and 15 minutes after ECT. Changes of SPO<sub>2</sub> amount was listed in Table 4. Rate Pressure Product (RPP) amount of three groups of patients receiving Atropine, Hyoscine and without premedication at the baseline did not differ significantly. Whereas the (RPP) during injection, 5 minutes and 10 minutes after injection

in patients receiving Atropine significantly (P>0.05) was higher than the other two groups. Changes the amount of RPP is listed in Figure 3.

Electroconvulsive therapy is the most effective and least dangerous in patients with various types of mental disorders that it can be tolerated well by patients.

Table 4. Changes in SPO <sub>2</sub> in the three groups of patients receiving atropine, hyoscine and without premedication				
Variable \ Group	Patients receiving atropine	Patients receiving hyoscine	Patients without premedication	Result of test
Base SPO <sub>2</sub>	96.40 ± 2.0	95.87 ± 0.7	96.10 ± 1.2	P= 0.303
SPO <sub>2</sub> during injection of premedication	97.30 ± 1.7	96.02 ± 1.4	96.10 ± 1.2	P*= 0.006
SPO <sub>2</sub> during ECT	96.77 ± 0.5	95.13 ± 0.6	94.26 ± 0.4	P*= 0.011
SPO <sub>2</sub> 5 minutes after ECT	99.20 ± 0.3	99.15 ± 0.4	98.67 ± 0.9	P= 0.521
SPO <sub>2</sub> 10 minutes after ECT	98.87 ± 0.4	98.24 ± 0.6	98.42 ± 0.9	P= 0.907
SPO <sub>2</sub> 15 minutes after ECT	97.60 ± 0.7	96.22 ± 1.5	96.37 ± 2.1	P= 0.204

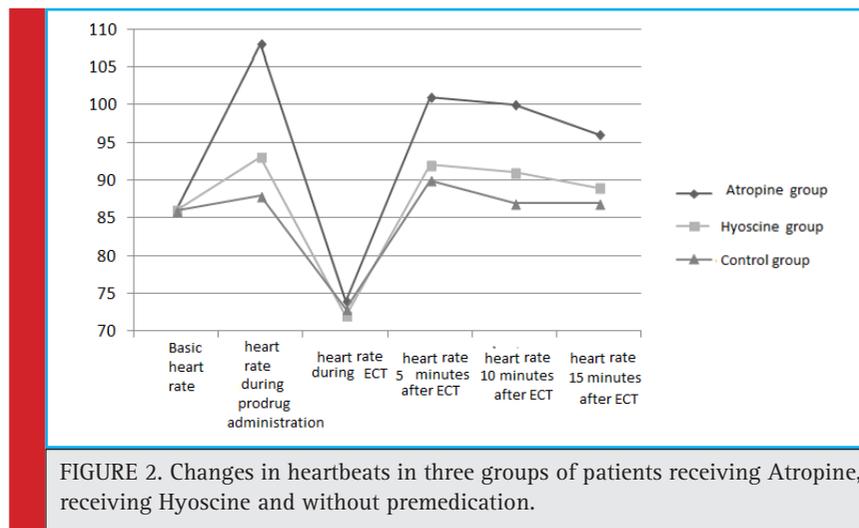


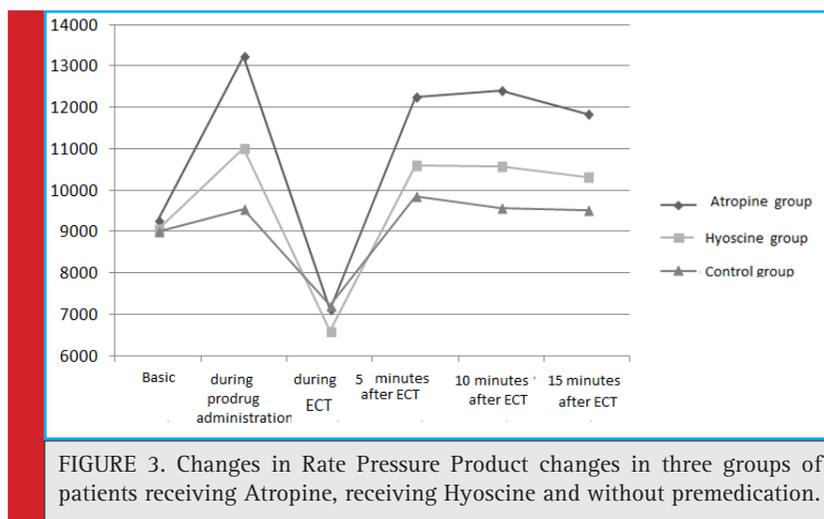
Possibility of mortality in this therapy is 1 per 10,000 people (Cristancho, et al., 2008). ECT side effects are headache, muscle aches, transient dizziness, and short-term memory disorders. Studies have shown that it may occur cardiovascular complications after ECT in 7.5 percent of people who had no history of cardiovascular diseases and 55 percent of people who had history of cardiovascular diseases that often shows itself in the form of a benign and transient arrhythmia (Zielinski et al., 1993). Therefore, Atropine is used as a pre-treatment to prevent unwanted cardiovascular effects such as bradycardia and asystole during ECT performing. Although the use of Atropine as premedication may cause tachycardia and leading to increased heart muscle work and its beats (Wyant, and MacDonald,1980).

Several studies has been done the field of ECT performing, method of anesthesia for patients and various

types of premedication before ECT performing, however, there are contradictory comments in this regard. For example, in contrast to articles have pointed out the efficient use of Atropine prior ECT, there are other studies that suggest there is no need to use Atropine before ECT (Mayur et al. 1998 ; Karliner, 1965 ) so that the Royal College of Psychiatry also is not recommended for all of patients the use of Atropine (Royal college of Psychiatrists,1995). Some researchers believe that Atropine drug should be given to patients intravenously and 1.5 mg to 2 mg before the ECT ( Barton 1974) whereas the others believe that 0.4 mg to 6.5 mg Atropine subcutaneously before the ECT performing is sufficient (Rich and Pitts 1972).

This study also showed that systolic blood pressure and heartbeats after ECT in patients who use Atropine as premedication were higher than patients with no pre-





medication use or used Hyoscine as a premedication. Based on present result, using the Hyoscine as premedication can make higher hemodynamic stability after ECT compared with Atropine for patients. High systolic blood pressure, heartbeats and amount of SPO<sub>2</sub> in patients receiving Atropine were indicator of rising cardiovascular work that these people are also consistent with previous studies (Mayur *et al.*, 1998).

Injection 0.5 mg Hyoscine drug intravenously 5 minutes before ECT leads to significant reduction in blood pressure during the ECT, after 5 and 10 minutes ECT. Study of Shahjahan *et al.* also showed that the average blood pressure after ECT in the Atropine group were significantly higher than the control group and the group receiving Glycopyrrolate (Shahjahan, *et al.*, 2005). Study of Shahjahan *et al.* revealed that average heartbeats after ECT in Atropine group were significantly higher than in group receiving Glycopyrrolate (Kelway, *et al.*, 1986). Study of Sommer also indicated that premedication of Glycopyrrolate was better than Atropin before ECT lead to hemodynamic stability in older patients (Sommer *et al.*, 1989). In contrast, Kramer found that the use of Atropin have fewer side effect than Glycopyrrolate and the use of Atropine is preferred (Kramer *et al.*, 1986).

In another study, Mirakhor *et al.*, concluded that hyoscine will make a better hemodynamic stability especially in people over 45 years (Mirakhor *et al.*, 1979). Also Mayur did not recommend in his study the use of Atropine in patients that are group 1 based on ASA classification system and he believed that atropine should be used with caution in the elderly and in people of other ASA classes (Mayur, *et al.*, 1998). The limitations of this study is lack of saliva measurement. Of course, Mirakhor's study showed that there was not any significant difference between atropine and hyoscine

drugs for reduction of saliva amount trait (Weinstein and Fischer, 1967). Increase in RPP in the group receiving Atropine reflecting gains in myocardial work after receiving Atropine. The results of Mayur, *et al.*, (1998) and the Royal College (Royal college of Psychiatrists, (1995) also indicated that the use of atropine leads to better RPP stability in patients. So hyoscine can be a persuaded replacement for anticholinergic drugs especially Atropine at the time of ECT performing and leads to a more manageable and less changes in patients.

## REFERENCES

- Association, A.P., The practice of electroconvulsive therapy: recommendations for treatment, training, and privileging (A task force report of the American Psychiatric Association). 2008: American Psychiatric Pub.
- Blatt, S.J., Experiences of depression: Theoretical, clinical, and research perspectives. 2004: American Psychological Association.
- Cristancho, M.A., *et al.*, Uncommon but serious complications associated with electroconvulsive therapy: recognition and management for the clinician. *Current psychiatry reports*, 2008. 10(6): p. 474-480.
- Ding, Z. and P.F. White, Anesthesia for electroconvulsive therapy. *Anesthesia & Analgesia*, 2002. 94(5): p. 1351-1364.
- Dejman, M., Cultural explanatory model of depression among Iranian women in three ethnic groups (Fars, Kurds and Turks). 2010: Institutionen för klinisk neurovetenskap/Department of Clinical Neuroscience.
- First, M.B. and H.A. Pincus, The DSM-IV Text Revision: rationale and potential impact on clinical practice. *Psychiatric Services*, 2014.
- Folk, J.W., *et al.*, Anesthesia for electroconvulsive therapy: a review. *The journal of ECT*, 2000. 16(2): p. 157-170.

- Farhoudian, A., et al., Prevalence of psychiatric disorders in Iran: A systematic review. *Iranian Journal of Psychiatry*, 2007. 2(4): p. 137-150.
- Gotlib, I.H. and C.L. Hammen, *Handbook of depression*. 2008: Guilford Press.
- JL Barton and P. Gosling, Death after ECT. *The British Medical Journal*, 1974: p. 120-355.
- Karliner, W., Accidental convulsion induced by atropine. *The American journal of psychiatry*, 1965. 122(5): p. 578.
- Kelway, B., et al., Effects of atropine and glycopyrrolate on cognitive function following anaesthesia and electroconvulsive therapy (ECT). *International clinical psychopharmacology*, 1986. 1(4): p. 296-302.
- Kramer, B.A., R.E. Allen, and B. Friedman, Atropine and glycopyrrolate as ECT preanesthesia. *Journal of Clinical Psychiatry*, 1986.
- Lisanby, S.H., Electroconvulsive therapy for depression. *New England Journal of Medicine*, 2007. 357(19): p. 1939-1945.
- Mathers, C., D.M. Fat, and J.T. Boerma, *The global burden of disease: 2004 update*. 2008: World Health Organization.
- Mayur, P., et al., Atropine premedication and the cardiovascular response to electroconvulsive therapy. *British journal of anaesthesia*, 1998. 81(3): p. 466-467.
- Mirakhor, R., J. Dundee, and J. Connolly, Studies of drugs given before anaesthesia XVII: anticholinergic premedicants. *British journal of anaesthesia*, 1979. 51(4): p. 339-345.
- Mirakhor, R., Comparative study of the effects of oral and im atropine and hyoscine in volunteers. *British journal of anaesthesia*, 1978. 50(6): p. 591-598.
- Michaud, C.M., C.J. Murray, and B.R. Bloom, Burden of disease—implications for future research. *Jama*, 2001. 285(5): p. 535-539.
- Mohammadi, M.-R., et al., Prevalence of mood disorders in Iran. *Iranian Journal of Psychiatry*, 2006. 1(2): p. 59-64.
- Mohammadi, M.-R., et al., An epidemiological survey of psychiatric disorders in Iran. *Clinical practice and epidemiology in mental health*, 2005. 1(1): p. 16.
- Persons, J.B., J. Davidson, and M.A. Tompkins, *Essential components of cognitive-behavior therapy for depression*. 2001: American Psychological Association.
- Renner, U.D., R. Oertel, and W. Kirch, Pharmacokinetics and pharmacodynamics in clinical use of scopolamine. *Therapeutic drug monitoring*, 2005. 27(5): p. 655-665.
- Royal college of Psychiatrists, *THE ECT Handbook*(council report GR 39). 1995, London: Gaskell.
- Rich C.L and Pitts E.N,jr, Fatal heart block with cardiac arrest following E.C.T. *Journal of Psychiatry*, 1972: p. 121-117.
- Sackeim, H.A., et al., Effects of stimulus intensity and electrode placement on the efficacy and cognitive effects of electroconvulsive therapy. *New England Journal of Medicine*, 1993. 328(12): p. 839-846.
- Shahjahan, M., et al., Study of Haemodynamic Status after Anticholinergic Premedication During Electroconvulsive Therapy—A Comparative Study Between Atropine and Glycopyrrolate. *Journal of the Bangladesh Society of Anaesthesiologists*, 2005. 18(1): p. 31-37.
- Shutt, L. and J. Bowes, Atropine and hyoscine. *Anaesthesia*, 1979. 34(5): p. 476-490.
- Sommer, B.R., et al., Glycopyrrolate versus atropine in post-ECT amnesia in the elderly. *Journal of geriatric psychiatry and neurology*, 1989. 2(1): p. 18-21.
- Sullivan, P.F., M.C. Neale, and K.S. Kendler, Genetic epidemiology of major depression: review and meta-analysis. *American Journal of Psychiatry*, 2014.
- Warner-Schmidt, J.L. and R.S. Duman, VEGF is an essential mediator of the neurogenic and behavioral actions of antidepressants. *Proceedings of the National Academy of Sciences*, 2007. 104(11): p. 4647-4652.
- WEINSTEIN, M.R. And A. FISCHER, Electroconvulsive treatment of a patient with artificial mitral and aortic valves. *American Journal of Psychiatry*, 1967. 123(7): p. 882-884.
- Wyant, G. and W. MacDonald, The role of atropine in electroconvulsive therapy. *Anaesthesia and intensive care*, 1980. 8(4): p. 445-450.
- Yu, S.W., et al., Atrioventricular dissociation after electroconvulsive therapy. *Cardiology research and practice*, 2011. 2011.
- Zielinski, R.J., et al., Cardiovascular complications of ECT in depressed patients with cardiac disease. *The American journal of psychiatry*, 1993. 150(6): p. 904-909.

## Studying the causes of lack of blood sugar in neonates born in Boali Hospital, Tehran from March 2014 to March 2016

Marjan Mohammadnuri

*Assistant Professor, Pediatrician, Pediatric Department, Islamic Azad University, Tehran Branch, Faculty of Medicine, Tehran, Iran*

### ABSTRACT

Lack of blood sugar in neonates is an important disorder that causes disruption in the evolution, and growth and development of nerve cells. Blood glucose less than 50 mg/dl is defined as neonatal hypoglycemia and has been attributed to maternal diabetes, prematurity, low birth weight etc. In this observational study, which was performed as a cross - sectional descriptive – analytical study, 96 neonates born at Boali Hospital from March 2014 to March 2016 were selected and evaluated. At the same time, causes of lack of blood glucose levels were investigated. The results obtained in this study revealed that, 16.7% of neonates had low blood sugar. There was no relationship between blood sugar and neonate gender, gestational age, method of birth, birth weight, and neonate health. The risk of hypoglycemia in neonates of mothers with hyperglycemia was significantly higher ( $P=0.001$ ). Based on the results of this study, it can be concluded that about one out of every six neonates was deficient in blood sugar.

**KEY WORDS:** NEONATES, CAUSES, LACK OF BLOOD SUGAR

### INTRODUCTION

Blood glucose deficiency in neonates is an important disorder that causes disruption in the evolution and, growth and development of nerve cells (1). Blood glucose less than 50 mg/dl can be defined as neonatal

hypoglycemia and has been attributed to maternal diabetes, prematurity, low birth weight etc (2).

Most damage is developed in a condition when blood glucose is less than 25 mg/dl and is associated with complications of irreversible brain damage (3).

#### ARTICLE INFORMATION:

\*Corresponding Author: [mmohammadnuri@icloud.com](mailto:mmohammadnuri@icloud.com)

Received 30<sup>th</sup> April, 2017

Accepted after revision 5<sup>th</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

Ninety four percent (94%) of neonates with low blood sugar suffer from cerebral white matter lesions and 51% of them have cerebral cortex lesions. Thirty percent (30%) of these neonates have bleeding in the brain white matter while two-thirds develop deep evolutionary problems within 18 months (4).

Causes of neonatal hypoglycemia:

- SGA (birth weight below the 10th percentile for gestational age)
- LGA (birth weight greater than the 90th percentile for gestational age)
- Prematurity and low birth weight (less than 37 weeks gestational age and birth weight less than 2500 g)
- Neonates of diabetic and macrosomia mothers (birth weight more than 4000 g)
- Polycythemia
- Hypothermia
- Damage caused by cold (cold stress)
- Drug usage in late pregnancy (salbutamol, terbutaline, propranolol, etc.)
- Stress of delivery
- Metabolic disorders and glycogen storage
- Erythroblastosisfetalis, blood transfusion
- Blood infection

Clinical symptoms: tremor, lethargy, restlessness, coma, apnea, cyanosis, tachypnea, tachycardia, paleness, seizures and temperature instability.

Treatment: repeated maternal breast-feeding, control of blood sugar for 2 h, in case of hypoglycemia, starting intravenous blood sugar with oral feeding

All of these indicate the need to identify the causes of lack of blood sugar in neonates and timely prevention, diagnosis, and treatment of this disease (5). Therefore, the aim of this study is to investigate the causes of blood sugar deficiency in neonates born in Boali Hospital, Tehran from March 2014 to March 2016.

## MATERIALS AND METHODS

In this observational study, which was conducted as cross-sectional study - descriptive - analytical, 96 neonates born at Boali Hospital from March 2014 to March 2016 were selected to determine the causes of lack of blood glucose at birth.

Data was collected from the field via the use of information collection form. Data analysis was carried out using statistical software SPSS13. Statistical tests employed in this study included Chi-square and Fisher's t-test and the level of statistical significance was set at  $P < 0.05$ .

## RESULTS

The results of this study revealed that, 16.7% of neonates had low blood sugar. A number of 45.8% of the patients studied were male and 54.2% were female. The percentage of preterm neonates was 2.1% (less than 38 weeks gestation) while 36.5% were delivered by natural method and 63.5 were delivered by Cesarean method.

A percentage of 4.2% had low birth weight (less than 2500 g), 1% were overweight (greater than 4000 g), and others were normal. A percentage of 94.8% of neonates were perfectly healthy while 16.7% of them had low blood sugar. A percentage of 6.7% of mothers had high blood sugar.

There was no relationship between blood sugar of neonates and gender, gestational age, method of birth, birth weight, and neonate health ( $P > 0.05$ ).

The risk of hypoglycemia in neonates of mothers with hyperglycemia was significantly higher ( $P = 0.001$ ).

There was no relationship between blood sugar of neonates with gender.

There was no relationship between blood sugar of neonates with their gestational age

There was no relationship between blood sugar of neonates and their method of birth.

There was no relationship between blood sugar of neonates and their birth weight.

There was no relationship between blood sugar of neonates with their health.

The risk of hypoglycemia in neonates of mothers who had hyperglycemia was significantly higher ( $P = 0.001$ ).

## DISCUSSION

Diagnosis and prompt treatment of low blood sugar during the neonatal period is necessary and therefore, its prevention requires cross-sectional studies so as to determine the causes and plan to prevent these complications. In this study, the causes of low blood sugar in neonates who were delivered in Boali Hospital, Tehran from March 2014 to March 2016 was examined and the results of this study revealed that 16.7% of neonates had low blood sugar and the only factor affecting neonatal low blood sugar was high blood sugar levels in their mothers.

In a study carried out by Nejati et al in Iran, 14,168 neonates were examined and it was discovered that 0.4% of them had hypoglycemia and were associated with factors such as; maternal diabetes, sepsis, asphyxia, and preterm birth (7). In our study, only the mother's high blood sugar was linked to neonatal hypoglycemia.

Depuy et al in a study in the United States of America where 348 neonates were evaluated, found that 24.7 in 1000 birth had hypoglycemia that was associated with

lower gestational age (8). In this study, the prevalence was higher and there was no relationship with age and pregnancy. In a study carried out by Cole et al in the United States of America, it was found that among 60 neonates, 43% delivered by Caesarean method and 37% delivered through natural method, were suffering from hypoglycemia (10). Similarly, it was revealed in our study that the method of delivery was not associated with incidence of hypoglycemia.

## CONCLUSION

Overall, based on the results of this study, it can be concluded that, about one of every six neonates were deficient in blood sugar. Nevertheless, it is recommended that further studies should be carried out to substantiate these findings obtained in this study with larger sample sizes as well as multi-center and other hospitals.

## REFERENCES

Straussman S, Levitsky LL. Neonatal hypoglycemia. *Curr Opin Endocrinol Diabetes Obes.* 2014 Feb; 17(1):20-4

Jain A, Aggarwal R, Jeevasanker M, Agarwal R. Hypoglycemia in the newborn. *Indian J Pediatr.* 2013Jan; 75(1):63-7

Alkalay AL, Flores-Sarnat L. Plasma glucose concentrations in profound neonatal hypoglycemia. *Clin Pediatr(Phila).* 2012 Jul;45(6):550-8

Burns CM, Rutherford MA. Patterns of cerebral injury and neurodevelopmental outcomes after symptomatic neonatal hypoglycemia. *Pediatrics.* 2012Jul; 122(1):65-74.

Marles SL, Casiro OG. Persistent neonatal hypoglycemia: Diagnosis and management. *Paediatr Child Health.* 1998 Jan; 3(1):16-9.

Harris DL, Weston PJ. Incidence of neonatal hypoglycemia in babies identified as at risk. *J Pediatr.* 2015 Nov; 161(5):787-91.

Najati N, Saboktakin L. Prevalence and underlying etiologies of neonatal hypoglycemia. *Pak J Biol Sci.* 2016 Aug1; 13(15):753-6

DePuy AM, Coassolo KM. Neonatal hypoglycemia in term, nondiabetic pregnancies. *Am J Obstet Gynecol.* 2015 May; 200(5): e45-51.

Pal DK, Manandhar DS. Neonatal hypoglycemia in Nepal. 2015 Jan; 82(1):F46-51.

Cole MD, Peevy K. Hypoglycemia in normal neonates appropriate for gestational age. *J Perinatol.* 2013Mar-Apr; 14(2):118-20.

## The response of the spring barley genotypes to drought stress during vegetative and reproductive phases

Parastou Ghashemi\*, Ahmad Rezbane Haghigi and Ali Hossein Babaiy

*Department of Agricultural Management, Tabriz Branch, Islamic Azad University, Tabriz, Iran*

### ABSTRACT

Iran is located in dried and semi-arid region in the world and water deficiency is one of the most important factors reducing the plants and crops yield. Thus, introducing genotypes tolerating drought is one of the major improvement goals in recent years. Accordingly, this article aims at investigating the impact of water shortage in the vegetative and reproductive phases in the 15 barely genotypes. The results showed that water deficiency in the vegetative and reproductive phases reduced the studied genotypes seed yield in the barely significantly. Biologic performance reduced significantly in the vegetative phase under water deficiency, however, it did not have a significant effect on the number of the seeds per ear as the main elements of the barely seeds yield. Among the studied genotypes, R2 N11, 5R2N, 8R4N, 15R4N, R4N13 genotypes have had the highest seed yield. R4N13 had the highest number of seed per ear and R2N5 had highest biologic function.

**KEY WORDS:** DROUGHT, BARELY, GENOTYPE, YIELD

### INTRODUCTION

Grains are important plants in the world and generally, they provide more than third from fourth energy and half of proteins needed for humans (Emam, 2004). In addition, grains are reliable nutritional resources in terms of compatibility with different environmental conditions (Fathbegeri et al., 2005). Barely is one of the plants of Gramineous family, *Hordium specie*, vulgar or *Satium* genus and plays an important role in providing animals and poultries nutrition (Badraquejad, 2008. Due

to resistance to drought, barely can produce high yield in areas which water limits production of grains. Water is determinant ecologic factors in growth and expansion of grains. Water stress reduces grains yield significantly (Jalil et al., 2007). Nowadays, water deficient is limiting factor of production of grains in the arid and semi-arid areas (Rodriquez, 2007). Locating of Iran in the arid and semi-arid region and existence of various climates have caused the agriculture to encounter with problems, particularly in rained areas. Since increase of production is possible with increase of under planting areas

#### ARTICLE INFORMATION:

\*Corresponding Author: [Msc.p.ghasemi@gmail.com](mailto:Msc.p.ghasemi@gmail.com)

Received 30<sup>th</sup> April, 2017

Accepted after revision 1<sup>st</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal  
NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

and enhancement of yield, due to limitation in increase of under planting areas, there is no solution except enhancement of yield in order to increase products.

The research shows that the barely yield is reduced in long-term drought stress (Zewski et al., 2009). Also the products yield under rained condition is 42% of water condition and it depicts the importance of paying attention to effective factors. They also concluded that all the studied genotypes under drought stress which their characteristics were measured suffered from relative loss. Drought stress reduces the barely germination traits significantly with reduction of water potential and there is a positive and significant correlation between GSI and germination percentage (Hagparast et al., 2010).

Research shows that drought stress decreases the number of seeds per ear and the number of fertile earing per plant (Fateh, 2010). Also response to stress in wheat and barley is accompanied by reduction of the number of seeds and in corn it is accompanied by reduction of the seed size (Martin et al., 1993). Richards and his colleagues (2001) reported that wet stress after germination reduces the speed of filling of the seeds and as a result decrease the weight of one-hundred seeds. Other studies showed that under the drought stress, filling of the seed lasts shorter than desired irrigation condition and as a result drought stress damages the seed yield without considering the stress level (Samareh et al., 2005). After flowering phase drought stress decreases the number and size of the seed and as result reduces yield (Lawlor et al., 2005).

Katriji and his colleagues (2009) showed that drought stress reduces the seeds about 37% and dry matter 18%. In other research it was concluded that stress in the filling of seed has had a significant impact on all yield traits and yield components except the ears weight and decreased the seed yield considerably (Babaeyan et al., 2009). A research on the barley genotypes showed average reduction of yield under drought stress about 5.25% (Vaezi et al., 2010). Drought stress decreases the leaf area, stem length, dry and fresh weight, humidity ratio and relative growth speed in barely (Anjum et al., 2003). The results of a research revealed that the number of days till harvest, stem length, peduncle length, and number of leaf, seed yield, one-hundred seeds and harvest index were reduced under drought stress (Gandha et al., 2005). Also biologic function with reduction of weight of one hundred seeds, number of earing, number of seed are reduced under drought stress (Samareh et al., 2007).

Husseinpour and his colleagues (2008) depicted that increase of stress reduces water relative content mean. In a research the barley genotypes showed a significant difference in all studied traits and the impact of complementary irrigation was significant except the peduncle length, on the other hand, the reciprocal effects of

genotypes in the environment was not significant for all traits except biologic function (Ebrahimi et al., 2009).

## MATERIALS AND METHODS

In this research the reaction of 15 genotypes of spring barely under drought stress in the vegetative and reproductive phases were studied. This research was carried out in the split-plot experimental design based on completely random block with three replications and the stress levels were considered as main factor in the vegetative and reproductive phases and genotype was considered as the secondary factor. Each experimental units included three rows with distance of 15 cm from each other and in length of 3 meter and planting distance of 2 cm in any row and the distance between plots was determined 5 m and the distance between each replication was considered 1m.

The mentioned plot was prepared according to the planting map and after preparation and cleaning in 91/2/10, the seeds were planted manually according to the planting map on the rows. The mentioned planting map was prepared according to the statistical application of MSTATC and the plot was planted randomly with stress and control level. It should be pointed that application of stress in two levels, one before greening until growth of ears and the other after growth of ears was done as interruption of irrigation and in the control treatment, irrigation was done based on the plant need under regional conditions. Other harvesting phase such as preventing growth of weeds and fertilizing were done as the same according to the experimental units. Also in the phase with several leaves by observing margin, ten specimens of each experimental units were chosen randomly and marked with plastic rings. Total plot was used for measuring some traits of these samples and yield. In the ripening phase, the cultivars were harvested separately and trashing the seed yield in unit area, one-hundred seeds weight and the number of seeds in each ear.

## RESULTS AND DISCUSSION

### THE STUDIED TRAITS ANALYSIS OF VARIANCE

The studied traits analysis of variance showed that water stress level was significant in terms of harvest index in probably level of 1 percent and for one-hundred seeds and seed yield in unit area in probably level of 5 percent. Also there was a significant different in genotypes in terms of number of seed in ear and seed yield in probably level of one percent. The reciprocal effects of stress and genotypes in terms of the leaf area in probably level of one percent and in one-hundred seed weight in probably

Table 1. the studied traits mean square in barley genotypes under drought stress according to spilt plots

Mean squares				
Variation	fd	Number of seed in each ear	Biologic function	Seed yield in unit area
Replication	2	80/282**	1/281**	180757/92**
Stress	2	10/653ns	2/324	78110/19*
Error 1	4	11/201**	0/194	5605/69
Genotype	14	12/01ns	0/182**	12189/09**
Stress. Genotype	28	2/655ns	0/083ns	5752/21ns
Error 2	84	3/607	0/065	5283/93
%CV	-	12/151	12/164	24/602

Table 2. mean comparison of the studied traits under stress and control

Stress level	Seed number in ear	Biologic function	Seed yield in unit area
Control	16/01	2/19	337/35
vegetative phase stress	15/78	1/85	295
Reproductive phase stress	15/08	2/28	254/03
LSD%	1/959	0/258	43/824

level of five percent were significant which depicts dissimilar reaction of genotypes to stress level in terms of the mentioned traits. Niستاني and his colleagues (2005) reported that there was a significant difference among barley cultivars in terms of number of ears in unit area, bush length, number of seeds in ear, one-hundred seeds weight and seed yield.

## NUMBER OF SEED IN EAR

Mean comparison of number of seeds per ear (table 3) showed that the highest number of seeds in each ear in genotype R4N13 was 17.27 and the lowest in genotype R1N9 was 13.57. Thus there was a difference in number of seeds in ear 3.7. After genotype R1N9, the geno-

Table 3. mean comparison of the studied traits in barley genotype

Genotype	Seed number in ear	Biologic function (g)	Seed yield in unit area (g/m <sup>2</sup> )
5R2N	15/957	2/332	331/71
11R2N	17/072	2/187	355/48
10R2N	15/57	2/211	319/11
7R4N	14/326	1/916	233/74
9R1N	13/578	2/038	272/94
2R2N	14/96	1/785	233/07
8R4N	13/606	2/3	331/12
16R4N	16/324	2/111	272/79
20R1N	16/043	2/106	313/48
14R4N	16/491	1/982	287/23
15R4N	16/764	2/108	326/84
19R4N	14/891	2/088	290/78
12R2N	15/876	2/072	257/21
17R3N	15/713	2/234	283/28
13R4N	17/287	2/141	320/1
LSD%	1/78	0/24	68/14

types R2N11, 15R4N, 14R4N, 16R4N and R1N20 have had highest number of seeds in each ear. Darikvand and his colleagues (2012) reported that there was a significant difference in barley genotypes in number of seed in ear. Balochi and his colleagues (2005) reported similar results and showed that there was a significant difference in number of seeds in ear. Zare and his colleagues (2011) reported that different barely cultivars have different number of seeds in ear.

## BIOLOGICAL FUNCTIONS

According to the results of mean comparison of the studied traits under different irrigation levels, stress in vegetative growth reduced biologic function significantly in barley, but stress in reproductive phase did not have a significant effect on this trait. Stress in vegetative phase reduced barely biomass about 15.5% (table 2). Mean comparison of biologic function in the studied genotypes (table 3) showed that the genotype 5R2N with 2.33 gram had highest and genotype 2R2N with 1.78 gram has lowest biomass. After genotype 5R2N, the genotypes 17R2N, 10R2N, 11R2N, 16 R2 N, 13R4N, 20 R1N and 15R4N had highest biologic function. Zare and his colleagues (2011) suggested that there was a significant difference among barely genotypes in biologic function. Derikvand and his colleagues (2011) reported similar results in examining 15 barley genotypes.

## SEED YIELD IN UNIT AREA

Mean comparison of seed yield in unit area for irrigation levels (table 20) showed that water stress reduces seed yield in unit area. Water stress decreased seed yield in unit area in vegetative and reproductive phases relative to complete irrigation about 13% and 25% (table 2). Drought has a negative impact on nitrogen level available to plant. This element plays an important role in determining the number of seeds and their weight (Banziner et al., 2002). Some researchers suggested that growth, assimilation and transfer are affected by nitrogen. Thus, drought prevents more assimilates and increase of yield by reduction of its absorption (Lodeiro et al., 2000).

According to results of mean comparison the seed yield in the studied genotypes (table 3) the highest seed yield in unit area was 355 gram obtained in genotype R2N11 which was higher relative to minimum seed yield observed in genotype R2N2 gram as 34.9%. After genotype 11R2N, genotypes R2N5, 13R4N, 10R2N and R1N20 had the highest seed yield in unit area (table 3). Some researchers reported that the morphologic, physiologic features and production power change according to the environment among the different cultivars. This information is useful in terms of yield and flexibility (Passioura, 2007).

## CONCLUSION

The results showed that water stress in vegetative phase reduced biologic function traits and seed yield and water stress in reproductive phase decreased seed yield significantly. The highest seed yield in genotypes R2N11 was 355 gram in g/m<sup>2</sup>. In this genotype, there was high harvest index. The highest biologic function was allocated to genotype R2N5 and highest one-hundred weight was obtained in R4N8. Also genotype R4RN13 produced highest number of seeds in ear. In cluster analysis, the barley studied genotypes were grouped in three classes. Group one included genotypes of R3N7, 9 R1N, 2R2N, 16R4N, 19R4N, 12R2N and R3N17. Group two consisted of R1N20, 14R4N, 15R4N and R4N13 and group three included R2N5, 11R2N, 10R2N and R4N8 which group three was superior in terms of yield and yield components.

## REFERENCES

- Babaeyan, M., Esmacili, A., Ganbari, A., Ahmadiyan. 2009. Examining the drought stress of end of growth season and animal and chemical fertilizers ratios on the yield and yield components of barley in Sistan. *Journal of Iranian Agriculture Research*, Vo. 6, pp. 46-54.
- Badraquejad, J. 2008. Examining the impact of drought stress on barley morphologic features. *Journal of Research and development*, no. 75, pp. 110-113.
- Ebrahimi, Z, A, Granchiyan, M, Tavaklu, Nistani, 2009. Evaluation of drought stress on cultivar and morphological traits of 12 barley genotypes in Sisab climate. *Journal of Iranian Science and Agriculture*, Vo. 40, pp. 50-57
- Emam, E. 2004. *Grains planting*, Shiraz University Press, 2<sup>nd</sup> edition, pp. 1-250.
- Fathbaheri, S., Javanshir, A., Kazemi, S., Aharizad, S. (2005). The impacts of irrigation in different philological phases on some spring barely traits. *Journal of Iranian Agriculture*, Vo. 36, pp. 167-176.
- Gandha, M., Taghavi, A. Karami. 2005. Evaluation of drought resistance in barley, *Journal of Iranian Agriculture*, Vo. 36, pp. 540-560.
- Gandha, M., Golpavar, Ahmadi, A., Zali, A. Majidi, Hervan, A. Gasemi (2006). Factor analysis of morphologic and morpho-physiologic traits in bread wheat genotypes under drought stress. *Quarterly of Research and Development*, Vo. 9, pp. 52-59.
- Neistani, A. E. Mahmoodi, R. Fatemehnia. 2005. Cause analysis of heredity of yield and yield components in different barely cultivars, *Journal of Agriculture*, V. 7, pp. 55-66.
- Sabagpour, S. H. 2006. Indices and mechanisms of resistance to drought stress in plants. *Committee of Drought*, Deputy of Ministry of Agriculture, pp. 11-14.
- Vaezhi, B., A. AhmadiKhah. 2010. Examining the resistance of 12 modified genotypes of barely against stress in arid and dry climate, *Plant Research*, pp. 23-44.

## Concept of Self-knowledge as the Basis for Lifestyle

Mohammad Reza Shamshiri

Isfahan (Khorasgan) Branch, Islamic Azad University, Isfahan, Iran

### ABSTRACT

In the *Holy Quran*, a human being is considered to have a distinct creation and essence and is therefore different from other creatures. Such a difference encompasses the shared goals, needs, abilities and psychological characteristics of all human beings and is assumed to prepare the ground for maturity and development. The realization of these depends on the degree of one's knowledge about him/her self. If self-knowledge is not achieved in a comprehensive manner, the realization of educational goals and reaching perfection will not be possible; any psychological theory will fail by ignoring this. This essay explores the meaning of the human in Islam and *Quran* and compares it with the views of two humanist psychologists, namely, Abraham Maslow and Carl Rogers, about the self and self-knowledge. For humanist psychologists, self-realization and perfection are one of the most important goals of human life. The Islamic religion considers perfection (*kamal*) and closeness to God (*ghorbe ela Allah*) as the goal of life. In humanist perspective, perfection is realizable in the material and empirical world and in relation to the human beings themselves. However, perfection in Islam goes beyond the limits of the material world. This can be put down to the difference in the meaning of the "real self". Although both humanism and Islam emphasize the realization of the real self, in humanist perspective the "real self" means the human and empirical self while in Islam the real self means the "divine self".

**KEY WORDS:** SELF, SELF-KNOWLEDGE, ISLAM, HUMANISM, REAL SELF

### INTRODUCTION

From a Quranic perspective, the human beings possess certain capabilities which help them in the process of knowledge and learning. One can study the human psyche and the possible weaknesses in one's personality on the basis of these capabilities. Self-knowledge can help us in fostering these capabilities and preventing psy-

chological disturbances. Moreover, self-knowledge can guide us in choosing our life goals and establishing true relationships and thus can lead us to change and perfection. In *Quran*, the "self" is an essential phenomenon, i.e. the capabilities and potentialities, emotional, cognitive, personal, social and even ethical characteristics of human beings are inherently given to them at the moment of their creation. Therefore, being aware of

#### ARTICLE INFORMATION:

\*Corresponding Author: [mo\\_shamshiri@yahoo.com](mailto:mo_shamshiri@yahoo.com)

Received 29<sup>th</sup> April, 2017

Accepted after revision 10<sup>th</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal  
NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

these talents and potentialities and fostering them play a pivotal role in improving the state of the “self”. Contemporary psychology, especially humanist psychology, has emphasized the concept of the self. This essay studies the views of Maslow and Rogers and tries to find the differences between the two approaches to the “self”.

## THE ESSENCE OF HUMAN BEINGS IN ISLAM

In Islamic perspective, a human being has two dimensions: the material and physical dimension which is signified by the fact of being created by dark and foul-smelling clay, and the spiritual and non-material dimension which is referred to as the “soul” (*rooh*) or “spirit” (*nafs*). Because of its divine and heavenly origin, the soul is the true dimension of being human. According to this view, the human being faces the earth on one hand and the heaven on the other (Nasri, 1982). The two categories of “soul” and “essence” can be used to describe the dimensions of being human:

### The soul

The human soul has a set of divine and temporal characteristics. It can be argued that in terms of its passivity and acceptance, the soul is infinite. If it is guided on the true path and directed toward perfection it will be embellished with good and admirable characteristics and virtues; if on the other hand it digresses from the true path it will acquire vile characteristics and moral vices. Thus, the human soul has two infinite dimensions: the dimension of perfection and the dimension of decay (Mohammadi Gilani, 1999, p. 128). In light of a Quranic perspective on self-knowledge, the soul has four dimensions:

### The evil-biding soul

This dimension of the soul constantly bids the human beings to do evil (*nafse amareh*) and to seek sensual and animal desires. In *Quran*, this soul is referred to as the “evil-biding” soul, i.e. that which constantly orders one to do evil (Elhami, 1998, p. 26). “Yet I claim not that my soul was innocent – surely the soul of man incites to evil” (Yusuf: 53).

### The reproachful-soul

“No! I swear by the reproachful soul [*nafse lavameh*]” (Ghiamat: 2). An aspect of the soul which reproaches, warns, deters and helps to return, i.e. if the sensual desires of a human being dominates, this aspect of the soul enables the human being to repent and return to a state of balance (Shamshiri, 2006, p. 269).

“And inspired it to lewdness and god-fearing” (Shams: 8). The reason why the word “inspired” (*molhameh*) is used is because God has inspired the good and the evil to

this dimension of the soul as in a way that it recognizes and knows the virtues from the vices without learning or additional knowledge (Mazaheri, 1996, p. 146).

### The peaceful-soul

“O soul at peace [*nafse motmaeneh*]! Return unto thy Lord, well-pleased, well-pleasing” (Fajr: 27-28). The highest order of the soul is that in which the soul is connected to God and through this connection and closeness a complete form of peace and certitude is achieved. There is no uncertainty in this dimension of the soul (Elhami, 1998, p. 27).

### The essence

Essence is a set of spiritual and non-material talents and inclinations that God has given to the human beings in order to fulfill the process of gradual guidance. If the favorable environment is provided they will lead a person to maturity and perfection. According to the Quranic insights, the special human capabilities and talents distinguish him/her from other creatures and also guide him/her toward spiritual sublimity. These talents and capabilities are manifestations of human superiority and dignity and which give succor in reaching the desired perfection, i.e. closeness to God (Nasri, 1982, p. 83).

## THE PSYCHOLOGICAL TALENTS AND TRAITS OF HUMAN BEINGS

In the Quranic worldview, some abilities and characteristics are delineated for human beings which are rarely mentioned by any psychologist (Faqihi, 2011). The following includes some of these:

### The ability to know oneself

“But man is a telling witness against himself” (Ghiamat: 14). Witnessing (*basirat*) refers to a truthful insight. This line signifies that a human being has talents and abilities which directly or joined by the guidance of holy prophets leads one to self-knowledge. Such knowledge/*basirat* is a truthful inward insight and a spiritual perception. This shows that a human being has a comprehensive awareness and knowledge about him/herself (Tabatabaee, 2015, p. 192).

### The ability to know virtue from vice

It is clearly states in *Quran* that the ability to know the good from the bad has been given to the human beings. “And inspired it (being conscious of) what is wrong for it and what is right for it” (Shams: 8).

### The ability for unlimited learning

A human being is able to learn something he/she did not know previously and to thus compensate for the possible

lack of knowing. The domain of human knowledge is not limited. Rather, a human being is able to constantly make up for the lack of knowledge and solve the problems that he/she encounters. As it is stated in *Quran*, “Teacheth man that which he knew not” (Alaq: 5). For some interpreters, the word “teach” refers to the preparation of human soul for learning and absorbing the true meanings (Raqeb Esfahani, 1963, p. 343).

#### The ability to describe

God has prepared the physical and psychological prerequisites for expression (i.e. speech) and has given the human beings the ability to describe the phenomenon they observe, what they think and what they feel. “He hath taught him utterance” (al-Rahman: 4). The ability to describe includes also the ability for reading, writing, understanding and teaching (Raqeb Esfahani, p. 69).

#### The ability to think

In the *Quran*, a human being is described as thinking and knowledgeable. The domain of thinking encompasses all the world. Those who use their thinking ability are called the prime wise (*ula al-albab*), “They think about the creation of heavens and the earth” (al-Emran: 191).

#### Having dignity

In *Quran*, two kinds of dignity are attributed to human beings:

1. Gradual dignity which shows the gradual superiority of human beings over other creatures: “Verily we have honored the children of Adam. We carry them on the land and on the sea, and have made provision of good things for them, and preferred them above many of those whom We created with a marked preferment” (Asra: 70). The focal point in such forms of dignity is the permission to make use of what is in the world, including the heavens and the earth. According to many sections in *Quran* (Nahl: 14, Loqman: 20, al-Rahman: 10) whatever exists in heavens and on earth belongs to human beings and should come under the subservience of human beings.
2. Another form of dignity refers to values and hierarchy in one’s status. Increasing knowledge, improving faith, virtues and the cultivation of good deeds can guide a person to salvation and closeness to God: “Lo! The noblest of you, in the sight of Allah, is the best in conduct” (al-Hojorat: 13).

#### Being eternal

A human being is eternal. This ability manifests itself in the inherent desire of everyone to live eternally, i.e. no one wants his/her life to have an end. This has been

emphasized in *Quran* by reminding everyone that they will have an eternal life after death. Many verses refer to the fulfillment of this divine promise and the eternity of the soul in heaven including, “and He hath made ready for them underneath which rivers flow, wherein they will abide forever” (Tobeh: 100), “Know they not that whoso opposeth Allah and His messenger, his verily is fore of hell to abide therein. That is the extreme abasement” (Tobeh: 63).

#### The ability to choose

In the Quranic worldview, a human being is free and has the will to choose freely. Paying attention to this characteristic makes a person to strongly feel that he/she is active and free in determining his/her path in life, that is, act according to his/her own desires and decisions. Thus, people are fundamentally different from one another, as it is stated in *Quran*, “Thou human beings choose either the world or the life after death on your own accord” (al-Emran: 52).

#### Closeness to God

Human beings are inherently inclined to know God and are naturally drawn to Him (Ghoreishi, 1993, p. 195). As stated in *Quran*, “So set thy purpose for religion as a man by nature upright – follow the God’s image created unto the man” (Rome: 30).

A human being can connect to God in many ways including through the prophets and Godly people (Aaraf: 35), prayers and trust in His power, forgiveness and magnanimity (Baqareh: 186), emotional connection and friendship, spiritual and closeness on the basis of love and confidence (Maedeh: 54), acquiring the divine characteristics (existential and perfectionist connection) and moving on the path of human perfection, observing the rites and devotional prayers such as sacrificing, praying, attending Hajj (Baqareh: 21), kindness and help toward other people and any other good thing which would satisfy God (Maedeh: 13).

#### The ability to interact with other people

Any person is naturally inclined to interact with other people and act on the basis of love, goodness, justice and cooperation. As stated in *Quran*, “Cooperate with each other on the basis of kindness and justice not on enmity and hostility” (Maedeh: 92). One is expected to show cooperation, fraternity and kindness to his/her fellow believer. “Surely the believers are brothers” (al-Hojorat: 10) and “be kind among yourselves” (Fath: 29).

## THE AIMS OF SELF-KNOWLEDGE IN ISLAM

Self-knowledge regulates the four dimensions of the relationship of a human being with God, world, other

people and him/herself. The following presents and analysis of each of these dimensions (Riazi & Shamshiri, 2013).

#### **The relationship with God**

The educational aims resulting from the concept of self-knowledge in terms of the relationship between human and God signifies the existence of different kinds of abstract and practical relationship between human and God. The ties between a human being and God emerges out of knowledge and awareness and becomes expanded through practical orientations such as trusting God or praying. The result of this relationship can be summarized in terms of faith in God, divine piety, obedience and sense of peace, sense of duty and giving thanks to God (Arafi *et al.*, 2002).

#### **The relationship with the world**

In Islamic worldview, the world and the existing phenomenon are manifestations of the names and characteristics of God. By reflecting upon these a human being can reach self-knowledge and knowledge of god. Needless to say, to achieve these goal a human being makes use of his/her innate talents and abilities and comes to exploit the world and its creatures for his/her own needs. With the abilities and potentials that have been given to human beings by God he/she can understand his/her relationship with the world, the relationship between the existing phenomena and discover the rules and natural conditions in order to make use of them in various aspects of human life (Kalyani, 2001, p. 98).

#### **The relationship with one's own self**

A comprehensive form of self-knowledge and awareness of one's abilities and positive and negative characteristics makes a person move on the path of purification of the soul and building a better self. This also helps the person overcome the challenges and obstacles on his/her evolutionary (perfectionist) journey, materialize his/her talents and guide his/her ethics and spirituality toward sublimity.

#### **The relationship between a person and other people**

The relationship between a person and other people makes the former committed and obligated to such values as justice, mercy, equality, fraternity, forgiveness and sacrifice. This in turn can improve social status and the relationship among the people. Duties and acts of worship such as charity, cooperation, preaching the good and prohibiting the bad are all pragmatic manifestations of this aspect of self-knowledge (Riazi & Shamshiri, 2013).

## **HUMANIST PSYCHOLOGY**

In the nineteenth century, two schools of thought, namely, existentialism and phenomenology, emerged with an emphasis on humanist values. These two schools of thought prepared the ground for changes in other disciplines including psychology. The efforts of phenomenologists and existentialists led to the rise of humanism in America and a third force against the influential schools of behaviorism and psychoanalysis. The bottom line of these views was the significance of human as an individual. That individual is defined as to have certain personal problems and challenges whose experience and performance are confirmed as a whole and thus should become the focal point of psychology (Kabiri, 2004). Humanist psychology look at the human from a refreshed perspective. The human in this view is different from the human described in behaviorism and psychoanalysis – traditional forms of psychology. Psychoanalysis and behaviorism have not addressed such matters as the potential talents of human beings and their desire to improve. In fact, these approaches paint a pessimistic picture of human beings. Behaviorist consider a human being as responsive to external stimuli while psychoanalysis see him/her as the play toy of biological and childhood forces. However, for perfection psychologists a human being is much more than these descriptions. The perfection psychologists do not deny the influence of external stimuli, instincts and internal conflicts on personality, but add that a human being is not a mere passive entity in the face of these forces. They believe that we need to grow and become mature and thus move beyond the limits of potentially deterrent forces (Schultz, 2003, p. 6-7).

## **THE CONCEPT OF SELF IN MASLOW AND ROGERS' VIEW**

Maslow has referred to the “self” as the essential core or inner nature. In his view, all human beings have this essential quality. This inner core is semi-instinctive and manifests itself in terms of inherent inclinations and internal desires. He believes that although the inner core is semi-instinctive it does not bear that much similarity to the instincts lower-rank animals. It does not clearly or explicitly say to a human being how to act; rather, it is a weak, delicate and subtle form of essence which is easily influenced by learning, cultural expectation, fear etc. and may be suppressed or forgotten. It grows and flourishes only in a culture which affirms the essence of the human (Maslow, 1992, p. 209).

In Rogers' psychology, the concept of the “self” is so much so important that his theory has come to be known as the “theory of the self”. In his writings, Carl Rogers

has noted that one's attitude toward him/herself is the most important factor in behavior prediction because the realistic understanding of the external realities and the situation in which a person is function in parallel to each other. The self is the result of rapid growth of certain aspects of a person's experience (D. Nye, 2002, p. 143). In infancy, a child separates an aspect of an experience from its other aspects. This aspect is its "self" which manifests itself with the growing use of phrases like "to me" and "for me". In this age, the infant acquires the ability to identify what belongs to him/her or what is part of him from other things that he/she sees, hears, touches and smells and thus gains an image of him/herself (Schultz, 2003, p. 44).

In Rogers' view, the human beings have the potentiality to become aware of all of their experiences. However, achieving this awareness/consciousness requires being open and sensitive to these experiences. This may or may not be encouraged by the important people in a child's life, i.e. parents and close friends during the period of maturity. If these important people accept all of the person's experiences the self-image of the person will be highly enriched and therefore will not be shaped according to the criteria of others (D. Nye, 2002, p. 143).

From Rogers' perspective, there are two kinds of "self": social self and real self. His phenomenological view signifies that internal conception and inward experiences of a person constitutes his/her existential reality (Rogers, 2011, p. 141). For Rogers, the inner deep voices of a person's existence constitutes his/her real self (ibid, p. 213). Both Rogers and Maslow believe that the inner being of a person is good and pure (similar to the Islamic perspective) and if a society or a social system accepts the self as it is and does not impose anything upon it, the self will grow and flourish. Rogers and Maslow believe in the potential talents of human beings to grow and flourish. In their view, growth and flourishing is a gradual and step-by-step process. Maslow depicts these steps in a pyramid of needs as to note that in every step one of the needs of a human being emerges and having satisfied this need the person moves onto the next step until reaching the highest and last step which is self-flourishing. Similarly, Rogers argues that self-flourishing is a process which is physiologic at first and then becomes oriented toward the psychological aspects as the person grows. In Rogers and Maslow's view, self-knowledge is understanding one's talents and potential abilities as well as inner feelings and voices. They believe that the real self is suppressed by culture, society and social system and fades beyond a veil. Therefore, understanding the real self is difficult and requires courage and assiduity, which can be facilitated by the help of a counselor in an atmosphere of love, affection and trust.

## THE TALENT FOR PERFECTION AND THE REAL SELF

Both Islam and humanist psychology emphasize the dignity and superiority of human beings and consider a high position for them. The humanists assume a human being to be potentially capable to flourish his/her talents. Unlike the preceding schools of thought which had an instrumental view on human beings and deemed a human being as naturally incapable and miserable, the humanists highlighted the significance and potentialities of perfection. The emphasis on the dignity and position of human beings is noticeable in Islam long before the humanist philosophy. In Islam, a human being, as noted by the mystics, is the mirror to the names of almighty God. From the perspective of Islam, the talent for perfection is inherent in human nature and a human being realizes this perfection by passing through different stages. The humanists have not considered the "self" is the ultimate aim, rather, have mentioned the potential talents of human beings which are realized gradually and in a step-by-step manner.

The kind of perfection that is discussed in humanism is achievable in the material-empirical world and in relation to a human him/herself. However, perfection in Islamic psychology goes beyond the limits of material world. This can be put down to the difference in the meaning the "real self" because as mentioned earlier both schools of thought assume that perfection means reaching the "real self". In humanism, the "real self" means the human and empirical self while in Islam, the real self means the "divine self". The empirical self is never denied in Islam, rather, a new meaning is added to it. In other words, Islam addresses deeper layers of the self which has been ignored by the humanists.

## THE REQUIREMENTS FOR SELF-KNOWLEDGE

### Basic needs

Islam has emphasized that human beings are allowed to make use of natural resources in the best way possible (Baqareh: 29, Rome: 21). The humanist consider that satisfying basic and physiologic needs is the prerequisite for realizing the "self". Similarly, Freud considers "id" is the source of energy for "ego" and "superego" (Schultz, 2013, p. 84). For Jung, the existence of the "shadow", which is the source of primary and evil instincts, is necessary for happiness, creativity and excitement. Jung believes that is the shadow is completely suppressed the psyche will be dull (ibid, p. 163).

### Guide and counselor

Both views emphasize the role of a guide and counselor. For Maslow, one of the ways for self-knowledge is

psycho-therapy and counselling. In such a process, the counselor has the role of a facilitator, not a teacher, to help the person to know him/herself and discover his/her deepest values (Maslow, 1995, p. 85). Similarly, Rogers believes that the controlling source is located in the inner being of a person. Counselling and psycho-therapy frees the innate potentialities and talents of a person and develops them (Qazi, 2004, p. 62). The counselor helps the patients to explore his/her own inner being, discover the talents and characteristics of his/her personality and finally gain self-knowledge. As a result of this self-exploration, the patient will have a quite realistic image of him/herself and will adapt his/her expectations with his/her abilities (ibid, pp. 166-167). Similarly, Islam does not consider any community without a guide or prophet (Tobeh: 33, Fatih: 28, Saf: 9, Ra'd: 7, Anbia': 73, Sajdeh: 24).

### Love

Love is another tool for self-knowledge. Both humanism and Islam have discussed the role of love. In humanism, love and affection are important prerequisites for self-flourishing. For Maslow, the satisfaction of this need is as necessary as the satisfaction of other needs. He notes that the stability of a society depends on love and affection. In Maslow's view, the failure in satisfying this need is the main reason for psychological conflicts and disturbances (Maslow, 1988, p. 81). He believes that love not only perceives the potential abilities but also flourishes them. The lack of affection will suppress or even destroy these abilities. Since personality development requires self-confidence and courage the lack of affection by the parents will lead to things such as unconfidence, anxiety and the feeling of worthlessness, which may bring about certain obstacles for development and self-flourishing (Maslow, 1992, p. 118). Maslow discussed two types of love: deficiency love (D-love) and being love (B-love). The need-based or deficiency-based type of love is a selfish preoccupation or an effort to attract the love and affection of others. However, the point is that when the need for this type of love is satisfied we can love others. Maslow calls this latter type of love "being love". Being love or ripe love is possible when the basic needs of a person are completely satisfied and when the person moves on the path of self-sufficiency (Ryckman, 2008, p. 449).

In *Motivation and Personality* (1970), Maslow presents a positive image of love among healthy people. Maslow defines love as passion and affection joined by pleasure, happiness, satisfaction, joy and ecstasy. A healthy love relationship is considered the most effective way for bridging the gap between two separate people (Maslow, 1988, p. 268).

From the perspective of the mystics, love is a burning fire whose domain includes all the world. It is through love that all creatures turn their face, in prayer, toward the eternal beloved. Affection is an essential human characteristic. The seed of love has been planted in hearts since the creation itself; in other words, the soul prior to belonging to the body and preceding other characteristics has been attributed with affection and love (Razi, 1973, p. 44). In Razi's view, love and affection can be fostered; "to make this affection perfect, the soul has been joined by the body" (ibid, p. 43). Similar to Maslow who considers the experience being love as specifically belonging to the healthy and flourishing people, Razi believes that not everyone deserves to reach perfection in love because "the eternal land of love will not be given to any beggar or king!" (ibid, p. 12).

It is clear that both views emphasize the issue of knowledge in love. However, the conception of love in humanism is a kind of earthly and virtual love which is limited to the humans and beauties of the world. The vehicle which takes the eager people to the divine and heavenly realm is true love whose object of affection is absolute perfection and the unique being of God.

### CONCLUSION

The "self" is one of the most important issues in western philosophy and psychology. Several social, cognitive and socio-analytical approaches have been offered so far. Zhel boundeker (1992) notes that "the self is the field of knowledge by which people act in the world and which has been created in response to the question of who I am." He cites Stoller: "the self is a psychological structure which is formed through the experiences of the person, is organized and characterized by them, and continues through them". William James considers "the self as having two basic aspects, i.e. subject-I and object-I. The object-I means a set of physical, social, psychological and spiritual characteristics which a person deems to belong to him/herself. The subject-I which has the role of organizing and interpreting the experiences is rooted in the will, distinction, thought, personal experiences and the continuity of self. For Damon and Hart (1982), self-understanding includes the knowledge of a person about the characteristics, personal abilities and thought. Similar to William James, they believe that the perception of the "self" includes the object-I and the subject-I. They emphasize that the self has a social structure and the perception of the self is a cognitive-social process. According to this view, the abilities are not innate; they are acquired (Damon & Hart, 1982, 1991). On the contrary, in the Quranic perspective, these abilities are innate and natural. Unlike these approaches, the

view offered in *Quran*, has paid attention to the spiritual, relationship to God, virtue and right as aspects of one's natural existence. The structure of the "self" in *Quran*, has been discussed as a set of abilities and psychological traits on one hand, and psychological vulnerability on the other. The knowledge about these is expected to help a person gain self-knowledge (Faqihi, 2011).

Self-knowledge in Islam as well as in psychology is a gradual process. If a person takes the necessary steps successfully and reach the real self, all aspects of the self will be coherent and integrated and thus perfection will be achieved. As the mystics say, such a person will be called a perfect human. In psychology, such a person is called self-flourishing. The basic reason for the difference between these two human beings is clear. The perfect human has achieved its position in relation to a transcendental origin while the self-flourishing human is an independent and unique person who is self-sufficient. From the perspective of Islamic mysticism, a perfect human is not someone who has severed him/herself from the real world. He/she is the intermediary between God and the people, coming back to the people after acquiring God's satisfaction, and does his/her bests to guide and help the people (Nasafi, 2005, p. 107; Motahari, 2013, p. 187).

In the same vein, Maslow has totally ignored the spiritual aspects of human life. For him, the ultimate aim of self-flourishing is values such as goodness, justice and beauty. These values are considered innate by Maslow. The values are rooted in the God-seeking nature of humans. However, the humanists have not noticed the connecting point in this regard. They assume that the reason behind problems like nihilism and alienation is the lack of these values, but have not taken into account the origin of this. On the other hand, the humanists, similar to psychologists and in search for a general theory, have studied the development since one's infancy. Islamic psychology has paid especial attention to the education of a child after three years old until the end of the age of teenager-hood.

It is clear that there are certain similarities and differences between the two approaches concerning an understanding of the human and the meaning of the "self". However, as discussed, the difference between the approaches with regard to the issue of the "real self" is a serious and fundamental difference. On one hand, in the humanist psychology, the ultimate aim of self-knowledge in reaching a human form of knowledge which is successful only in the material life of the human beings. On the other hand, a religious human while rejecting asceticism assumes that the material world is the farm for the life after death. The aim of a healthy life is not just the life in the material world; rather, the horizon is set for heaven and the Godly position of human beings.

Despite the fact that the humanist psychology has many practical aspects with regard to self-knowledge and consequently in education is not able to meet the needs for an Islamic lifestyle on its own. The humanist psychology takes the person through certain stages but does not arrive at the final destination. This necessitates a religious and transcendental perspective. However, it is important to discuss religious approaches with meticulous analysis and attention to details to present an approach which is more practical for the general audience. Accordingly, it is possible to present the similarities and differences between the two approaches in this essay as a new theory or model; a theory and model which is suitable in the context of Islamic thought and which can lead us to a form of local and Islamic psychology.

## REFERENCES

- Holy Quran
- Arafi, Alireza and others (2002). *The aims of education in Islam*. Tehran: SAMT.
- Elhami, Davud (1998). "Self-knowledge in Islam". *Ethics and Mysticism*: 4, pp. 26-33.
- D. Nye, Robert (2002). *Three schools of psychology: Freud, Skinner and Rogers*. Trans. Ahmad Jalali. Tehran: Padrah Publications.
- Rogers, Carl (2011). *On becoming a person*. Trans. Mahin Milani. Tehran: Nashr-e Nou Publications.
- Razi, Najmeddin (1973). *Mersad al-Ebad*. Tehran: Bongah-e Tarjome va Nashr-e Ketab.
- Raqeb Esfahani, Hossein ibn Mohammad (1953). *Almofradat fi Qarib al-Quran*. Edited by Mohammad Seyyed Gilani. Tehran: Almaktabe al-Mortazavieh.
- Ryckman, Richard. M (2008). *Theories of personality*. Trans. Mehrdad Firuzbakht. Tehran: Arasbaran.
- Riazi Haravi, Sheida, Shamshiri, Babak (2013). "A study of the concept of self-knowledge in Islam and the implications for education". *Knowledge*: 22 (191), pp. 45-58.
- Shamshiri, Babak (2006). *Education in mysticism and love*. Tehran: Tahuri.
- Schultz, Duane. P (2003). "The psychology of comparative mysticism". *Research in Religions*: 2c (4).
- Tabatabaee, Seyyed Mohammad Hossein (2015). *Al-mizan fi tafsire al-Quran*. Tehran: Dar al-Ketab al-Eslamee.
- Faqihi, Ali Naqi, Rafiee Moqadam, Fatemeh (2011). "Self-knowledge and it educational implications based on Quran". *Islam and Educational Research*: 3 (1), pp. 5-26.
- Qoreishi, Seyyed Ali Akbar (1993). *Qamoos al-Quran*. Tehran: Dar al-Ketab al-Eslamee.
- Qazi, Qasem (2004). *Theories of counselling and psychotherapy*. Esfahan: Jangal.

## Mohammad Reza Shamshiri

Kalyani, Majed Arsan (2001). *Collection of essays on religious education*. Trans. Shahab al-Din Masheyekhi. Qom: Pazhuheshkadeh Howzeh va Daneshgah.

Maslow, Abraham Harold (1995). *The farther researches of human nature*. Trans. Ahmad Rezvani. Mashhad: Movanate Farhangi Astan-e Qods.

Mohammadi Gilani, Mohammad (1999). *Lessons in Islamic ethics*. Edited by Jafar Saeedi. Tehran: Sayeh.

Mazaheri, Hossein (1990). *Fighting the self*. Qom: Nashr-e Anjoman Eslami Moleman.

Nasafi, Aziz al-Din (2005). *Collection of works on perfect human*. Trans. Seyyed Zia al-Din Dehshiri. Tehran: Tahuri.

Nasri, Abdollah (1982). *The basics of Quranic anthropology*. Tehran: Bonyade Enteqal be Talim va tarbiat.

Damo, W., and Hart, D., The development of self-understanding from infancy through adolescence, child development. 52, pp 864-314, 1982.

Damo, W., and Hart, D., self-understanding in childhood and adolescence, Cambridge studies in social and emotional development, university of Cambridge press, 1991

## A study to assess the effectiveness of training package and group counseling with framework of skilled helper model on social, intellectual and occupational wellness of the students

Mojtaba Tamadoni\*<sup>1</sup>, Masoud Janbozorgi, Ph.D.<sup>2</sup>, Masoud Azarbaijani, Ph.D.<sup>3</sup>, Gholam Ali Afrooz, Ph.D.<sup>4</sup> and Seyed Kazem Rasoulzadeh Tabatabaei, Ph.D.<sup>5</sup>

<sup>1</sup>Researcher, Counseling Department, Imam Reza International University, Mashhad Iran

<sup>2</sup>Associate Professor, Psychology Department of Research Institute Of Howza and University, Qom, Iran

<sup>3</sup>Associate Professor, Psychology Department of Research Institute Of Howza and University, Qom, Iran

<sup>4</sup>Professor of Psychology, University of Tehran, Iran

<sup>5</sup>Associate Professor, Psychology Department of Tarbiat Modares University, Tehran, Iran

### ABSTRACT

Wellness is a concept of optimal health that emphasizes the integration of body, mind, and environment to maximize the function of an individual. Investigations about the ways of improving wellness may serve to enhance currently existing wellness in university. In fact, education and counseling may be an opportunity for students to strive for social, intellectual and occupational wellness. Hence with the purpose of evaluation of the effectiveness of a training package and group counseling with framework of Egan's skilled helper model on promoting Social, intellectual and occupational wellness of students, a sample including 60 students (With an average age 28 and standard deviation 4.7) were selected with convenience sampling method. A case of pre and posttest with the questionnaire of TestWel was implemented for sample groups. The results showed that mean scores of posttest is significant at the level of ( $P=0.001$ ) for Social ( $F=8.52$ ), Environmental ( $F=6.15$ ), Intellectual ( $F=7.25$ ), Occupational wellness ( $F=8.15$ ). Also LSD post hoc test showed that the first experimental group has obtained the significant improvement compared to the second experimental group and the control group in both variables and this hypothesis that execution of consulting and training package with skilled helper model reinforces variables of wellness was confirmed. As an accomplishment from this research, Egan's skilled helper model is an excellent approach for training and promoting wellness in university.

**KEY WORDS:** SOCIAL WELLNESS, ENVIRONMENTAL WELLNESS, INTELLECTUAL WELLNESS, OCCUPATIONAL WELLNESS, SKILLED HELPER MODEL

### ARTICLE INFORMATION:

\*Corresponding Author: [heyda.javadi@gmail.com](mailto:heyda.javadi@gmail.com)

Received 30<sup>th</sup> April, 2017

Accepted after revision 4<sup>th</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

Wellness can first be traced back to Aristotle, who explained the difference between health and illness (Myers & Sweeney, 2005). To fully understand wellness, one must acknowledge the difference between health and wellness. Health is considered a static process and wellness is a dynamic process. Myers, Sweeney, and Witmer (2000) defined wellness from a counseling perspective as

“a way of life oriented toward optimal health and well-being, in which body, mind, and spirit are integrated by the individual to live life more fully within the human and natural community. Ideally, it is the optimum state of health and well-being that each individual is capable of achieving.” In addition, the wellness construct is both an “outcome” and a “process” (Myers & Sweeney 2005), since wellness is a goal to be achieved and also a way in which individuals live life every day. As the dependent variable of research, wellness is a state of being in which one’s potential to live, work and contribute to society is expanded through positive personal choice for optimum and integrated levels of the intellectual, social, emotional, spiritual, occupational and physical dimensions of well-being (Corbin, Lindsey, Welk, & Corbin, 2002; Hettler, 2002).

Moreover, wellness is “a concept of optimal health that emphasizes the integration of body, mind, and environment to maximize the function of an individual” (Anderson, Keith, Novak, & Elliot, 2002). Also, wellness is a condition obtained when a person achieves a level of health that minimizes the chances of becoming ill. Wellness is achieved by a combination of emotional, environmental, mental, physical, social, and spiritual health. (Kent & Oxford University Press, 2006).

Wellness is the optimal state of health of individuals and groups. There are two focal concerns: the realization of the fullest potential of an individual physically, psychologically, socially, spiritually and economically, and the fulfillment of one’s role expectations in the family, community, place of worship, workplace and other settings (Smith, Tang, & Nutbeam, 2006). Social wellness is defined as “the positive movement toward balance and integration of the interaction between the individual, society, and nature; and a person’s social experience and interaction” (Hyde-Smith, 2012).

In a study conducted by LaFountaine, Neisen & Parsons (2006) utilized the Wellness Evaluation of Lifestyle

(WEL) survey, first-year college students scored highest in love and self-worth categories because of the emphasis they place on social connections. LaFountaine et al. suggested “the higher sense of worth rates may be related to the increased love ratings for these students”. As students are building relationships across campus, they are increasing their overall social well-being. LaFountaine et al.’s research is a prime example of how different dimensions of wellness interact with one another. “When students have a high sense of worth, they feel good about themselves, and are more likely to have positive relationships which reflect higher rating in the love dimension” (as cited in LaFountaine et al. 2006).

For the purpose of this study, the love dimension can be directly related to the emotional wellness dimension within Hettler’s wellness model. As students are coming to campuses, they have to build new relationships (Conley, Travers, Bryan, 2013). Research shows this is a hard task for many students resulting in “college students frequently reporting loneliness, homesickness, conflict, and distress in interpersonal relationships” Conley et al. claimed it is not surprising “college students report high levels of stress can leave [them] vulnerable to stress-related mental health problems”.

Renger et al. (2000) and May (2007) defined environmental wellness to include the balance between home and work life, as well as the individual’s relationship with nature and community resources, e.g. involvement in a recycling or community cleanup effort. Ryff & Singer (2006) describe environmental mastery as a dimension of wellness and state that to make the most of our lives and our world we need to advance the science of interpersonal flourishing.

Ansbaugh, Hamrick, Rosato, (2004) and Hales (2005) further impress the need to consider the safety of food and water supply, and freedom from such things as infectious diseases, violence in a society, ultraviolet radiation, air and water pollution, and second hand tobacco smoke.

Initially, intellectual wellness was a clearly defined dimension associated with the degree that one engages in creative and stimulating activities, as well as the use of resources to expand knowledge and focus on the acquisition, development, application, and articulation of critical thinking (Hatfield & Hatfield, 1992). According to Hales (2005) intellectual wellness represents a commitment to life-long learning, an effort to share knowledge with others, and developing skills and abilities to achieve a more satisfying life. More recently the distinction between cognitive (intellectual) and emotional (psychological) processes are considered as closely affecting one another (Myers et al., 2005; Oguz-Duran & Tezer, 2009), and clarification around intellectual wellness is still evolving. Ryff & Singer (2006) state that realizing

one's personal potential involves cognitive processes and comprehension of life's purpose. The perception of being energized by an optimal amount of intellectually stimulating activity which involves critical reasoning is also important (Adams, Bezner, & Steinhardt, 1997).

According to Connolly and Myers (2003), having the ability to make meaning through work is a greater opportunity to experience job satisfaction. This satisfaction has been related to physical, psychological, demographic or situation, and workplace variables (Cranny, Smith, and Stone, 1992). Reaching a high-level of occupational wellness has the potential to increase productivity. Cranny et al. suggest the increase in productivity is a direct result of having a sense of mattering in the workplace. When employees feel they matter, their productivity increases because there is less chance workers will miss work (Connolly & Myers, 2003). Research has also shown "employees are 8 times more likely to be engaged when wellness is a workplace priority and 1.5 times more likely to stay with their organization if wellness is actively promoted" (Mudge-Riley, McCarthy, & Persichetti, 2013). As a result of employee engagement and retention, there are a growing number of employers promoting wellness in the workplace (Tucker, 2010).

Within the dimension of occupational wellness, three components exist: future possibilities, personality as it relates to preferred work environments, and one's personal concept of work (LiPuma, 1993). To be proactive in having healthier employees, employers are beginning wellness initiatives to integrate all aspects of wellness into the workplace (Mattke, Schnyer, & Van Busum, 2012). Initiatives include: incentive-based programs, social media programs, and health plan integration (Mudge-Riley, McCarthy, M., & Persichetti, 2013).

Skilled helper Model (Egan, 2014) has a structured and focused basis on solution in terms of counseling attention approaches. It is a three-stage model that each stage includes certain skills to help move toward a better future and more efficiency.

Theoretically the Skilled Helper approach draws on Carkuff's theory of high-level functioning helpers (which explains that helpers with the skills of empathy, respect, concreteness, congruence, self-disclosure, confrontation and immediacy are most effective); Strong's Social influence theory (which explains that helping is a process whereby clients are influenced by others because they perceive therapists as having particular attributes and with this influence being most powerful when the therapist avoids both laxity and coercion and is instead collaborative, empowering and democratic) and Albert Bandura's Learning theory (in which clients are seen as acquiring skills through coming to understand the processes of learning and developing appropriate self-

efficacy expectations - expecting to achieve their goals by learning useful behaviors) (Nelson, 2007).

The goal of skilled helper model is help to clients for transition of skills and enough awareness of solving current and future problems. Helper makes a treating union based on a warm and accepting relationship with collaboration to facilitate transition of client. A skilled helper helps the client to accept the responsibility of changing to a more effective person in life and develop his inner resources by helps him to formation of action plan (Nelson, 2007). Also the skilled helper as a facilitator helps client to achieve new skills and awareness for new situations he plans realistic and appropriate goals (which is counterpart with solving problem skills of that) for clients, encourages them to become autonomous and transition of solving problem skills; helps them to develop their inner abilities and utilize outer resources and group support, helps them to identify their poetical abilities and as a facilitator stimulates them to develop goals which are certain, Measurable, attainable, realistic, ethical, reasonable and rational. In addition the skilled helper is sensitive and aware to nonverbal communications of clients in all conditions (Egan, 2013).

Egan's skilled helper approach encourages clients to accept active commentator role of the world, give meaning to actions, events and situations, encountering and overcoming the challenges, explore difficult problems, searching for opportunities and writing goals. Simply success usually is the result of person's effort through positive activities transition of problem solving strategies (Nelson, 2007).

## METHODOLOGY

The plan of this research is type of semi-experimental research plans with two experimental groups and a control group. 60 volunteers of participant in counseling and training classes were divided into three groups and they were placed in three situations randomly. The first group participated in counseling and training class with the framework of the skilled helper model. This group experienced all decuple steps of the skilled helper model to improve wellness.

The second group was placed with random replacement in a situation that just received information about wellness without framework of skilled helper model and usual methods were used to provide information like speech. The third group was considered as the control group and didn't receive any informational and training framework about wellness. Training the wellness was in six weeks and included an introduction class for the skilled helper model and execution of TestWel questionnaire (National Institute of Wellness, 2004) in the first

Table 1. Demographic features of the sample group in the second level of evaluation of effectiveness

Variable	Experimental group 1		Experimental group 2		control group	
	n	%	n	%	n	%
Sex						
Female	13	0.65	11	0.55	14	0.70
Male	7	0.35	9	0.45	6	0.30
	20		20		20	100

week and execution of steps and stages of the skilled helper model from the second week. Students group under training and consultation followed and planned the ideas and discussions about improvement of wellness.

The five subscales of the TestWel questionnaire the version of the National Wellness Institute (2004) was chosen for pretest and posttest survey as the main tool to measure students' wellness. The first part of the questionnaire includes information on the participants' demographic features such as age, sex, marital status, training level and occupational status. The subscales of TestWel questionnaire have 44 items and it has been chosen because of alignment with the curriculum and the availability. This tool is executed to measure the 5 domains wellness.

Some of estimations has been executed on the reliability of the questionnaire especially in America (Owen, 1999; Palombi, 1992).Goss (2011) with factor analysis, and has identified its components. According to the research and theoretical analysis on last survey-based validity and reliability had been acceptable (Goss, 2011). Alpha coefficient of whole scale in evaluating the Goss (2011) had been 0.93 and Palombi (1992), only in eight cases of twelve subscale of the questionnaire had been

acceptable. In the treatise the alpha coefficient was estimated as 0.95 for the whole scale. Alpha coefficient of the research of Goss (2011) for the pretest and posttest was obtained as 0.93 and 0.96 respectively. That it indicates acceptable internal consistency. These coefficients in the ongoing research were estimated 0.88 and 0.94 to pretest and posttest, respectively.

## FINDINGS

In this section data obtained from the execution of counseling and training package with framework of helper model is analyzed to improvement of wellness. Two methods as follows have been used to analyze the variables that were measured of counted and also to convert experimental data as a systematic collection:

1. Description of data on the basis of conventional methods, in the descriptive statistics, and
2. the interpretation of results of test and hypotheses of the research on the basis of covariance analysis test

Given that subjects of all three groups of research in the pretest and posttest stage responded to wellness questionnaire, in this section, at first the descriptive features of scores has been presented for all three groups in pretest and then posttest.

As can be seen in Table 4, the average of the three groups, especially in variables of physical and nutrition fitness is almost equal to each other.

In general the numbers in Table 5 show that the training package with skilled helper model and also providing information without framework of skilled helper model had an impact in improving wellness of subjects. However, at this stage it is unclear whether these differences are significant or not. For this question it is necessary to analyze the data in relation to the research hypothesis.

Table 2. five subscales and validity of physical and emotional wellness test

Questionnaire	Scales	Validity	Type of Reply
Four subscales of wellness test	scale 1 Environmental wellness scale 2 Social awareness scale 3 Intellectual wellness scale 4 Occupational wellness	(Owen, 1999; Palumbi, 1992)	1. Never or almost never 2. Sometimes 3. Often 4. In most cases, 5. always or almost always

Table 3. subscales, Validity for each in researches and the ongoing research

	Subscales	number of items		Owen test (1999)	Botha and Brand 2009	Goss test (2011)	Tamadonni (2016)
		Others	Tamadpni				
1	Social awareness	10	9	0.77	0.762	0.558	0.727
2	Environment wellness	10	10	0.71	0.740	0.595	0.727
3	intellectual wellness	10	10	0.73	0.827	0.557	0.625
4	Occupational wellness	10	10	0.85	854	0.587	0.791

Table 4. descriptive statistics features of the studied variables in the pretest

Variables	E1		E2		Control	
	Sd	Mean	Sd	Mean	Mean	Sd
Social awareness	29.25	2.6	27.00	4.1	28.45	4.8
Environment wellness	30.10	5.5	28.20	4.8	28.55	6.8
intellectual wellness	31.50	3.2	30.90	3.2	31.00	3.3
Occupational wellness	32.25	4.5	32.60	4.5	31.05	7.2

E1= experimental group1, E2= experimental group2

Table 5. descriptive statistical features of the studied variables in posttest

Variables	E1		E2		Control	
	Sd	Mean	Sd	Mean	Mean	Sd
Social awareness	38.25	2.7	22.40	4.7	32.40	4.6
Environment wellness	34.60	3.7	28.55	6.2	28.30	6.0
intellectual wellness	42.45	5.3	37.40	4.9	32.75	4.1
Occupational wellness	44.35	5.2	40.35	7.3	35.05	5.1

E1= experimental group1, E2= experimental group2

### DATA ANALYSIS IN RELATION TO THE RESEARCH HYPOTHESIS

Research hypothesis: a sample group that in situation of training and counseling package of wellness with framework of skilled helper model achieves higher level of Social, scientific and occupational wellness compared to the Frameless group and control group.

Covariance analysis was used to test this hypothesis due to the existence of an interval dependent variable and pretest and posttest. It was necessary to covariance analysis, the model assumptions, homogeneous of beta coefficients and variances to be investigated at first .the results of three groups comparison of linear combination of components, and each of which by using multivariate covariance analysis of MONCOVA was used given that used scale has five subscales. Before that Mbox test is used to evaluate the being significant.

Due to the significance of Mbox test among the special values of MANCOVA the Vpillai is used that is more resistant compared to violations of the assumptions.

Table 7 shows that the difference there are significant differences between the three groups in the linear combination of dependent variables that were scale components. Thus, analysis of covariance test was used to determine the difference between the groups in sub-

Table 6. Mbox results for significance of means

Variable	F	df1	df1	P
Overall scores	229.238	132	8715.93	0.03

Table 7. Vpillai Analysis for evaluating the specific values

Variable	Value	F	P
Social awareness	0.164	0.640	0.783
Environment wellness	0.283	1.293	0.268
intellectual wellness	0.154	0.598	0.818
Occupational wellness	0.268	1.198	0.323

scales of dependent variable. But first its assumption was investigated by Levene test to homogeneity of variance equality.

As can be seen in Table 8 equality of variances test with Levene test in the posttest scores in the all three groups and after the execution of counseling and training package with framework of skilled helper model is still equal with each other. So it can be concluded that the main assumption of analysis of variance is established for its execution. Thus, analysis of covariance test was used to determine the difference among the groups in the all subscales of the dependent variable.

Table 8. Summary of Leven test for equality of variances in the means of posttest

Social awareness	F Leven	P
Environment wellness	0.712	0.496
intellectual wellness	0.618	0.006
Occupational wellness	0.341	0.712
Social wellness	3.201	0.048

Table 9. Results of analysis of covariance related to physical and emotional subscales

Source and variable	df	SS	MS	F	$\omega^2$
Social awareness	2	298.94	149.47	8.52	0.001
Environment wellness	2	357.39	187.70	6.15	0.004
intellectual wellness	2	833.08	416.54	17.25	0.001
Occupational wellness	2	678.44	289.22	8.08	0.001

Table 4-18 shows the differences between groups in interval of wellness component is significant in following LSD test was used to determine differences in groups.

LSD post hoc test results showed that the four subscales (except of sexual awareness ), group that have participated in training and counseling class with the framework of (E1) skilled helper model have achieved higher level of wellness compared to without the framework experimental group (E2) and the control group. However, differences in the experimental group with framework of (E1) are more significant with the control group. In addition, the without framework experimental group (E2) with the control group is not significant in most subscales (except of emotional awareness). In other words, the means of experimental group (E2) and the control group has remained unchanged.

### CONCLUSION

Performing the pretest to determine the various aspects of wellness scores showed most students in the total score of the questionnaire and its subscales are in average and under average. In fact, the quantitative data showed the wellness scores in the both groups is only slightly above

average. The total score contained the total of five scale of TestWel questionnaire that was executed among students. These findings are supported from similar studies that have been executed based on the hexagonal Hitler model of the wellness (Dimonda, 2005). Average grade in the wellness scores is consistent and with conducted researches on inappropriate situation of wellness in the universities and shows that act to improve biological healthy is important for students and can be considered a plan to improve biological healthy as a possible target. Researchers warn that the healthy status, physical and mental well-being, quality of life and wellness is undesirable in the universities and should be found a solution to improve it (Goss, 2011 and Tamadoni, 2005).

Subscales assessment showed independently that students participating in the class framework of skilled helper model have shown improvement in all dimensions significantly. These findings suggest that execution of a training package has been effective to improve the current status of students. The social dimension of wellness with two subscales of social awareness (Heidi Smith, 2012; Conelly et al., 2013) and environmental awareness (Hu, Liebens, & Rao, 2008; May, 2007) that focuses on the preservation of the environment was considered in many of the studies and showed that investing on improvement of this dimension of wellness is important. Pretest and posttest scores for these subscales were statisticant in covariance analysis and showed the consulting and training package has been effective in changing the situation.

Generally, execution of counseling and training package with skilled helper model framework was proved on the wellness aspects of significant change. However, students who participated in the class without the framework of training package had no significant difference with the control group except in emotional awareness. Mean comparison by LSD test also showed

Table 10. comparison of means the three groups by using LSD test

Variables		Mean differences	Deviation	p	Comparison
Social awareness	2 of 1	5.22*	1.52	0.001	3 = 2 < 1
	3 of 1	5.23*	1.43	0.001	
	3 of 2	-0.009	1.51	0.995	
Environment wellness	2 of 1	6.22*	1.95	0.003	3 = 2 < 1
	3 of 1	5.20*	1.85	0.007	
	3 of 2	-1.02	1.84	0.604	
intellectual wellness	2 of 1	5.18*	1.78	0.006	3 = 2 < 1
	3 of 1	9.87*	1.68	0.001	
	3 of 2	4.69*	1.77	0.011	
Occupational wellness	2 of 1	4.05	2.17	0.068	2 = 1
	3 of 1	8.23*	2.05	0.001	3 < 1
	3 of 2	4.18	2.16	0.059	3 = 2

that the group with the framework in most cases except for sexual awareness has better condition from the without the framework group and have gained the higher score in questionnaire of TestWel than the control group in all cases. In addition, the group of without framework only showed a significant difference in subscales of emotional awareness that showed the mere providing information even can make minor change only but do not create a significant difference. Finally, encourage to compliance of counseling and training package with framework of the skilled helper model means to increase in life returns, convert the problems into opportunities, empowerment and personal independence and prevention of the return the problems to change of thought pattern and was provided different look to the healthy subject.

## SUGGESTIONS FOR FUTURE RESEARCH

Suggestions is presented as follow order to perform a more complete and more comprehensive researches in the future and also development of more and broader training packages to improve wellness in various fields:

it is suggested the different tools and methods of data collection such as observation, interview and experts grading tools that reduce the bias responses to be used to measure wellness order to universalize the concept of wellness.

it is suggested in future studies the other age, population and education groups reagent sample to be chosen and studied order to increase the strength of generalizing the results and further identification of relationships between variables and its components in various groups.

It is suggested the longitudinal researches to be used and be identified and measured by different and valid criteria for predictive validity of the questionnaire for wellness.

## REFERENCES

- Adams, T., Bezner, J., & Steinhardt, M. (1997). The Conceptualisation and Measurement of Perceived Wellness: Integrating Balance Across and Within Dimensions. *American Journal of Health Promotion*, 11(3), 208–218.
- Anderson, D. M., Keith, J., Novak, P. D., & Elliot, M. A. (2002). *Mosby's medical, nursing, & allied health dictionary* (6th ed.). St. Louis, MO: Mosby.
- Anspaugh, D., Hamrick, M., & Rosato, F. (2004). *Wellness: Concepts and Applications*. 6th ed. Boston: McGraw Hill. "Wellness and Fitness for life"
- Connolly, K.M., & Myers, J.E. (2003). Wellness and mattering: The role of holistic factors in job satisfaction. *Journal of employment counseling*, 40.
- Conley, C.S., Travers, L.V, Bryan, F.B., (2013). Promoting psychosocial adjustment and stress management in first-year college students: The benefits of engagement in a psychosocial wellness seminar. *Journal of American College Health*. 61(2).
- Corbin, C. B., Lindsey, R., Welk, G. J., & Corbin, W. R. (2002). *Concepts of Fitness and Wellness: A Comprehensive Lifestyle Approach* (4th ed.). New York: McGraw-Hill.
- Cranny, C. J., Smith, P. C. and Stone, E. F. (1992). *Job Satisfaction: How People Feels about their Jobs and How it Affects their performance*. Lexington Books: New York.
- DiMonda, S. (2005). A comparison of undergraduate student behaviors in six dimensions of wellness and their grade point average (Unpublished doctoral dissertation). Available from ProQuest Dissertations & Theses database. (UMI No. 3176651)
- Egan, G, (2013) *The Skilled Helper: A Problem-Management and Opportunity-Development Approach to Helping*. Brooks Cole; 10 edition.
- Goss. H. (2011) *Wellness education: An integrated theoretical framework for fostering Transformative Learning*. the Queensland University of Technology. For the degree of Doctor of Philosophy.
- Hettler, B. (1980). Wellness promotion on a university campus. *Family and Community Health: Journal of Health Promotion and Maintenance*, 3, 77-95.
- Hales, D. (2005). *An Invitation to Health*, 11th ed. Belmont, CA: Thomson & Wadsworth. "An Invitation to Health for the Twenty-First Century".
- Hatfield, T., & Hatfield, S. R. (1992). As If Your Life Depended on It: Promoting Cognitive Development to Promote Wellness. *Journal of Counseling and Development*, 71, 164–167.
- Hettler, B. (2002). Bill Hettler home page. Retrieved 2015 from <http://www.hettler.com/>
- Hettler, W. (1984). *Wellness: Encouraging a lifetime pursuit of excellence*.
- Hyde-Smith, M.J.E. (2012). The wellness spa: Construction definition and performance evaluation. Retrieved 2015 from <http://aut.researchgateway.ac.nz/bitstream/handle/10292/5417/Hyde-SmithMJE.pdf?sequence=3>.
- LaFountaine, J., Neisen, M. Parsons, R. (2006) Wellness factors in first year college students. *American Journal of Health Studies*. 21(4).
- Hu, Z., Liebens, J., & Rao, K. R. (2008). Linking stroke mortality with air pollution, income, and greenness in northwest Florida: An ecological geographical study. *International Journal of Health Geographics*, 7(1), 20-42.
- Kent, M., & Oxford University Press. (2006). *The Oxford dictionary of sports science and medicine*. Oxford, UK: Oxford University Press. Retrieved from <http://gateway.library.qut.edu.au/login?url=http://www.oxfordreference.com/views/BOOK%5FSEARCH.html?book=t161>
- LaFountaine, J., Neisen, M. Parsons, R. (2006). Wellness factors in first year college students. *American Journal of Health Studies*. 21(4).

- LiPuma, R. (1993). A four-step wellness model for self-understanding and total health [abstract]. Public Health Reports.
- Mattke, S., Schnyer, C., & Van Busum, K.R. (2012). A review of the U.S. workplace wellness market. Rand Health.
- May, D. (2007). Determinants of well-being. 1-7. Memorial University of Newfoundland and Newfoundland and Labrador Statistics Agency. <http://www.communityaccounts.ca>
- Myers, J. E., & Sweeney, T. J. (Eds.). (2005). *Counseling for Wellness: Theory, Research, and Practice*. Alexandria, VA: American Counseling Association.
- Myers, J. E., Sweeney, T. J., & Witmer, J. M. (2000). The wheel of wellness counseling for wellness: A holistic model for treatment planning. *Journal of Counseling and Development*, 78(3), 251-266.
- Mudge-Rile, M., McCarthy, M., & Persichetti, T.E. (2013). Incorporating wellness into employee benefit strategies: Why it makes sense. *Benefits Quarterly*, 29(4), 30-34.
- Nelson, P (2007). An Easy Introduction to Egan's Skilled Helper Solution Focused Counseling Approach. Retrieved 9/2/2016 from <http://www.academia.edu/8402672>.
- Palombi, B. J. (1992). Psychometric Properties of Wellness Instruments. *Journal of Counseling & Development*, 71, 221.
- Oguz-Duran, N., & Tezer, E. (2009). Wellness and self esteem among Turkish university students. *International Journal of Advanced Counselling*. 31, 32-44.
- Owen, T. R. (1999). The reliability and validity of a wellness inventory. *American Journal of Health Promotion*, 13, 180-182.
- Renger, R. F., Midyett, S. J., Mas, F. G., Erin, T. E., McDermott, H. M., Papenfuss, R. L., Eichling, P. S., Baker, D. H., Johnson, K. A., & Hewitt, M. J. (2000). Optimal Living Profile: An inventory to assess health and wellness. *American Journal of Health Promotion*, 24(6) 403-412.
- Ryff, C. D., & Singer, B. H. (2006). Best news yet on the six-factor model of well-being. *Social Science Research*, 35, 1103-1119.
- Smith, B. J., Tang, K. C., & Nutbeam, D. (2006). WHO Health Promotion Glossary: new terms. *Health Promotion International*, 21, 340-345.
- Tamadoni, M. (2005). A study about health and lifestyle. Report for Azad Islamic University of Tehran South Branch.
- Tucker, D., (2010) Promoting wellness programs to college students: RELAX program at Cal Poly San Luis Obispo.

## The effect of narrative therapy on the reduction of aggressiveness among Kindergarten children

Marziyeh Mirdamadi<sup>1\*</sup> and Farnaz Keshavarzi Arshad<sup>2</sup>

<sup>1</sup>MA Psychology and Teaching Students with Disabilities, Central Tehran Branch, Islamic Azad University, Tehran, Iran

<sup>2</sup>Faculty Member of Central Tehran Branch, Islamic Azad University, Tehran, Iran

### ABSTRACT

The purpose of the present study is to investigate the effects of Narrative Therapy as the independent and experimental variable on children with disorders like aggressiveness, being headstrong, disobedience, anxiety, depression and hyperactivity and decentralization as the dependent variable in the experimental and control groups. A quasi-experimental pre-test and post-test design with control group was used. The convenient sampling method was used in this study. The statistical population of the study consisted of 4, 5 and 6-year-old children of kindergartens supported by Tehran Welfare Organization in 2009-2010 who were identified with the symptoms of aggressive and offensive behaviors (verbal and nonverbal) to other children and adults. Then, aggressiveness questionnaire and CSI-4 were used to identify them with certainty. In this study, the descriptive and inferential data analysis methods were used. In the present study, statistical software SPSS was used. The study results revealed that narrative therapy has a significant effect on decreasing aggressive and offensive behaviors among children.

### INTRODUCTION

Among the disorders of childhood, aggressiveness is one of the areas that has been the mainstay of researchers in psychology. Psychologists have defined aggressiveness as the behavior that aims to harm oneself or others. In this definition, the intention and aim of behavior is very important. In fact, a harmful behavior is regarded as aggressive behavior if it to be conducted purposefully and deliberately to hurt others or oneself (Karimi, 1996).

Harmful effects of aggression caused extensive researches has been done on different points of view with various methods and techniques to reduce aggressive behaviors. In a way that some have focused on changes in biological factors and the use of drugs, some have insisted on changing psychological factors and others have considered changes in environmental conditions. Finally, some have emphasized on releasing excitement, fantasy and consolidation of "I" (Barron, 1991).

#### ARTICLE INFORMATION:

\*Corresponding Author: [mirdamadi1981@yahoo.com](mailto:mirdamadi1981@yahoo.com)

Received 27<sup>th</sup> April, 2017

Accepted after revision 2<sup>nd</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal  
NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

In recent years, narrative therapy is proposed as one of the methods of play therapy for children. Tale or story is a means to satisfy the needs of children and even adults and gives children the opportunity to interpret their subconscious desires and to know their living environment and this is the most important goals of education. The story causes the children without the fear and discomfort avoid harmful animals and objects and is the best way to feed children's imagination (Shoari Nezhad, 1993). In fact, storytelling is a kind of game for children and game is the children's language and talks during the stories help children gain a better understanding of their thoughts and feelings and grow (Arad, 2004, as cited in Matin, 2006). Later in the healing process scientists found that story can be used as a therapeutic tool and thereby children can face with their feelings, thoughts and behaviors. Because they are not yet ready to talk with advisers about their own behavior (Thompson & Radloph, 1996, as cited in Seyedi, 2000).

Tale is a creative, easy and enjoyable tool which due to simplicity and enjoying the element of imagination it is usually heard better until to be read (Afshari, 2006). Storytelling is also useful in helping children to recognize the possible consequences of their behavior (Thompson and Radolph, Trans: Tahorian, 2005, as cited in Seyedi, 2003). Narrative therapy is a branch of child psychotherapy. When a child listens to the story, he imagines himself in the role of hero of story and acquires experience along with it. This practice helps audience overcome his previous failures and find his future meaningful (Kaiser Ling). Story-based therapeutic approaches lead to the stimulation of children's minds and self-exploration activity with more potential to motivate insights and change behavior. This type of treatment can provide a pattern for overcoming the resistance of child, new concepts and a pattern for appropriate behavior (Zayps, 1995, as cited in Matin, 2004). Further, stories are the proper tool to introduce temporal patterns of desirable behaviors. Children through replication of these patterns modify their mental images (Pope et al. 1994, as cited in Matin, 2004). A child who has low self-esteem conforms himself to the right pattern of the story and involves with its beliefs and thoughts and consequently, his worthlessness feeling is gradually reduced (Biyabangard, 1994). Finally, narrative therapy is very powerful tool in human relationships, psychotherapy, education, family, art, organization and management and life (Jalali, 2007).

### WHAT IS THE DISORDER?

Every human growth resulted from a certain process that is influenced by both genetic and environmental factors. This process is very fast and sometimes unstable

in childhood. Children face with some problems during this process that make their parents worry and they think their children have the disorder or specific problem while these problems are part of child's development and usually are temporary and that is why they are called transient developmental crises. These problems make child familiar with different experiences. These experiences teach him how to deal with emotions and his surroundings and how to cope with problems and difficult situations. However, if the problems of childhood last for a long time or cause other problems, they are worrying and a solution should be regarded for them (Farhadi Sabet, 1993, as cited in Hasirbafi, 2009).

### DEFINITION OF BEHAVIORAL DISORDERS FROM VARIOUS PERSPECTIVES

According to Clark (2003) a behavior is deviant or emotional that in addition to being disproportionate with individual's age, it is severe, chronic, or persistent and its scope is from hyperactive and aggressive behavior to the dissociable behaviors. Characteristic of such behavior is that it initially has negative effect on the growth process and suitable adaptation of child to the environment and secondly, it disrupts the lives of others. Hering (1963, as cited in Hasirbafi, 2009) believes that if a child due to the physical problem or environmental impacts chronically has one of the characteristics including learning disability in accordance with IQ, sensory and motor disability and physical growth, disability in establishing and maintaining good social relationships, inability in responding to the conditions of daily life properly, and various extremist behaviors, he/she is considered as a child with behavioral disorders .

### COMMON DISORDERS IN CHILDREN AND THEIR TREATMENT

#### Anxiety disorder and its definition in children

Anxiety is a term that has been used widely in psychiatry and in explaining many clinical phenomena always is the present and fixed component (Pour Afkari, 2004). Anxiety refers to the sense of uncertainty and physiological arousal. Generally, anxiety is a very unpleasant released feeling with one or several physical sense like chest tightness, heart palpitations, sweating, headache and so on. Anxiety is a form of general reaction that every person will experience it in a greater or lesser rate. Anxiety is a type of disorder, worry and mental stress which leads to the demoralization, reduction of study and learning, lack of opportunity or failure to reach the desirable conclusion. Anxiety in addition to the disruption of peace of mind, reduces the manpower because a

person in a state of anxiety cannot use his forces and talents properly and wastes a lot of energy.

### Hyperactivity disorder in children

According to Barkley (1998) hyperactivity is developmental disorder in attention span, impulsivity and principled behaviors in which these deficiencies are remarkably effective and temporal. It is usually stable and chronic over time and is not considered as the direct result of severe language delay and deafness, blindness and autism or childhood psychosis. Hyperactivity is a developmental disorder that can be seen in attention span, impulse control, restlessness, and providing age-appropriate behavior. The disorder will appear in early childhood (before age 6) with inclusive nature and major neurological disability, sensory, motor, or emotional disorder cannot be outlined for it (Oliaee, 2002).

ADHD is a disorder in which vibrant, neglect and sudden behaviors are observable more and sever than other children. 3% to 5% of children are affected by this disorder which is more common in boys. Some suffer from symptoms of dynamic and abrupt behavior and others may suffer from neglect. Symptoms of the disorder begin before age 7, but often causes serious problems in school (Farshid Nejad, 2001).

### Aggressive disorder

Aggressive behavior is one of the major behaviors of human when faces with failures and its repetition in society leads to unpleasant consequences for individuals, the disruption of interpersonal relations and unhappiness (Shariati Roodsari, as cited in Mottaghi, 2003). In child's social education, whether in terms of the compatibility of child or its effect on society, any behavior is not important than the aggressive behavior. Failure to instruct children to refrain from aggressive behavior or at least to express these behaviors in the forms and conditions that are acceptable in community can leads to serious long-term consequences (Rossiter, 2002).

## BACKGROUND OF STUDY

Fashenbakh (1979, as cited in Shekarkan, 2002) conducted a study on the students to investigate the imaginary aggression. For this purpose, two group of students were selected and instructor insulted them. One group was allowed to write imaginary stories about aggression and the other group did not has such an opportunity. Results showed that the group that had opportunity to write a story about aggression indicated less aggression. He found that imaginary aggression temporarily decreases aggression.

Myers (1990) in a study compared storytelling and reading story and investigated how children and story-

teller and adult reader interact with each other. He concluded that collaborative and common dialogic space between storyteller and audience is a solution for a severe interaction. Interestingly, they prefer their teacher tells story rather than playing it by cassette.

Several case study conducted by Allen and Brown (1993) showed that using sand play therapy is effective on reducing impulsive and aggressive behavior and improving social skills and the ability to transfer energy to appropriate activities such as sports and art. Playing with sand allows children to express their aggressive feelings to facilitate more appropriate social behaviors.

Kim (1999) investigated the effects of storytelling and pretending to play on cognitive processes and reminding storytelling through short-term and long-term memory. The aim of this study is to quantitatively evaluate how storytelling can teach children (during the game and role playing) various laws and their enforcement. This research has three phases: storytelling, images and dolls. The study results showed that storytelling and play therapy develop cognitive skills and strengthen short-term and long-term memory.

In a longitudinal study conducted in 1968 on 369 participants it was found that the intimate environment of family can protect aggressive children from incompatibility in school and unemployment in the future (Waylernz, 2000).

Hammer (2000) examined the effect of storytelling on students' education and understanding of lessons. He found that orally narrated stories are helpful in knowledge understanding and learning of students. Teachers should be able to establish useful connections between the story and their lessons. Finally, they concluded that through stories various courses can be trained much easier and students' understanding of lessons is increased.

Edvard and Riuoson (2001) conducted a study with 12 sessions of music therapy on female subjects to examine the effect of music therapy on anxiety, aggressive behavior and depression. Participants during the performance of music therapy technique expressed that when they listen to light music, their stress and anxiety is reduced and anger management and control is more feasible. The study results revealed the impact of music therapy on reducing anxiety, aggression and depression.

Sabbaghian (2005) in his study entitled "The study of the effect of storytelling on aggression of first and second grade of elementary school children of Mehriz city" came to the conclusion that storytelling can reduce aggressive behavior among children.

Sheibani (2006) in his study entitled "The impact of narrative therapy on depression of children and coping strategies among children with depression" concluded that storytelling can reduce depression in children.

Sultani (2006) in his study entitled "The effect of storytelling in group form on enhancement of self-esteem in the second grade of elementary school girls" found that storytelling in group form increases students' self-esteem.

Masaebi (2008) conducted a study on the impact of training anger management skills on aggression and social adjustment of 12- 15 years old male students. The results indicated the significant effect of training anger management skills on aggression and social adjustment of 12- 15 years old male students.

Zarei (2008) in a research investigated the effect of painting on pre-school children's aggression by complementary and selective method. The results showed that painting by using complementary and selective method is effective on reducing aggression in pre-school children.

## METHODOLOGY

In this study a quasi-experimental pre-test and post-test design with control group was used. The statistical population of the study consisted of 4, 5 and 6-year-old children of kindergartens supported by Tehran Welfare Organization in 2009-2010 who were identified with symptoms of aggressive and offensive behaviors (verbal and nonverbal) to other children and adults. The convenient sampling method was used in this study. The independent variable was narrative therapy performed by researcher and the dependent variable was the rate of aggressive and offensive behavior.

## INSTRUMENT OF THE STUDY

### Child Symptom Inventory (CSI-4)

In this study, the Child Symptom Inventory (CSI-4) was used to determine the presence and severity of symptoms of disorder and to identify incompatible children with desired disorders. 4 - CSI has two forms of parents and teachers. The form of parents with 12 questions was set for 11 major groups and one human group of behavioral disorders and the form of teachers with 77 questions encompasses 9 major groups of behavioral disorders. Generally, the study results regarding the investigation of reliability of CSI-4 through reimplementation of the test show that the questionnaire as a tool to measure behavioral and emotional disorders in Iranian children has relative reliability in the parents from and it can be used as a screening tool for emotional and behavioral disorders in children.

Further, validity evidences related to the content show that sample questions, assignments or test questions are introducing a whole or areas of content so that in addition to defining the measured scopes of the questionnaire, it was given to 9 psychiatrists to examine the

relation of each test question with the definition which is considered for that area. The investigation of experts' opinions showed that all nine psychiatrists confirmed the consistency and appropriateness of content of CSI-4 with the measured area and considered the questionnaire as a successful tool in screening the behavioral and emotional disorders in children.

### A researcher-made aggression questionnaire

Another tool used in the study was a checklist based on clinical signs and criteria of aggression existing in scientific resources in order to recognize the aggression rate that has been adapted from MA thesis of Tahereh Seyedi (2003). In order to determine the content validity of this inventory, this checklist was given to a few professors and was modified on the basis of their ideas. This checklist includes 24 cases of behaviors that children exhibit when they are angry and sad. Finally, in order to determine the construct validity, the checklist of aggression was conducted on 219 students from two geographical zones of the center and south of Tehran. In analyzing the data obtained from checklist, the correlation of each item with the total was calculated and then, two items with under 0.25 correlation was removed. The correlation scope of items of checklist was from 0.49 to 0.6040. The reliability of aggression questionnaire in the first phase was 0.60 and after removing two weak items reached to 0.65. This questionnaire was used in pre-test and post-test for the diagnosis of aggression.

In order to calculate the internal consistency of questions of Symptom Inventory subscales, Cronbach's alpha coefficient was calculated separately for each of the subscales.

Cronbach's alpha coefficients calculated for all symptoms except for social phobia were very good. The greatest amount of alpha coefficient was for attention deficit-hyperactivity (0.865) and the minimum amount was for social phobia (0.495).

Table 1. Cronbach's alpha coefficient for each of the subscales

Subscale	Questions	Cronbach's alpha coefficient
Attention deficit-hyperactivity disorder	18 - 1	865 0.
headstrong and disobedience	26 - 19	660 0.
Behavioral disorder	40 - 27	7610.
Anxiety disorder	46 - 42	6580.
Anxiety and Tic disorders	54 - 49	7250.
social phobia	87 - 84	495 0.

In the present study to calculate the internal consistency of the questions of aggression questionnaire, Cronbach's alpha coefficient was calculated for all the questions in the pre-test phase which was equal to 0.828 and indicates a very good internal consistency of Aggression Questionnaire.

Other tools include story books and stories were selected with the help of educators. The stories encompassed the aggressive positions and trained proper and peaceful solutions for children to cope with the problems.

## PROCEDURE

Given that the sampling method was continent, the intended kindergartens were coordinated and tests were conducted by teachers and children who had aggressive disorder were collected and therapy sessions for 16 sessions (30 minutes) were performed. The program of 16 sessions was as follows.

*First and second sessions:* In this session after establishing an emotional relationship with the subjects, the new program of storytelling and bilateral conversation about everyday life issues and personal issues and identifying the thoughts and feelings and performances were explained. The duration of program and terms and conditions of attending hearings and their active participation in sessions were mentioned. One of the stories was told. Each tale was told in two sessions for children and the corresponding questions were asked. The content of the story that was mentioned in the first and second sessions was that how the child can control himself when he is angry. The story trained him to think, breathe deeply and speak with elder person when he is angry instead of screaming. Finally, questions about the story text were asked children.

*The third and fourth sessions:* The story of "Little Bear" was read. This story explained the situations in which Little Bear was angry and beat its friends. During the story, he was taught how to manage his anger to maintain his friends in order to not to be alone. Finally, questions were asked children.

*Fifth and sixth sessions:* The story of "Little Ali" was read. In this story, Little Ali wanted to take every toy he saw and cried non-stop so that his parents were upset and his friends were reluctant to play with him. During the story they were taught how they could play with their toys and entertain themselves and they were told that humans cannot always have what they see. Finally, they were asked questions.

*Seventh and eighth sessions:* The story of "Ji Ji squeaker" was read and while watching pictures of the book they were asked questions.

*Ninth and tenth sessions:* The story of "Headstrong Li Li" was read. The story of headstrong girl who finally

learned how to fight with his stubbornness and questions were asked about stubborn Li Li.

*Eleventh and twelfth session:* The story of "Clever Rabbits" was selected from the book "Tales of the Night" and was read. The story was about the sequel of wicked and cruel person who hurts others. Then, questions were asked about hurting others.

*Thirteenth and fourteenth sessions:* The story of "vibrant Anna" was read. This story was written by researcher. In this story, Anna constantly noised and destroyed household appliances and threw toys to her friends. She could not be quiet and everybody leaved him. She learns how to control herself and does not throw her toys and does not destroy household appliances.

*Fifteenth and sixteenth sessions:* The mentioned stories were reviewed.

## RESULTS

### DESCRIPTIVE DATA ANALYSIS

In this study, descriptive statistical methods including central tendency, dispersion and diagram and inferential data analysis methods including covariance analysis method were used. Statistical calculation was done using SPSS.

Results of Table 2 show that the mean of aggression in children at posttest phase compared to pre-test in two experimental and control groups is decreased. Although this decrease is more in the experimental group. Descriptive indicators related to the scores of symptoms questionnaire in children at pre-test and post-test phases were calculated in both experimental and control groups and are presented in Table 3.

Based on the results of Table 3, the mean of the symptoms among children in both experimental and control groups at posttest compared to pre-test is decreased.

### INFERENTIAL DATA ANALYSIS

**H<sub>1</sub>: Narrative therapy is effective on reducing aggression in children.**

To investigate the effect of narrative therapy on aggression in children to keep fix the pre-test effect of

Table 2. Descriptive indicators of aggression scores

Aggression scores	Control group n=12		Experimental group n=12	
	SD	Mean	SD	Mean
Pre-test	88 /9	83 /17	74 /5	72 /18
Post-test	30/9	08 /17	66 / 6	83 /15

Table 3. Descriptive indicators of the scores of symptoms in children at pre-test and post-test phases in both experimental and control groups

Group	Symptoms	Post-test n=12		Pre-test n=12	
		SD	Mean	SD	Mean
Experimental	Attention Deficit	37 /5	50/11	67 /6	83 /13
	Hyperactivity	04/7	08/12	53/6	33/15
	Attention Deficit- Hyperactivity	57/9	58/23	84/8	17/29
	Stubbornness and disobedience	70/4	67/8	16/4	67/9
	Behavioral disorder	66/3	83/3	17/3	25/4
	Anxiety disorder	06/3	42/3	47/2	50/3
	Social Phobia	73/1	42/1	88/1	42/2
Control	Attention Deficit	32/7	67/12	36/6	50/12
	Hyperactivity	58/8	33/11	07/8	25/11
	Attention Deficit- Hyperactivity	35/11	00/24	80/10	75/23
	Stubbornness and disobedience	04/4	83/7	50/3	67/10
	Behavioral disorder	81/2	33/2	63/4	73/3
	Anxiety disorder	74/2	80/2	50/2	08/3
	Social Phobia	15/2	50/2	39/2	08/3

aggression in the experimental group (the group that was treated by narrative therapy) and control group, covariance analysis (ANCOVA) was used. The results are provided in Table 4.

According to the results presented in Table 4, F value calculated for aggression posttest scores in both experimental and control groups after fixing the effect of aggression pre-test scores is significant ( $F(21,1) = 5.14, P = 0.034$ ). The comparison of adjusted averages of two groups shows that aggression in the experimental group ( $M = 14.83$ ) is lower than the control group ( $M = 18.08$ ). This difference is shown in diagram 4. Thus, generally narrative therapy reduced aggression in children of experimental group (those who were received narrative therapy) compared with the control group who did not receive the narrative therapy program. Consequently, the research hypothesis that narrative therapy is effective on reducing aggression in children is confirmed.

#### $H_2$ : Narrative therapy is effective on reducing symptoms among children.

The covariance analysis (ANCOVA) was used to investigate the effect of narrative therapy on reducing symptoms among children for fixing the effect of symptoms

pre-test scores in the experimental group and control group. The results are presented in Table 5.

Based on the results presented in Table 5, F value calculated for hyperactivity symptoms in both experimental and control groups after fixing the effect of hyperactivity pre-test scores is significant ( $F(1,23) = 7.12, P = 0.014$ ). As a result, there is a significant difference between averages of hyperactivity pre-test scores in both experimental and control groups by fixing the effect of the pre-test in all symptoms. This difference is shown in diagram 5. Therefore, generally narrative therapy reduced symptoms in children of experimental group compared with the children of control group. However, it seems that the least change is for symptoms of disobedience and social phobia.

## CONCLUSION

In recent years, the theoretical and research formulations of the treatment process shows that the movement should be from microscopic study of theological methods towards the holistic approach. One of these methods is organized in the form of story. Stories are fundamen-

Table 4. Results of ANCOVA for aggression in both experimental and control groups

Sources of variation	Sum of squares	DF	Mean of squares	F	Sig.
Pre-test	322/1185	1	322/1185	285/98	001/0
Group	960/61	1	960/61	138/5	034/0
Error	261/253	21	060/12		
Total	958/1447	23			

Table 5. Results of covariance analysis for symptoms scores in both experimental and control groups						
Symptoms	Sources of variation	Sum of squares	DF	Mean of square	F	Sig
Attention Deficit	Pre-test	496/421	1	496/421	282/18	001/0
	Group	068/29	1	068/29	261/1	274/0
	Error	170/484	21	056/23		
	Total	833/913	23			
Hyperactivity	Pre-test	212/1044	1	212/1044	425/70	001/0
	Group	542/105	1	542/105	118/7	014/0
	Error	371/311	21	827/14		
	Total	958/1358	23			
Attention Deficit-Hyperactivity	Pre-test	040/1085	1	040/1085	031/17	001/0
	Group	551/159	1	551/159	504/2	128/0
	Error	877/1337	21	708/63		
	Total	958/2423	23			
Stubbornness and disobedience	Pre-test	754/86	1	754/86	429/5	030/0
	Group	733/10	1	733/10	672/0	422/0
	Error	579/335	21	980/15		
	Total	500/426	23			
Behavioral disorder	Pre-test	638/158	1	638/158	017/43	001/0
	Group	864/5	1	864/5	590/1	222/0
	Error	756/73	20	688/3		
	Total	304/243	22			
Anxiety disorder	Pre-test	220/57	1	220/57	596/9	006/0
	Group	057/0	1	057/0	010/0	923/0
	Error	297/113	19	963/5		
	Total	591/172	21			
Social phobia	Pre-test	853/55	1	853/55	794/41	001/0
	Group	033/2	1	033/2	521/1	231/0
	Error	064/28	21	336/1		
	Total	958/90	23			

tal tools of meaning forming (Kangaloz and Machado, 1999, as cited in Joseph Loya and Matin, 2006).

Stories are widely used in the field of human relations and these dimensions include their oral and written dimensions. Actually, stories form the main part of our experiences (Raymond Mar, 2004; cited in Joseph Loya, 2006). Our life gets meaning from the stories that we live or say them. In other words, the meaning of our life is shaped in this way that how we relate events to each other in a significant sequence and how we shape the feeling to "self" and make it a part of our life story (Dilalou et al., 2002; cited in Joseph Loya, 2006). The story approaches emphasize that basically treat is a specific type of dialogue that evokes capabilities, competencies and solutions from client in a way that the therapist in a creative dialogue reveals the ability of client and gives him the courage to change. In this process, the therapist

and the child discover and interpret the complex issues in the problem-solving process and thus, the child can cope with problems better (Farlangr, 1999, as cited in Joseph Loya and Matin, 2006). People based on a collection of stories adjust their performance in the world and their relationships with others. In the story, different characters debate the meanings of events (DiMaggio et al., 2003). We formulate our experiences in the form of stories to give meaning to events and predict the coming situations and conduct our activities (Salvatore et al., 2004). Recently, narrative therapy approaches are spread to explain human psychological aspects. In the framework of these approaches, psychopathology is an example of the life stories which is excluded from the main route and psychotherapy is an exercise to repair and regenerate the life story (Howard, 1991, as cited in Sheibani, 2006).

The aim of this study was to investigate the effect of narrative therapy on aggressive children. In this study, the effect of narrative therapy is considered on the aggression rate and comorbid disorders with aggression. In this study, through the process of narrative therapy participants become familiar with their disorders and express their painful sense. Participants in addition to discussing about their painful problems and feelings pay attention to facilities, capabilities and new solutions and cope with them with more power. According to the stories read for subjects, they noticed the harmful effects of anger and aggression and were looking for a more effective solution for their own unpleasant feeling. This process was performed during 16 consecutive sessions. At all stages of treatment, the active role of the therapist and participants in the creative discussion and targeted questioning to clarify the issues, problems, feelings and style of behavior and how to deal with aggressive situations were emphasized. The study results revealed a significant decrease in symptoms of aggression in children with this disorder. Further, the effect of narrative therapy on comorbid disorders (being headstrong, disobedience, anxiety, depression and hyperactivity and decentralization) was considered among subjects and the results showed that after treatment sessions, these symptoms were considerably decreased. Various studies have emphasized on the effectiveness of story approaches in psychotherapy of children with psychological disorders such as the study of the use of narrative therapy to reduce anxiety and to increase the sense of control and competence and hope in children (Haty and Kozlofska, 2002, as cited in Sheibani et al., 2006), changing the coping strategies in children with learning disorder (Joseph Loya and Matin, 2006), the restoration of social cognition in children with intellectual disability (Islami, 2000), the treatment of communication problems in children with autism in interacting with others and drawing problem solving skills (Del Val, Mac Ichren and Chambers, 2001) and the treatment of depression in children (Shibani et al., 2006). Accordingly, the results of this study in terms of the effectiveness of narrative therapy in the treatment of anxiety disorders in children are consistent with the findings of the mentioned researchers.

## REFERENCES

- Afshari, A. (2006). Story, storytelling and its educational impact. *Peivand Journal*, 327.
- Azar, M. (2004). The use of stories in the improvement of coping strategies for children with learning difficulties. MA thesis, Central Tehran branch, Islamic Azad University, Tehran.
- Bernstein, B. (2004). Social class and linguistic development. In A.H.Halsey, J. Floud, & C. Anderson (Eds). *Education, Economy and Society*, New York: Free Press
- Clark, R.W.(2000) Teachers as story tellers. Doctoral dissertation, Saint Louis university.
- Dimaggio, G., Salvatore, G., Azzara, C., Catania, D., Semerari, A. & Hermans, H. J. (2003). Dialogical relationships in narratives: From theory to clinical practice, 76, 385-409.
- Farshidnezhad, A. (2001). The study of Epidemiology of behavioral disorders among primary school students in Isfahan. Isfahan University, Iran
- Hasirbafi, S. (2009). A review and comparison of behavioral disorders among preschool children under the auspices of Family Welfare Organization and ordinary families in Tehran, Allameh Tabatabaei University, Tehran.
- Karimi, Y. (2000). Social psychology. Arasbaran publication: Tehran.
- Masaebi, A. (2008). The effect of training on aggression, anger management and social adjustment among 12-15 aged students in Khodabande city. MA thesis, Allameh Tabatabaei University, Tehran.
- Mottaghi, Sh. (2002). The study of the effect of pre-school education experience in behavioral disorders and educational effectiveness among elementary school second grade students. MA thesis, Alzahra Univrsity, Tehran.
- Myers, P. (2006). Stories From Print language Arts. National Story telling Association. Tales as tools: The Power of story in the classroom. Jonesborough, TN: National story-telling press.
- Rossiter, M. (2002). Narrative and stories adult teaching and learning . Eric digest No.241 Eric / Acre Publications.
- Sabbaghian, H. (2005). The effect of storytelling on aggression among children in the first grade and second-grade in Mehriz city. MA thesis, Allameh Tabatabaei University, Tehran.
- Salvatore, G. Dimaggio, G., Semerari, A. (2004). A model of narrative development: implications for understanding psychology and guiding therapy. *Psycho Therapy*, 77, 231-544.
- Seyyedi, S.T. (2003). The use of storytelling in the treatment of emotional and behavioral problems: Aggression. *Quarterly Journal of Exceptional Children Research Institute*, 22,23.
- Sheibani, Sh. (2006). The effect of narrative therapy on depression among children and coping strategies for depressed children. MA thesis, Central Tehran branch, Islamic Azad University, Tehran.
- Shoharinezhad, A.A. (2000). Children literature. Information publication: Tehran.
- Soltani, M. (2006). The effect of storytelling as a group and increasing the self-esteem among female students in second grade guidance school. MA thesis, Faculty of Psychology and Educational Sciences.

## Comparing styles and life satisfaction among faculty members of public universities and the self-employed people in Tehran

M. Molaei, K. Hashemian and P. Farrukhzad

*Department of Psychology, College of Psychology, Roodehen Islamic Azad University, Tehran, Iran*

### ABSTRACT

Life style of people can affect on type of their behavior with others such as spouse, children, coworkers and customers, etc. the main purpose of this research was to compare life style and life satisfaction within two groups: university Professors and self employment persons in Tehran city. The design for this research was descriptive. The instruments were used: a) demographic in formation, b) Shaeari's life style and Diner's life satisfaction. 40 Professors of Tehran universities and 40 self employment persons were selected attitude cluster. Descriptive and inferential statistical methods were used for analyzing information. The results showed that there are differences between situations of sleep and rest between members of governmental universities' Professors and self employment persons in Tehran. Also, the results showed that there were differences in type of behavior in work environment between members of governmental universities' Professors and self employment persons in Tehran. But there weren't differences between satisfaction of sex with spouse and situation of religiousness within members of governmental universities' Professors and self employment persons in Tehran. The results of research also showed, there was difference in life satisfaction between university Professors and self employment persons. The mean scores of self employment persons was reported more than university Professors in small scales of amusement, nutrition and behavior at work place.

**KEY WORDS:** LIFE STYLE, LIFE CONSENT, SELF EMPLOYMENT PERSONS, NUTRITION, LEISURE TIMES

### ARTICLE INFORMATION:

*\*Corresponding Author:*

*Received 30<sup>th</sup> April, 2017*

*Accepted after revision 6<sup>th</sup> Aug, 2017*

*BBRC Print ISSN: 0974-6455*

*Online ISSN: 2321-4007*



*Thomson Reuters ISI ESC and Crossref Indexed Journal*

*NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006*

*© A Society of Science and Nature Publication, 2017. All rights reserved.*

*Online Contents Available at: <http://www.bbrc.in/>*

## INTRODUCTION

Lifestyle is one of the causes of health and lifestyle includes behaviors and decisions the person takes for health and are within his control partly (Lalond, 2010, cited by Manshaei, 2011, p. 49).

Lifestyle determines the worldview and attitudes to life. According to Morgan

Lifestyle can set goals and direction in life among people with different attitudes. (Morgan, 2009)

In an epidemiologic study by black and Breslow (2010), it was determined that following healthy exercise are related to lifestyle: 1- 7 or 8 hours of sleep per day 2-eat breakfast every day 3. Not having any thing between meals; 4. weight adjustment 5. not smoking 6. no alcohol 7. regular physical activity (1997).

Lifestyle can lead to convergence and consensus in marriage between man and woman. At the same time, different lifestyles between men and women could cause some disagreements and hostilities. (Morovvati, 2010)

In the meantime, according to Davidson (2010) interactive and direct relationship exists between lifestyle and life satisfaction. In other words lifestyle can determine life satisfaction and life satisfaction can be considered a continuation of the lifestyles of spouses. So this paper is to compare between lifestyle and life satisfaction among faculty members and people self-employed in the city of Tehran; in this regard, the key question of this study is: Is the style and life satisfaction among faculty members of Tehran's public universities and the self-employed different?

## LITERATURE

### LIFESTYLE (DEFINITION OF CONCEPT)

The World Health Organization considers lifestyle as pattern behavioral that can be identified and defined, which is created via the interaction between personal characteristics, social relations, environmental and socio-economic situations. Morgan (2010) questionnaire was used to measure lifestyle, and 50 closed-answer questions were designed, and the respondent scores indicated lifestyle of self-employed people and professors.

### LIFE SATISFACTION

Life satisfaction, according to some, means the ideal of all the circumstances of time and place and to provide all facilities for healthy living, while the true meaning of life satisfaction is positive attitude towards life today with all the difficulties and hardships, bitterness and failures along with successes and success, happiness and nurturing talent. (Omidvar, 2010)

In order to measure life satisfaction in this study, standard questionnaire of life Satisfaction of Dineer was used, and test scores in subscales of the questionnaire show life satisfaction of participants in research.

## LITERATURE

Gilman et al (2011) examined the relationship between lifestyle and life satisfaction among the elderly residents of the City of London's Boarding. In this field survey with the population of people aged 65 years and older living in boarding homes in London, a total of 98 elderly participated in the study. The results show the elderly nutritional quality and life satisfaction had significant relationship. In addition, findings show that the attention to health and hygiene among the elderly and increased life satisfaction had a significant relation.

Johnson and Kragr (2006) examined the relationship between lifestyle and mental health among teachers in America in state of Florida. In this survey, a standard questionnaire was used to collect information. 321 teachers have participated in the research. The results show the teachers who have healthy relationships with his wife and children and also paid greater attention to spirituality had higher levels of mental health and satisfaction of life.

Seligman et al. (2005) investigated the impact of spirituality and religion tendency on lifestyle. The findings show that more religious nurses had more satisfaction in personal life and career. The study population comprised women nurses of New York City, and show that nurses with religious affiliation has the distinctive lifestyle from nurses whose attitudes were less religious. In addition, nurses with a spiritual orientation shows less stress to economic issues. Snyder and Lopez (2002) studied the relationship between the self-regulation behavior caused by lifestyle and life satisfaction among parents of high school students in London. The study results show that parents who have greater preventive behaviors of high risk behaviors have higher life satisfaction. In contrast, parents who have more reported risk behaviors in themselves and their children such as addiction to drugs or alcohol were less satisfied than life. Gutmann (2004) investigated the factors influencing marital satisfaction, and stated that confirming leads to greater satisfaction in couples because they become aware of the reaction between them and also find how to appreciate each other.

## HYPOTHESES

First hypothesis: there are differences between university faculty members and the self-employed in Tehran in terms of lifestyle and life satisfaction.

The first hypothesis (A): there are differences between university faculty members and the self-employed in Tehran in terms of the state of health.

The first hypothesis (B): there are differences between university faculty members and the self-employed in Tehran in terms of the nutritional status.

The first hypothesis (C): there are differences between university faculty members and the self-employed in Tehran in terms of sleep and relaxation.

The first hypothesis (D): there are differences between university faculty members and the self-employed in Tehran in terms of the type of behavior in the workplace.

The first hypothesis (E): there are differences between university faculty members and the self-employed in Tehran in terms of between recreation and leisure times.

The first hypothesis (F): there are differences between university faculty members and the self-employed in Tehran in terms of the treatment of his wife and children.

The first hypothesis (G): there are differences between university faculty members and the self-employed in Tehran in terms of the satisfaction of sexual relations with the wife.

The first hypothesis (H): there are differences between university faculty members and the self-employed in Tehran in terms of religion and religiosity.

The first hypothesis (I): there are differences between university faculty members and the self-employed in Tehran in terms of parenting practices.

**METHODS**

This study was descriptive and field research. This research can be considered an applied research. In terms of methodology, it is survey. In this study, 40 professors and 40 businesses were selected randomly. The data in this study were obtained using library and field. So that the questionnaire used in the field.

In this study, data analysis was performed using descriptive statistics (frequency distribution, tables, calculation of percentages and central indices calculations), and also inferential statistics (chi-square test). The t-test was used to compare the two groups, data were first given as input to a computer and analyzed via spss statistical software.

In order to collect the data collected in this study, lifestyle questionnaire and Diner life satisfaction scale were used.

**THE FINDINGS**

With use of parametric statistical method using the Kolmogorov-Smirnov test, normality of results was examined. Kolmogorov-Smirnov test results can be seen in the table below.

Based on the above data, it can be argued that because the Z score calculated for the components of this study at 95% level was lower than average; therefore, it is concluded that the above distribution satisfies normality has and mean can be used as central bias index and parametric statistical models can be used.

According to the results in table above, it can be said that the mean and median of the distribution of life satisfaction scores are not significantly different as well as kurtosis and skewness index is less than 0.5. Therefore it can be concluded that the distribution of scores for life satisfaction is normal distribution.

**There are differences between university faculty members and the self-employed in Tehran in terms of lifestyle and life satisfaction.**

According to the results of the above table in the degree of freedom 78, we find that the T-test obtained from

Table 4.9. K-S test for good fitness distribution of scores related to lifestyle variables

	Health	Nutrition	Parenting	Sleep and relaxing	Workplace behavior	Leisure time	Behavior to wife and children	Sexual satisfaction	Religiosity
Number	80	80	80	80	80	80	80	80	80
average	3.8269	3.0649	3.3317	4.0649	3.1034	3.117	3.4356	3.1123	3.832
The standard deviation	.88890	.97542	.9678	.76798	1.0408	.9853	.68944	.5823	.84510
Equal	.116	.122	.199	.163	.097	.115	.066	.041	.099
Quite positive differences	.093	.122	.199	.119	.097	.115	.066	.046	.051
Completely negative differences	-.116	-.079	-.061	-.163	-.095	-.074	-.044	-.052	-.069
Z	1.184	1.246	1.32	1.158	.992	1.172	.677	.633	1.212
Sig.(2-tailed)	.121	.090	.166	.08	.279	.128	.749	.718	.113

Table 2. Descriptive indices for scores of life satisfaction among respondents

Variable	Central indices		Scattering parameters		Distribution indices	
	Mean	Median	SD	Range of scores	Kurtosis	Skewness
Life satisfaction	72/40	50/42	46/12	65	137/0-	170/0

Table 3. T test results to determine the difference between the two groups in terms of lifestyle

Statistical index	Professors			Self-employed		
	Size	Mean	SD	Size	Mean	SD
Lifestyle	40	60.135	53.24	40	17.127	75.23
t-test				78df = t = 6/88		$H_0 = \mu_1 - \mu_2 = 0$ $H_1 = \mu_1 - \mu_2 \neq 0$
t distribution table	df		05.0	01.0		
	78		98.1	36.2		
Analogy				98.<16/88:%95 36.2<6/88:%99		
Result	Hypothesis confirmed					

the t-test is larger than the observed t values from the table at 99% and is larger than the t values observed at 95%, and we conclude that the research hypothesis is confirmed. In other words, it can be stated that there is a difference between the lifestyle among the faculty members of the governmental and self-employed universities of Tehran. The average score of professors in this subscale was more than self-employed.

According to the scores in table at high degree of freedom of 78, we find that t obtained is bigger from observed t values from the table at 99% and bigger than observed t values at 95%. Therefore, we conclude the hypothesis was confirmed. In other words, it can be said that in terms of life satisfaction, there is difference among faculty members of Tehran's government and the self-employed. Average score for this subscale for the self-employed was lower than the professors.

Table 4. T test results to determine the difference between the two groups in terms of life satisfaction

Statistical index	Professors			Self-employed		
	Size	Mean	SD	Size	Mean	SD
Life satisfaction	40	71.131	51.21	40	13.122	42.21
t-test				78df = t = 5/12		$H_0 = \mu_1 - \mu_2 = 0$ $H_1 = \mu_1 - \mu_2 \neq 0$
t distribution table	df		05.0	01.0		
	78		98.1	36.2		
Analogy				98.<15/88 : %95 36.2 < 5/12 : %99		
Result	Hypothesis confirmed					

**Hypothesis 1: there is difference in terms of health status between faculty members of public universities and the self-employed people in Tehran.**

Table 5. T test results to determine the difference between the two groups in terms of health						
Statistical index	Professors			Self-employed		
	Size	Mean	SD	Size	Mean	SD
Health	40	47.152	23.28	40	52.142	78.26
t-test	78df = t = 12/85					$H_0 = \mu_1 - \mu_2 = 0$ $H_1 = \mu_1 - \mu_2 \neq 0$
t distribution table	df		05.0	01.0		
	78		98.1	36.2		
Analogy						98.< 1 12/85 : % 95 36.2 < 12/85 : % 99
Result	confirmed					

Hypothesis 9: there is difference in terms of the nutrition status between faculty members of public universiites and the self-employed people in Tehran.

Table 6. T test results to determine the difference between the two groups in terms of nutrition status						
Statistical index	Professors			Self-employed		
	Size	Mean	SD	Size	Mean	SD
Nutrition	40	11.116	67.26	40	56.121	12.25
t-test	78df = t = 9/17					$H_0 = \mu_1 - \mu_2 = 0$ $H_1 = \mu_1 - \mu_2 \neq 0$
t distribution table	df		05.0	01.0		
	78		98.1	36.2		
Analogy						98.< 1 9/17 : % 95 36.2 < 9/17 : % 99
Result	Hypothesis confirmed					

Hypothesis 9: there is difference in terms of sleep and relaxation between faculty members of public universiites and the self-employed people in Tehran.

Table 7. T test results to determine the difference between the two groups in terms of sleep and relaxation						
Statistical index	Professors			Self-employed		
	Size	Mean	SD	Size	Mean	SD
Sleep and relaxation	40	44.98	56.23	40	22.101	99.24
t-test	78df = t = 10/75					$H_0 = \mu_1 - \mu_2 = 0$ $H_1 = \mu_1 - \mu_2 \neq 0$
t distribution table	df		05.0	01.0		
	78		98.1	36.2		
Analogy						98.< 1 10/75 : % 95 36.2 < 10/75 : % 99
Result	Hypothesis confirmed					

**Hypothesis 4: there is difference in terms of type of behavior at workplace between faculty members of public universities and the self-employed people in Tehran.**

Table 8. Test results The difference between sleep and rest between the two groups studied						
Statistical index	Professors			Self-employed		
Workplace behavior	Size	Mean	SD	Size	Mean	SD
	40	17.132	23.28	40	62.127	36.29
t-test	78df = t = 11/45					$H_0 = \mu_1 - \mu_2 = 0$ $H_1 = \mu_1 - \mu_2 \neq 0$
t distribution table	df	05.0	01.0			
	78	98.1	36.2			
Analogy						98.< 1 11/45 : % 95 36.2 < 11/45 : % 99
Result	Hypothesis confirmed					

**Hypothesis 5: there is difference in terms of the recreation and leisure time between faculty members of public universities and the self-employed people in Tehran.**

Table 9. Test results for determining the difference between leisure and leisure status among the two groups						
Statistical index	Professors			Self-employed		
Leisure time	Size	Mean	SD	Size	Mean	SD
	40	66.125	73.23	40	02.131	88.28
t-test	78df = t = 9/66					$H_0 = \mu_1 - \mu_2 = 0$ $H_1 = \mu_1 - \mu_2 \neq 0$
t distribution table	df	05.0	01.0			
	78	98.1	36.2			
Analogy						98.< 1 9/66 : % 95 36.2 < 9/66 : % 99
Result	Hypothesis confirmed					

**Hypothesis 6: there is difference in terms of how to treat wife and children between faculty members of public universities and the self-employed people in Tehran.**

Table 10. Determining the difference between the treatment of the spouse and the children among the two groups studied						
Statistical index	Professors			Self-employed		
Treatment of wife and children	Size	Mean	SD	Size	Mean	SD
	40	67.137	23.28	40	22.130	18.29
t-test	78df = t = 6/95					$H_0 = \mu_1 - \mu_2 = 0$ $H_1 = \mu_1 - \mu_2 \neq 0$
t distribution table	df	05.0	01.0			
	78	98.1	36.2			
Analogy						98.< 1 6/95 : % 95 36.2 < 6/95 : % 99
Result	Hypothesis confirmed					

According to the scores in table at high degree of freedom of 78, we find that t obtained is bigger from observed t values from the table at 99% and bigger than observed t values at 95%. Therefore, we conclude the hypothesis was confirmed. In other words, it can be said that in terms of how to treat wife and children, there is difference among faculty members of Tehran's gov-

ernment and the self-employed. Average score for this subscale for the self-employed was lower than the professors.

**Hypothesis 7: there is difference in terms of satisfaction with sexual relation with wife between faculty members of public universiites and the self-employed people in Tehran.**

Table 11. T test results to determine the difference between the two groups in terms of satisfaction with sexual relation with wife						
Statistical index	Professors			Self-employed		
	Size	Mean	SD	Size	Mean	SD
Sexual satisfaction	40	78.85	45.23	40	76.84	44.22
t-test				78df = t = 1/11		$H_0 = \mu_1 - \mu_2 = 0$ $H_1 = \mu_1 - \mu_2 \neq 0$
t distribution table	df		05.0	01.0		
	78		98.1	36.2		
Analogy				98.< 1 1/11 : % 95 36.2 < 1/11 : % 99		
Result	Hypothesis confirmed					

According to the scores in table at high degree of freedom of 78, we find that t obtained is smaller from observed t values from the table at 99% and smaller than observed t values at 95%. Therefore, we conclude the hypothesis was not confirmed. In other words, it can be said that in terms of satisfaction with sexual relation with wife, there is no difference among faculty members

of Tehran's government and the self-employed. Average obtained for the two groups also show that there is little difference between the professors and the self-employed.

**Hypothesis 8: there is difference in terms of the religiosity between faculty members of public universiites and the self-employed people in Tehran.**

Table 12.						
Statistical index	Professors			Self-employed		
	Size	Mean	SD	Size	Mean	SD
Religion and religiosity	40	33.95	11.25	40	52.94	73.25
t-test				78df = t = 1/36		$H_0 = \mu_1 - \mu_2 = 0$ $H_1 = \mu_1 - \mu_2 \neq 0$
t distribution table	df		05.0	01.0		
	78		98.1	36.2		
Analogy				98.< 1 1/36 : % 95 36.2 < 1/36 : % 99		
Result	Hypothesis confirmed					

According to the scores in table at high degree of freedom of 78, we find that t obtained is smaller from observed t values from the table at 99% and smaller than observed t values at 95%. Therefore, we conclude the hypothesis was not confirmed. In other words, it can be said that in terms of religion and religiosity, there is no difference among faculty members of Tehran's gov-

ernment and the self-employed. Average obtained for the two groups also show that there is little difference between the professors and the self-employed.

**Hypothesis 9: there is difference in terms of the child-rearing practices between faculty members of public universiites and the self-employed people in Tehran.**

Table 13. Test results Determine the difference between parenting style among the two groups						
Statistical index	Professors			Self-employed		
	Size	Mean	SD	Size	Mean	SD
Parenting style	40	75.142	23.28	40	22.136	79.26
t-test				78df = t = 9/71		$H_0 = \mu_1 - \mu_2 = 0$ $H_1 = \mu_1 - \mu_2 \neq 0$
t distribution table	df		05.0	01.0		
	78		98.1	36.2		
Analogy				98.< 1 9/71 : % 95 36.2 < 9/71 : % 99		
Result	Hypothesis confirmed					

### EXPLANATION OF RESULTS

Basic hypothesis about the relationship between lifestyle and life satisfaction among university faculty members and the self-employed people was tested and approved. This finding is consistent with results of Kajbaf et al (2011). In this study, they have believed that life satisfaction and evaluation of a person about his life could be in two forms: 1. positive cognitive evaluation; 2. and emotional evaluation of his life, this assessments composed of emotional responses to events, as well as cognitive judgments of satisfaction and fulfillment.

The results also showed that lifestyle and life satisfaction among university professors is reported higher. The reason for that should be searched in their attitudes to life.

The first hypothesis about the state of health research among faculty members of Tehran’s government and the self-employed are different, have been tested and approved. This finding is consistent with results Yousefinejad (1389) consistent and aligned. However, in terms of income, academic staff showed lower income than the self-employed, but the lifestyle and behavior towards bystander showed that they could create a greater share in the satisfaction of life.

The first hypothesis about the state of health among faculty members of Tehran’s government universities and the self-employed are different was tested and approved. This finding is consistent with results of Yousefinejad (2010). Yousefinejad (2010) in a study evaluated the effect of coping skills training on quality of life, lifestyle and glycemic control in patients with type II diabetes referred to Shariati Hospital. In this research, he believes that people with more education due to more intelligent care more about their health.

Lifestyle is a cultural matter, and of course we know that culture is basically a very eclectic mix. Culture includes religion and customs and myths and strange beliefs and habits, both good and bad.

The second hypothesis of the research about the nutritional status among faculty members of Tehran’s government universities and the self-employed are different have been tested and approved. This finding is consistent with results of Mokhtari (2011).

Mokhtari (2011) in his study studied factors affecting life satisfaction among veterans in Karaj and came to the conclusion that there is a significant relationship between people nutrition style and their life satisfaction.

The research findings are consistent with results of Gilman et al. (2011). The results indicate that there is a significant relationship between nutrition for the elderly and life satisfaction.

For change in lifestyle, it is required to recognize desirable lifestyle. Then approaches to satisfaction of needs to be examined separately, and basic lifestyle promoted by the model should be pathologically evaluated and the gap with the ideal situation depicted in law and ethics be determined and then the model of satisfaction of needs to be designed based on the standard of life style.

The third hypothesis of the research about sleep and rest between the self-employed among faculty members of Tehran government universities are differences was tested and approved. This finding are consistent with Shamsi (2010) who studied Health-based lifestyles in the city of Bukan, and came to the conclusion that being well-rested and healthy is one of the most important factors of life satisfaction and self-employed people because of rest and vacation in the field have earned a higher score.

Chini (2010) argues “Lifestyle can be seen as patterns of action distinguishing people in the community.” Chini also said that “set the actions and attitudes comprise of lifestyles perceivable in specific context”, “Lifestyle is relatively stable pattern of organizing everyday life in the context of a situation (situation) available.

The fourth hypothesis of the research about the kind of behavior in the workplace among faculty members of

Tehran's government universities and the self-employed are different was tested and approved. This finding is consistent with results of Ahmadi (2010), who investigate the sociological study of factors (social, religious and media) on lifestyle (Case Study of Sanandaj), and concluded that university professors in their work environment are treated with respect and also are venerated. Therefore, this factor is effective in the creation of higher life satisfaction among them.

The role of job satisfaction in life satisfaction must be held in mind. Research shows that life satisfaction of people working is more than people that are unemployed as well as those who are engaged in professional work than those who do not have professional jobs.

Without a doubt we can say that condition of lifestyle is a choice. Because in today's world consumption culture provide consumer with a wide range of choices and the choice of indicator values, attitudes and tastes of the consumer forms the concept of social identity. Ability and taste as selection of hobby is his responsibility whereby he will be judged by others. It combines taste with a sense of identity. (Chavoshian, 2002: 23)

It can also be said that each person in terms of the role plays in social relationship obtains opportunities. In other words, each one obtains according to the size of their contribution to the social production of social wealth, including income, experience, skills, information and knowledge. Situations such as the share of social wealth are more or less similar. The enjoyment of social capital depends on the individual's ability to enjoy certain lifestyle.

The fifth hypothesis about the status of recreational and leisure time among faculty members of Tehran's government university and the self-employed are different have been tested and approved. This finding is consistent with results of Mehrizi (2007) who studied the amount of capital (social, cultural and economic) and its relationship with Tehran's youth lifestyles. In this research, he believes that the leisure and recreation can lead to healthy lifestyles. The findings of this study are consistent with the results of Anthony Will (1991), the results of this study showed that the influence structures such as social class has maintained their impact on the shaping and behavior of leisure time. In many ways the general psychological consequences such as life satisfaction may be derived mainly from external factors of the environment.

Life satisfaction is a more general sense than hope for the future, despite some people see life satisfaction as all conditions being ideal in terms of time and place and the availability of facilities for healthy living, the true meaning of life satisfaction is the positive attitude towards life today, with all the difficulties and hardships, bitterness and failures along with successes, happiness

and aptitude. The discussion of being content with conditions gives rise to "determinism" which is different from consent of life. This difference arises from the fact that life satisfaction means seeing all conditions, restrictions, freedom to achieve the goal using existing facilities, but determinism of life also accept the same conditions and the same situation. In the first, there is development and effort.

Sixth hypothesis of this study about the treatment of wife and children among faculty members of Tehran's government universities and the self-employed are different was tested and approved. This finding is consistent with results of Chuli Mahmoud Abadi (2011) titled Social, economic and cultural factors' effects on lifestyle of Iranian families in urban population of Urmia. The research has concluded the interaction and communication with wife and children depends on the social, cultural, economic factors, and so it is. University professors in the meantime also learn more about life skills, trying to build a loving encounter with their family members.

These findings are consistent with Kragr Johnson (2006), showing that teachers with life healthy relationships with his wife and children have a higher level of mental health.

The seventh hypothesis of this study about the satisfaction of having sexual relations with a wife among faculty members of Tehran's government universities and the self-employed are different, was tested but not approved.

This finding is consistent with results Amiri Heidari (2011) studying the relationship between personal identity and lifestyle among women 18-45 years old in Kerman, and concluding that sexual relations between people and their satisfaction with their lives is a function of the understanding between them and gender identity.

On the other hand, abundant evidence exist in relation to marriage and mental health, which is one of the determinants of life satisfaction, showing relation between the two, and pressures of marital life with psychological trauma, especially depression, anxiety disorders and related physical ailments.

Eighth hypothesis of this study about the state of religion and religiosity among faculty members of Tehran's government universities and the self-employed are different was tested but not confirmed. This finding is consistent with results of Reihani (2011) who in his thesis investigates the relationship between life style and organizational commitment. He believes that religiosity is an important factor for a happy life. Religious people have usually more relaxed life and more of the enjoyment of contentment and away from greed and thus can experience greater convenience.

In this context, researchers can distinguish some lifestyles and make a group with such features as their

index. However, this does not mean that the society level, a group that has such style are differentiable and identifiable from others. Diagnosis often requires that group is seen as members who have common goals and sustained engagement. Since the formation of such a group is not lifestyle preconditions, the recognition cannot also be regarded as life-style property. The research findings were consistent with Seligman et al (2005). The results of this study showed the more religious nurses have experienced personal and professional satisfaction in life more than others. In addition, nurses with the moral and have shown less reaction to economic issues and related stressors.

In this context also is noted that life satisfaction is a concept very closely related with happiness, so that one satisfied with his life feel more happiness than someone dissatisfied, and review the results of studies in a thesis shows that religious attitudes of young people is associated with higher levels of happiness, positive mood, efficiency, greater self-esteem and life satisfaction.

Ninth hypothesis of this study about parenting practices among faculty members of Tehran's government universities and the self-employed are different was tested and approved. This finding was consistent with Taher (2011) studying the relationship between life satisfaction and coping styles and personality traits of women in Rasht city's higher education institutions. In this study, he believed employed women following authoritative parenting style in life are usually less stressful. The research findings also consistent with Snyder and Lopez (2002). The study results show that parents who have used preventive behaviors of high risk behavior have a greater share of health and life satisfaction. Unlike, parents and their children reported more risky behaviors, such as addiction to drugs or alcohol, were less satisfied with life.

Overall from above studies, several points can be inferred:

1. lifestyle is a way of life, a pattern of conduct, a set of functions, organization way of life, behavior and material preferences and consumption pattern.
2. Style selection of life based on the decision of people to act.
3. Choosing a specific lifestyle is based on individual tastes and interests.
4. Lifestyle choices are specific to the resources available, one's social status, social background and texture in which one is located.
5. The more the construction and social context have favorable characteristics and features to free actors to break free from the shackles of the construction, the more the possibility of crystallization of individual identity and social actors. In other words the possibility of expressiveness and

introducing themselves through lifestyle choices will be more. 6. Through lifestyle choices, the similarities and differences in each other and from each other of activists are determined. In other words, the lifestyle is distinctive of individuals and groups. 7. Any particular life style has relative coherence. Set of behaviors and activities of each actor make sense relying on the apparatus, facilities and special abilities and background in special situations, in response to the demands, preferences and specific requirements of actor for self-expressive.

## REFERENCES

- Omidvar, F (210) lifestyle and social class, *Journal of Association*, 2 (14).
- Morovvati, SM (2010) Quality of life and marital adjustment, *medicine and purification*, 2(21).
- Monshizadeh, H. (2011) Factors affecting life satisfaction among veterans, *Journal of Behavior Journal*, No. 134 consecutive.
- Berslo, N., (2010) Knowledge, behavior and attitude with respect to cardio-vascular disease. *Archives Des Maladies Du Coeur Et Des Vaisseux (Paris)*. 80: 929-935.
- Davidson, G.C.and J.M. Neale (2011); *Abnormal Psychology*; John Wiley and Sons, Inc.
- Gatman, T (2004). "Psychological sequelae of combat violence: A review of the impact of PTSD on the veteran's family and possible interventions". *Aggression and Violent Behavior*. Vol.9, Issue 5, pp.477-501.
- Gilman, J. J., Sefick W. J. & Emmons, R. A. (2011) Counting blessings in early adolescents: An experimental study of gratitude and subjective well-being, *Journal of School Psychology*.
- Gilman, R., Ashby, J.S., Sverko, D., Florell, D., and Varjas, K.( 2011). The relationship between perfectionism and multidimensional life satisfaction among Croatian and American youth. *Personality & Individual Differences*. Vol.39, Issue.1, pp.155-166.
- Johnson, W., and Krueger, R.F. ( 2006). How money buys happiness: genetic and environmental processes linking finances and life satisfaction. *Journal of Personality and Social Psychology*. Vol 90, Issue 4, pp. 680-691.
- Morgan, C. (2010) You can do it if you set your mind to it: a qualitative study of patients with coronary disease. *Journal of Advanced Nursing* 36: 733-741.
- Morgan, T. B. (2010) Gratitude and subjective well-being in early adolescence: Examining gender differences, *Journal of Adolescence*.
- Seligman, M.E.P., Steen, T., Park, N. and Peterson, Ch., (2005). "Positive psychology progress: empirical validation of interventions". *American Psychologist*. Vol 60, Issue 5, pp. 410-421.

## Macro ergonomics: An approach to improve safety efficiency and the quality of working life

Hashemi Zahra<sup>1,2</sup>, Nasl Saraji Gebrail<sup>3\*</sup> and Asadi Nasrin<sup>2</sup>

<sup>1</sup>PhD Student, Occupational Health Engineering, School of Public Health, Tehran University, Tehran, Iran

<sup>2</sup>Instructor, Department of Occupational Health Engineering, Behbahan Faculty of Medical Sciences, Behbahan, Iran

<sup>3</sup>Professor, Faculty of Occupational Health Engineering, School of Public Health, Tehran University of Medical Sciences

### ABSTRACT

Economic and social development and industrial revolution led to the rise of modern assembly systems. The users of mechanical and assembly systems are inherently looking for independence, participation and respect; however, the use of these systems led to a repetitive and monotonous work, mental stress and physical defects in the work, lack of motivation and commitment for the users. Despite the investments and using sophisticated and modern technologies, the industry owners had not achieved their goal of increasing production and productivity. Benefiting from Macro ergonomics approach as a solution to this problem has come into consideration in recent decades. In this study, through searching in the Google Scholar the databases with keywords of productivity, macro ergonomics and quality, more than 100 studies were collected. The results of reviewing 15 relevant articles showed that by applying macro-ergonomic principles, not only the rates of musculoskeletal disorders and absenteeism from work will reduce, but also, this approach would lead to increased employees' participation and decision-making, enhanced motivation, increased quality of products and services, and will ultimately, resulting in increased productivity.

**KEY WORDS:** MACRO ERGONOMICS; PRODUCT QUALITY; PRODUCTIVITY

### ARTICLE INFORMATION:

\*Corresponding Author: [jnsaraji@sina.tums.ac.ir](mailto:jnsaraji@sina.tums.ac.ir)

Received 2<sup>nd</sup> May, 2017

Accepted after revision 10<sup>th</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

The emergence of socio-productive organizations and their increasing development are as clear features of human civilization; thus, due to various spatial and temporal factors, and specific characteristics and needs of different communities, a variety of social organizations emerge and spread everyday with an increasing trend in number. Using limited resources at their disposal, organizations in each community somehow manage to meet individual and group needs of the community members. Since, the production resources have always been faced with the scarcity feature, the major goal of organizations is often the efficient use of factors of production and achieving effectiveness. Sink and Tuttle (1989) suggested that the organizational performance can be measured with seven criteria of performance, productivity, effectiveness, product quality, working conditions quality, innovation and profitability (Sink and Tuttle 1989).

In today's competitive world, as a philosophy and viewpoint based on improvement strategy, productivity appears as the most important goal of any organization, and can encompass the activities of all sectors of the population as a chain (Taheer sh, 1999). From the perspective of management and economic, in general, productivity refers to the function of three variables of technology, human resources and organization. Each variable separately leads to productivity; each of the factors of being up-to-date, modern equipment, professional and skilled human capital, adequate and coherent coordination can appear as a source of gradual or fundamental change in productivity (Greve, Arent & Benassi, Mario 2003). All work systems include human and a machine components that have been incorporated in a system with a specific purpose. If working conditions are not properly designed, no proper control can be applied over the process of doing the job, safety and quality of the products.

In contrast, by having a proper design, the synergistic effect of three factors of ergonomics, safety and quality would emerge, which results in the appearance of self-control organization, effective staff, safety and quality (Thomas et al, 1999). In the modern era, competitive advantages due to human resources seem to be critical for the success of a company and business environments (Boselie & Wiele (2002) and Vouzas (2006)). When designing any system, the characteristics of those involved in the work must be recognized, and these features have to be considered during designing. While speaking of productivity, a man is defined as an operator or as an agent of motion and an active force. In the face of technology growth and subsequent changes, today's world has realized the fact that the human factor can be the most critical component in evaluation of productiv-

ity, since through serious participation, this factor can recognize and control many of executive failures leading to mismatch of the results with our objectives. Thus, human is both factor of productivity and its purpose as well (Özer Sarı, 2009).

Many experts in the field of management and economic have studied the factors affecting productivity and introduced the following factors: Low quality of doing things, inefficient structure, weak management systems, lack of meritocracy in management, lack of appropriate cultural contexts to implement projects related to productivity, job dissatisfaction of staff, lack of job stability for managers and staff, lack of trust between managers and employees, lack of proper and up-to-date trainings in the area of productivity system, lack of work ethics in employees, fading employees' participation system within the organization and lack of qualitative nature in the management system. These and other reasons have turned productivity to a complex variable (Taleghanigh et al., 2011).

Quality refers to the conformity rate of products or services with the standards, specifications or expectations. Quality management produces the products with fewer defects and lower costs, which actually defines the concept of productivity improvement. Improvement in quality is not limited to the manufacturing operation and is directly related to labor and working conditions of the employees. Designing the work systems in accordance with ergonomic principles can provide a good quality, not only for employees as internal customers but also for buyers as external customers. Hence, improving quality means improved productivity, and improved productivity refers to the concept of quality improvement (Jazani 2014).

In this study, productivity improvement and the quality of products from the perspective of macroergonomics and were factors affecting productivity and quality were studied. Initially, we reviewed working conditions and the challenges ahead. Then, with the introduction of macroergonomics and its principles, the relationships between macroergonomics, productivity and quality were discussed in the conducted studies.

**Definitions and Concepts:** Indicators used to measure productivity, Labor productivity, Productivity of capital, Total Factor Productivity (TFP) by Kendrick method, Sales per capita, Gross profit margin percentage, Energy productivity efficiency, Labor productivity

The index is obtained from value added divided by the compensation of employees. Some experts on productivity calls this ratio as Competitiveness Index. This index refers to the amount created value added per Dollar unit paid for compensation of services. It should be noted that the labor productivity is calculated by dividing the value added by the number of employees, which

reflects the amount of wealth generated in the institute in proportion to the number of its employees.

$$LP = \frac{\text{Value added}}{\text{Employees' Compensation}} \quad (1)$$

- Capital productivity

Capital productivity is the ratio of value added to the depreciation expense of fixed assets. This index shows that in a firm (business), how much value added has been created for per Rial of assets depreciation expense. Since, the purpose of measuring this index to determine the amount of added value created per using a unit of fixed assets, thus, the cost of depreciation is used in the denominator.

$$CP = \frac{\text{Value added}}{\text{Depreciation of assets}} \quad (2)$$

- TFP by Kendrick method

This index is achieved from the ratio of value added to the weighted combination of inputs of labor and capital used in the organization.

$$TFC = \frac{AV}{\alpha L + \beta D} \quad (3)$$

AV = Added value

$\alpha$  = Coefficient of elasticity of production manpower factor

$\beta$  = Coefficient of elasticity of production capital factor

L = Compensation of employees

Alpha and beta values for each firm are usually obtained using econometric methods and by estimating the coefficients of elasticity of production factors.

- Energy productivity

This ratio reflects the added value created per unit of energy used. Lower ratios indicate that more energy has been used for created added value and vice versa.

$$EP = \frac{\text{Value added}}{\text{Energy used}} \quad (4)$$

- Sales per capita

This ratio represents the amount of sales for each of the organization's employees, and its increase can indicate the adoption of appropriate policies in sale or caused by the reduced number of employees.

$$\text{Per capita sales} = \frac{\text{Value of net sale}}{\text{Number of employees}} \quad (5)$$

- Gross profit margin percentage

This ratio compares the firm net profit with total sales and displays the end result of management. By comparing the margins of gross and non-specific profit of a company, a good understanding of non-productive, non-operational and indirect costs such as financial, administrative and marketing costs can be provided (Theoretical Foundations measure of productivity in the national festival productivity).

$$\text{Gross profit margin percentage} = \frac{\text{After tax Net (loss) earnings}}{\text{Sale net value}} \times 100 \quad (6)$$

- New working systems

Advanced production systems tend to change jobs towards independence with no need to skills. With the advent of computer science in industrial systems, incentives were developed to use programmable and numerical machine tools such as numerical control and (NC), computerized numerical control (CNC) machine-oriented (MC) tools. With changes in technical knowledge of information and production, jobs and organizational structure have changed. The jobs became simple, independent and repetitive. On the other hand, excessive division of labor had some disadvantages such as fatigue, illness, production cuts, tension and displacement. The organization was also divided into classes and different sections. Such shift in tendencies deprived man from having skill, independence and self-actualization in the organization. From the perspective of human factors, the problem in new production systems is that people often work with their hands and feet like a machine or tool. Employees want to gain high productivity without expertise and skill. The result of lack of skills and work specialization expertise is unbalancing in personality growth. The classification of organizational structure has led to the centralization of decision-making and powers at upper levels of the organization, and people in low levels of organization are often unhappy and unmotivated. They do not appreciate give their work and cannot be committed to the organization (Macroergonomics Theory,2006).

Many ergonomic analyses in the field of human activities are rooted in the work and time studies, which form the basis for production engineering. As a result, it is natural to consider productivity in doing ergonomic analyses. Productivity improvement is an easy way to encourage management to spend on planning and applying ergonomic interventions. This justification method can act more effectively for people with no ergonomic information (Dempsey and Mathiassen 2006). Ergonomics is a science that meanwhile considering the health of human resources follows an accurate attitude toward production and productivity. The aim of ergonomic interventions and application of ergonomic

knowledge is to achieve a proper and logical relationship between employees with the environment, machine, job and the organization. In these circumstances, employees can gain optimal production, improved product quality and productivity (Shaliza 2006).

Resolving ergonomic problems in the workplace requires improvement at different levels of the organization. Such improvement should be made not only in duties but also in the overall structure of the organization, conduct of business activities, and development of organizational policies and procedures. This method is called systematic approach to achieve macroergonomic improvement (Hendrick and Kleiner (2001). The purpose of macroergonomics involves work system synchronization at all organizational and individual levels. Balance and coordination between system components, including people, technology, politics and organization policies not only increase the health status, but also will bring high level needs such as job satisfaction, organizational commitment and increased productivity (Freivalds, 2005).

Using macroergonomics in developed countries revealed that the method can provide many successes in improving favorable conditions. People working in such environments have high motivation, which will lead to increased productivity (Hägg GM. 2003).

- Macroergonomics principles
  - Job enrichment

Job enrichment is one of macroergonomic solutions for smoothly and repetitive work systems. Job enrichment or development is classified in two horizontal and vertical forms. Horizontal enrichment increases the job complexity for elevating the interests, and vertical development gives the employees an opportunity to experience major successes, gratitude, responsibility and personal growth. Therefore, job enrichment leads to generation of proper motivational factors in the content of job. Kleiner believes that the lack of skills and simplification of jobs lead to workers conflict in the workplace as well as poor organizational performance. Authors believe that the complexity of job can be an important factor in predicting job satisfaction and may improve the performance results through increasing satisfaction (Cotton et al 2002).

- Job design / redesign

Job design involves the process of determining and reconstruction of duties, powers, responsibilities, job process, employment relationships and workplace conditions so that by adaptation of career features with the employees talents and abilities, both individual needs and organization goals would be met (Mirkamaly 2004). One of the goals of ergonomics is to tailor the work

with people, which is made by detailed analyses on job requirements and people's physical and mental abilities. One of the factors with a decisive role on mental health and stress inflicted on workers is the job and task that workers should play a role in it (Kompier 2003). This becomes more important when it assumes smart people are employed in a simple and repetitive job. These people become quickly bored and unmotivated. Studies show that motivated employees determine the success or failure of the organization (Bergmann et al., 2001). One of the motivating factors in employees is to create jobs that are interesting, creative and meaningful, which often lead to a high level of satisfaction (Schermerhorn et al., 2004).

In general, employees' empowerment is a management practice that is divided into two main direct and indirect types. Direct forms include handing over more responsibility to individuals and teams to perform and manage their tasks and participate in decision-making, such as the formation of self-managing teams. Indirect forms involve extensive engagement in the group. Managers must equip their employees to implement any type of empowerment (Leach Desmond & wall toby.d (nd), (2006)). Involving employees in organizational decision-making appears to be as tools that empower the employees.

Degree of participation refers to the influence and control that the employees apply in the organization decision-making Desmond & Toby (2006). Latham claims that employees' involvement has a motivational effect on increasing employees' satisfaction and commitment (Latham et al., 1994). Participatory ergonomics programs are one of the most common approaches of macroergonomics that increase the organizational performance. Employees and management participation in identifying and implementation of change is an essential part of participatory ergonomic interventions, and the results of such interventions include increased effectiveness of modified programs, increased problem-solving capabilities needed to improve working conditions as well as better communication between departments in the organization (Haines et al., 2002). By creating a participation atmosphere, the labor force would accept the changes easier, and participatory interventions enable them to deal with physical stress and organizational factors simultaneously (Halpern et al., 1997). The European Foundation for the Improvement of Living and Working Conditions (1999) reported that direct participation in the organization often leads to improved quality (90%), reduced production time (60%) and cost reduction (60%) (European Foundation for the Improvement of Living and Working Conditions, 1999).

Competence and self-efficacy refer to an individual's belief regarding having the abilities required to perform

tasks related to his duty. In other words, this feeling determines that whether people will make efforts to do a hard work and will have perseverance or not (Hamill SK. 2003). Research shows that occupational self-efficiency has a positive correlation with job satisfaction and organizational commitment and is negatively correlated with job burnout and occupational stress (Hofman & Spatariu 2007). Self-organization refers to the right choose. When people have a feeling of self-organizing, they voluntarily and knowingly participate in tasks rather than engage in a work unwillingly or desist it (Thomas 1990).

Training is always considered as a reliable means to improve the quality of performance and solve the management problems, and its absence appears to be one of the key and acute issues of any organization. Training is seen as a key factor in the development, which can be considered as one of the most important measures to increase the efficiency of the organization. According to available statistics, the average American companies spend more than 1,500 \$ per year for training of every employee that the spent figures in total account for 52% of total sales of those companies (Bailey and Allan 2003).

The studies have also shows that training leads to maintained continuity and survival of the organization. A three-year study in Singapore showed that 17% of commercial and industrial companies have gone bankrupt in this country. Of these, less than 1% have been companies that had held training programs for their employees (Carr 2002). Proper training greatly reduces job dissatisfaction and reworking and helps employees to work at full capacity. Such important objectives could not be realized unless all the organizational hierarchy (from the executive managers to staff) would be aware of the importance of training (Ivancevich 2001).

Implementation of the principles outlined in the scope of macroergonomics requires the accompanying of senior managers, and consequently, the organization's policies. Managers always play a crucial and critical role in organizations. Middle and senior managers are key elements in guiding, conducting and success of operational managers and employees. Organizations reasonable flexibility in dealing with various changes and technological developments allows the organizations to be up-to-date and set their policies, methods, programs and decisions based on the facts, and if necessary, make necessary changes and fix the problems and draw their progress plans.

## METHODOLOGY

In this study, through searching in the Google Scholar the databases with keywords of productivity, macroer-

gonomics and quality, more than 100 studies were collected. After review, a total of 15 papers with more relevance to the present study were selected, which were discussed in detail in the results section.

## RESULTS AND DISCUSSION

A study was conducted in 1992 by Nagamachi in the oil industry with teamwork approach to enhance health and safety (participatory ergonomics), train safety and make changes in the structure and workplace. The results represented a 54% reduction in injuries, 51% reduction in vehicle accidents and 94% reduction in lost days (Nagamachi Imada 1992). Rooney et al. in Bean Company, known to produce high quality clothing, conducted a study in 1993. They used macroergonomics to introduce a total quality management (TQM). During 2 years of use of macroergonomics, the rate of accidents decreased as 70% and job satisfaction had significantly increased (Rooney et al., 1993).

In 1993, Brown showed that participatory ergonomics can lead to positive changes in productivity, quality of working life and the use of potential capacities of employees. Top management commitment to this part of macroergonomics principles will cause sustainable increase in production and productivity (Brown 1993).

In a research in 1997, Hendrick showed that performance increase from 60 to 90% (productivity – quality) has been obtained by using macroergonomics, while using microergonomics, the increase has been seen as about 10 to 20% (Hendrick 1997). In a study carried out in 1999 by Pascale in South Korea to answer to the question of “How ergonomics can lead to the growth and promotion of Total Quality Management?” an 8-step model was provided to achieve this response. At first, the whole processes were evaluated by workers. The troubled processes were evaluated by available committees to prioritize the strategies and solutions. The ergonomics improvement team, including experts in the areas of health and safety, process engineers and management, selected and implemented simple and low-cost solutions. One can say that utilizing the areas of ergonomics, such as total quality management, has been effective in improving the workplace, resulting in increased productivity, cost savings, and improved immunity (Carayon, 1999).

In 2000, a study was performed to evaluate productivity before and after ergonomic interventions (analysis and design of workstations, environment, organization and products). According to the results of this study, productivity showed increase depending on the complexity of the task on assembly lines, and the employees reported higher incentive and less fatigue after the interventions (Guimarães et al., 2000).

In a study conducted in 2001 by Kleiner, a 10-stage process was conducted, including identification, designing and defining enterprise systems, their performance and expectations, identifying operations and procedures, inconsistencies and non-conformities, allocation of performance, commitment and sense of responsibility, design of subsystems, implementation of strategies and reimplementation. They came to the conclusion that managers spend 60-70% of their time for technology subsystems and 30-40% for staff subsystems.

The results of this study revealed that the use of macroergonomics will improve work system performance and subsystems such as productivity, quality of life and job satisfaction (Kleiner, (2001). Motamedzadeh et al. did a research in 2003 in a factory in Tehran with participatory ergonomics approach as one of the principles of macroergonomics (use of potential abilities of employees to do the work). In this method, a model was developed by a team of specialists in 4 steps, including model designing, project justification to change the attitudes of managers and increase the employees' knowledge on ergonomics, implementation of provided solutions by collective wisdom through using available resources, and in the final stage, method evaluation to assess the success rate. The results suggested that the use of participatory ergonomics can be seen a cost-effective and efficient method. In addition, conditions such as limited financial resources, low social and economic literacy, employees' status, market volatility and high rate of management change caused the interventions made would lead to changes with a slight slope toward improved working conditions, increased productivity and improved quality (Motamedzade, et al., 2003).

The results of another study on the subject showed that the use of participatory ergonomics has led to increased productivity up to 44%, reduced working time to 46% and increased added value of 74% to 92%. At the end of the day, workers reported less fatigue (Rhijn, et al.2005).

In 2007, Hendrick showed in a study that as a result of using macroergonomics, a 50% to 90% increase in organizational performance and up to 200% improvement in productivity have been achieved (Hendrick 2007). De Looze conducted a study in 2010 with the aim of improving the productivity and ergonomics of assembly lines in two factories of producing magnetic valves and office furniture. In this study, using an active participatory approach and by merging two fields of assembly engineering and ergonomics, they achieved some solutions. To analyze bottlenecks, main problems and design the assembly process, they worked closely with Companies' representatives. Then, by applying new concepts of assembly and microergonomic interventions (table height correction), they could increase the productivity

rate as 15- 20%, significantly reduce the lead time and eliminate the dangerous states of the body (De Looze, et al., 2003). In a study in 2009, Dul et al. reported that the main cause of entrepreneurship has been the use of macroergonomics in policies and approaches of the organization. In addition, participatory ergonomics has caused increased employees' self-confidence, increased commitment, reduced stress and job satisfaction (Dul 2009).

In a case-control study conducted in a shoe factory in 2011, the level of work quality was increased by utilizing microergonomics and macroergonomics (defects dropped from 6.14% to 1.54%). Also, the quality of working conditions increased (from 03/58% to 33/93%). In this study, some teams were formed to develop more interactions between managers and employees. These teams received trainings such as increasing the knowledge of employees in the production process, more participation in problem solving as well as how the ergonomics affects the organizational and production levels. In the next step, the created problems were resolved with the participation of representatives from management, staff and the team of ergonomists (Sandra and Mej, 2011).

In a study, analysis of profit - cost of ergonomics interventions in a Brazilian shoe company was made. In comparison the results of the proposed production line (including 100 multi-skilled workers) and 8 traditional production lines (A person performs a specific duty) showed that the benefits of the intervention outweigh the costs of intervention (80% reduction of industrial accidents, 100% reduction of musculoskeletal disorders and medical advice, 45.6% reduction of absenteeism, and increase in production (3% increase in productivity and reducing wastes to less than 1%). The net worth of interventions was as 430,000\$ with the benefit-cost ratio of 7/2 (Guimarães et al., 2012).

In a study conducted by the same researcher after 3.5 years later in the same factory to compare the use of social - technical system rather than Taylor - Ford production system, the results showed that the working conditions of people that had been working on a team and had multiple skills have enriched, and they showed more flexibility during work tasks. Comparing the results before and after the interventions indicated increased job satisfaction and commitments, (Guimarães 2014).

The results of Abargouei study (2012) on examining the effects of ergonomic interventions (microergonomics - macroergonomics) showed that interventions and performance evaluation are based on four principles of management support, knowledge support, employees involvement and assessment, recognition and encouragement of intervention process with managers training. The positive effects of using this knowledge can

be found in increased productivity and reduced musculoskeletal disorders. Comparing the performance before and after the interventions indicated the reduction in costs, increase in revenues and doing more work with a smaller workforce (Abarghouei 2012). A study was carried out in 2015 in a furniture manufacturing company in southern Brazil with the goal of improving ergonomics and production. The cellular teamwork model was replaced Taylorism model in this study. Changes such as enriching tasks in both vertical and horizontal levels, improvement in the design of workstations, increased speed of production, employees' satisfaction, reduction in improper posture, fatigue and body pain were observed. The workload had reduced by 42% and productivity had increased by 46% (25% related to unnecessary load transports, waiting time and transportation, and 21% of the manufacturing process in the factory).

The workers involvement in the processes of identifying problems, designing and evaluation of solutions has played a major role in these results. This study shows that integration of macroergonomics and production management principles increases the levels of welfare and productivity, resulting in a more sustainable system (Guimarães et al., 2015).

## DISCUSSION & CONCLUSION

In ergonomics literature, four major components of a social - technical system are as follows: Personnel subsystem, technical subsystem, organizational structure and the external environment. These four elements interact with each other. Changes in one of them affect others. Unfortunately, technology-oriented approach does not consider the system sociotechnical variables properly in the design of organization and work. As a result, the designed systems neither act optimally on productivity nor on the sense of the value of employees, stress, satisfaction and other health and safety cases. Macroergonomics is a socio-technical approach that involves organizational design, work system as well as designing of human-machine, human-environment and man-job interactions and focuses on employees' participation. Using macroergonomics, many microergonomic principles are considered spontaneously. Proper use of macroergonomic methods can lead to favorable results (Habibi, et al., 2008).

Organizational performance can be assessed by criteria such as efficiency, productivity, effectiveness, product quality, working conditions quality, innovation and profitability (1). The results of above studies indicate that macro-ergonomics approach can lead to increase in productivity and products quality, satisfaction, employees' participation as well as reduce in musculoskeletal

diseases, accidents, reduced delivery time and the lost days (34-50). Different results have been obtained in different studies due to different discussed standards, different working environment and the ultimate goal of the study. The common thing in most studies was the formation of a joint team of management, Health-Ergonomics experts and the staff. Involving employees and using employees' opinions follow a dual goal in these studies. However, given that staff work closely with different parts of job and equipment, they can well identify the problems and offer appropriate solutions. In addition, employees' participation in decision making leads to a sense of commitment, increased motivation and job satisfaction, which are all directly related to improved product quality and productivity (Carayon et al., 1999 -Dul and Neumann 2009). The effective factor on the success rate of the macroergonomic methods relies on the support from senior management on implementing this method (Abarghouei 2012). The high rate of management change and low socioeconomic literacy rate of employees makes the results of macroergonomic interactions not to be seen sensibly (Motamedzade et al., 2003). Redesign of work stations in order to enrich jobs and moving from Taylor system toward cellular work stations can play a vital role in increasing productivity and employees' satisfaction (Ribeiro et al., 2014 and Guimarães et al., 2015). Despite the widespread use of ISO900 for Total Quality Management (TQM), it seems that macroergonomics can be very helpful as a strategy. It is expected that a new trend of macroergonomics will develop in this field, which will cause the extensive development of total quality management (Rooney et al., 1993 and Hendrick 1995).

## REFERENCES

- Bailey, Allan, (2003), Training Analytics, the Canadian Learning Journal.
- Bergmann, T. J., Scarpello, V. G., & Hills, F. S. (2001). Compensation decision making (4th ed ed.): Dryden Press.
- Boselie, P. & Wiele, T. (2002) Employee perceptions of HRM and TQM, and the effects on the satisfaction and intention to leave. *Managing Service Quality*. Vol. 12, No. 3, pp.165-172
- Brown, O., Jr. (1993). On the relationship between participatory ergonomics, performance and productivity in organizational systems. In W.S. Marras, W. Karwowski, J.L. Smith, & L. Pacholski (Eds.), *Proceedings of the International Ergonomics Association, World Conference on Ergonomics of the Material Handling and Information Processing at Work* (pp. 495-498). London, UK: Taylor & Francis.
- Carr, Wendyf (2002), Designing an Effective Training Evaluation Process, *Journal of European Industrial Training*.
- Cotton, S. J., Dollard, M. F., & de Jonge, J. (2002). Stress and student job design: Satisfaction, well-being, and performance

- in university students. *International Journal of Stress Management*, 9(3), 147-162
- Dempsey, P.G., Mathiassen, S.E., on the evolution of task-based analysis of manual materials handling, and its applicability in contemporary ergonomics. *Applied Ergonomics*, 2006, 37 (1), 33-43.
- Dul J, Neumann WP. Ergonomics contributions to company strategies. *Appl Ergon* 2009;40:745-2
- D.S. Sink, T.C. Tuttle Planning and Measurement in Your Organization of the Future. Industrial Engineering and Management Press, Norcross, GA (1989)
- European Foundation for the Improvement of Living and Working Conditions, 1999. *Communique July/August, 1999, EFILWC 2, Dublin.*
- Freivalds, A. Introduction to Work Design PowerPoint. Penn State (2005)
- Greve, Arent & Benassi, Mario, (2003), exploring the contributions of human and social capital to productivity, Hawaii International Conference on System Sciences, January 5-8, Hilton Waikoloa Village, and Big Island, Hawaii.
- Guimarães LBDM, Anzanello MJ, Ribeiro JLD, Saurin TA. Participatory ergonomics intervention for improving human and production outcomes of a Brazilian furniture company. *Int J Ind Ergon* 2015;1-11. doi:10.1016/j.ergon.2015.02.002.
- Hägg GM. Corporate initiatives in ergonomics--an introduction. *Appl Ergon* 2003;34:3-
- Hendrick, H.W. and Kleiner, B.M. (2001) *Macroergonomics: An Introduction to Work System Design*. Human Factors and Ergonomics Society, Santa Monica
- Haines H, Wilson JR, Vink P, Koningsveld E. Validating a framework for participatory ergonomics (the PEF). *Ergonomics*. 2002; 45(4):309-327.
- Halpern CA, Dawson KD. Design and implementation of a participatory ergonomics program for machine sewing tasks. *International Journal of Industrial Ergonomics*. 1997; 20(6):429-440.
- Hamill SK. Resilience and self-efficacy: The importance of efficacy beliefs and coping mechanisms in resilient adolescents. *Colgate University Journal of the Sciences* 2003; 35: 115-46
- Hofman, B. & Spataru, A. (2007). The influence of self-efficacy on met cognitive, contemporary *Educational Psychology*, 26-32.
- Hendrick, H.W., 1997. *Good Ergonomics is Good Economics*. The Human Factors and Ergonomics Society, Santa Monica, CA
- Hendrick HW. *Macroergonomics: The analysis and design of work systems*. *Reviews of human factors and ergonomics*. 2007; 3(1):44-78.
- Habibi, E., Amini, N.R., Porabdian, S., Rismanchian, M. and Hasanzadeh, A. (2008) Assessment of Relationship between Macro Ergonomic Conditions and Employees Work Satisfaction Touse-eh and Omran Factory. *Iran Occupational Health Journal*, 5, 15-20.
- Hendrick, H W. Future directions in macroergonomics. *Ergonomics*. 1995;38(8):1617-1624
- Taheri sh. *Productivity & analysis on organizations on (Total productivity Management)*, Tehran, IP st P Edition.
- Thomas J. Smith. *Synergism of Ergonomics, Safety, and Quality—A Behavioral Cybernetic Analysis*. *International Journal of Occupational Safety and Ergonomics*. 1999;5(2): 247-278
- Ivancevich, John. M.(2001), "Human Resources Management", Companies, Inc.
- J.W.van Rhijn, M.P.de Looze, G. Tuinzaad, L. Groenesteijn, M.D.de Groot, P. Vink Changing from batch to flow assembly in the production of emergency lighting devices *International Journal of Production Research*, 43 (17) (2005). 3687-3701
- Kompier, M. (2003). *Job design and well-being*. The handbook of work and health psychology, 429. Bergmann, T. J., Scarpello, V. G., & Hills, F. S (2001). *Compensation decision making* (4th ed ed.): Dryden Press
- Keliner, B.M. (2001) *Macroergonomics*. In: Karwowski, W., Eds., *International Encyclopedia of Ergonomics and Human Factors*, Taylor & Francis, London, 124-125.
- Leach Desmond & wall toby.d (nd), (2006), "What is empowerment?" *Institute of work psychology*, retrieved august 3. form [www.about.com](http://www.about.com)
- Latham, G. P., winters, D.C., and Locke, E. A., (1994), "Cognitive and motivational effects of participation: A mediator study", *journal of organizational behavior*, Vol .15, 49-63
- LBM de Guimarães, D Fischer, F Ely, C a Diehl. , Evaluation of Productivity before and after an Ergonomic Intervention. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting July 2000*; 44(10) 292-294
- L.B.de M. Guimarães,J.L.D. Ribeiro, J.S. Renner. Cost-benefit analysis of a socio-technical intervention in a Brazilian footwear company. *Applied Ergonomics* .Volume 43, Issue 5, September 2012, Pages 948-957
- L.B. de M. Guimarães, J.L.D. Ribeiro, J.S. Renner,P.A.B. de Oliveira. Worker evaluation of a macroergonomic intervention in a Brazilian footwear company. *Applied ergonomics* Volume 45, Issue 4, July 2014, Pages 923-935
- Motamedzade, M., Shahnava, H., Kazemnejad, A., Azar, A. and Karimi, H. (2003), "The impact of participatory ergonomics on working conditions, quality, and productivity", *International Journal of Occupational Safety and Ergonomics*, Vol. 9 No. 2, pp. 135-47. [CrossRef]
- M. P. De Looze, J. W. Van Rhijn, J. Van Deursen, G. H. Tuinzaad & C. N. Reijneveld. A participatory and integrative approach to improve productivity and ergonomics in assembly. *Production Planning & Control: The Management of Operations* .Volume 14, Issue 2, 2003
- Macroergonomics Theory, methods, and applications* edited by Hal W. Hendrick. 2002
- Mirkamaly, S. M. (2004). The significant increase in job satisfaction of teachers teaching profession *Journal of Management Education*, 37-40.

- Abarghouei, SH H. Hosseini Nasab. An Ergonomic Evaluation and Intervention Model: Macro ergonomic approach. *International Journal of Scientific & Engineering Research*. 2012;3(2).1-7
- Nagamachi, M., Imada, A.S., 1992. A macroergonomic approach for improving safety and work design. Paper presented at the Proceedings of the Human Factors and Ergonomics Society 36th Annual Meeting, Santa Monica, CA.
- Özer Sarı, F., 2009. Effects of employee trainings on the occupational safety and health in accommodation sector, *Procedia -Social and Behavioral Sciences*; 1(1):1865-1870.
- Pascale Carayon, François Sainfort & Michael J. Smith .Macroergonomics and Total Quality Management: How to Improve Quality of Working Life? *International Journal Of Occupational Safety And Ergonomics* 1999; 5(2):303-334
- Reza Khani Jazani, Sajad Mousav the Impacts of Ergonomic Aspects on the Quality. *Open Journal of Safety Science and Technology*, 2014, 4, 15-21
- Rooney, E.F., Morency, R.R. and Herrick, D.R. (1993) Macroergonomics and Total Quality Management at L. L. Bean: A Case Study. In: Neilson, N.R. and Jorgensen, K., Eds., *Advances in Industrial Ergonomics and Safety V*, Taylor & Francis, London, 493-498.
- Sandra Haydee Meras Herrera<sup>1</sup> and Luisa Huaccho Huatuco. Macroergonomics Intervention Programs: Recommendations for Their Design and Implementation. *Human Factors and Ergonomics in Manufacturing & Service Industries* 21 (3) 227-243 (2011)
- Shaliza, A. M., Shahrul, K., Mohzani, M., Zalinda, O., Khairanum, S., Application of Quality Function Deployment in Identifying Ergonomics Programs for MALaysian The Effect of Ergonomics Applications in Work System on Mental Health of Visual Display Terminal Workers 354 Anufacturing Industries. [CD ROM] Proceedings in International Conference on Technology Management (ICTM 2006).
- Schermerhorn, J. R., Hunt, J. G., Osborn, R .N. & Osborn, R. (2004). *Core concepts of organizational behavior*: John Wiley & Sons Inc.
- Taleghani GH. Tanaomi MM Farhangi A Determinants of the increase in efficiency (Case study: Saman Bank) .*Quarterly Journal Public Administration*.3 (7),2011.115-130.[ Persian]
- Thomas. K. welthose, B.A, (1990), "Cognitive elements of empowerment: an interpretive model of intrinsic task motivation", *academy of management review*, vol. 15, No.4.
- Theoretical Foundations measure of productivity in the national festival productivity. <https://ipcel.ir/wpcontent/uploads/0101.pdf> [ Persian]
- Vouzas, (2006) Investigating the link between quality improvement efforts and strategic HRM in selected Greek industrial organizations implementing the new ISO 9000:2000, *Measuring Business Excellence*, Vol. 10, No. 1. pp.48-59
- Wilson JR, Haines HM, Morris W. Participatory ergonomics. *Handbook of human factors and ergonomics*. 1997; 2:490-513.

## Examining self-care behavior in patients with type II diabetes in Tehran

Fatemeh Mohammadkhah<sup>1</sup>, Mohtasham Ghaffari<sup>2</sup>, Sakineh Rakhshandehrou<sup>3</sup>, Mahnaz Khalfeh Nilsaz<sup>4</sup>, Kobra Noori<sup>5</sup>, Mohammad Hossein Vaziri<sup>6</sup> and Parisa Kasmaei<sup>7\*</sup>

<sup>1</sup>PhD Student in Health Education and Health Promotion, Student Research Committee, (Department and Faculty of Public Health), Shahid Beheshti University of Medical Sciences, Tehran, Iran

<sup>2</sup>PhD in Health Education and Health Promotion, Environmental and Occupational Hazards Control Research Center, School of Public Health, Shahid Beheshti University of Medical Sciences, Tehran, Iran

<sup>3</sup>PhD in Health Education and Health Promotion, Environmental and Occupational Hazards Control Research Center, School of Public Health, Shahid Beheshti University of Medical Sciences, Tehran, Iran

<sup>4</sup>PhD Student in Health Education and Health Promotion, Student Research Committee, (Department and Faculty of Public Health), Shahid Beheshti University of Medical Sciences, Tehran, Iran

<sup>5</sup>PhD Student in Health Education and Health Promotion, Student Research Committee, (Department and Faculty of Public Health), Shahid Beheshti University of Medical Sciences, Tehran, Iran

<sup>6</sup>PhD Student in Health Education and Health Promotion, Student Research Committee, (Department and Faculty of Public Health), Shahid Beheshti University of Medical Sciences, Tehran, Iran

<sup>7</sup>Assistant Professor, Research Center Of Health And Environment , Guilan University Of Medical Sciences, Rasht, Iran

### ABSTRACT

Self-care is an important process in the control of diabetes. The purpose of this study was to determine the status of self-care and its factors affecting patients with diabetes living in Tehran. In this cross-sectional study, 80 patients were examined with type 2 diabetes referred to Diabetes Center of Shohada Hospital in Tehran selected by simple random sampling. Data collection tool was Glasgow scale that evaluated patients' self-care status in various fields over the past seven days. Data were analyzed using central indices and dispersion using statistical software SPSS. Mean score of patients' self-care was  $32.6 \pm 1.17$  and self-care status was moderate. And the maximum mean score of self-care was related to timely medicine taking ( $5.9 \pm 1.3$ ), and the minimum mean score of self-care behavior was related to tests of blood sugar ( $3.5 \pm 1.08$ ) and physical activity ( $4.3 \pm 1.03$ ). Given that mean score of self-care in patients was moderate, we need a broader plan to promote self-care behavior in patients with diabetes.

**KEY WORDS:** SELF-CARE, DIABETES, DISEASE

### ARTICLE INFORMATION:

\*Corresponding Author: [mirdamadi1981@yahoo.com](mailto:mirdamadi1981@yahoo.com)

Received 30<sup>th</sup> April, 2017

Accepted after revision 4<sup>th</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

Diabetes mellitus is one of the most common Ando Crane diseases that is determined by metabolic disorders, long-term complications on eyes, kidneys, nerves and blood vessels. The disease is an important and costly health problem, both for patients and health care system that threatens the quality of life of patients (Shahabjahanloo *et al.*, 2008). Diabetes as the most common disease caused by metabolic disorders is considered as an important global challenge. Increasing the number of patients with type II diabetes implies a global epidemic. It is predicted that by 2030 the disease prevalence is equivalent to 4/4% of the population of the world. A national study, investigating risk factors for non-communicable diseases, has estimated the prevalence of diabetes in Iran in 2008, 7/7% (CI 95%: 7.9). The World Health Organization has estimated that the number of diabetic patients in Iran in 2030 will be more than six million (Shakibazadeh *et al.*, 2009). According to World Health Organization report, over the next 25 years the number of people with diabetes will be double. Also it has been estimated that during 25 years, the prevalence of diabetes for all age groups throughout the world will be increased from 2.8 percent to 4/4 percent. Every year 3.2 million deaths worldwide were attributed to diabetes (Farsi *et al.*, 2009).

Self-care in health refers to the activities of individuals, families and communities aimed to enhance health, prevent and limit the disease, and restore health (Geneva, 1983). Diabetes self-care includes a range of activities (such as: self-monitoring of blood glucose, low intake of fatty foods, legs' examination) now it has proven that different aspects of self-care are not highly correlated with each other (Rubin *et al.*, 1992; Orme, 1989). Diabetes self-care requires fundamental changes in lifestyle. Continuous self-care is associated with lower level of glycosylated hemoglobin and fewer complications. The importance of considering this issue is that some of the reviews consider lack of daily self-care as the most important factor for mortality in diabetic patients (Shayeghian *et al.*, 2014).

Patient participation in treatment and doing self-care behaviors are effective factors on improving the quality of life of patients during the disease (Rezae *et al.*, 2007). So it is hoped that by specifying the level of self-care in patients with diabetics to detect obstacles of doing self-care behaviors we can have comprehensive and clearer plan for improving their health. Therefore, this study has been conducted aimed to determine self-care behaviors in those with type II diabetes.

## MATERIAL AND METHODS

This study is descriptive, analytical and cross-sectional. The study population is type II diabetic patients referred

to Shohada Hospital Diabetes Center in Tehran. So that patients were selected by convenience sampling, and including all patients aged 30 years and over, at least six months after their diagnosis and with records. Data collection tool in this study was a questionnaire and information were collected through self-report questionnaire completing. The questionnaire used in the present study includes the following sections: 1. Individual information questionnaire (24 questions) 2. Questionnaire of Summary of Diabetes Self-Care Activities of Toobert *et al.* (SDSCA), its reliability and validity have been proven in many studies in Iran (Dehghani *et al.*, 2015; Parizad, 2013; Shojaeezadeh *et al.*, 2013) which has two parts: A. Self-care capability in patients with diabetes (16 questions). B. Foot self-care in patients with diabetes (28 questions). In the questionnaire, different aspects of self-care are as follows that each one was divided into 3 levels of weak, medium and strong:

1. Follow a healthy diet (range of scores= 0-21)
2. Blood sugar test (range of scores= 0-14)
3. timely use of medicine (range of scores= 0-7)
4. Regular physical activity (range of scores= 0-14)
5. The general care of the feet (range of scores= 0-14)

The range of self-care score was 0-70 that each was divided into three levels: weak, medium and strong. After providing an introduction letter to conduct a research work, a study was conducted on 80 patients to determine the level of self-care behavior. Sampling was simple random. Using Cochran formula and a sample of 102 subjects, the sample size was calculated 80 subjects.

In this formula:

$$n = \frac{\frac{z^2 pq}{d^2}}{1 + \frac{1}{N} \left( \frac{z^2 pq}{d^2} - 1 \right)}$$

n = the sample size

N = Statistical population size

t or z = A percentage of confidence acceptable standard error

p = A ratio of the population with certain traits (e.g. male population)

q= (1-p) a ratio of the population lacks certain traits (e.g. female population)

d = degree of certainty or potential efficiency

In this study, p and q are .5. Z value is 1.96 and d can be .01 or .05.

Initially, the researcher explained the purpose of conducting this study and how to do this to the samples. Then, self-care questionnaires were provided to the par-

ticipants interested in participating in the study according to inclusion and exclusion criteria to complete self-report questionnaires. After data collection, data were analyzed according to the research objectives. The study collected data were analyzed after entering software SPSS and using central indices and dispersion relevant.

## RESULTS AND DISCUSSION

In this study, 80 patients with type II diabetes were examined in terms of self-care status and its factors. Patients' mean age was  $35.6 \pm 5$  years. Of the total patients, 52 percent (n=65) were female and the rest were male, and in terms of educational status, most of them had high school education level. Average disease duration was  $6.81 \pm 1.7$  years. The results of self-care status and its different aspects are shown in Table 1.

Different aspects of self-care	Mean $\pm$ S.D	Range including scores
Follow a healthy diet	7/2 $\pm$ 8/11	21-0
Testing blood sugar	3/3 $\pm$ 4/3	14-0
Timely drug consumption	3/1 $\pm$ 9/5	7-0
Regular physical activity	3/3 $\pm$ 2/4	14-0
Basic care of the feet	3/3 $\pm$ 1/4	14-0
The self-care general	3/11 $\pm$ 4/31	70-0

According to the Table results, the highest scores of self-care was in the area of timely medicine taking and the lowest scores of self-care were related to tests of blood sugar and physical activity. Mean scores of self-care represent moderate desirability of self-care status of patients. No significant relationship was found between age, diabetes duration, fasting blood sugar test (FBS), and Hemoglobin test (HbA1c) and self-care in type II diabetic patients. The frequency of self-care behaviors in terms of the number of weekdays in those with diabetes (II) is shown in Table 2.

The study results showed, higher education and awareness about the disease and its possible complications and outcomes facilitates the process of self-care.

## DISCUSSION AND CONCLUSION

This study purpose is to determine the status of self-care and its factors affecting patients with type II diabetes living in Tehran. Our research findings show that self-care status of studied patients is not desirable in general, and in the majority of its aspects especially in the field of daily blood sugar control, and doing physical activity. Also in Jordan *et al.* study on self-care behavior of patients with diabetes in America the results showed that self-care status of patients is moderate in terms of the level of utility. In this study, the lowest self-care activity has been on daily blood sugar control and doing regular physical activity (Jordan, 2010).

In our study, no significant difference was found between mean scores of self-care in terms of gender. However it is expected that in men due to assigning less time to self-care due to being busy, poor dependency of treatment and higher risk behaviors, including smoking, self-care status is worse, but this difference was not significant in our study. While in Farmer *et al.* study self-care scores in female patients with diabetes was significantly higher than male patients (Farmer *et al.*, 2009). The reasons for this inconsistency can be due to gender difference in our study population to the mentioned study. Also in our study, education was an important factor affecting self-care status so that those with university education had a better status in the field of self-care than other patients, and these results are consistent with the results of Carter study (Karter *et al.*, 2000), indicating that higher education and having more knowledge about the disease and its possible complications and outcomes facilitates the process of self-care.

The results of the present study showed, studied patients had moderate moderately desirable level of self-care.

The study data provide useful information to diabetes management planners and health educators to make changes in their plans, also in this study the highest scores were in the area of timely medicine taking. Given that diabetes self-care programs emphasize timely medicine taking it represents the usefulness of self-care education programs of patients with diabetes in the mentioned Center.

Hiring efficient workforce such as nutritionists and nurses trained in diabetic patients' service centers plays a significant role in improving the disease control status by patients, and public health authorities should

Activities seven days a week	No day	1 day	2 days	3 days	4 days	5 days	6 days	7 days
Frequency (percent)	8%	5%	12%	26%	21%	11%	9%	8%

develop a comprehensive operational plan and provide sources needed for continuous implementation in health care centers to improve health in these patients and strengthen their self-care behaviors.

## REFERENCES

- Dehghani-Tafti A, Morowatisharifabad MA, Ardakani MA, Rezaeipandari H, Lotfi MH. Determinants of Self Care in Diabetic Patients Based on Health Belief Model. *Global journal of health science*. 2015 Sep 1; 7(5):33.
- Farmer A, Wade AN, French DP, Simon J, Yudkin P, Gray A, et al. Blood glucose Self-monitoring in type 2 diabetes: a randomized control trail. *Health Techno Assess*. 2009; 13(15): 41-50.
- Farsi Z, Jabari morooee M. Ebadi A. Application of Health Belief Model in Change of Self Care Behaviors of Diabetic Patients. *Journal of Nursing and Midwifery, Iran University of Medical Sciences*, 2009. 22(61): 61-72 (Text in Persian).
- Geneva S, World Health Organization. 21-25 November 1983. Access in [www.who.int](http://www.who.int).
- Jordan DN, Jordan JL. Self-care behaviors of Filipino-American adult with type 2 Diabetes mellitus. *J Diabetes Complication*. 2010; 24(4):250-258.
- Karter AJ, Ferrara A, Darbinian JA, Ackerson LM, Selby JV. Self-monitoring of Blood glucose: Language aid Financial barriers in a managed care population with diabetes. *Diabetes Care*. 2000; 23(4):47-483.
- Orme CM, Binik YM, Consistency of adherence across regimen demands. *Health Psychol j*. 1989;8:27-43, 1989
- Parizad N, HEMMATI MM, Khalkhali HR. Promoting Self-Care in Patients with Type 2 Diabetes: Tele education. *Hakim J*. 2013; 16(3): 220-227 (Text in Persian).
- Rezae HA, Dalvandi A, Hosseini MA, Rarahgoz ar M. The effect of self-care education on quality of life in patients with heart failure. *Tavanbakhsi J*, 2007; 10(2): 21-26 (Text in Persian).
- Rubin RR, Peyrot M, Psychosocial problems and interventions in diabetes. *Diabetes Care J* 1992; 15: 1640-1657.
- Shahabjahanloo A, Ghofranipour F, Vafaei M, Kimiagar M, Haidarnia A, Sobhani A. Structures of Health belife model in diabetic patients with favorable and unfavorable control. *Journal of Hormozgan Medical Sciences*, 2008; 12(1): 37-42 (Text in Persian).
- Hakibazadeh H E, Rashidian A, Larigani B, SHOjaeizadeh D, Frouzanfar M, KarimiShahanjerini A. The relationship between efficacy and perceived barriers to self-care functioning in patients with type 2 diabetes. *Journal of Nursing and Midwifery (Hayat)*. 2009; 15(4): 69-78 (Text in Persian).
- Shayeghian Z, Aguilar-Vafaie M, Besharat MA, Amiri P, Parvin M, Roohi Gillani K. The Association between Self-Care and Control of Blood Sugar and Health-related Quality of Life in Type II Diabetes Patients. *Iranian Journal of Endocrinology and Metabolism*, 2014; (15): 6 (Text in Persian).
- Shojaeezadeh D, Tol A, Sharifirad Gh, Alhani F. Effect of education program based on empowerment model in promoting self-care among type 2 diabetic patients in Isfahan. *Razi J Med Sci* 2013; 20(107): 18-31 (Text in Persian).

## Study of the rheological behavior of yoghurt as a viscoelastic fluid

Amir Heidarinasab\* and Pirouz Peivast

Department of Chemical Engineering, Science and Research Branch, Islamic Azad university, Tehran, Iran

### ABSTRACT

The purpose of the present study is to investigate the effects of Narrative Therapy as the independent and experimIn this paper, we have tried to find the rheological properties of yoghurt and the parameters influencing it like fat percent, dry matter percent, number of microorganisms, pH, and other properties. Moreover, the thixotropic and viscoelasticity of yoghurt have been checked and in each part, the equation of yoghurt rheology has been found. The purpose of this paper is to find a global equation that can cover the rheological behavior of yoghurt in time-independent and time-dependent models as well as viscoelastic. In this case, with regard to “superimpose” principle, the effects of different parameters on that have been applied. Thereupon, the time-independent model showed the “Power-law” behavior in which the K parameter included fat percent, pH, dry matter percent, and microorganisms, and the time-dependent model showed the thixotropic behavior. In the end, the viewpoint of the model included viscoelastic behavior and the non-steady behavior resulted from the stress in the beginning of this fluid.

### INTRODUCTION

Yoghurt is the most common fermented milk product worldwide and originates from countries around the Eastern Mediterranean Sea and the Balkans. It is a very popular functional dairy product which is produced by acid fermentation of milk with the *thermophilic homo-fermentative* lactic acid bacteria *Streptococcus thermophilus* and *Lactobacillus delbrueckii ssp.* (Speck Marvin 1976) *bulgaricus*. The manufacturing processes of yogurt differ depending on the country, but it always comprises a lactic fermentation that brings milk to gelification due

to destabilization of the protein system. Many cultures have appreciated yoghurt as an integral part of everyday diet for centuries (Ozcan, 2013).

Moreover, the industrial production of yoghurt increases. Rheological properties of yogurt are complex and influenced by solid content, physical states of fats and proteins in milk, milk composition, temperature and time of milk heat pretreatment, mechanical handling of coagulum, use of stabilizers, type and quantity of starter culture incorporated for inoculation, homogenization, acidity, degree of proteolysis and heat pretreatment of milk, fermentation temperature and storage conditions

#### ARTICLE INFORMATION:

\*Corresponding Author: [mirdamadi1981@yahoo.com](mailto:mirdamadi1981@yahoo.com)

Received 29<sup>th</sup> April, 2017

Accepted after revision 5<sup>th</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

of the final product. In this study, we try to find a global equation for yoghurt rheological behavior in order for using it in prediction of the properties of the product we want to produce (Afonso 1992).

### EXPERIMENTS LAYOUT

In this study, we have tested some parameters that may influence the yoghurt rheology behavior. Most of tests have been conducted in different shear rate from two to 50 rpm. First, we have tested the influence of fat percent on yoghurt. In this case, we took three type of yoghurt with 1.5 , 2.5 and 10 fat percent and tested them; then, we chose another yoghurt with 6% of fat and higher dry material and tested it to find the sensation of dry material on yoghurt rheology. After that, we tested yoghurt in different days from 2 days after production until 18 days. In this test, we used the 1.5% yoghurt and kept it in refrigerator in 5° C. Therewith, pH test and microorganism count was done to find the impact of these parameters on the global equation. The thixotropic test was done in different rate for about 15 minute and the structural parameter was found. In the end, stress over shoot test was done and its constant parameters was found and by using every equation, we achieved a global equation for yoghurt rheological behavior (Folkenberg Ditte Marie, 2006).

### DISCUSSION

In the current study, we selected the power-law equation for yoghurt that is simple and aureate compared to the other models. Primarily, we tested the effect of fat percent and the results are shown in the following figure

We select  $n_{ave} = 0.23$  and describe K as a function of fat percent and find an equation

$$K = 17.27 \times \exp\left(\frac{-0.81}{f}\right)$$

$$K = 1.7 \times K_{1.5} \times \exp\left(\frac{-0.81}{f}\right) \tag{1}$$

where  $f$  represents the fat percent and  $K_{1.5}$  represents the K value in the 1.5% of fat yoghurt. The above yoghurt samples had 10.2% dry material and we tested yoghurt with 13.5% of dry material to find its effect. However, this yoghurt sample had 6% of fat. To this end, from the equation above, we achieved the K value of a 6% of fat yoghurt sample and compared it with the yoghurt sample with 13.5% dry material shown in blow figure.

With this information, we find an equation for influence of dry material on yoghurt rheological behavior

$$K = 1.09.K_c.\Delta d \tag{2}$$

That  $d\Delta$  means the difference between yoghurt we want and the yoghurt with 10.2% of dry material and  $KC$  is the K of 10.2% of dry material yoghurt. Because of we have only one yoghurt with different dry material in the market this equation did not aureate good and only can use for a premilary prediction. (Mullineux Glen, 2007).

In the next stage, we test the influence of number of yeast and influence of pH and find equations for each of them. Because these parameter are dependent variable

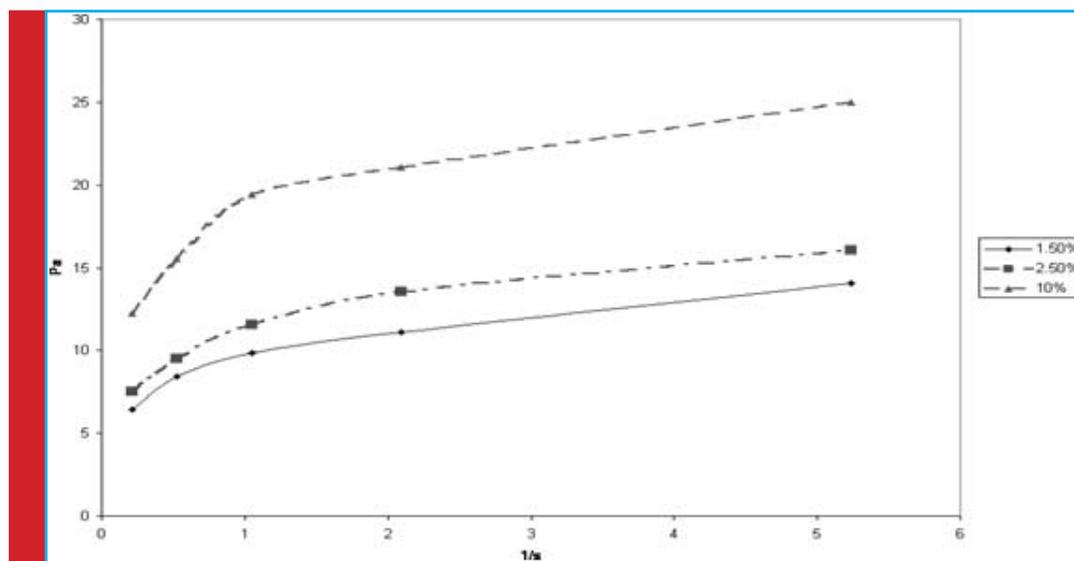


FIGURE 1. Shear stress versus shear rate in different fat percent

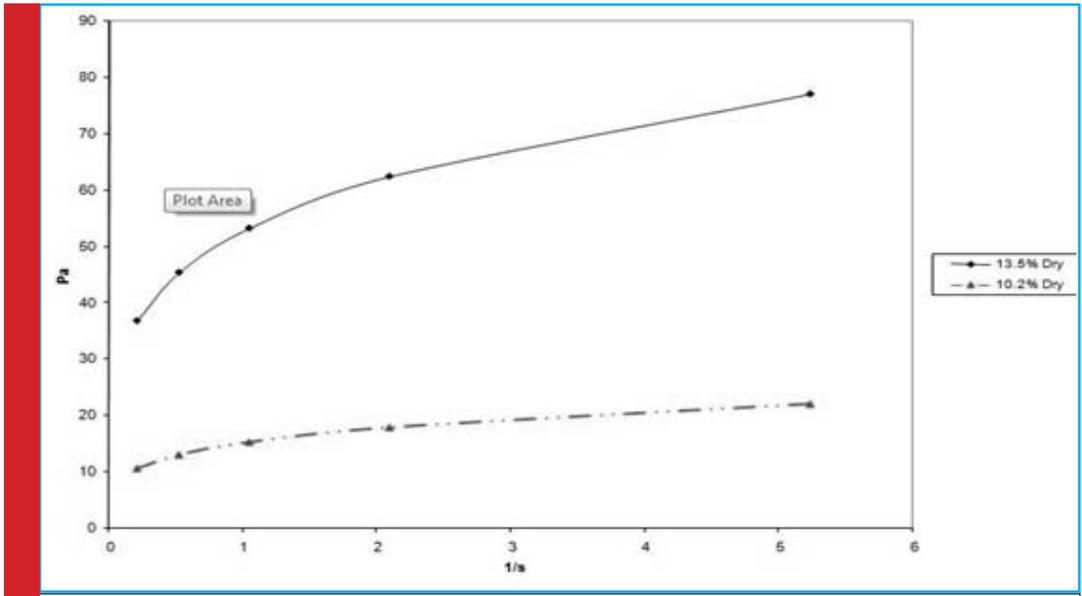


FIGURE 2. Shear stress versus shear rate in different dry material

With this test, we find an equation for relation of Number of microorganism to K:

$$K = 0.28M + 9.28 \quad (3)$$

That M means the number of yeasts. Then we find an equation for pH

From this test, we achieve the below equation

$$K = -17.38 \times PH + 88.61 \quad (4)$$

Equation (3) and (4) are valid only in shelf life of yoghurt. In the next stage, we test thixotropic properties of yoghurt and find the structural parameter  $\lambda$ .

To find  $\lambda$  we extract data from 30<sup>th</sup> second until 900<sup>th</sup>. We have the equation

$$\sigma = \lambda(K\dot{\gamma})^n \quad (6)$$

In addition,  $\lambda$  is a function of time. The decay of the structural parameter with time may be assumed a second order equation:

$$\frac{d\lambda}{dt} = -k_1(\lambda - \lambda_e)^2 \quad (7)$$

In the final, we have:

$$\lambda = \frac{\eta}{K\dot{\gamma}^{n-1}} = \frac{1}{K\dot{\gamma}^{n-1}} \left( \frac{1}{\eta_o - \eta_e} + \frac{k_1\dot{\gamma}^{1-n}}{K} (t - 30) \right)^{-1} + \eta_e \quad (8)$$

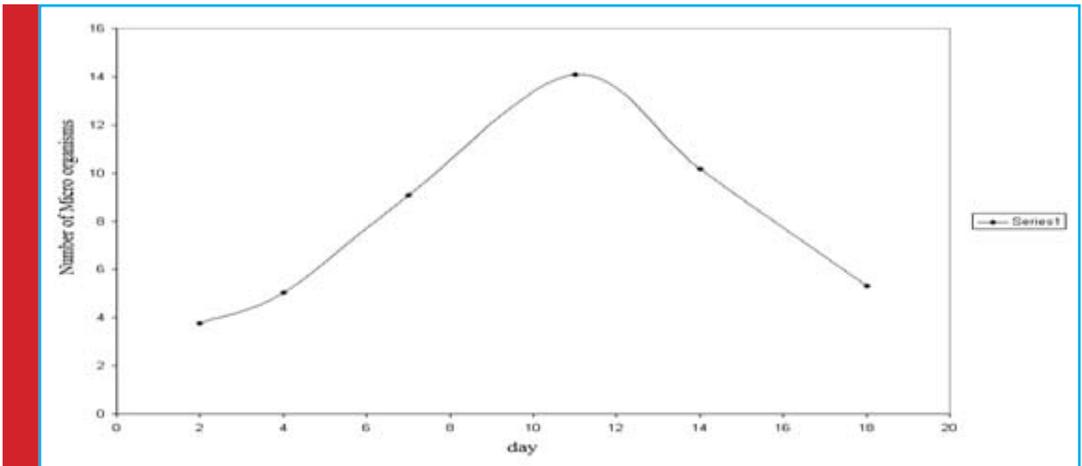


FIGURE 3. Number of yeast versus Day

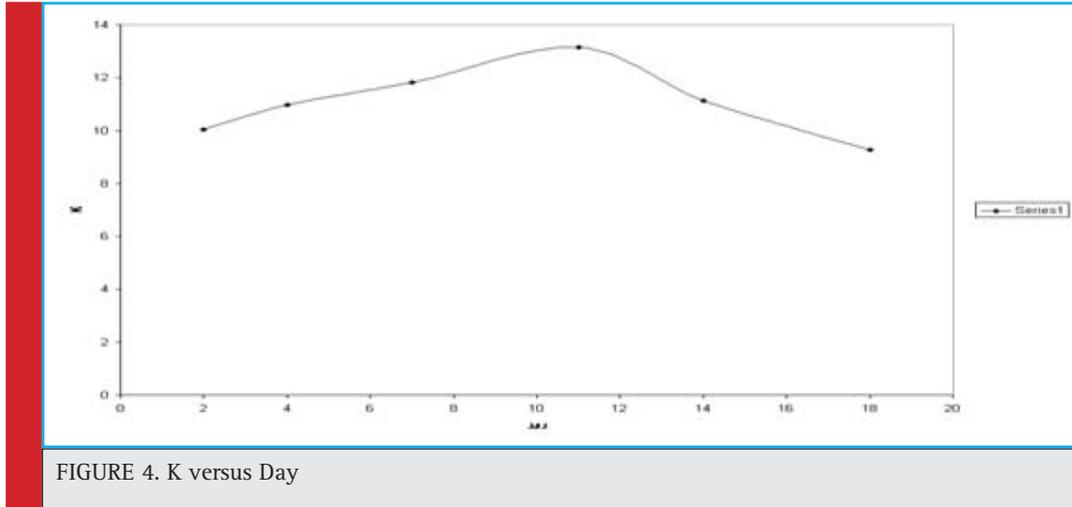


FIGURE 4. K versus Day

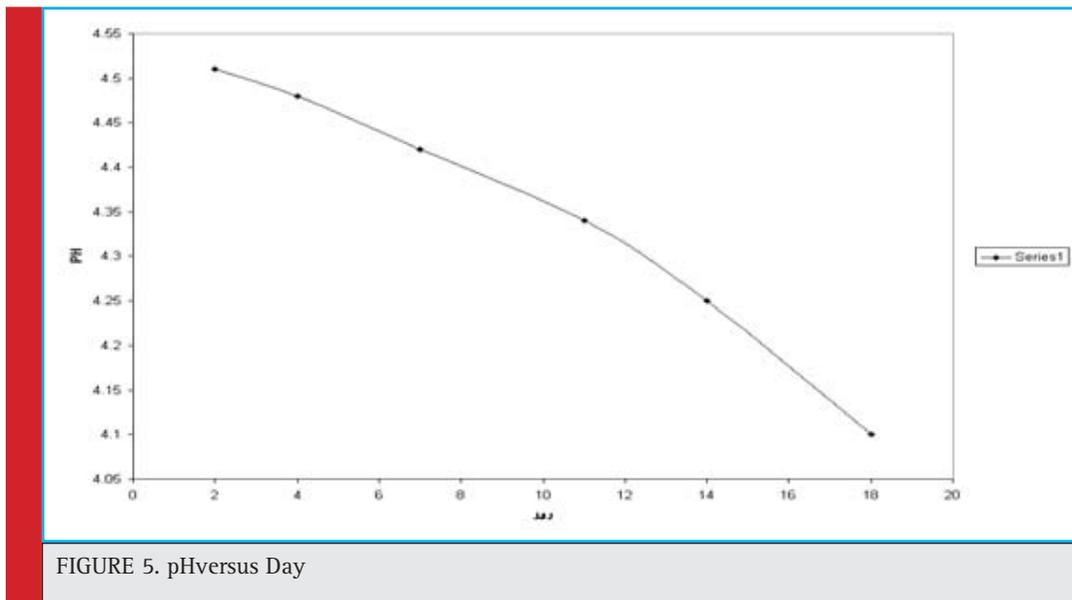


FIGURE 5. pH versus Day

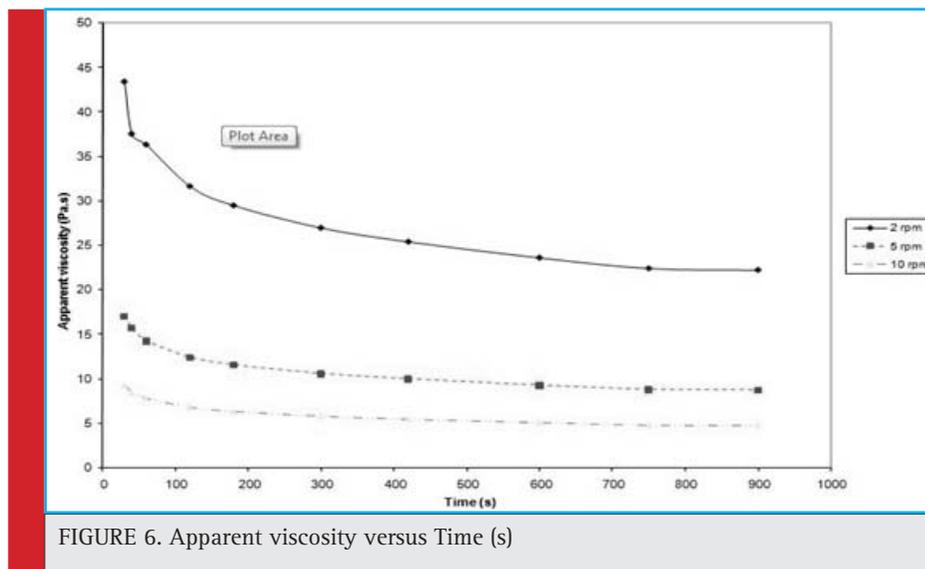


FIGURE 6. Apparent viscosity versus Time (s)

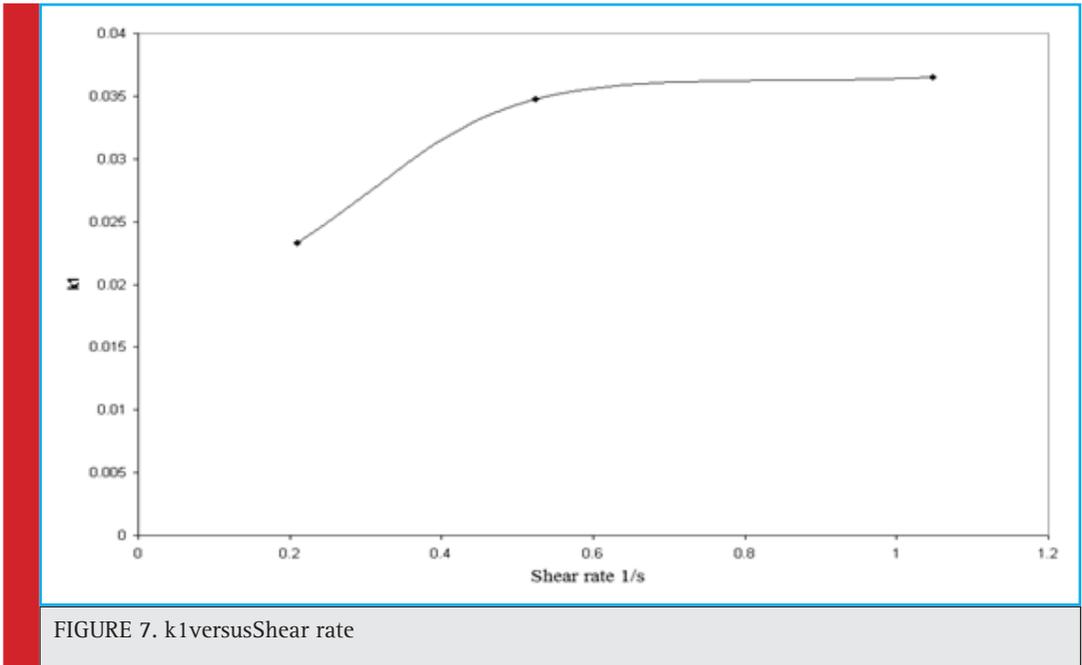


FIGURE 7. k1 versus Shear rate

To find  $k_1$  we can use the figure below  
 In the last stage, we test the stress over shoot and extract data in the first seconds of applying a shear rate. For this test, we have these equations:

$$\sigma_{21}^+ = f(\dot{\gamma}, t) = K(\dot{\gamma})^n \left( 1 + (b\dot{\gamma}t - 1) \exp\left(\frac{-t}{an\lambda}\right) \right) \quad (9)$$

That  $\lambda$  can find from

$$\lambda = \left( \frac{K'}{2K} \right)^{1/(n'-n)} \quad (10)$$

The data shown in the below picture  
 After calculation, we find these parameters:  $\lambda=6.58$   
 $a=-24.35$   $b=55.15$

**CONCLUSION**

With the result of each test we can now write a global equation for yoghurt rheological behavior that contain time dependent, time independent and viscoelastic terms:

$$\sigma_{21}^+ = f(\dot{\gamma}, t) = K(\dot{\gamma})^{0.23} \left( 1 + (55.15\dot{\gamma}t - 1) \exp\left(\frac{-t}{-24.35 \cdot 0.23 \cdot 6.58}\right) \right) \lambda \quad (11)$$

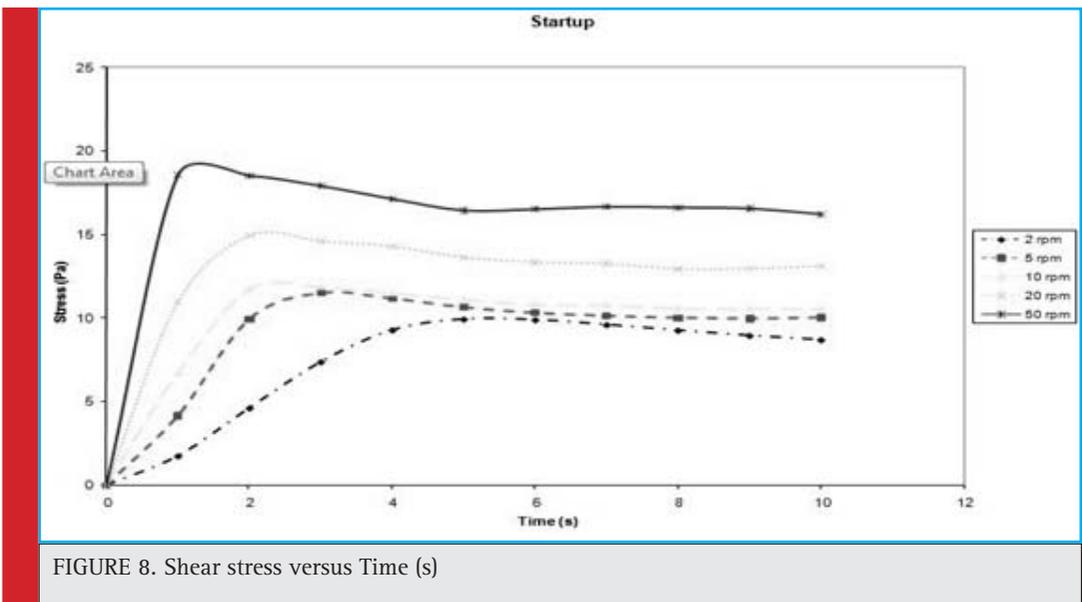


FIGURE 8. Shear stress versus Time (s)

That  $\lambda$  can find from

$$\lambda = \frac{\eta}{K\dot{\gamma}^{\bar{n}-1}} = \frac{1}{K\dot{\gamma}^{\bar{n}-1}} \left[ \frac{1}{\eta_o - \eta_e} + \frac{k_1 \dot{\gamma}^{1-\bar{n}}}{K} (t-30) \right]^{-1} + \eta_e$$

In addition, K can find from

$$K = (0.519M + 17.196) \times \exp\left(\frac{-0.81}{f}\right) \cdot \Delta d$$

Or

$$K = (-32.21 \cdot PH + 164.19) \times \exp\left(\frac{-0.81}{f}\right) \cdot \Delta d$$

Moreover, we can use this global equation to predict the rheological behavior of desired yoghurt.

## REFERENCES

Ozcan, Tulay. Determination of yogurt quality by using rheological and textural parameters. 2013 2nd International Conference on Nutrition and Food Sciences-ICNFS. 2013.

Speck Marvin L., "Compendium of Methods for the Microbiological Examination of Foods", 1976, American Public Health Association (233, 1141)

Mullineux Glen, Simmons Mark J.H. Effects of processing on shear rate of yoghurt 2007, Journal of Food Engineering 79 (2007) 850-857

Afonso Isabel M., Maria Joao M., Rheological monitoring of structure evolution and development in stirred yoghurt", 1992, Journal of Food Engineering 42 (1992) 183-190

Folkenberg Ditte Marie, Dejmek Petr, Skriver Anne, Guldager Helle Skov, Ipsen Richard Sensory and rheological screening of exopolysaccharide producing strains of bacterial yoghurt cultures 2006, International Dairy Journal 16 (2006) 111-118

## Effects of resveratrol on morphine-induced liver injuries in male Balb/c mice

Mohammad Reza Salahshoor<sup>1</sup>, Sahar Ahmadi<sup>2</sup>, Fatemeh Makalani<sup>3</sup>, Shiva Roshankhah<sup>4</sup> and Cyrus Jalili<sup>5\*</sup>

<sup>1,3,4,5</sup>PhD, Department of Anatomical Sciences, Medical School, Kermanshah University of Medical Sciences, Kermanshah, Iran

<sup>2</sup>Students research committee, Kermanshah university of Medical Sciences. Daneshgah Ave, Taghbostan, Kermanshah, Iran

### ABSTRACT

Resveratrol used as a dietary supplement is a stilbenoid and a phytoalexin produced by several plants. Morphine is a pain medication of the opiate type, metabolized essentially in the liver and causes disturbing effects. This study was designed to evaluate effects of resveratrol against morphine damages on liver of mice. In this study, forty eight male mice were divided into six groups (n=8). Various doses of resveratrol (10, 20 and 30 mg/kg) by oral gavage and morphine (interaperitoneally) plus resveratrol (10, 20 and 30 mg/kg) were administered for twenty consequent days. Animals and liver weight, diameter of hepatocytes and central hepatic vein, aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (ALP) and serum nitric oxide levels have been studied. The results indicated that morphine administration significantly decreased animals and liver weight and increased the mean diameter of central hepatic vein and hepatocytes, blood serum nitric oxide and liver enzymes levels to saline group (P<0.05). However, resveratrol and resveratrol plus morphine administration significantly boosted animals and liver weight and reduced the mean diameter of hepatocyte, central hepatic vein, liver enzymes and nitric oxide levels in all doses compared to morphine group (P<0.05). It seems that resveratrol can improve liver injuries induced by morphine in mice

**KEY WORDS:** RESVERATROL; LIVER; MORPHINE

### ARTICLE INFORMATION:

\*Corresponding Author: [cjalili@yahoo.com](mailto:cjalili@yahoo.com)

Received 30<sup>th</sup> April, 2017

Accepted after revision 3<sup>rd</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

Liver is a vital body organ that plays a pivotal role in the metabolism of carbohydrates, proteins and fat, maintaining homeostasis, excreting toxic materials and eliminating bilirubin and bile acids (Freeman et al, 2004). Since important enzymes are involved in liver activity, cellular injuries and dysfunctions in endocrine function and metabolic activities of liver can be recognized by measurement of enzymes like aspartate aminotransferase, alanine aminotransferase and alkaline phosphatase (Salahshoor MR et al, 2016). Oxidative stress plays a key role in toxic liver injuries. Increased reactive oxygen species (ROS) can cause oxidative stress and lipid oxidation (Jalili et al, 2015). This causes the loss of biologic membranes by induction of DNA fracture and inactivation of specific proteins (Salahshoor MR et al, 2016). Increased oxidative stress plays a pivotal role in the pathology of diseases related to opioids such as cancer and liver diseases (Pantelidou M et al, 2017). Administration of morphine can induce oxidative stress in the body's internal environment (Jokinen V et al, 2017).

Crystal morphine is white or light brown and is extracted from opium, or directly from poppy stem (Casarrubea et al, 2016). Antioxidants in foodstuff can protect the body against various kinds of oxidative stress resulting from oxygen free radicals (Sueishi et al, 2017). Resveratrol (trans-3, 4, 5-trihydroxystilbene) is a polyphenolic phytoalexin derived from plants. Resveratrol exists in at least 72 plant species, and is formed by a reaction between three molecules of malonyl coenzyme A and one molecule of 4-coumaroyl coenzyme A (Athar et al, 2009). Resveratrol possesses antioxidant properties, inhibits free radicals and increases a number of antioxidative enzymes. The antioxidant ability of this polyphenol depends on the properties of polyphenolic hydroxyl groups (Cucciolla et al, 2007). Resveratrol contains two aromatic groups, and as an antioxidant can prevent oxidative stresses induced by cellular damage and disease (Robert et al, 2006). Resveratrol can stop the cell cycle and induce apoptosis in several cancer cell lines (Joe et al, 2002). Considering the toxic effects of morphine due to oxidative stress as well as the antioxidant properties of resveratrol, and that no study has ever studied the effects of resveratrol on the morphine-induced damages in liver, the present study was conducted to evaluate the effects of resveratrol on the morphine-induced impairments in liver in an animal model.

## MATERIALS AND METHODS

In this experimental study, Forty-eight male Balb/c mice, with a weight range of 27-30 g were purchased from Tehran Razi institute. To keep the mice, standard cages

in medical school that there are 6 mice in each cage were used. For one week before the start of the experiment animals were kept at the animal house under laboratory conditions at  $22\pm 2$  °C 12 hours in darkness and 12 hours in lighting conditions and free access to water and food. All experimentation was conducted in accordance with the guidelines provided by the Ethics Committee of Kermanshah University of Medical Sciences (Ghorbani et al, 2015).

The mice were randomly divided into six groups of eight mice as follows: (Freeman et al, 2004) Control group (normal saline; 1 ml DW/daily); (Salahshoor et al, 2016) morphine treated group 20 mg/kg; (Jalili et al, 2015) morphine + resveratrol 10 mg/kg treated group; (Salahshoor et al, 2016) morphine + resveratrol 20 mg/kg treated group; (Pantelidou et al, 2017) morphine + resveratrol 30 mg/kg treated group; (Jokinen et al, 2017) resveratrol 10 mg/kg treated group; (Casarrubea et al, 2017) resveratrol 20 mg/kg treated group and (8) resveratrol 30 mg/kg treated group. Morphine administered by intraperitoneally injecting as follows: 20 mg/kg once daily within the first 5 days and twice per day within the next 5 days. On days 11-20, a dose of up to 30 mg/kg twice per day. Mice were treated with resveratrol daily by oral gavage for 20 days (Salahshoor et al, 2016; Zhou et al 2015).

Resveratrol (3, 5, 4'-trihydroxy-trans-stilbene) (Merk-Germany) was dissolved in ethanol and diluted by normal saline (0.9%) to prepare different doses. Morphine (C<sub>16</sub>H<sub>19</sub>N<sub>3</sub>O<sub>3</sub>) was obtained from sigma chemical company (St. Louis, USA) and was dissolved in saline (0.9%) for administration. The animals' weight was measured at the beginning and end of the study. Animals were then killed and sacrificed. Livers were removed and weighed on a microbalance sensitive to 0.001 mg (Precisa 125A, Switzerland) and recorded (Jalili et al, 2017).

At the end of the treatment period, all animals were anesthetized with chloroform, midline laparotomy was performed and liver specimens were obtained. Blood samples were drawn by cardiac puncture and were incubated at 37 °C to coagulate. The coagulated blood samples were then centrifuged for 15 minutes at 3000 rpm until the serum was separated. The separated serum was kept at -20 °C until the measurement of biochemical factors and nitric oxide levels (Salahshoor et al, 2016). Livers from all mice were rinsed with saline and a small cross section of the liver was obtained. Liver specimens were fixed in 10% formalin and paraffin embedded, sectioned (5 µm), (Leica 2125, Leica Microsystems Nussloch GmbH, Germany) and stained with hematoxylin and Eosin. The preparation was examined an Olympus BX-51T-32E01 research microscope connected to a DP12 Camera with 3.34-million pixel resolution and Olysia Bio software (from: Olympus Optical Co. Ltd., Tokyo, Japan) (Jalili et al, 2015).

The mean diameter of hepatocytes and central hepatic vein were measured. For each hepatocyte, the total cellular area was measured. The outline of each hepatocyte was measured after taking an image with a  $\times 40$  objective. The longest and shortest axis were measured in the drawing of each hepatocyte in order to estimate the mean diameter (mean axis). At least 50 hepatocytes from each zone (total 100) were measured in each liver. A separate measurement for central hepatic vein was performed, using the same methodology (Salahshoor *et al.*, 2016 ).

Important enzymes of the liver were analyzed to check liver function. To separate the enzymes, livers were scrapped and turned into a uniform solution and centrifuged twice for 15 minutes (10,000 rpm). The upper part of the solution was parted to quantify the enzymes. Serum alanine aspartate aminotransferase (AST) and alanine aminotransferase (ALT) were tested using method of Reitman and Frankel. Activities of alkaline phosphatase (ALP) were determined according to the protocol described in laboratory practical manual (Salahshoor *et al.*, 2016 ).

Nitric oxide in serum samples were determined by Griess staining method. Sulfonamide solutions, N-(1-naphthyl) ethylenediamine dihydrochloride (NEED) and nitrite standards were prepared. To measure nitrite concentration in serum, after de-freezing the serum samples, 100  $\mu$ l of the sample serum was deproteinized by zinc sulfate (6 mg zinc sulfate powder was mixed with 400 $\mu$ l serum and vortexed for 1 minute.) To recover nitrate to nitrite, 100  $\mu$ l chloride vanadium, 50  $\mu$ l sulfonamide, and 50  $\mu$ l NEED solutions were added afterwards. The samples were incubated in the temperature of 30°C in darkness Standard solutions of sodium nitrate prepared

with different concentrations of nitrate. Samples' optical density (OD) was assessed using ELISA reader at the wavelength of 540 nm (Jalili *et al.*, 2017).

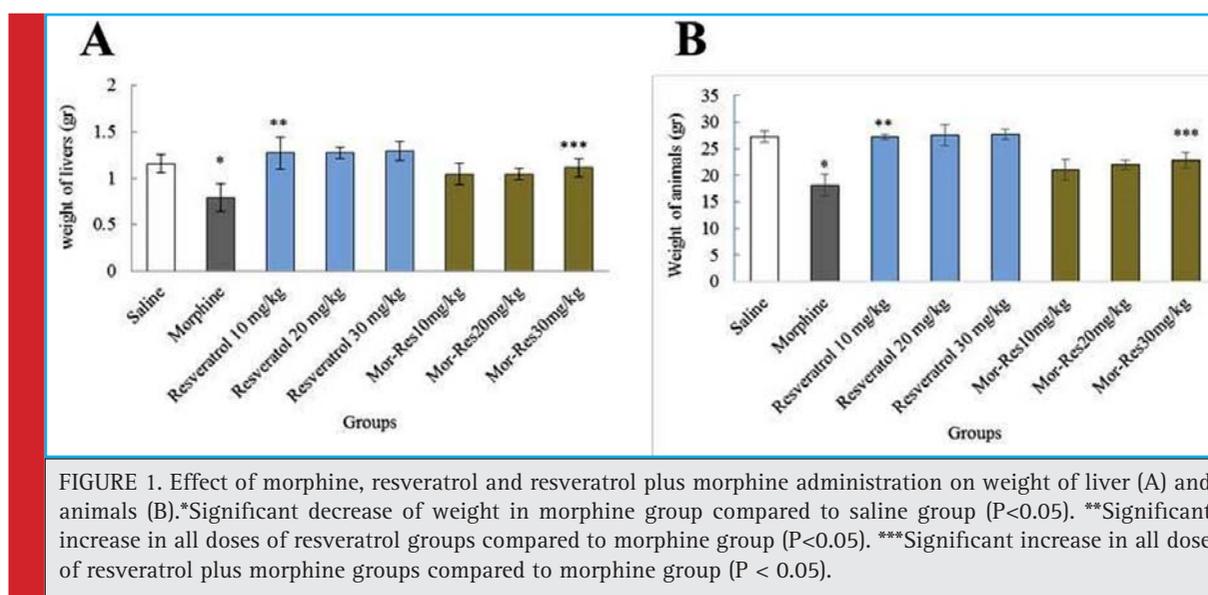
For statistical analysis, SPSS software (version 16) was used and quantitative data were compared using one-way analysis of variance (ANOVA) and Tukey test and  $P < 0.05$  was considered significant.

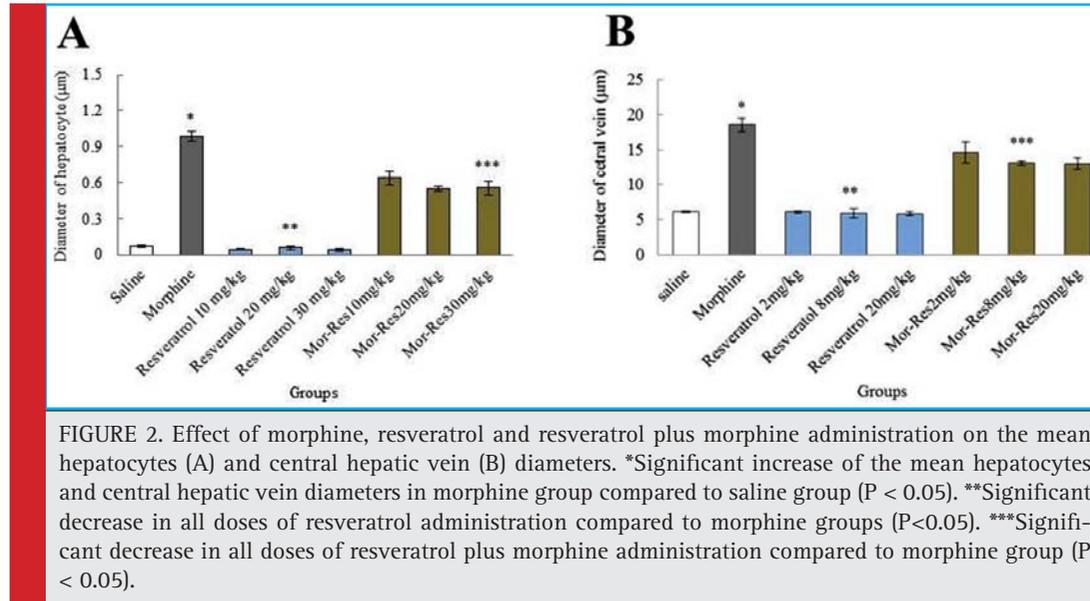
## RESULTS AND DISCUSSION

In the present study, resveratrol improved animals and livers weight in treated animals of all doses compared with the morphine group ( $p < 0.05$ ). The means of animals and livers weight was significantly increased in treated animals with resveratrol and resveratrol plus morphine in all doses in comparison with morphine group ( $p < 0.05$ ). Moreover, the effective dose of morphine caused a significant decrease in the mean of animals and livers weight of mice compared to Saline group ( $p < 0.05$ ) (Fig. 1).

The analysis of the mean diameter of hepatocytes and central hepatic vein in experimental groups revealed a significant difference between saline group and morphine and morphine plus resveratrol groups ( $p < 0.05$ ). Further, resveratrol and resveratrol plus morphine caused a significant decrease the mean diameter of hepatocytes and central hepatic vein in all treated groups in comparison with morphine group administration ( $p < 0.05$ ) (fig 2 and 3).

The mean of ALT, AST and ALP enzymes decreased significantly in resveratrol and resveratrol plus morphine in all groups administration compared to morphine group ( $p < 0.05$ ). In addition, morphine caused a significant increase in the mean of ALT, AST and ALP enzymes compared to saline group ( $p < 0.05$ ) (fig.4).



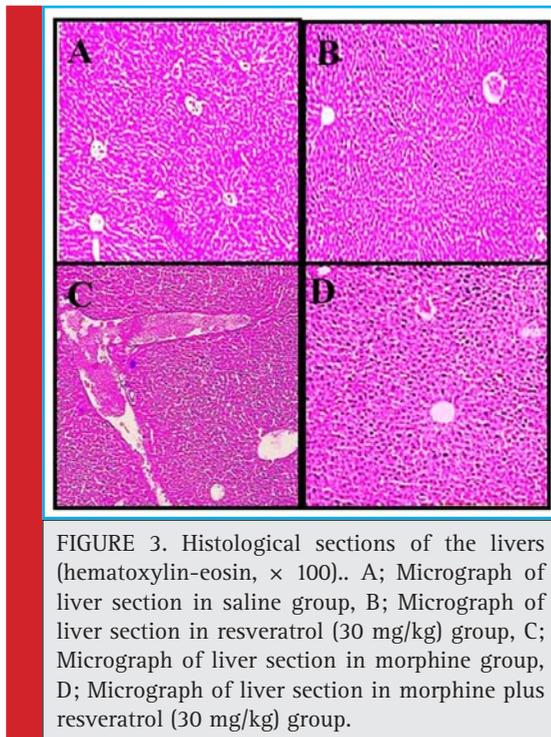


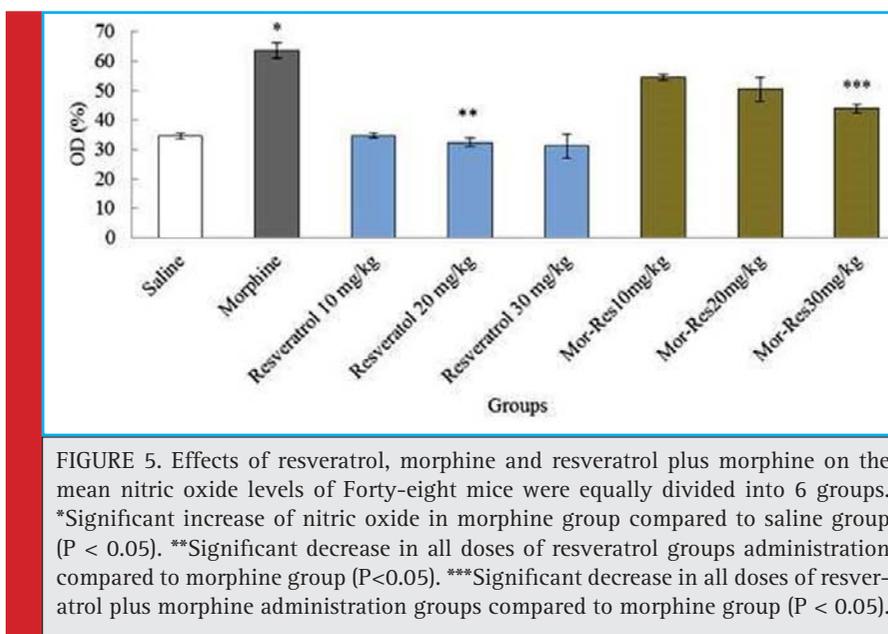
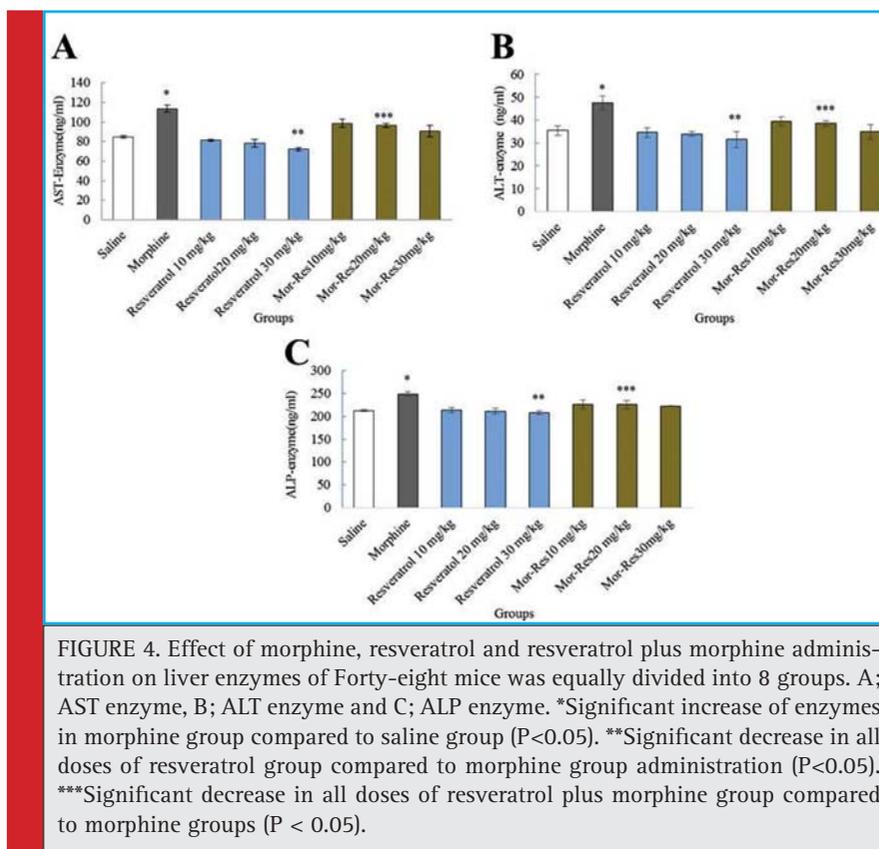
The mean of nitric oxide in blood serum decreased significantly in resveratrol and resveratrol plus morphine in all doses compared to morphine group ( $p < 0.05$ ). Also, the findings of blood serum NO measurement indicated a significant increase in morphine group compared to saline group ( $p < 0.05$ ) (fig. 5).

Addiction to opium and other drugs is a problem that is increasingly developing among various societies.

Morphine can increase cell apoptosis, produce free radicals, block antioxidant enzymes, and damage lipids, proteins and nucleic acids (Samarghandian *et al.*, 2014). The current study evaluated the protective effect of resveratrol on the morphine-induced injuries in liver enzymes, liver histology, liver weight and NO level in the blood serum of male Balb/c mice. The results of the weight analysis of animals showed a significant decrease in liver weight between the group receiving morphine and saline group. Administration of resveratrol plus morphine reduced the effects of morphine on the mice weight and liver. It seems that morphine can reduce the weight of body organs by decreasing the appetite, increasing the metabolic activity, producing free radicals and ROS and inducing cell death (Zhang *et al.*, 2004). Considering its antioxidant properties (Cucciolla *et al.*, 2007), resveratrol seems to largely neutralize the reducing effects of morphine on the weight. Kyselova *et al.* reported that consumption of resveratrol increased the weight of body and organs, confirming the findings of the present study (Kyselova *et al.*, 2003). Resveratrol is a lipophilic molecule that is able to inhibit the induction of lipid peroxidation via Fenton reaction (Berrougui *et al.*, 2009).

The results of analysis of liver enzymes in the present research showed that liver enzymes were significantly increased in the morphine-receiving groups than in saline group. The increase in liver enzymes performance index, including serum AST, Alt and ALP is indicative of liver damage, based on which the damage to liver cells can be realized (Salahshoor *et al.*, 2016). In the present study, treatment with resveratrol significantly prevented the increase of serum liver enzymes. Free radicals invade





the liver cells due to morphine and cause the necrosis of parenchymal cells. These cells induce inflammatory responses in liver and cause the influx of mononuclear inflammatory cells to the impaired tissue. The necrotic cells release proinflammatory mediators, which in turn intensifies morphine-induced liver damage (Jalili et al, 2015; Vozarova et al, 2002). Return or reduction of serum enzymes in the groups receiving morphine plus resveratrol, following morphine-induced liver damage, can be the result of absence of leakage in intracellular enzymes owing to maintaining the integrity and stability of cell membrane or regeneration of impaired liver cells (Hebbar et al, 2005).

The results of Salahshoor et al showed that administration of morphine increased serum ALT and AST levels, which is in agreement with the findings of the current study (Salahshoor et al, 2016). It seems that resveratrol leads to stabilization of cell membranes and inhibition of the leakage of enzymes by preventing lipid peroxidation (Yousef et al, 2009). The results of the present study confirm the findings of Schmatz et al in that resveratrol administration (10 and 20 mg/kg) reduces liver enzymes in diabetic mice and prevents damage to hepatocytes (Schmatz et al, 2012). Moreover, resveratrol can, owing to its antioxidant properties, prevent DNA damage by hydrogen peroxide and peroxynitrite (Hamburger et al, 2013).

The results of histopathologic studies on the diameter of hepatocytes and central vein in the study groups showed that the diameter of hepatocytes and central vein was significantly increased in the groups receiving morphine alone. Also, in the groups receiving morphine and resveratrol, a significant reduction was seen in the diameter of hepatocytes and central vein compared with the group receiving only morphine. The change in the size of hepatocytes can be an indication of increased metabolic activity (Salahshoor et al, 2016). The necrosis of hepatocytes in the morphine-receiving groups can be associated with increased activity of cells to excrete toxins from the body during morphine detoxification process (Lee et al, 2016).

It seems that a major part of morphine is metabolized by glucuronidation mechanism in liver and is excreted intact or as *glucuronide metabolite* via bile or urine (Nagamatsu et al, 1986). Bujanda et al reported a significant decrease in ALT level and fat accumulation in hepatocytes due to resveratrol consumption in a non-alcoholic fatty liver animal model, confirming the results of the present study (Bujanda et al, 2008). Further, Jalili et al reported that crocin, as an antioxidant, reduced the effects of morphine and diameter of hepatocytes and central vein in liver, which is in line with the results of present study. Liver protection by resveratrol against fibrogenesis through polyphenolic capacity seems to

inhibit the activity of stellate cells in liver via impairment of signal transduction pathways and expression of proteins stopping the cell cycle. Stellate cells play a major role in developing liver fibrosis and increasing oxidative stress (Bi et al, 2005). Resveratrol can exert its effects through inhibition of NF- $\kappa$ B by reducing H<sub>2</sub>O<sub>2</sub> production, inhibition of IK $\beta$  kinase, inhibition of P65 phosphorylation and deacetylation of P65 (Palomer et al, 2013).

The results of Rubiolo et al showed that resveratrol protected the frozen primary hepatocytes of mice against oxidative damage, confirming the findings of the present research (Rubiolo et al, 2008). The findings of the current study indicated that NO level was increased in the group receiving morphine than in saline group. It seems that NO increase leads to cascade reactions and production of free radicals (Ghaffari et al, 2012). No increase due to morphine can be associated with intracellular regulation of calcium by calcium/calmodulin-dependent NOS (Jalili et al, 2016). Administration of resveratrol in the present study caused a reduction in the morphine-induced increase of NO level. Antioxidants can damage and destroy the NO system (protein enzymes, substrates and cofactors), thereby decreasing NO production (Jalili et al, 2017). Konyalioglu et al reported a significant reduction of NO in stem cells by resveratrol, confirming the results of the current research (Konyalioglu et al, 2013). On the other hand, Gresele et al showed that resveratrol increased NO level in platelets, which is in contrast with the results of the present study (Gresele et al, 2008). In general, it seems that resveratrol, as a scavenger of free radicals and an antioxidant factor, can partly decrease the effects of morphine, an addictive drug that is able to damage the liver tissue by inducing oxidative stress.

## CONCLUSION

The present study findings showed that potential effects of resveratrol administration especially antioxidant effects against toxic effects of morphine administration. In addition, the results suggest that resveratrol can significantly improve impairments resulting from the toxicity of morphine in the liver. However, further research in animal models is warranted to obtain more conclusive evidence for the molecular interaction between resveratrol and morphine leading to improve liver damage.

## ACKNOWLEDGMENTS

We gratefully acknowledge the Research Council of Kermanshah University of Medical Sciences (no: 94416) for the financial support. This work was performed in partial fulfillment of the requirements for MD of Sahar

Ahmadi in faculty of medicine, Kermanshah University of Medical Sciences, Kermanshah, Iran.

## REFERENCES

- Athar M, Kopelovich L, Bickers DR, Kim AL. Arch Biochem Biophys. Multiple molecular targets of resveratrol: Anti-carcinogenic mechanisms. Arch Biochem Biophys. 2009;15;486(2): 95-102.
- Berrougui H, Grenier G, Loued S, Drouin G, Khalil A. A new insight into resveratrol as an atheroprotective compound: inhibition of lipid peroxidation and enhancement of cholesterol efflux. Atherosclerosis. 2009;207(2):420-7.
- Bi XL, Yang JY, Dong YX, Wang JM, Cui YH, Ikeshima T, et al. Resveratrol inhibits nitric oxide and TNF- $\alpha$  production by lipopolysaccharide-activated microglia. International immunopharmacology. 2005;5(1):185-93.
- Bujanda L, Hijona E, Larzabal M, Beraza M, Aldazabal P, García-Urkia N, et al. Resveratrol inhibits nonalcoholic fatty liver disease in rats. BMC gastroenterology. 2008; 8(1): 40.
- Casarrubea M, Faulisi F, Magnusson MS, Crescimanno G. The effects of morphine on the temporal structure of Wistar rat behavioral response to pain in hot-plate. Psychopharmacology. 2016 Aug 1; 233(15-16):2891-900.
- Cucciolla V, Oliva A, Galletti P, Zappia V, Della Ragione F. Resveratrol: from basic science to the clinic. Cell Cycle. 2007;15;6(20):2495-510.
- Cyrus Jalili, Ahmadi Sharareh, Shiva Roshankhah, Salahshoor MR. Preventing effect of Genistein on reproductive parameter and serum nitric oxide levels in Morphine-treated Mice. Int J Reprod BioMed 2016; 14(2):95-102.
- Freeman RB, Edwards E, Harper A, Merion R, Wolfe R. Results of the first year of the new liver allocation plan. Liver Transpl. 2004;10:7-5.
- Ghaffari MA. Lipid Peroxidation and Nitric Oxide Levels in Male Smokers' Spermatozoa and their Relation with Sperm Motility. J Reprod Infertil. 2012;13(2):81-7.
- Ghorbani. R, Jalili. C. Salahshoor. MR, Shiasi M. The effect of time and temperature on viability and performance of Langerhans islets separated from Balb/c mouse after death. ABR.2015.4 (1); 93
- Gresele P, Pignatelli P, Guglielmini G, Carnevale R, Mezzasoma AM, Ghiselli A, et al. Resveratrol, at concentrations attainable with moderate wine consumption, stimulates human platelet nitric oxide production. The Journal of Nutrition. 2008; 138(9):1602-8.
- Hebbar V, Shen G, Hu R, Kim BR, Chen C, Korytko PJ, et al. Toxicogenomics of resveratrol in rat liver. Life sciences. 2005 Apr 1; 76(20):2299-314.
- Hamburger T, Broecker-Preuss M, Hartmann M, Schade FU, de Groot H, Petrat F. Effects of glycine, pyruvate, resveratrol, and nitrite on tissue injury and cytokine response in endotoxemic rats. Journal of surgical research. 2013; 183(1):e7-21.
- Jalili C, Tabatabaei H, Kakaberiei S, Roshankhah S, Salahshoor MR. Protective role of Crocin against nicotine induced damages on male mice liver. Int J Prev Med. 2015; 6:92.
- Jalili C, Salahshoor MR, Hoseini M, Roshankhah S, Sohrabi M, Shabanizadeh A. Protective Effect of Thymoquinone Against Morphine Injuries to Kidneys of Mice. IJKD 2017; 11: 142-50.
- Jokinen V, Lilius T, Laitila J, Niemi M, Kambur O, Kalso E, et al. Do Diuretics have Antinociceptive Actions: Studies of Spironolactone, Eplerenone, Furosemide and Chlorothiazide, Individually and with Oxycodone and Morphine. Basic & Clinical Pharmacology & Toxicology. 2017; 120(1):38-45.
- Joe AK, Liu H, Suzui M, Vural ME, Xiao D, Weinstein IB. Resveratrol induces growth inhibition, S-phase arrest, apoptosis, and changes in biomarker expression in several human cancer cell lines. Clinical Cancer Research. 2002; 8(3):893-903.
- Konyalioglu S, Armagan G, Yalcin A, Atalayin C, Dagci T. Effects of resveratrol on hydrogen peroxide-induced oxidative stress in embryonic neural stem cells. Neural regeneration research. 2013; 8(6):485.
- Kyselova V, Peknicova J, Buckiova D, Boubelik M. Effects of p-nonylphenol and resveratrol on body and organ weight and in vivo fertility of outbred CD-1 mice. Reproductive Biology and Endocrinology. 2003; 1(1):30.
- Lee YJ, Zhao RJ, Kim YW, Kang SJ, Lee EK, Kim NJ, et al. Acupuncture inhibits liver injury induced by morphine plus acetaminophen through antioxidant system. European Journal of Integrative Medicine. 2016 Jun 30; 8(3):204-12.
- Nagamatsu K, Ohno Y, Ikebuchi H, Takahashi A, Terao T, Takanaka A. Morphine metabolism in isolated rat hepatocytes and its implications for hepatotoxicity. Biochemical pharmacology. 1986;35(20):3543-8.
- Palomer X, Capdevila-Busquets E, Álvarez-Guardia D, Barroso E, Pallàs M, Camins A, et al. Resveratrol induces nuclear factor- $\kappa$ B activity in human cardiac cells. International journal of cardiology. 2013;167(6):2507-16.
- Pantelidou M, Tsiakitzis K, Rekka EA, Kourounakis PN. Biologic Stress, Oxidative Stress, and Resistance to Drugs: What Is Hidden Behind. Molecules. 2017; 22(2):307.
- Robert E. King1 JAB, David B. Bioactivity of Resveratrol.. Comprehensive Reviews in Food Science and Food Safet. 2006;5(3):65-70.
- Rubiolo J, Vega F. Resveratrol protects primary rat hepatocytes against necrosis induced by reactive oxygen species. Biomedicine & Pharmacotherapy. 2008;62(9):606-12.
- Samarghandian S, Afshari R, Farkhondeh T. Effect of long-term treatment of morphine on enzymes, oxidative stress indices and antioxidant status in male rat liver. Int J Clin Exp Med. 2014 Jan 1; 7(5):1449-53.
- Salahshoor MR, Khashiadeh M, Roshankhah SH, Kakaberaei S, Jalili C. Protective effect of crocin on liver toxicity induced by morphine. ; RPS 2016; 11(2): 120-129.
- Salahshoor MR, Mohamadian S, Kakabaraei S, Roshankhah Sh, Jalili C. Curcumin Improves liver Damage in Male Mice

- Exposed to Nicotine. *Journal of Traditional and Complementary Medicine* 2016; 176-183.
- Schmatz R, Perreira LB, Stefanello N, Mazzanti C, Spanevello R, Gutierrez J, et al. Effects of resveratrol on biomarkers of oxidative stress and on the activity of delta aminolevulinic acid dehydratase in liver and kidney of streptozotocin-induced diabetic rats. *Biochimie*. 2012;94(2):374-83.
- Sueishi Y, Kamogawa E, Kimura A, Kitahara G, Satoh H, Asanuma T, et al. Multiple free-radical scavenging (MULTIS) capacity in cattle serum. *Journal of Clinical Biochemistry and Nutrition*. 2017; 60(1):76-80.
- Vozarova B, Lindsay R.S, Saremi A, Pratley R.E, Bogardus C. High alanine aminotransferase is associated with decreased hepatic insulin sensitivity and predicts the development of type 2 diabetes. *Diabet*. 2002;51: 1889-95.
- Yousef M, Saad A, El-Shennawy L. Protective effect of grape seed proanthocyanidin extract against oxidative stress induced by cisplatin in rats. *Food and Chemical Toxicology*. 2009;47(6):1176-83.
- Zhou Y, Chen K, He L, Xia Y, Dai W, Wang F, et al. The protective effect of resveratrol on concanavalin-A-induced acute hepatic injury in mice. *Gastroenterology research and practice*. 2015;24; 2015.
- Zhang YT, Zheng QS, Pan J, Zheng RL. Oxidative damage of biomolecules in mouse liver induced by morphine and protected by antioxidants. *Basic & clinical pharmacology & toxicology*. 2004;95(2):53-8.

## Relationship between job stress and sexual function index among females employed in public hospitals of Shushtar, Iran

Azam Jahangirimehr<sup>1</sup>, Azam Honarmandpour<sup>2\*</sup> and Fatemeh Safarzadeh<sup>3</sup>

<sup>1</sup>MSc Biostatistics, Department of Biostatistics, Shushtar Faculty of Medical Sciences, Shushtar, Iran

<sup>2</sup>MSc Midwifery, Department of Midwifery, Shushtar Faculty of Medical Sciences, Shushtar, Iran

<sup>3</sup>B.A Midwifery, Department of Midwifery, Shushtar Faculty of Medical Sciences, Shushtar, Iran

### ABSTRACT

Healthy sexual function is not only a sign of mental health, but its dysfunctions also strongly affect physical health. Due to the effects of occupational factors on sexual function, this study aimed to investigate the relationship between personnel's job stress and sexual performance index among female personnel employed in public hospitals of the city of Shushtar in 2017. This study is a cross-sectional research, which is conducted by census method among 130 female staff working in public hospitals in Shushtar. Data were collected by a Female Sexual Function Index questionnaire and job stress questionnaire. Data were analyzed using SPSS software version 16, and by the methods of descriptive statistics and variance analysis test. The mean score of women's sexual function index and job stress was  $22.57 \pm 7$  and  $99.03 \pm 17.72$  respectively. 76.2% of personnel had sexual dysfunction and 56.5% of them had moderate job stress. There was a statistically significant and inverse relationship between job stress and sexual function, it means that with an increase of job stress, the quality of sexual function has decreased ( $p$ -value  $< 0.001$ ,  $r = -0.344$ ). There was a statistically significant relationship between job stress of personnel and indices of sexual arousal, vaginal moisture, orgasm, sexual satisfaction and sexual pain ( $p$ -value  $< 0.05$ ), but there was not a significant relationship between job stress of personnel and sexual desire ( $p$ -value  $> 0.05$ ). Increasing job stress negatively affects the sexual function of personnel. So the relevant authorities with proper communication with medical staffs and their support operate by reducing psychological pressures and personnel participation in decision-making to reduce job stress.

**KEY WORDS:** FEMALE SEXUAL FUNCTION INDEX, JOB STRESS, HOSPITAL

### ARTICLE INFORMATION:

\*Corresponding Author: [honarmandpour.a@gmail.com](mailto:honarmandpour.a@gmail.com)

Received 29<sup>th</sup> April, 2017

Accepted after revision 5<sup>th</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal  
NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

Women are the main base of the family, so that their physical and mental health has a direct impact on physical and mental health of the family and the upbringing of their children (Ghorbania and Golchin 2011). World Health Organization introduced women's health as one of growth indices of countries and also introduced mental health as one of the important aspects of health concept (Nazari and Kafi 2007). In the meantime, sexual health is not only a sign of mental health, but also its dysfunctions strongly affect physical health (Onouzi et al., 2008, so, the World Health Organization has reported sexual health as a sign of the physical, mental and social health associated with sexual activity (Health topics Sexual health. World Health Organization, 2015). It has been also defined as sexual dysfunction as a way in which, one can participate in a sexual relationship as s/he wishes not to be (Douma et al 2007). Although close estimation of the prevalence of female sexual dysfunction is difficult, available statistics show that about 19 to 45 percent of women suffer from at least one similar sexual problem (Lindau et al 2007; Hayes et al. 2009). Bernard (2002) reported that sexual dysfunction is one of the most common and treatable problems in modern societies and mentions its prevalence in women 30 to 50% (Bernard 2002).

In the conducted study by Michael (2013), female sexual dysfunction reported 51.2% (Mitchell 2013). Researchers showed that among 43% of women are suffering from sexual dysfunction, 25-32% of them lacked pleasure in sex, 22-86% of them are still not able to reach orgasm during sex and 8-22% of them have pain during sexual intercourse (Schuiling and Likis 2006). In Iran, few studies have examined the prevalence of sexual dysfunction. In these studies, the most common sexual dysfunction in women of reproductive age in Arak (Ramezani et al., 2012) and Sabzevar (Bolourian and Ghanjloo 2007) have been reported respectively, 64 and 63.2% and the lowest prevalence of dysfunction in Babol (Bakouei et al. 2007) and Kohgilouye and Boyerahmad have been reported by respectively 19.2 and 8.5% (Gashtasbi et al., 2007).

Sexuality in addition to one's life has the impact on the relationship between the partners and everyone in the community, (Khajehei et al. 2015) it seems that neglecting the sexual instinct in humans causes irreparable complications (Pak Gouhar et al., .2008). On the other hand, sexual function is an important aspect affecting the quality of life, as understanding and awareness of sexual dysfunction is considered essential (Zeighami-Mohammadi and Ghaffari 2009).

Therefore, the study of responses and sexual behavior of couples, especially women have high priority (Pregler

and Decherney 2002). Salehzadeh et al., 2011 also considered different factors which have impact on trends, function and human sexual behavior; some of them are physiological, anatomical, psychological, social, cultural, and occupational factors (Salehzadeh 2011). People's Job is one of the main reasons of stress in their lives and there is more stress in jobs related to human relations (Bahri et al., 2003). One of the factors that can affect sexual function is stress. Among the common problems in the workplace, job stress can be noted. Job stress is the job's impact on individuals and is lead to internal changes and their deviation from their usual actions (Toews et al., 1993). Institute for Occupational Safety and Health (NIOSH) defines Job stress as the harmful physical and emotional responses, the occurrence of which depends on the lack of coordination of the job requirements with abilities, supportive resources and the needs of employers (Brauer 2006).

Also, According to the diseases World Index, mental illness, including stress-related mental disorders, will be the second cause of disabilities by 2020 (Kalia 2002). United Nations in 1992 introduced job stress as disease of the twentieth century, later the World Health Organization introduced job stress as an epidemic problem in the world (Tangri 2003). Job stress symptoms are appeared in three domains: psychological, physical and behavioral. The psychological domain of job stress is associated with job dissatisfaction that causes depression, anxiety, boredom, Sexual disorders, frustration, isolation and alienation (Knezevic et al., 2011). Some of the physical symptoms of job stress are heart and vascular disease, gastrointestinal disease, allergies, skin diseases, sleep disorders, headaches. Behavioral symptoms include behaviors such as work stoppages, smoking, alcohol consumption, overeating or loss of appetite, aggressive behavior towards colleagues or family members and organizational behaviors such as absenteeism, leaving job, increased accidents, reduced productivity and performance (Funakoshi et al., 2003). Also, as it is reported in several studies, approximately 30% of the workforce in developed countries suffer from job stress and the rate is higher in developing countries (Newton and Waters 2001). Evidence obtained from the Health & Safety Executive (HSE) organization shows that 20% of employees faced with job stress in a large extent in their workplace, which of course in some jobs this rate reaches 40% (Collins and Gibbs 2003). Psychologists and researchers have investigated the role of stress in different situations; in the meantime, the effect of stress on employees of healthcare sector, due to the complexity of work, is more significant and is known as an important and influential factor.

The results of the study of Peterson et al. (2008) in Sweden showed that mental disorders, especially depres-

sion, anxiety and stress are the major cause of long-term sick leave (over 12 months). However, the midwives and nurses cover a large part of healthcare employees across the world and are responsible for more than 80% of patient care (WHO 2008). The subject emphasizes the importance of promoting mental health among this group of women. Also if the mental job stress goes beyond its threshold, it can endanger individual's health by creating physical, psychological and behavioral side effects. On the other hand, these pressures may reduce the quality performance of individuals by the threatening the organizational goals (Shamloo 2007). Chang et.al in their study concluded that reducing workplace stress along with increasing the amount of support among nurses can led to strengthening their mental health (Chang et al. 2006).

The results of LianJun's et al s (2011) study showed that depression, anxiety and stress are the main risk factors for sexual dysfunction (Lianjun et al. 2011). Despite the high prevalence of female sexual dysfunction, many of them for some religious and cultural issues do not express their sexual problems or are not looking for medical ways to fix it. In the meantime, sexual dysfunction has negative impact on physical, psychological and social health of women. On the other hand, job stress is a common problem in the workplace. Due to the increasing stress in the workplace and that the job stress is very important and critical on different aspects of health, including healthy female sexual function, the present study aimed to investigate the relationship between sexual function and job stress among female personnel employed in public hospitals of Shushtar.

## MATERIALS AND METHODS

This cross-sectional study was conducted in 2017, by census method among 130 personnel working in the only two public hospitals of Shushtar. The participants worked in maternity wards, maternity and gynecological surgery, neonatal intensive care, neonatal, operating rooms, laboratories, emergency, nursing station, thalassemia, radiology, dialysis, endoscopy, general surgery, pediatrics, internal medicine, intensive care unit (ICU) and Cardiac Care Unit (CCU). Inclusion criteria include: samples are the medical staff with college education, married, age Between 20-50 year, Iranian, being the-only-wife, having sex during the past 4 weeks and having willing to participate in the study' and menopausal women , pregnant women, and those who have a history of infertility, having physical and mental well known diseases, have a controversial family, alcohol consumer, drugs, illness affecting the sexual activity of the spouses (such as cardiovascular diseases, hypothyroidism and hyperthyroidism, epilepsy, diabetes, respiratory, cancer,

etc.) and psychological disorders (such as depression or other mental disorders, treated with antidepressants and other drugs known to affect mental status), the use of drugs treating sexual problems and anomalies, genital injuries, were excluded from the study. Collected data contains a three-part questionnaire including demographic measure, the measure of female sexual function index and measuring job stress HSE. The first part of the questionnaire measured personal characteristics of the samples. The second part is Job Stress Questionnaire (HSE) that was made in the late 1990s by the English Health and Safety Institute in order to measure job stress of workers and English staffs (Cousins et al., 2004).

The tool consists of 35 questions and has seven scales that each have some sub-scales; these measures include: the role of communication, managerial support, peer support, control, demand and changes, which are based on a 5-point Likert scale of always, often, sometimes, rarely, and never. This measure was scored with a score of 1 to 5 as the sum of scores of phrases for each subscale indicate the measured values of the subscale where favorable response points 1 and undesirable and stressful response points 5. According to the total stress score, the score of (0-35) measured as the favorable stress, (35-70) as low stress, (70-105) as moderate stress, (105-140) as high stress, and (140-175) as undesirable stress. Validity and reliability of the mentioned questionnaire to determine the level of stress were studied by Marzabadi and Fesharaki in 2011 in Iran. . In order to determine validity of job stress the researchers used the Cronbach's alpha and split-half method which were 0.78 and 0.65 respectively (Marzabadi and Fesharaki 2011).

The third part of questionnaire is Female Sexual Function Index (FSFI) that is made by Rosen and colleagues in 2002 (Rosen 2002), this tool is a six dimensions questionnaire of sexual function with 19 questions about aspects of sexual stimulation or sexual arousal, vaginal moisture, orgasm, sexual satisfaction, and pain. The scores for each question considered in terms of sexual desire (1 to 5 points) and the dimensions of sexual arousal, vaginal moisture, orgasm, sexual satisfaction and pain (zero to 5 points) respectively. Individual score in every part will be calculated with the sum of the scores of questions in each section and multiplying the sum of the scores by coefficient of each part. The final score of less than 12, indicates poor sexual function, 12.1 to 24 shows moderate sexual function and 24.1 to 36 is the optimal sexual function and overall higher score indicates better desirable sexual function.

The Study of Mohammadi et al (2008) in Iran determined the validity and reliability of the Female Sexual Function Index questionnaire. In this questionnaire, there is a significant difference between the total scale and each of the areas where the two groups with and

without sexual dysfunction indicating the validity of this tool. Reliability of scale was calculated through analysis of stability or internal consistency coefficient. Cronbach's alpha coefficients in all individuals for each of the areas and total score in the study of Rosen (2002) was 0.89 and in the study Mohammadi was 0.70 and higher. The data were analyzed by SPS software version 16 and descriptive statistics (mean and standard deviation) and t test, Pearson correlation coefficient and ANOVA. The P less than 0.05 were considered significant.

In this study, all ethical considerations and coordination with hospital officials were conducted. Objectives of the study fully explained to the participants and they were assured about the confidentiality of information as well as notifying them of the results if desired.

## RESULTS AND DISCUSSION

The mean age was  $(34.38 \pm 6.47)$  years old, of which approximately 47 percent of people aged 40-30 years old. The average age of marriage was  $(9.91 \pm 6.26)$  years old. The average work experience was  $(9.08 \pm 5.85)$  years, average working in a week was  $(49.34 \pm 10.53)$  hours, of which nearly 40% of people were in the class of 50-40 hours. Almost 46% of people's employment status were official and covenant. The mean of job stress was  $(99.03 \pm 17.72)$ , which their lowest stress score was 45 and the highest score was 140, 38.5% of people had high levels of job stress, 56.2 percent had mean occupational stress, and 5.4% had low levels of job stress. The average of sexual function was  $22.79 \pm 6.47$ , the lowest score of sexual function was 2 and maximum score was 36, table (1). 31 patients (24%) had optimal sexual function 99 patients (76%) with varying degrees of sexual dysfunction complained.

In examining the various aspects of sexual function according to cut points, we found that 37.7 percent sex-

ual desire disorder, 50 percent sexual arousal disorder, 43.1 percent vaginal moisture disorder, 32.4 inability of reaching orgasm, 50.8 percent sexual dissatisfaction, and 27.7 percent had pain during sex. According to Kolmogorov-Smirnov test, the stress and function data ( $k_s = 0.055$ ,  $p\text{-value} = 0.2$ ) and ( $k_s = 0.074$ ,  $p\text{-value} = 0.08$ ) had normal distribution. In this study, there was no significant relationship between the age of individual with the job stress ( $p\text{-value} = 0.11$ ,  $r = -0.141$ ) and between age and the type of sexual function ( $p\text{-value} = 0.556$ ,  $r = -0.052$ ), but with the increase of age in individuals, their stress and sexual function had decreased.

There was a significant and reverse relationship between work experience and job stress This means that with increasing work experience, job stress has decreased ( $p\text{-value} = 0.023$ ,  $r = -0.205$ ) and there was no significant relationship between work experience and sexual function ( $p\text{-value} = 0.956$ ,  $r = -0.005$ ). There was a significant and inverse relationship between the weekly working and job stress. This means that with an increase in weekly working hours, job stress has increased ( $p\text{-value} = 0.030$ ,  $r = 0.192$ ). Also, there was no significant statistical relationship between the amounts of work in week and sexual function. But the people who work more than 50 hours a week they had a poor sexual function ( $p\text{-value} = 0.738$ ,  $r = 0.031$ ).

The employment status has affected on job stress, job stress in people whose employment status was contractual is greater than those with formal treaties or scheme ( $p\text{-value} = 0.038$ ,  $F = 3.368$ ). But employment status had no significant effect on their sexual function and sexual function in those with contractual employment status is less than those with formal treaties or scheme ( $p\text{-value} = 0.223$ ,  $F = 1.517$ ). Job had no impact on job stress ( $p\text{-value} = 0.11$ ,  $F = 1.837$ ) and sexual function ( $p\text{-value} = 0.098$ ,  $F = 1.908$ ) (Table 2). There was a significant and inverse relation between job stress of personnel and the end result of sexual function, it means that as job stress increases, the sexual function declines ( $p\text{-value}$

Table 1. Mean and standard deviation of job stress and sexual function in terms of other subscales

Variable	Mean $\pm$ standard deviation	Minimum	Maximum
Staff Working	17.72 $\pm$ 99.03	45	140
sexual dysfunction	6.47 $\pm$ 22.79	2	36
sexual desires	1.04 $\pm$ 3.42	1.2	6
sexual stimulation	1.35 $\pm$ 3.24	0	6
vaginal moisture	1.36 $\pm$ 3.82	0	6
orgasm	1.45 $\pm$ 3.80	0	6
sexual satisfaction	1.46 $\pm$ 3.80	0.8	6
Pain sexual	1.59 $\pm$ 4.46	0	6

Table 2. the relationship between job stress and sexual function in terms of other variables

Variable		sexual dysfunction Statistic (p-value)	Staff Working Statistic (p-value)
The age of the person		r=-0.052( p-value=0.556)	r=-0.141 (p-value=0.110)
The age of their husbands		r=-0.053( p-value=0.553)	r=-0.062 (p-value=0.485)
The number of children		r=-0.018( p-value=0.835)	r=0.019( p-value=0.830)
The number of years of marriage		r=-0.085( p-value=0.344)	r=-0.074( p-value=0.411)
Work experience		r=0.005( p-value=0.956)	r=-0.205*( p-value=0.023)
Weekly working hours		r=-0.031( p-value=0.728)	r=0.192*( p-value=0.030)
Employment Status	Formal Contractual Projective	F=1.517( p-value=0.223)	F=3.368*( p-value=0.038)
Education of the person	Associate Degree Bachelor Higher degree of Bachelor	F=1.651( p-value=0.196)	F=1.948( p-value=0.147)
Education of their husbands	lower Degree Degree Associate Degree Bachelor Higher degree of Bachelor	F=2.999*( p-value=0.021)	F=0.828( p-value=0.510)
Job of the person	Midwife Nurse The personnel of operating room Laboratory sciences Health worker and nurse aid Radiologist	F=1.908( p-value=0.098)	F=1.837( p-value=0.110)
Job of their husbands	self employment governmental	T=3.053**( p-value=0.003)	T=1.545( p-value=0.148)
Correlation is significant at the 0.01 level** Correlation is significant at the 0.05 level*			

<0.001, r = -0.344). There was statistically significant relationship between job stress of personnel and indices of sexual arousal, vaginal moisture, orgasm, sexual satisfaction and sexual pain (p-value <0.05), but there was not a statistically significant relationship between the stress of personnel and sex desire (p-value> 0.05) (table 3). The linear regression used for the studied variables (stress, age, age of spouse, women's education and her husband's, number of children, years of marriage, work experience, job, weekly working hours and employment status) on sexual function. Linear regression analysis showed that only variable of job stress is effective on sexual function in people with standardized coefficient (-0.359 = β) (T = -2.609, p-value = 0.012). According to the coefficient of determination, job stress variable can explain almost 13% of the variability in sexual function variable and predict it.

In the present study, the majority had moderate job stress. In the study of Noorian (2010) to investigate the relationship between job stress and health of nurses 76.48% had experienced moderate stress (Nourian et al., 2010). In the study of Nejad (2010), most midwives

Table 3. The relationship between job stresses with sexual function subscales

Staff Working		Variable	
p-value	Statistic		
0.083	-0.152	sexual desires	sexual desires
0.002	-0.272**	sexual stimulation	
0.002	-0.275**	vaginal moisture	
0.000	-0.302**	orgasm	
0.000	-0.349**	sexual satisfaction	
0.004	-0.249**	Pain sexual	
0.000	-0.344**	results	

(Nejad, 2010) and in Yaghubian's Research (2002) the majority of nurses (Yaghubian's, 2002) had moderate severity of job stress that are consistent with the results of this study. In this study, 76% had poor sexual function, the results are consistent with the result of Shayan (2015), and Yeke Falah (2009). The results of Lianjun study (2011) showed that depression, anxiety and stress are the main risk factors for sexual dysfunction (Lianjun, 2011).

In this study there was no relation between the age and the level of job stress and sexual function, but as we could find from the results tables, stress levels and sexual function decreased by age. Mollart (2013) and Knezevic (2011) considered age as a influential factor and mentioned that, younger people are more exposed to occupational hazards (Mollart 2013, Knezevic 2011), which can be caused by an increased readiness of older people to meet stressful situations, Trompeter (2011) in America and Mazinani (2013) stated that increase of age in women is affective on sexual dysfunction which it is consistent with the results of this study (Trompeter 2011 Mazinani 2013).

There was a significant and inverse relationship between work experience and job stress, it means that with increasing work experience, job stress has declined that is consistent with the results of Payami (2002) and Gholamnejad (2009). Also, in the study Mollart (2011) midwives with experience of working for more than 21 years had far lower job stress than those with lower experience (Payami, 2002; Gholamnejad 2009 Mollart, 2011), which can be a result of increased experience and cope with stressors as well as the skill of doing duty. In the study of Hashemi Nejad (2010), there was no relationship between job stress and work experience of midwives that it is not consistent with results of this study. The reason for this can be due to lack of work experience in the study of Hashemi Nejad. However, there was not a significant relationship between work experience and their sexual function. In this study, there was a significant relation between the weekly working and job stress. It means that job stress has increased by increasing the weekly working hours. However, the weekly work was not associated with sexual function but the people who work more than 50 hours a week had poorer sexual function. Since the increase in working hours increased conflict in family duties and marital relationships, it could reduce sexual function.

Greenglass (2001) reported a significant relation between working hours and job stress because an increase in working hours resulted in Increase of conflict in work and family duties that could cause stress. Employment status affected job stress and their sexual function, as stress of contractual staff is more and their sexual function is reported less than those with formal, treaties or plan.

Khalili et al (2015) in their study showed that some occupational factors such as work experience and employment status are associated with marital satisfaction of nurses . since sexual satisfaction affects marital satisfaction (Korbany et al., 2011). As a result, these factors can affect sexual satisfaction. In the study of Toews et al (1993), contractual members had more stress than the formal staff (Toews et al,1993) that these results are consistent with this study. The type of people's job had no impact on job stress and their sexual function. But the highest average score of job stress were shown in paramedic and nurse aid, the reason for this may be due to the small number of paramedic and nurse aid, too much pressure and their responsibility's diversity in different parts of the study population.

Shayan et al., (2015) did not found a relationship between women's job and sexual dysfunction, which is in line with the results of this study. This study showed that there was a significant and inverse relationship between job stresses with reduced quality of sexual function of women. Salehzadeh also mentions the effects of different factors on trends, function and Sexual behavior of humans, which can include physiological, anatomical, psychological, social, cultural and occupational factors. It seems that this finding support the importance of the psychological issues in sexual dysfunction. In this study, 24% of people had good sexual function and 76% of varying degrees of sexual dysfunction complained.

In the study of Shayan (2015), the results showed that 9/91% have sexual dysfunction . the results of the Yeke Fallah (2009) showed that 93.1% of women in Qazvin were suffered from sexual dysfunction and only 21.5% women were satisfied with their sexual activity , which is consistent with our study. But these findings contradict with the results Bakouei 2007), which showed that only 19.2% of women had sexual dysfunction . In another study by Palacios (2009) in Spain and Zhang (2011) in China the prevalence of female sexual dysfunction were reported 40% and 56.8% . It seems that the prevalence of sexual dysfunction in women is high, but the difference observed in the prevalence of female sexual function among different papers can be caused by demographic characteristics of the studied population, the instruments used and the modesty of women in the expression of sexual problems. In examining the various aspects of sexual function in this study more prevalent disorders have been reported as follows: sexual dissatisfaction, sexual arousal, vaginal moisture and the less prevalent disorders have been inability of reaching orgasm, and pain during sex. In a study by Charandabi (2014) most prevalent of dysfunction was in aspects of arousal, desire and satisfaction and the lowest prevalence of dysfunction was in sexual pain, moisture and orgasm.

In a study by Roodsari et al (2005), it has been reported that the highest dysfunction was in aspects of arousal and lowest dysfunction was in sexual pain. In study by Beigi et al (2008), the highest intensity of dysfunction was sexual desire and the lowest was orgasmic, the findings of the studies support from the findings of this study. In studies by Zeighami and Mohammadi (2009) most sexual dysfunction was related to sexuality and sexual arousal. In a study by Safarinejad, the highest frequency of disorder was in orgasm and moisture and the least prevalent was arousal disorder, which is inconsistent with the results of this study. Relationship and sexuality in all societies and religions is a taboo subject that is wrapped in an aura of superstitious beliefs and talk about it with a sense of shame and guilt, and perhaps cultural, ethnic, religious and racial differences in explaining, expressing and dealing with sexuality in each country and even in different parts of Iran and the use of tools and scales to measure different and not localized is the reason for the difference in statistics. So that according to various studies, women in Asia experience more sexual dysfunction than Western women (Laumann et al., 2004). In the present study, the most common sexual dysfunction, have been reported to be sexual dissatisfaction with 50.8 percent. In the Raisi's study (2015) that had studied the prevalence of sexual dysfunction in patients with obsessive-compulsive disorder, 42% of women had problem in sexual satisfaction. Ramezani et al (2012) reported the overall prevalence of sexual satisfaction 20.8%. Lack of sexual satisfaction is along with a significant feeling of depression, marital conflict and women's stress, which can lead to a higher incidence of sexual dysfunction in women.

In examining the various aspects of sexual function in the study, 50 percent had sexual arousal disorder, according to the study of Safarinejad (2006) overall prevalence of sexual dysfunction was reported 30% in Iran. In addition, it seems that people with job stress had not enough relaxation to be active in sex and this distraction during sexual activity will interfere with sexual arousal (VanMinnen and Kampman 2000). In the present study, 43.1% had disorder in vaginal moisture; in the study by Ramezani (2012) 18.9% of the general female population of Iran had difficulty in lubrication. This study reported that 37.7% of women has sexual disorder. Pasteur in 2011 reported that there had been a decrease in sexual desire in 40% women and 10 to 16 percent of women are worried about the loss of their sexuality. In the present study, it was stated that the 32.4 % of the participants have disability in reaching orgasm, the general prevalence of orgasm disorders in the general population of women have been reported 25% (Shokrollahi et al., 1999).

It seems that reaching orgasm involves dropping the mind. Since people with job stress always have intel-

lectual pursuit, so they have problems on the point of orgasm. Although explanation of nerve - biological anxiety is complex, it includes the release of adrenergic substances (epinephrine and nor epinephrine) and Sympathetic dominance, and this has negative effects on the process of arousal and orgasm. The relationship approved between anxiety and female anorgasmia. In the present study, 27.7 percent had pain during sex, in the study Safarinejad (2006) this disorder have been reported 26.7%. Pathological physiological factors that are involved in controlling pain are unknown. An interesting hypothesis suggests that there is a strong relation between stress, anxiety and sexual dysfunction. Thus, in sexual activity; threatening stimuli gains more attention (Corretti and Baldi 2007).

Sexual psychological factors studied in this research and their synchronization with dyspareunia have been frequently reported. Women who complain from dyspareunia have thoughts and more negative attitudes towards sex and they do sexual relationship with disgust. There is a relationship between job stress of personnel and indices of sexual arousal, vaginal moisture, orgasm, sexual satisfaction and sexual pain there. But there was no relationship between personnel's job stress and libido. This can be explained that components of arousal, vaginal moisture, orgasm, satisfaction and sexual pain affected by the cultural, social and occupational factors and the other components of desire is a mental component and rarely affected in social and occupational factors.

Study of Chyores (2011) showed that there is relation between depression and orgasm, but there is no relation between depression and sexual desire. Khademi et al (2008) and Bremen et al (2003) said that there is a consistent relationship between sexual function and depression and anxiety, Kazemi et al (2007) in their study mentioned the influence of psychological factors on sexual function. In Iran investigations, Ziamanesh et al (2008) reported a significant negative relation between scores of anxiety and depression and female sexual function. The findings of this study is consistent with the results Kashdn et al. (2011) and McCabe (2005) who said that The role of stress and anxiety is crucial on severity and stay of sexual dysfunction, as well as Bradford and Bradford (2006) and Brizendine (2006) stated that there is a relation between the stress, anxiety and reducing sexual arousal and is consistent with the results of the present study.

## CONCLUSION

The results of most published studies indicated the effects of job stress on sexual dysfunction. Different challenges in the areas of economics, and marital

relationships, child care, lack of independent income source for themselves, and no encouragement provides a suitable opportunity for prevalence of mental disorders, particularly stress on married women. It seems that women working in hospitals due to job stress are at higher risk for developing sexual dysfunction. So direct addressing in order to diagnose of these disorders and understanding the factors influencing this process could help them to solve these problems and improve relations between couples.

## REFERENCES

- Aksaray G, Yelken B, Kaptanoğlu C, Oflu S, Ozaltın M. Sexuality in women with obsessive compulsive disorder. *J Sex Marital Ther* 2001; 27(3):273-7.
- Asghari Roodsari A, Khademi A, Akbari Hamed E, Tabatabaifiar SL, Alleyassin A. Female Sexual Dysfunction in Married Medical Students. *McGill Journal of Medicine* 2005; 8(2): 104-8.
- Azad marzabadi E, Gholami Fesharaki M. Reliability and Validity Assessment for the HSE Job Stress Questionnaire. *Journal of Behavioral Sciences*. 2011; 4 (4) :11-12. (Persian).
- Baba Nazari L, Kafi SM. Comparative study of mental health and its relative demographic factors in different periods of pregnancy]. *Res Psychol Health*. 2007; 1(2):44-52. (Persian).
- Bernnard LA. Sexuality and sexual health care for women. *Clinical Obs & Gyn*. 2002; 45(4): 1089-98.
- Bakouei F Omidvar Sh, Nasiri F. Prevalence of female sexual dysfunction in married women and its related factors in Babol. *Journal of Babol University of Medical Sciences* 2007; 9 (4) 59-64. (Persian).
- Bahri Bynabaj N, Moghimian M, Atarbashy M, Qarcheh M. Study of Related burnout and mental health in midwifery and Nursing. ofoghedanesh. *Journals of Gonabad University of Medical Sciences and Health Services*.2003; 9(1): 52-7. (persion).
- Brauer RL. Safty and health for engineers. Wiley-Interscience. 2006.
- Bakewell RT, Volker DL. Sexual dysfunction related to the treatment of young women with breast cancer. *Clin J Oncol Nurs* 2005; 9(6):697-702.
- Beigi M, Javanmardi Z, Abdolahi M. A Study on Women's Sexual Functioning Disorders before and after Menopause. *Sci J Hamadan NursMidwifery Fac* 2008; 16(2): 37-42. (Persian).
- Berman JB, Berman LA, Kanaly KA. Female sexual dysfunction: New perspectives on Anatomy, physiology, evaluation & treatment. *EAU Update series*. 2003; 1:166-77.
- Brizendine L. Female brain. The female brain. New York: Broadway Books; 2006.
- Bradford A, Meston CM. The impact of anxiety on sexual arousal in women. *J Behav Res Theory* 2006; 44(8):1067-77.
- Bolourian Z ,Ghanjloo J. Evaluating sexual dysfunction and some related factors in women attending Sabzevar health care centers. *Journal of Reproduction & Fertility*. 2007; 8 (2) 163-170. (Persian).
- Chivers ML, Pittini R, Grigoriadis S, Villegas L, Ross LE. The relationship between sexual functioning and depressive symptomatology in postpartum women: a pilot study. *J Sex Med*2011; 8(3):792-9.
- Corretti G, Baldi I. The relationship between anxiety disorders and sexual dysfunction. *Psychiatry Times* 2007; 24:9.
- Chang EM, Daly JW, Hancock KM, Bidewell J, Johnson A, Lambert VA, et al. The relationships among workplace stressors, coping methods, demographic characteristics, and health in Australian nurses. *Journal of professional nursing*. 2006; 22(1):30-8.
- Collins P, Gibbs A. Stress in police officers: a study of the origins, prevalence and severity of stress-related symptoms within a county police force. *Occupational Medicine*. 2003;53(4): 256-64.
- Cousins R, MacKay C, Clarke SD, Kelly C, Kelly PJ, McCaig RH. Management standards and work-related stress in the UK: practical development. *Work Stress*. 2004; 18:113-36.
- Douma S, Doumas M, Tsakiris A, Zamboulis C. Male and female sexual dysfunction: is hypertension an innocent bystander or a major contributor? *Rev Bras Hipertens*. 2007; 14(3): 139-47.
- Funakoshi M, Tamora A, Tadoda K, Tsujimura H, Nishiyama K. Risk factors for low back pain among taxi drivers in Japan. *Sangyo Eiseigaku Zasshi*. 2003;45(6):235-47.
- Gashtasbi A, Vahdani Nia M, Rahimi Forooshani A, Mohamadi A. Sexual dysfunction and its association with reproductive variables in the Kohkiluyeh & Boyer Ahmad province. *Payesh Health Monit*. 2007; 7(1): 67-73. (Persian).
- Gholamnejad H, Nikpeima N. Causes of occupational stress among nurses. *Journal of Occupational Health in Iran*. 2009;6(1): 22-7. (Persian).
- Ghorbania A, Golchin M. Investigating the mental health status of women in Qazvin province. *J Qazvin Univ Med Sci*. 2011; 15(1):55-61. (Persian).
- Greenglass ER, Burke RJ. Stress and the effects of hospital restructuring in nurses. *Canadian Journal of Nursing Research Archive*. 2001;33(2):93-108 .
- Hayes RD, Dennerstein L, Bennett CM, Fairley CK. What is the "true" prevalence of female sexual dysfunctions and does the way we assess these conditions have an impact? *J Sex Med*. 2008; 5(4):777-87.
- Health topics Sexual health. World Health Organization. Available at: URL: [http://www.who.int/topics/sexual\\_health/en](http://www.who.int/topics/sexual_health/en); 2015.
- Hasheminejad N, Rahimi Moghaddam S, Mohamadian M, Amiri F. Relationship of mental health and job stress midwives Working in Kerman hospitals in 2010. *Iranian Journal of Obstetrics Gynecology and Infertility* . 2010; 16(64): 1-9. (persion).
- Kalia M. Assessing the economic impact of stress [mdash] The modern day hidden epidemic. *Metabolism*. 2002;51(6):49-53.

- Kashdan TB, Adams L, Savostyanova A, Ferssizidis P, Macknight PE, Nezlak JB. Effects of social anxiety and depressive symptoms on the frequency and quality of sexual activity: A daily process approach. *J Behav Res Theory* 2011; 49(5): 352-60.
- Kazemi- Saleh D, Pishgou B, Assari S, Tavallai SA. Fear of sexual intercourse in patients with coronary artery disease: a pilot study of associated morbidity. *J Sex Med.* 2007; 4(6):1619-250. (Persian).
- Khalili Z, Sadrollahi A, Gholipour F, Nazari R, Mohammadi M, Nasir Kh. assess marital satisfaction and its related factors in nurses [Master's Thesis]. Ardebil, Iran: Ardebil University of Medical Sciences; 2015. (Persian). URL: <http://jwww.ournal.muq.ac.ir>.
- Khademi A, Alleyasin A, Amini M, Ghaemi M. Evolution of sexual dysfunction prevalence in infertile couples. *J Sex Med.* 2008;5(6):1402-10. (Persian).
- Khajehi M, Doherty M, Tilley PJ. An update on sexual function and dysfunction in women. *Arch Womens Ment Health.* 2015; 18(3):423-33.
- Korbany A, Saadatmand S, Sepehrian F. The relationship between sexual functioning and marital adjustment among women. *Proceedings of the 5th congress on family and sexual health.* Tehran: Shahed University; 2011. P. 69. (Persian).
- Knezevic B, Milosevic M, Golubic R, Belosevic L, Russo A, Mustajbegovic J. Work-related stress and work ability among Croatian university hospital midwives. *Midwifery.* 2011;27(2):146-53.
- Laumann EO, Nicolosi A, Glasser DB, Paik A, Gingell C, Moreira E, et al. Sexual problems among women and men aged 40-80 y: prevalence and correlates identified in the Global Study of Sexual Attitudes and Behaviors. *Int J Impot Res* 2004; 17(1):39-57.
- Lindau ST, Schumm LP, Laumann EO, Levinson W, O'Muirheartaigh CA, Waite LJ. A study of sexuality and health among older adults in the United States. *N Engl J Med.* 2007; 357(8):762-74.
- Lianjun P, Aixia Z, Zhong W, Feng P, Li B, Xiaona Y. Risk factors for low sexual function among urban Chinese women: a hospital-based investigation. *The Journal of Sexual Medicine* 2011; 8:2299-304.
- Mazinani R, Akbari Mehr M, Kaskian A, Kashanian M. Evaluation of Prevalence of sexual dysfunctions and its related factors in women. *Razi Journal of Medical Sciences.* 2013; 19 (105): 59-66. (Persian).
- Mitchell RK, Mercer HC, Ploubidis GB, Jones KG, Datta J, Field N, et al. Sexual function in Britain: findings from the third National Survey of Sexual Attitudes and Lifestyles (Natsal-3). *Lancet.* 2013; 382(9907):1817-29.
- McCabe M. The role of performance anxiety in the development and maintenance of sexual dysfunction in men and women. *J Stress Manag* 2005; 12(4): 379-88.
- Mohammadi kh, Heydari M, Faghihzade S. The Female Sexual Function Index (FSFI): Validation of the Iranian version. *Payesh Journal.* 2008; 7(3). 269 -78. (Persian).
- Mollart L, Skinner VM, Newing C, Foureur M. Factors that may influence midwives work-related stress and burnout. *Women and Birth.* 2013;26(1):26-32.
- Mohammad-Alizadeh-Charandabi S, Mirghafourvand M, Asghari-Jafarabadi M, Tavananezhad N, Karkhaneh M. Modeling of socio-demographic predictors of sexual function in women of reproductive age. *J Mazandaran Univ Med Sci.* 2014; 23 (110):238-242 URL: <http://jmums.mazums.ac.ir/article-1-3394-fa.html>
- Newton J, Waters V. Community palliative care clinical nurse specialists' descriptions of stress in their work. *International journal of palliative nursing.* 2001;7(11):531-40.
- Nourian K, Parvin N, Mehrabi T. Evaluation of the relationship between occupational stress and general health condition in nurses working in Isfahan university hospitals 2005. 2010; 5(1,2): 45-52. (persian).
- Palacios S, Castano R, Grazziotin A. Epidemiology of female sexual dysfunction. *Maturitas.* 2009; 63(2): 119-23.
- Pastor Z. Female sexual desire disorders prevalence, classification and treatment possibilities. *Ceska Gynekol.* 2011; 76(1):59-64.
- Peterson U, Demerouti E, Bergström G, Samuelsson M, Åsberg M, Nygren Å. Burnout and physical and mental health among Swedish healthcare workers. *Journal of advanced nursing.* 2008; 62(1):84-95.
- PakGouhar M, Vizheh M, Babaei G, Ramezanzadeh F, Abedianian N. Effect of counseling on sexual satisfaction among infertile women referred to Tehran fertility center. *Hayat.* 2008; 14 (1): 21-30. (Persian).
- Pregler J-P, Decherney A-H: *Women's health principles and clinical practice.* Hamilton, B. C Decker .2002.
- Payami Bvsary M. Burnout syndrome and some related factors Aimed at female nurses working in hospitals of Zanjan. *Journal of Zanjan University of Medical Science & Health Services* .2002;40: 47-51. (Persian).
- Ramezani N, Dolatian M, Shams J, Alavi H. The relationship between self-esteem and sexual dysfunction and satisfaction in women. *J Arak Univ Med Sci.* 2012; 14(6): 57-65. (Persian).
- Raisi F, Ghassemzadeh H, Meysami A, Firoozikhojastefar R, Karamghadiri N, Sorayani M, et al . Sexual dysfunction in Obsessive-Compulsive disorder. *Tehran Univ Med J.* 2015; 73 (2):101-109. (Persian). URL: <http://tumj.tums.ac.ir/article-1-6606-fa.html>.
- Rosen R-C. Assessment of female sexual dysfunction. Review of validated methods. *Fertility and Sterility.* 2002; 77: 80-9.
- Safarinejad MR. Female sexual dysfunction in a population-based study in Iran: prevalence and associated risk factors. *Int J Impot Res* 2006; 18(4):382-95. (Persian).
- salehzadeh M, Kajbaf M-B, Molavi H, Zolfaghari M. Effectiveness of cognitive - behavior therapy on sexual dysfunction in women. *Psychological Studies.*2011; 7(1):11-31. (persian).
- Schuiling K-D, Likis F-E : *Women's Gynecology.*Jones and Bartlet. 2006.

- Shamloo S. *Mental Health*. 19th ed. Tehran: 2007: 11.
- Shayan A, Kaviani M, Haghpanah S, Gholamzadeh S, Zarenezhad M, Masoumi S-Z. Evaluation of Sexual Dysfunctions and its Related Factors in Women Experiencing Domestic Violence Had Been Referred to Forensic Medicine Center of Shiraz. *Scientific Journal of Hamadan Nursing & Midwifery Faculty*. 2015;23(2):32-41. (Persian). URL: <http://nmj.umsha.ac.ir/article-1-1329-en.html>.
- Shokrollahi P, Mirmohamadi M, Mehrabi F, Babaei G. Prevalence of sexual dysfunction in women seeking services at family planning centers in Tehran. *J Sex Marital Ther* 1999; 25(3):211-5.
- Tangri RP. What stress costs. Special report produced by Chrysalis Performance Strategies, Inc Nova Scotia, Canada. 2003.
- Toews JA, Lockyer JM, Dobson DJ, Brownell AK. Stress among residents, medical students, and graduate science (MSc/PhD) students. *Academic Medicine*. 1993;68(10): 46-8.
- Trompeter SE, Bettencourt R, Barrett-Connor E. Sexual activity and satisfaction in healthy community-dwelling older women. *Am J Med* 2011; 125(1):37-43.
- VanMinnen A, Kampman M. The interaction between anxiety and sexual functioning: A controlled study of sexual functioning in women with anxiety disorders. *Sex Relationship Ther* 2000; 15(1):47- 57.
- WHO. *Nursing and midwifery*. Geneva: World Health Organization; 2008. Available at: [www.who.int/hrh/nursing-midwifery/en/S](http://www.who.int/hrh/nursing-midwifery/en/S) (Accessed: 04/10/2008).
- Yaghubian M, Parhizkar S. Occupational stress survey Nurses in hospitals of East Mazandaran in 1999. *Yasuj University of Medical Sciences Armaghane danesh Journal*. 2002; 7(25): 13-20. (Persian).
- Yekefallah L, Goudarzi MR. Prevalence sexual dysfunction and effective factors in married men and women of Ghazvin in 2004.; *Second Congress Of Family And Sexual Problems, 2004 Shahed University, Tehran*. (Persian).
- Zonouzi A, Satarzadeh N, Zamanzadeh V. Recognition of experienced psychological varieties in women sexual relationship after childbirth. *J Qazvin Univ Med Sci*. 2008; 12(3):38-44. (Persian).
- Zeighami-Mohammadi Sh, Ghaffari F. Sexual dysfunction and its relationship with quality of life in patients with cancer. *Iranian Journal of Obstetrics Gynecology and Infertility*. 2009; 12(3): 39-46. (Persian).
- Zhang AX, Pan LJ, Chen XY, Pan F, Kan YJ. An investigation on female sexual dysfunction among urban Chinese women in Nanjing. *Zhonghua Nan Ke Xue*. 2011;17(6):488-91.
- Ziamanesh A, Yousefilouyeh M, Sedighilouyeh E. Sexual function and psyche health of women. *2014 Third Congress of Family and Sexual Health, Shahed University, Tehran*. (Persian).

## Investigating the Effect of Home-Based Cardiac Rehabilitation on Fatigue of Patients with Coronary Heart Disease (A Clinical Trial)

Saeedeh Piri<sup>1</sup>, Aazam Dabirian<sup>2\*</sup>, Zahra Safavi Bayat<sup>3</sup>, Sima Zohari Anbohi<sup>4</sup>,  
Mohamad Amin Pourhoseingholi<sup>5</sup> and Mehrdad Namdari<sup>6</sup>

<sup>1</sup>Graduated, Master of Nursing, Faculty of Nursing and Midwifery, Shahid Beheshti University of Medical Science, Tehran, Iran

<sup>2</sup>Lecturer, Department of Medical-Surgical Nursing, Faculty of Nursing and Midwifery, Shahid Beheshti University of Medical Science, Tehran, Iran

<sup>3</sup>PhD student in Nursing, Department of Medical-Surgical Nursing, Faculty of Nursing and Midwifery, Shahid Beheshti University of Medical Science, Tehran, Iran

<sup>4</sup>PhD student in Nursing, Department of Medical-Surgical Nursing, Faculty of Nursing and Midwifery, Shahid Beheshti University of Medical Science, Tehran, Iran

<sup>5</sup>Assistant Professor, Department of Biostatistics, Faculty of Paramedical Science, Shahid Beheshti University of Medical Science, Tehran, Iran

<sup>6</sup>Assistant Professor, Department of Cardiology, Faculty of Medicine, Lorestan University of Medical Sciences, Lorestan, Iran

### ABSTRACT

Fatigue is a common symptom in patients suffering from Coronary Heart Disease. Rehabilitation is one of the most effective ways to reduce fatigue in patients with Coronary Heart Disease. This study was carried out to determine the effect of home-based cardiac rehabilitation on fatigue in patients Coronary Heart Disease referred to the Khorramabad cardiac rehabilitation center in 2014. This study is one-group clinical trial research. Samples consisted of 46 patients selected by purposive sampling method according to inclusion criteria among patients with Coronary Heart Disease who had referred to the Khorramabad rehabilitation center. The study included 4 one-hour education sessions of face to face in 4 consecutive days with content of home-based cardiac rehabilitation and followed for 8 weeks after discharging at patient's home. Demographic characteristics questionnaire and Piper Fatigue Scale (PFS) collected data. Fatigue was measured using the Piper Fatigue Scale (PFS) before and seven weeks after intervention. Validity

### ARTICLE INFORMATION:

\*Corresponding Author: [aazamdabirian@yahoo.com](mailto:aazamdabirian@yahoo.com)

Received 21<sup>st</sup> April, 2017

Accepted after revision 25<sup>th</sup> July, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

of the instrument was assured by content and face validity methods and Cronbach's alpha was used to determine the reliability. Data were analyzed using descriptive and analytic statistic (paired t-test, and covariance analysis) with SPSS version 19. The mean score of fatigue in patients who have undergone coronary artery bypass graft surgery (CABG) before intervention was  $5.49 \pm 1.96$  and after intervention was  $2.69 \pm 0.09$  that shows a statistically significant difference ( $P < 0.001$ ); and the mean score of fatigue in patients undergoing percutaneous coronary intervention (PCI) before interventions was  $5.11 \pm 2.02$  and after intervention was calculated  $2.79 \pm 1.28$  that reflects the difference was significant ( $P < 0.001$ ). According to results of the study, home-based cardiac rehabilitation nursing could decrease fatigue in patients with Coronary Heart Disease.

**KEY WORDS:** HOME-BASED CARDIAC REHABILITATION, CORONARY HEART DISEASE, FATIGUE

## INTRODUCTION

Coronary Heart Disease has considered as leading cause of death around the world (Go A.S *et al.* 2013). Of Coronary Heart Diseases, coronary artery disease is responsible for half of all deaths. In Iran based on information obtained from an epidemiological study conducted in 2009 to investigate the cause of death, which of between 321,570 death, the number 82,307 is the result of coronary artery disease with 25.6 percent of the first the leading cause of death in the country (Amani F *et al.* (2010)). The features of coronary heart disease include chest pain, fatigue, decreased activity, stress, and change of body image and loss of performance (Hassanpour-Dehkordi A *et al.* (2009)). At the same time, fatigue is one of the most uncomfortable symptoms at all stages of the disease, with symptoms such need plenty of rest, drowsiness, weakness, decreased stamina and ability to work, loss of muscle strength and intellectual battle and makes individual disable in the physical and mental health (Zahed F *et al.*(2009)). These signs can be seen in more than 69 to 82 percent of patients with coronary artery disease (Bartels M.N. (2009)). Home-based rehabilitation programs in the patients' adherence to rehabilitation programs, reduce costs (Dalal H.M *et al.* (2010); Taylor R.S *et al.* (2007)), reduce re-hospitalization after discharge (Sinclair A.J *et al.* (2005)), as well as improving quality of life, and fatigue (Jokar Z *et al.* (2012)) are more effective than center-based programs. Given the above mentioned, and considering the lack of similar studies in the country, especially about the effect of home-based rehabilitation on fatigue in patients with coronary artery disease and to emphasize home-based rehabilitation services as a way to challenges future health especially increase the rate of elderly population and the incidence of chronic diseases, particularly coronary artery disease, researchers intent to carry out research in this field.

## MATERIALS AND METHODS

This research is a before and after one-group clinical trial. In this study, subjects were all patients with heart coronary artery disease undergoing coronary artery bypass

graft surgery and percutaneous coronary interventions were diagnosed with cardiologist, 4-6 after the discharge dated from 21.03/2014 to 07.10/2014 for rehabilitation referred to Khorramabad heart rehabilitation center and were eligible for the study. The inclusion criteria include age range 35-70 years, the sustainability of vital signs of the patient to participate in the program, traverse 4-6 weeks of discharge, lack of mobility-limiting disease, uncontrolled heart failure patient's disease, unstable arrhythmias and angina, exhaustion is not treated with drugs and sedatives such as amantadine, have at least ability to read and write and understand conversation in Farsi; and exclusion criteria were not following the recommended training and exercises, withdrew from the study was the incidence of physical disorders. The sample size based on 95%, test power of 80% and estimate the rate of change of fatigue before and after the intervention (based on similar studies, standard deviation (sigma) 7 units intended) and assuming an estimation error in the amount of 4 units (Delta), based on the similar results 50 patients were determined. So after proven inclusion features of the study and 50 patients based on purposive sampling method were selected. It should be noted that one of the study subjects due to death and three people because of lack of cooperation during the intervention were excluded. The data collection tool was demographic information questionnaire and Piper fatigue questionnaire. Piper fatigue questionnaire, which includes four domains of behavior (Question 2-7), emotional (8-12), sensory (13-17) and cognitive (18-23), contains 23 questions that for eleven degrees is scored from zero to 10 and the average total score of the scale from zero to ten. A higher score indicates a high level of fatigue. The reliability by Cronbach's (0.94) has been reported. After translating scientific validity through the content validity and reliability of Cronbach's alpha (0.78) also were acquired. First introduced on the first day baseline to the specific objectives of the study and completed demographic data, Piper fatigue questionnaire by patients was completed. In the next stage intervention as the implementation of four consecutive one-hour meeting and face-to-face training with content related to home-based cardiac rehabilitation

program (first meeting of explaining disease, complications, therapy and cardiac rehabilitation in simple language- second session training disease risk factors and control ways include smoking, high blood fat, high blood pressure, weight gain and stress- third session training regimen and diet and medication regimen in patients with cardiovascular disease- fourth session included training and implementation walking frequency, duration, sports allowed in this group of patients and how to control pulse during exercise) were performed. At the end of the fourth session review the three sessions and training manual for training sessions were carried out using established scientific texts and by nursing experts and cardiologist was confirmed, and distributed among patients. In the last training session, within safe limits the amount of increased heart rate in the table at the end of training manual for educating patients and based on the individual's readiness for exercise was marked by a cardiologist. Given that nurses are active members of the rehabilitation team in fact, rehabilitation is an important component of the nursing profession and nurses play a key role in it (Mohammadi Shahblaghy F. (2006).), training sessions at Khorramabad heart rehabilitation center by researcher who passed rehabilitation-training courses under the supervision of cardiologists were held. The need to measure learning in different time intervals, the patient was asked in the presence of researcher has been practice trained content. In addition, after completing the rehabilitation program at twice home-based visit at the end of the fourth and eighth week by the researcher continued control of the rehabilitation program, training provided and solving problems and answering possible questions. In order to ensure the implementation of training provided to patients asking them to comply with instructions mark the form of home care that was given to the patients. It should be noted that this form is also available to researchers and the 8-week intervention, researcher contact with patients once a week to do, emphasizing the concepts taught, the exercise and ensure that in case of problems refer back to their homes.

Researcher telephone also be given to the patients they contact if have any problems or possible questions. At the end of 8 weeks with a visit to the homes of patients (second visit), they were asked to fill out the fatigue questionnaire. Data analysis using descriptive and analytical statistics (t-test and ANCOVA) was performed using SPSS software version 19. In this study, the ethical permission from the university and ethics committee, described the work procedures to patients and obtaining informed consent from them, confidentiality of information gathered, commitment to the authorities for making available the results of the study were considered.

## FINDINGS

The results of this study in relation to demographic variables showed that of 46 patients, 54.3% of men and 45.7 percent were women. The mean age of participants was  $54.63 \pm 8.87$  and most of them are married (87%). Most of the participants (26.1%) have high school education. In terms of employment status, most subjects (19.6%) self-employed and most women were housewives. 21.7% of patients in the study were smoking. In addition, 50% sample had hypertension, 47.8% cholesterol background and 34.8% had a history of Diabetes. More units were studied (60.9%) have a family history of heart disease. In terms of body mass index 45.7% of the patients were overweight (25–29.99). Of the 46 patients, participating in the study (63%) underwent coronary artery bypass graft surgery and percutaneous coronary interventions were 37% of patients. Mean fatigue scores in patients undergoing coronary artery bypass surgery and in patients undergoing percutaneous coronary interventions in all four dimensions: behavioral, emotional, sensory and cognitive as well as general fatigue decreased compared to before the study. The mean fatigue score by paired t test in each group had significant difference ( $p < 0.001$ ) in each of the dimensions of behavioral, emotional, sensory, cognitive and general fatigue after the

Table 1. Mean fatigue in patients with coronary heart disease undergo coronary artery bypass graft surgery before and after home-based cardiac rehabilitation program

Step rehabilitation Fatigue Dimensions	Before rehabilitation program		After rehabilitation program		Result Test Paired t Df =28
	Average	Standard deviation	Average	Standard deviation	
Behavioral	5.94	1.96	2.94	0.90	T=10.051 ( $p < 0.001$ )
Emotional	5.30	2.19	2.66	1.19	T=7.034 ( $p < 0.001$ )
Sensory	5.37	2.14	2.59	0.99	T=9.011 ( $p < 0.001$ )
Cognitive	5.31	2.26	2.57	1.00	T= 7.956 ( $p < 0.001$ )
Total fatigue	5.49	1.91	2.69	0.90	T=9.876 ( $p < 0.001$ )

Step rehabilitation Fatigue Dimensions	Before rehabilitation program		After rehabilitation program		Result Test Paired t Df =28
	Average	Standard deviation	Average	Standard deviation	
Behavioral	5.00	1.89	3.04	1.62	T=5.464 (p<0.001)
Emotional	4.48	1.96	2.80	1.19	T=5.343 (p<0.001)
Sensory	4.96	1.91	2.41	1.24	T=6.967 (p<0.001)
Cognitive	5.86	3.58	2.84	1.34	T= 3.803 (p=0.002)
Total fatigue	5.11	2.02	2.79	1.28	T=6.242 (p<0.001)

intervention than before the intervention. To evaluate the impact of demographic variables influence such as age, sex, disease duration and type of treatment on the fatigue changes after the intervention of covariance was used. In the meantime demographic information has no significant effect on the rate of fatigue change ( $p>0.05$ ).

## DISCUSSION AND CONCLUSION

The findings show that after the intervention of home-based cardiac rehabilitation, average fatigue in patients with coronary artery disease who are undergoing coronary artery bypass graft surgery as well as in a group of patients undergoing percutaneous coronary interventions have been reduced compared to before intervention which reflects the positive effects of participating in home-based rehabilitation programs. These results are consistent with the results of Davoodvand Et al. (Davoodvand S.h Elahi N Haghighizadeh M.H. (2009)), which noted that the implementation of cardiac rehabilitation program in patients with myocardial infarction, reduce the fatigue of these patients. The results of this study, Van Geffen et al (Van Geffen M.E et al. (2013)) as "reduce the fatigue after home-based cardiac rehabilitation in a year of follow-up" confirmed that shows cardiac rehabilitation program includes exercise and training cardiovascular disease risk factors on patients' fatigue. So feeling of fatigue after a cardiac rehabilitation program reduced, and to a one-year follow-up was stable ( $p<0.05$ ). Koertge et al in a (Koertge J et al. (2008)) study entitled "The impact of stress management programs on fatigue and depression in women with coronary artery disease" did, the study consisted of 247 women less than 75 years with a cardiac event such as PCI, CABG, MI will be examined. Follow-up of patients at 10 weeks, 1 year and 2 years was conducted. The results showed that stress management program is part of the cardiac rehabilitation program reduce fatigue in patients with coronary artery disease, which is in line with the results. However, in the post-test fatigue test

group was significantly lower than the control group ( $p<0.009$ ), so participating in a home-based rehabilitation program reduce fatigue in patients with chronic obstructive pulmonary disease which is in line with the results. In this study, the approach cause cardiac rehabilitation program recommended as an interventional low-cost, accessible and useable by the client, accepted and comfortable in his residence, conducted. In this context, the role of nurses is very important. Create awareness and commitment to the strict implementation of a home-based cardiac rehabilitation program with the management of rehabilitation nurses, particularly nurses can play an important role in improving psychological complications and reduce the adverse consequences of the disease. On the other hand, the findings implicitly affirm the role of nurses in health care services in the home, which unfortunately our country is quite noticeable gaps in the health system. The results of this study suggest that home-based cardiac rehabilitation program, as a non-invasive intervention with easy implementation, low cost, effectiveness and reduce fatigue, patients with coronary artery disease should be considered first-line therapy. The limitations of this study is that fatigue is a subjective phenomenon and can be influenced by many variables such as emotional changes and other symptoms of the disease, therefore, a careful examination of the problem and its control is responsible for foreign researchers. The grueling lifestyle of people of different activities and allows integration of these did not exist. On the other hand creating activities contributing to differentiate between fatigue and fatigue caused by the disease was not possible.

## ACKNOWLEDGEMENT

This article is extracted from Master's Thesis Mrs. Saeedeh Piri graduated student of Shahid Beheshti Nursing and Midwifery faculty advice Mrs. Azam Dabirian. So all patients participating in the study, nurses of Khorramabad Cardiac Rehabilitation Center, Deputy of research

and training, and professors who assist in determining validity of this research tool were acknowledged.

## REFRENCES

Amani F et al. (2010). [Trend of the major causes of mortality in the years 1350-88]. *Journal of Gorgan University of Medical Sciences*. 12(4):85-90. (Persian)

Bartels M.N. (2009). Fatigue in cardiopulmonary disease. *Physical Medicine and Rehabilitation Clinics of North America*. 20(2):389-404.

-Davoodvand S.h Elahi N Haghighizadeh M.H. (2009). [Effectiveness of short-term cardiac rehabilitation on clinical manifestations in post-MI patients] .*Hayat*. 15(3):66-73. (Persian)

Dalal H.M et al. (2010). Home based versus centre based cardiac rehabilitation: Cochrane systematic review and meta-analysis. *Britishl*. 340, b5631. Online]. <<http://www.bmj.com/content/340/bmj.b5631>>. [4May2014]

Go A.S et al. (2013). Heart disease and stroke statistics--2013 update: a report from the American Heart Association. *Circulation*. 127 (1): e6-e245

Hassanpour-Dehkordi A et al. (2009). [Factors influencing quality of life in patients with myocardial infarction]. *Iran Journal of Nursing*. 22(57):43-52. (Persian)

Jokar Z et al. (2012). [Effect of home-based pulmonary rehabilitation on fatigue in patients with COPD]. *Hayat*. 18 (5):64-72. (Persian)

-Koertge J et al. (2008). Effects of a stress management program on vital exhaustion and depression in women with coronary heart disease: a randomized controlled intervention study. *Journal of Internal Medicine*. 263(3): 281-93.

Mohammadi Shahblaghy F. (2006). [Theoretical Foundations of Nursing Rehabilitation]. 1 th edition. Tehran: University of Social Welfare and Rehabilitation Sciences. (persian)

Sinclair A.J et al. (2005). Post-discharge home-based support for older cardiac patients: a randomised controlled trial. *Age Ageing*. 34(4): 338-43.

Taylor R.S et al. (2007). Home-based cardiac rehabilitation versus hospital-based rehabilitation: a cost effectiveness analysis. *International Journal of Cardiology*. 119(2):196-201.

-Van Geffen M.E et al. (2013). Experienced fatigue is decreased after cardiac rehabilitation and at one year follow up. [Abstract]. *European Heart Journal*. 34. [Online] .<[http://eurheartj.oxfordjournals.org/content/ehj/34/suppl\\_1/P5800.full.pdf](http://eurheartj.oxfordjournals.org/content/ehj/34/suppl_1/P5800.full.pdf)>. [18 Dec 2013].

Zahed F et al. (2009). the relationship of fatigue and hostility with health in patients with coronary artery disease.» *Journal of Guilan University of Medical Sciences*. 18(72): 77-84

## The relationship between organizational culture with social loafing

Irandegani M<sup>1</sup>, Nastiezaie N<sup>2\*</sup> and Shahrakipur H<sup>3</sup>

<sup>1</sup>Master Student of Educational Administration, Islamic Azad University, Zahedan branch

<sup>2</sup>Assistance professor of Educational Administration, University of Sistan and Baluchestan, Education & Psychology Faculty, Zahedan, Iran

<sup>3</sup>Associate Professor of Educational Administration, Islamic Azad University, Rodehen branch

### ABSTRACT

The goal of this research was to study the relationship organizational culture with social loafing of teachers. Research method was descriptive-correlational and the data was collected through a survey. A sample of 285 teachers were stratified random selected out of a population all secondary school teachers in the city of Zahedan. Research instruments included organizational culture questionnaire (Denison, 2007) with an alpha coefficient of 0/86, social loafing questionnaire (George, 1992) with alpha coefficients of 0/73. To analyze the obtained data, Pearson correlation coefficient and simultaneous regression analysis were used via SPSS v.21. According to the results, the correlation coefficients between organizational culture with social loafing was -0.753 (P<0.01). Moreover, the results of multiple regression analysis revealed that organizational culture can predict %59/2 of the variance social loafing. Based on the results it can be concluded that appropriate organizational culture reduce social loafing.

**KEY WORDS:** ORGANIZATIONAL CULTURE, SOCIAL LOAFING, PROCRASTINATION

### INTRODUCTION

People often perform things together and try to achieve the set goals at the possible lowest cost. Of the reasons that reduce the productivity of the working groups, is people's willingness to slumber when activities alongside the other members of the group. This phenomenon is

arised as Social Loafing, Social Loafing refers to behavior that based on it, people during working with others show less effort. Social Loafing is people tend to make less effort teamwork than individual work (JavadiYeganeh and Fooladian, 2011).

In social Loafing are facing with situation that group makes be undermined person's behavior. In other words,

#### ARTICLE INFORMATION:

\*Corresponding Author: N\_nastie1354@ped.usb.ac.ir

Received 30<sup>th</sup> April, 2017

Accepted after revision 5<sup>th</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal  
NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

someone in the group shows less effort, while individual in individual situations, does not show this inactivity. Such behavior can be brought many problems and negative consequences for the individual and society at the macro level and in the long term. Hypothyroidism person in the group in the form of social phenomenon leads to reduced socially responsible, slacker person because in this situation the contribution of each person in the group is unknown and there is no oversight on contribution of each member (Taklo et al., 2015).

Social Loafing in addition to reducing performance of Group, leaves other detrimental effects on their organizations. Social Loafing reduce Group cohesion that its result is increased work absenteeism. It is clear people who do not seriously take their work and do not present to work, during its presence in the organization do not use all their energies to the tasks and shirk from duties (Mousavi David and Fartash, 2012). The main obstacle is social Loafing by teamwork and will be causes most destructive form of intergroup conflict. The main reason of social Loafing is that people in teamwork feel unmotivated, because they think that their efforts will not be considered. In other words, most organizations, many people put together and try to cooperate and work together to achieve defined goals. If these people believe that their individual performance among colleagues is not recognized, not only refuse from further efforts for the success of entire group but reduces their performance as the lowest member of the group.

Social Loafing factor can be cited the ability to identify an individual in the group, Individuals performance evaluation by other team members with team manager, The difficulty of the task and the expectations of team members from individual (Damghanian et al., 2015). Social Loafing of teachers can be influenced by several factors such as leadership style, school climate, and level of professionalism of teachers but perhaps one of most important factor is the organizational culture of the school. In terms of Hoy & Miskel (2012) organizational culture, is system of common directives that elements takes a set with each other gives distinct identity to it. School culture, Common ideas include assumptions, values and beliefs that gives identity to organization and reflects standards for expected behavior. Hodkinson et al (2008) sees culture as a social phenomenon - an action - that forms by the interaction and communication between members and working conditions an organization. Military school culture is norms, meanings and values that is shared between members of the school such as students, teachers and other staff. The essential characteristic of culture is its high stability; such that against the effect of incoming has been from highly resistant environment and rarely changes. This feature makes culture powerful and extensive and to the same extent impact on differ-

ent groups from students who enter a school (Hofstede et al., 2010).

School culture must contain features that can in addition create sharing among the assumptions fundamental of values and norms of a school employee, distinguish that School from other schools. So Managers should be invention of functions that can makes the school unique (Ugurlu, 2009). The culture of organizations, including school organization basically has been classified to manufacturer or specialist culture against defense culture. For example, in manufacturer or specialist culture class, staff have behavioral expectations and norms of success, Innovation, competence, cooperation, support and responsibility and emphasis on rewards for their performance.

On the contrary in defense or hardy culture class, staff have behavioral expectations and norms of verification, comply with religion and old customs, dependence, opposition, strength, formulation and repression (Shim, 2010). There is patterns and different opinions in organizational culture. The pattern that has been used in this research, is Denison's model. In this model, corporate culture has four dimensions: Engaged in work, Compatibility (stability and integrity), adaptability and mission.

A) Engage in work: This dimension is determined with three components of teamwork, empowerment and development capabilities. Effective organizations empower their people, form organizations on the basis of working group and develop human resource capabilities at all levels. Organization members are committed to their work and feel him/his self as some of Organization bodies. People at all levels feel that have role in decision making and this decision is that is effective on their work and their work is directly linked to organizational goals.

B) Compatibility (stability and integrity): Organizations that are most effective and have been stable and integrated, and employee behavior has been derived from fundamental values. Leaders and followers have found skills in reaching agreement (even when they have mutual perspective) and organizational activities have been well coordinated and interconnected. These organizations with such features, have strong and distinct culture and sufficiently have influence on employee behavior.

C) Adaptability: Organizations that are well integrated, become hard to change. Therefore, internal integrity and external adaptability can be taken into account advantage of Organization. Adaptable organizations are guided by customers, take risks and adopt advice from their mistakes and

have capacity and experience to make changes. They continually improving the organization's ability due to valuing customers.

D) Mission: May be said most important feature of organizational culture is its mission. Organizations or institutions which do not know where they are and what is their existing situation usually go to devious. Successful organizations have clear understanding of the goals and direction such has defined that organizational goals as strategic goals and drawe prospect of Organization (Monavaryan and Ahmadi Tonekaboni, 2012).

In relation to the importance and necessity of the research should be said that Iranian community in one of past two decades has been located much criticism in terms of laziness. It is obvious that existence of phenomenon of social Loafing in Iranian culture and organizations, creates Irreparable damage to the country (JvadyYeganeh and Fooladian, 2011).

Hence identifying level of social Loafing of employees will be necessary in order to find solutions to its possible reduction. Empower employees and managers can rely on the power of culture in the organization, impact on organization's ability to change its strategic direction. Therefore identify the current status of organizational culture by examining Improvable cultural points and the factors influencing in promoting cultural status of organization, are very important. Correct understanding of of organizational culture, has an impact on determining destiny of organization (Pakdel et al., 2014).

Hence present research also will help managers and teachers to identify the current status of schools organizational culture, take steps in order to achieve its optimal situation. Schools that use from integrated and coherent of organizational culture that is supported by members of the school, will be have more effectiveness and also, cause greater job satisfaction and solidarity among its members (Adliet al., 2013).

In the literature review, Damghanian et al (2015) did research entitled Investigate the relationship between organizational justice and social Loafing among bank staff Mellat in Mazandaran province, Research findings show that organizational justice has significant and negative relationship with social Loafing of employees. Taklo et al (2015) did research entitled examine the relationship between the components of the five-factor model of personality and social Loafing In staff of Kermanshah University of Medical Sciences. Findings showed that there is significant relationship between all independent variables of personality traits (neurosis, extraversion, flexibility, agreeableness and conscientiousness) except flexibility variable with the dependent variable of social Loafing.

Meydan, Kahraman and Basar (2014) did research entitled Social Loafing and harvesting management in organizational situations for this purpose, were studied employees from private banks of Ankara Turkey for example. Results showed that type of conception and understanding of management has relationship with social Loafing, in organizations that leaders are Permissive, Social Loafing of staff is usually higher. But in organizations that leaders are strict, Social Loafing of staff is lower.

Taştan & Türkerb (2014) did research entitled relationship between organizational culture, job involvement among the employees of Turkish banks. Findings showed that there is significant and positive relationship between organizational culture and job involvement. Given the importance of two phenomenon of social Loafing and social adjustment in group activities and organizational and identifying factors affecting on them, Researchers sought to examine the relationship between organizational culture with Loafing and adjustment social among teachers of Zahedan city.

It is worth noting research that has not been doneto examine the role of organizational culture in Loafing and adjustment social, especially in educational institutions. The same point was caused up to researcher select this issue as research topic that through this can provide Scientific and practical suggestions to Authorities of Zahedan education system and school administrators. So the main problem of this research is that is there relationship between organizational culture and Loafing social and social adjustment of teachers in Zahedan?

## ANALYSIS METHOD

Current study In terms of aim is applied and In terms of method of collecting data is descriptive - correlation research. The statistical population research is included all high school teachers in the city of Zahedan in the academic year 2016-2015 were volume 1100 people (459 male teachers and 641 female teachers) who 285 teachers (119 male teachers and 166 female teachers) were studied by Stratified random sampling method Commensurate with the size and based on Cochran sampling formula.

Data collection tool were as follows: A) organizational culture questionnaire (Denison, 2007): This questionnaire pay to examines the organizational culture in the form of 60 items and 4 components engaging in work (15 items), Stability and integration (15 items), adaptability (15 items) organizational missions (15 items). Questionnaire has been adjusted based on the spectrum 5 points Likert (from very low to very high) and its scoring is from 1 (low) to 5 (very much). Higher scores in this questionnaire is indicates the presence of appropriate and desirable organizational culture in the organization.

The reliability of this questionnaire in the study of Damghanian et al (2012) have been reported 0/955 through calculate Cronbach's alpha coefficient. B) Social Loafing questionnaire (George, 1992): This questionnaire with 10 items pay to evaluate the employees of an organization's social Loafing. Questionnaire has been adjusted based on the spectrum 5 points Likert (from very low to very high) and its scoring is from 1 (low) to 5 (very much). Higher scores in this questionnaire is sign of higher social Loafing. The reliability of this questionnaire in the study of Damghanian et al (2015) have been reported 0/752 through calculate Cronbach's alpha coefficient. Content validity method was used to determine the validity of tool. In this regard, the questionnaire was confirmed by university professors of Sistan and Baluchestan and was assured that the questionnaires measures same attribute of researcher and have necessary Validity. To determine the reliability of the tool, Cronbach's alpha test was used that coefficient was obtained 0/86 for organizational culture questionnaire and was obtained 0/73 for Social Loafing. Obtained coefficients indicate that desired questionnaires has necessary reliability. To analyze the data Pearson's correlation coefficient and multiple regression analysis were used with the help of spss17 software.

### FINDINGS

In the present study 285 were studied middle school teachers in the city of Zahedan. 58/2% female, 41/8% male, 8.8% single and 91/2% married, 21/11% less than 10 years, 36/8% between 10 and 20 years and 42/1 percent over 20 years have work experience. 73/7 percent

in public schools and 26/3 percent in private schools and 90/2 percent formal and 9/8 percent contracts were working. To examine the relationship between organizational culture and Social Loafing of teachers, in the first stage, Pearson correlation coefficient has been used that its results have been reported in Table 1.

Based on the results of table above, there is significant and negative relationship between organizational culture and its components with social Loafing ( $p < 0/01$ ) which means that whatever school organizational culture emphasis on engaging in work, have the stability and integrity, and adapt itself with conditions and change of day and have clear organizational mission, is reduced from level of social Loafing of teachers. In the second stage, multiple regression was used to predict social Loafing based on organizational culture. its findings have been reported in Table 2.

Based on the regression model, Determination coefficient ( $R^2$ ) is equal to 0/592 that Means to organizational culture explain 59/2 percent of the variance of social Loafing. The results also show that components: Engaged in work with the amount of  $\beta$  (0 / 392 -), adaptability with the amount  $\beta$  (0 / 363 -), organizational mission with the amount of  $\beta$  (0 / 265 -), and Stability and integrity with the amount of  $\beta$  (0 / 104 -) Respectively have had feom largest negative impact on social Loafing of teachers ( $p < 0 / 05$ ).

### DISCUSSION AND CONCLUSION

This study was done aimed to determine the relationship between organizational culture and social loafing of teachers of zahedan. Based on these findings, there is

Table 1. mutual correlation coefficient organizational culture (and its components) with social Loafing

organizational culture (total)	organizational mission	adaptability	stability and integrity	Engaged in work	Variable	
753/0-000/0	553/0-000/0	612/0-000/0	515/0-000/0	433/0-000/0	r	social Loafing
					p	

Table 2. Summary of regression analysis to predict the social Loafing based on components of organizational culture

Sig	T	standardized coefficients	Non-standardized coefficients		
		Beta	Std. Error	B	
000/0	09/10-	392/0-	042/0	421/0-	Engaged in work
039/0	07/2-	104/0-	056/0	116/0-	stability and integrity
000/0	39/6-	363/0-	057/0	365/0-	adaptability
000/0	37/5-	265/0-	049/0	263/0-	organizational mission
000/0 Sig =62/101F=592/0R2=77/0r=					

a significant and negative relationship between organizational culture and social loafing of teachers. In literature review, a study was not observed that pay to examine the relationship between organizational culture and social loafing and social adjustment. But close study confirms the findings of this study. In relation, culture with social loafing should be said that Social loafing isn't for specific community, organization and culture, But this phenomenon can be found everywhere, but it can be different from one culture to another. For example, Japan is often thought as a hardworking and workaholic culture. Many of them believe many hours working behind the desk, Show loyalty to the organization. Many employees in Japan are reluctant to early leave work and even until their boss has not leave work, do not leave their workplace and even yearly Some Japanese die due to excessive work (Powell, 1994 quoted ZareiMatin and Kahsary, 2010).

Unlike Japan, nowadays much criticism has been made to social behavior of the Iranian people and particularly laziness. Even some texts like Jamalzadeh (1966), Bazargan (1978), Ghazi Moradi (1999; 2007), Chalabi (2002) about Negative mood of Iranians and at the end is social loafing. (Jvadyyeganh and Fooladian, 2011). Clark & Baker (2011) paid to examine cultural attitudes to social laziness among diverse ethnic groups" this study pay to compare level of responsibilities Chinese students and western students in group activities. Findings showed that there is social loafing in both Western and Chinese culture. They suggest that New Zealand academics, should use Strategies that emphasis on teamwork and cooperation to reduce social loafing. In addition to the above can be said that the rule of belief in destiny and fate in culture of the society and Organization can explain social loafing of Member. JavadiYeganeh and Fooladian (2011) studied effective factors on social loafing of Tehran citizens in terms of sociology. They cited along with factors such as social structure, Separation of state and nation, lawlessness and lack of supervision from fatalism as effective factors on social loafing. It should be noted that there is social loafing in teamwork. And teamwork may widely be accepted in a national culture and other national culture be met with resistance (Sewell, 242: 1999). The relationship between national culture with teamwork have been studied by many researchers (Kirkman et al., 2001; Gibson et al., 2001). Review the findings of related studies, shows that component of collectivism - individualism has the greatest impact on teamwork. The tendency of individualism - collectivism affect on staff attitudes such as loyalty and team commitment (Ramamoorthy& Flood, 2004).

In fact, the tendency individualistic leads to competitive attitudes and collectivist tendency leads to coop-

erative attitude (Ramamoorthy and others, 2004; Eby & Dobinns, 1997). Collectivism in Teams and team work conditions have greater cooperation than individualists (Gundlach et al., 2006). Kirkman et al. (2001) believe that, collectivism compared with Individualism, appreciate cooperation in the group and fear of isolation in groups and are often more pleasing from working in groups than individual work.

Taslimi and et al (2010) in their study with the aim to the impact of Iran National culture on teamwork, pay to refuse foreign done studies (Such as Lambton, 1966, Fuller, 1998, Jackson, 1990, Chardin, 1993, Murieh, 1997) that refuse iranicollectivism and introduce Iranian individualistic and sometimes egocentric individualist and against emphasis on Iranian culture of collectivism and Root and cause of substantially weakness and shortcoming in the field of collective and team behaviorspecially In the public field know fundamental weakness In knowledge and research and related studies, internal traditional systems and disability to understand and localization of new knowledge, Such as new cooperatives, administrative and management system imported from the West, and structural and behavioral aspects.

Finally it must be said that if attitude of employees positive and constructive be culture, reduce from level of social loafing. Taştan & Türker (2014) have done study entitled relationship with organizational culture with job Involvement among staff of Turkish banks, The findings showed there is positive and significant relationship between organizational culture and job involvement, This means that whatever attitude of the staff be more positive to organizational culture,at same amount increases their job involvement. Finally it must be said that if in workplace, Culture emphasize on meritocracy, justice and equality reduce from level of social loafing. Murphy et al (2003) found that whenever staff realize that managers establish fair and friendly relations with them, add the amount of their efforts in the workplace that its result will be reduction in social loafing. Also Liden et al (2004) found that equitable distribution of rewards has negative relationship with social loafing of staff. In total, according to findings of this study suggest that whenever school organizational culture emphasize on engaged in work such that encourage involved and employee participation in different activities of organization and create sense of ownership and responsibility in them, Adaptability by creating system of norms and beliefs that increases ability to receive, interpret and apply environmental signals in behavioral changes within the organization and chances of survival, growth and development of the organization, follow Stability and integration through the creating ideals and common values and clearly explain vision, mission, goals and organization direction to employees can be

expected that Reduce social loafing of teachers. According to the results of this study suggest to the top managers of the Education Organization that held Service training courses of organizational culture, Social loafing and develop social skills for managers and teachers. It also was recommended to school managers that strongly encourage involvement and participation of teachers in the various activities of organization and create sense of ownership and responsibility in them (emphasis on involvement in the work), adapt schools with the expectations and demands of their stakeholders, be risky, and considering the developments internal and external environment of school, have capacity and experience to make the change (emphasis on adaptability), create grounds of compatibility by creating ideals, values and fundamental objectives and group (Emphasis on compatibility) draw organizational vision with the help of teachers, express as clear and transparent mission and main role of the school in the city, province, Region, country and even the world (Emphasis on organizational mission), By using Quranic verses and hadiths as well as concrete experiences of organizations and succeed countries emphasize on engaged in work and teamwork and the negative consequences of social loafing (the negation of social loafing). Due to the fact that few studies had been performed in relation to this research topic, is recommended to other researchers doing such studies in other organizations. The most important limitation is being qualitative study that can not exactly identify different dimensions of this issue. Another limitation of this research was limiting the Research samples to second middle school teachers in Zahedan. So will have restrictions in generalizability of the results.

## REFERENCES

- Adli M, Haidari H, Zarei E, & Sadeghifard M. (2013). Relationship between emotional and social adjustment with marital satisfaction, *Journal of Life Science and Biomedicine*, 3(2): 118-22.
- Clark J, Baker T. (2011). It's Not Fair! Cultural Attitudes to Social Loafing in Ethnically Diverse Groups, *Intercultural Communication Studies*, 20(1):124-40.
- Damghanian, Hussein, Mousavi Davoudi, Seyyed Mehdi, Fartash, Kiyarash. (2015). investigate the relationship between organizational justice and social loafing, *Organizational Culture Management*, 13 (35): 115-132.
- Eby LT, Dobinns GH. (1997). Collectivism Orientation in Teams: An Individual and Group-Level Analysis, *Journal of Organizational Behavior*, 18(3):275-95.
- George NI, Ukpong DE. (2012). Adolescents' sex differential social adjustment problems and academic performance of junior secondary school students in Uyo Metropolitan City, *International Journal of Business and Social Science*, 3(19):245-51.
- Gibson CB, Zellmer-Bruhn ME. (2001). Metaphors and Meaning: An Intercultural Analysis of the Concept of Teamwork, *Administrative Science Quarterly*, 46(2):274-303.
- Gundlach M, Zivnuska S, & Jason S. (2006). Understanding the relationship between Individualism-Collectivism and Team Performance through an Integration of Social Identity Theory and the Social Relations Model, *Human Relations*, 59 (12):1603-32.
- Hardin G. (1968). The tragedy of the commons, *Science*, 162 (3859):1243-48.
- Hodkinson P, Biesta G, & James D. (2008). Understanding Learning Culturally: Overcoming the Dualism Between Social and Individual Views of Learning, *Vocations and Learning*, 1(1):27-47.
- Hofstede G, Hofstede GJ, & Minkov M. (2010). *Culture and Organization: Software of the Mind*. (3ed), New York: McGraw-Hill.
- Hoy WK, Miskel CG. (2012). *Educational Administration: Theory, Research, and Practice*, (9nd ed.), New York: McGraw-Hill.
- Javadi Yeganeh, Mohammad Reza., Fooladian Majid. (2011). social loafing and factors affecting on it, *Iranian Sociology*, 12 (4): 109-137.
- Kirkman BL, Gibson CB, & Shapiro DL. (2001). Exporting Teams: Enhancing the Implementation and Effectiveness of Work Teams in Global Affiliates, *Organizational Dynamics*, 30(1):12-29.
- Liden RC, Wayne SJ, Jaworski RA, Bennett N. (2004). Social loafing: A field investigation, *Journal of Management*, 30(2):285-304.
- Meydan CH, Kahraman CA, Basar U. (2014). Social Loafing and Impression Management in an Organizational Context, *International Review of Management and Marketing*, 4(3):201-206.
- Murphy SM, Wayne SJ, Liden RC, & Erdogan B. (2003). Understanding social loafing: The role of justice perceptions & exchange relationships, *Human Relations*, 56(1): 61-84.
- Monavaryan Abbas Mehdi Ahmadi Tonkaboni. (2012). investigate the effect of organizational culture on organizational entrepreneurship orientation in Karafarin Bank, the process of Development and Management, 25 (2): 53-76.
- Mousavi Davoudi, Seyyed Mehdi, Fartash, Kiyarash. (2012). The relationship between knowledge sharing, trust and social laziness, the first regional conference on research and innovative solutions in accounting and management, Tonekabon Branch, nonprofit institution of higher education Shafaq, twenty-third of December.
- Pakdel, Said, Ebrahimi, Mohsen, Arasto, Iman. (2014). Understanding organizational culture based on the Denison Model, *Organizational Culture Management*, 12 (4): 741-761.
- Ramamoorthy N, Flood PC. (2004). Individualism/Collectivism, Perceived Task Interdependence and Teamwork Attitudes among Irish Blue-Collar Employees: A Test of the main and Moderating Effects, *Human Relations* 57 (3):347-66.
- Shim M. (2010). Factors influencing child welfare employees turnover: focusing on organisational culture and climate, *Children and Youth Services Review*, 32(2010), 847-856.

Taştan SB, Türker MV. (2014). A Study of the Relationship between Organizational Culture and Job Involvement: The Moderating Role of Psychological Conditions of Meaningfulness and Safety, *Procedia - Social and Behavioral Sciences*, 149 ( 2014 ):943 - 47.

Taslimi Mohammed Said, Abedi, Jafar .Hassan, Farhangi, Ali Akbar; RaznahanFiruz. (2010). Model impact of national culture on teamwork in Iran, *strategy culture*, 3 (10-11): 127-162.

Taklo, Farideh, Ahmadi, Kiomars and Zya'pvrArash. (2015). examine the relationship between the components of the

five-factor model of personality and social Loafing In staff of Kermanshah University of Medical Sciences in 2014, *Clinical Research in Paramedical Sciences*, 4 (1): 43-51.

Ugurlu CT. (2009). The significance of school culture in elementary schools in terms of organizational development. *Procedia - Social and Behavioral Sciences*, 1(1):1003-1007.

Zarei, Matin, Hasan, Jamshidi, Kahsary, Hamze. (2010). Investigation feature of addiction among nurses working in Iran (gender differences between men and women) Case Study: Nurses working in hospitals in Mazandaran province, *Organizational Culture Management*, 8 (21): 133-157.

## The effects of *Spirulina* supplementation on lipid peroxidation and GPO glutathione peroxidase antioxidant capacity after resistance exercise in disabled men

Ameneh Zandi, Hassan Matin Homaiee and Maghsood Piri

*Department of Physical Education and Sport Sciences of Tehran Islamic Azad University, Tehran, Iran*

### ABSTRACT

It is reported that *Spirulina* supplementation may reduce oxidative stress induced by exercise, but according to the type of activity- dose and type of supplements results are inconsistent in this area. This study aimed to investigate the effects of spirulina supplementation on lipid peroxidation and GPO plasma antioxidant capacity after a session of resistance exercise. In a randomized experimental design with randomized, double-blind, thirty untrained young men were divided into 2 placebo and spirulina supplement. Spirulina group took daily three (500 mg) spirulina tablets for a week and the placebo group also took the same amount of pseudo. The subjects participated in a high-intensity resistance exercise, and 5 ml of blood from a vein in the elbow immediately prior week and 24 hours after resistance exercise to determine the concentration of serum Mallon dialdehyde and GPO antioxidant capacity were collected. Mallon aldehyde serum concentration in 24 hours after the exercise in the placebo group compared with spirulina supplement was significantly higher ( $p= 0.005$ ) In addition, the average of GPO antioxidant capacity did not show significant differences in any of the previous time and 24 hours after the second group exercise.  $P < 0.05$ . The results of this study showed that use of *Spirulina* supplementation prevents increased levels of Mallon di aldehyde M.D.A following a one session of power exercise can operate as an appropriate way to avoid damage caused by oxidative stress in disabled men.

**KEY WORDS:** MALLON DI ALDEHYDE MDA - GPO ANTIOXIDANT CAPACITY - RESISTANCE EXERCISE

### ARTICLE INFORMATION:

*\*Corresponding Author:*

Received 30<sup>th</sup> April, 2017

Accepted after revision 10<sup>th</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

Recently, scientists focus on non-work factors which have a regulator focused on physical work capacity such as free radicals and antioxidants which are produced during physical activity (*Characterization of Spirulina biomass for CELSS diet potential*, 1988). There are many benefits of regular exercise for individual health (Cornet 1990). However, some reports suggest that intense exercise can cause the production of nitrogen-oxygen species which caused damage through oxidative stress and decreased athletic performance (Vonshak 1997). Oxidative stress is a condition in which the concrete production balance of nitrogen, oxygen species and antioxidant defense has been eliminated and it is believed that it has an important role in the development of diseases such as arthritis and askolse. (Eun et al, 2008). Research has shown that some physical activity with the release of excessive free radicals and depletion of endogenous antioxidant cause oxidative damage to biological macromolecules, including proteins, membrane lipids (MDA), nucleic acids and another undesirable changes (Cifferi 1983) so Vangs et al. reported elevation markers of plasma oxidative stress in non-athlete men after resistance exercise (Wang et al, 2005 ) also Lloyd et al observed a session of exercise increased the concentration of Mallon di aldehyde (MDA), as a lipid peroxidation and reduced the activity of anti- Oxidation enzyme of glutathione syntheses (GS) in mice, (Mao et al, 2005) In addition, it seems that exercise with high intensity cause resonance response markers of oxidative stress in the blood such as creatine kinase (CK) enzyme reagent for pain, and between 24 to 48 hours after the test peaked, resulting in (DOMS), and then gradually decreases (Misbahuddin et al, 2006) under these terms the use of nutritional interventions and antioxidant supplements can be a suitable solution for protection against oxidative stress induced by intensive exercise.

An important factor of effective supplement is its safety - legality-. Spirulina supplement is a member of micro Alg family. It is one of the few that has all of the above benefits, that is being produced in our country in Qeshm Island which has some certificates including America Health Authority - Institute of Food and Agricultural Products in the World Health Organization. Research showed that Spirulina is rich in blue polypeptide called Fikosyatin which is affecting the bone marrow stem cells to produce white blood cells for immune system and red blood cells, which produces oxygen (Diaz 1928).

Chinese scientists proved that (Sammon et al, 1999) Fikosyatin stimulates the blood production in which its effects is equivalent to the erythropoietin hormone (EPO) results in tuning performance of bone marrow

stem cells (Simpore et al, 2008 ). Workers have studied the beneficial effects of spirulina on the immune system of birds and rodents in which the beneficial effects of these supplements can improve the humeral immunity (Kulshreshtha 2008)

Given that most research is based on the effects of Spirulina on animal models and few practices is done on the human samples so its consequences for the human immune system and athletic performance is contradictory and very small. With respect to current consumption of this materials in Cuban and Chinese athletes (Johnstone 2002) it is believed that this supplement boosts the immune system, improve athletic performance and fast recovery of athlete's body. All of the above are good reasons for a closer study. (Lowe 2000).The aim of the present study is investigate the effect of spirulina on lipid peroxidation (MDA) and GPO antioxidant capacity in sedentary men after extreme intensive resistance exercise.

## MATERIAL AND METHODS

In an experimental trial with double blind study, 30 non-athlete young male voluntarily participated as subjects in this study. None of the volunteers over the last 6 months has been under medical treatment, also they did not use vitamins and minerals supplement. Furthermore they have no history of chronic health problems and common diseases such as respiratory, metabolic, cardiovascular, renal and liver diseases. After full description, objectives, research methods and complete consent and health questionnaire, of all participants will be asked for two days to avoid engage in extreme sports activities and heavy lifting. The subjects were randomly divided into 2 groups; spirulina supplements (n = 15) and placebo (n = 15).

The subject of *Spirulina* supplement received 3 Spirulina tablets (500) mg daily 3 times a day, for 7 days (Vousden et al, 2002).In the control group placebo administered in the same way, it must be noted that Spirulina tablets were provided from the company importer of pharmaceutical products Amyn- Manufacturing Co. Qeshm, Iran with health permits 158-1232809 from the Division Ministry of Health food. All subjects of both groups were asked during the study, to maintain their usual diet, and depending on the group in which they exist to do not change their physical activity or participate in other sporting activities.In addition, using 24-hour dietary questionnaires during the study subjects was monitored in the case of quantity and nutritional quality to eliminate the nutritional disturbance effects on the case study variables.

In order to know the movements and devices used, a week before the start of supplementation protocol, all

subjects, were called to fitness and bodybuilding hall, for to be familiar to the proper way to move weights and good technique to breath-taking and to calculate the repetition of the interest history (to determine one maximum repetition (1-RM) Brzycki formula used) then a week of supplementation, subjects in both groups participated in a session eccentric resistance exercise with the intensity of 1-RM 120%, including implementation 4 sets of 6 reps each leg press movements - opening leg and bend the legs. It must be noted that exercise program used in this study has already been used in other studies (Watanabe et al, 1998).

All the movements monitored by researcher and colleagues of physical education was conducted in Universities fitness and beauty salons. In order to determine the body density and body fat percent skin thickness and three point gauge of America's Sports Medicine School was used (thick folds of skin on the back of the arm, abdomen and above right pelvis).

Blood samples and biochemical assays. The first blood samples were collected in the early morning hours of fasting one day before the start of supplementation with Spirulina from a vein in the right arm or left elbow of each group. Followed, subjects were taking supplements for a week, again the second blood samples immediately after the test and the third blood sample 24 hours after eccentric resistance exercise program were collected from all subjects.

In order to measure the serum Mallon dialdehyde, as the main indicator of lipid peroxidation acid Tio Barbito test a spectrophotometry method was used. In addition, GPO glutathione peroxidase using a special kit was analyzed in laboratory. In order to analyze the data to check the normal distribution of test data Kolomograve-Asmyran of test was used. The statistical method of analysis of variance with repeated measures was used, after understanding the difference between the procedure, and r groups, post Bonefzony test was used. Statistical analysis using SPSS software sixteenth edition was done at the significant level of 0.05.

## RESULTS AND DISCUSSION

General trail of subjects are presented separately in the table which shows no significant difference between the two groups in the case of body mass index (BM1), body fat percentage, age, height, weight ( $P>0.05$ ) and groups were equal to each other.

Serum Mallon dialdehyde concentration in both groups 24 hours after a resistance exercise increased.

However, the pattern was different between the two groups

So that the concentration of Mallon dialdehyde in the embankments placebo significantly increased. (p

Table 1. Mean and standard deviation demographic of subjects on breakdown Group

P	Spirulina =15	Placebo = 15	variable
0.09	20.34	21.55=2.34	Age (years)
0.125	181.32=10.5	179.66=0.1	Weight (kg)
0.368	1.67 $\pm$ 23.5	179.66=0.1	Height (cm)
0.219	23.5=1.67	22.44=2.3	BMI(kgm) <sup>2</sup>
0.148	18.34 = 1.75	17.19=1.81	Body fat percentage

<0.01) But in the group receiving spirulina supplements the observed changes were not significant

In addition, check the results using repeated measures analysis of internal factors variance showed that impact of different periods of time to supplement before exercise and 24 hours after exercise on amounts of MDA is significant. ( $P< 0.001$ ) Considering the significant difference of post hoc Bonfozomy test at different times showed. There is a Significant differences between steps, the pre-supplementation -24 hours after exercise and  $P<0.01$  and two or three  $P<0.001$  were observed in the placebo group. So a resistance exercise session on serum MDA levels has a significant effect in non-athletic men taking placebo.

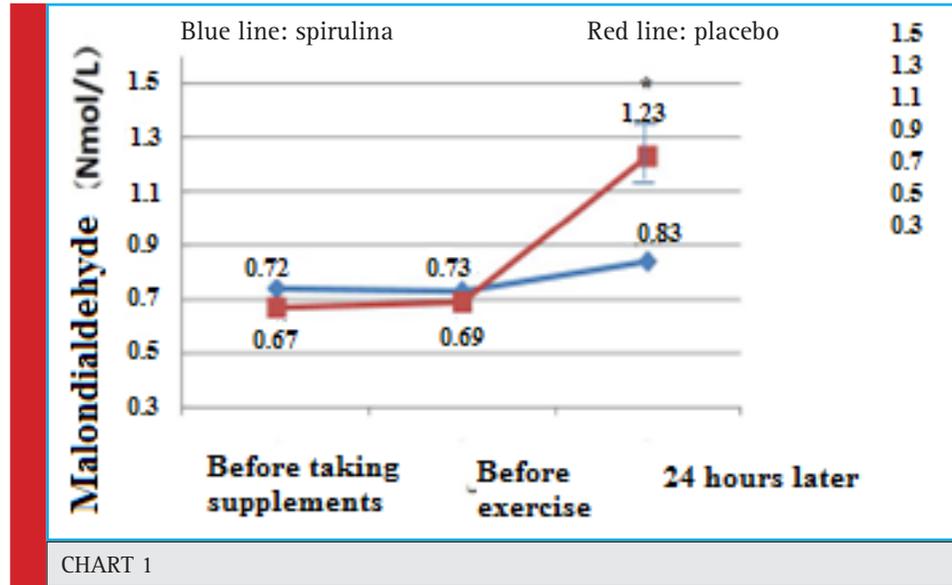
Mallondialdehyde concentration in both groups after resistance exercise shows significant difference with spirulina

In addition, results showed that the concentration of plasma antioxidant GPO capacity that there is no significant difference in mean change before and 24 hours after a resistance exercise.  $P> 0.05$  In other words, spirulina supplementation and resistance exercise had no significant effect on serum range.

Despite the beneficial effects of regular exercise on health, direct and indirect evidence shows that the body vigorous exercise increases the production of free radicals and oxidative stress in the muscles and the other parts of the body (Chen et al, 2009) providing appropriate solutions to prevent the production of stress oxidative during strenuous physical activity could have important implications.

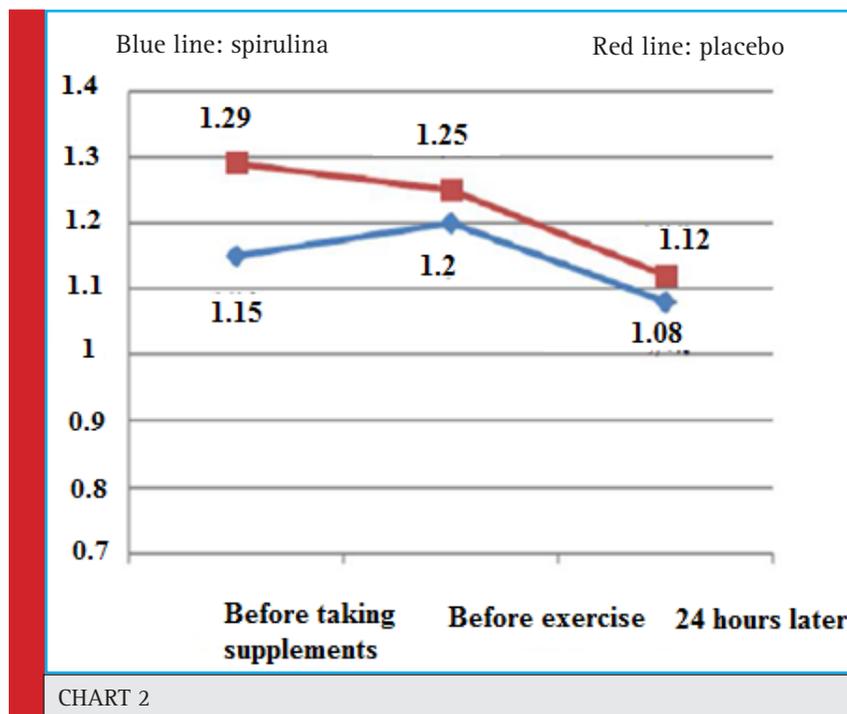
The results of this study indicate that a session eccentric resistance severe significantly increased MDA plasma as peroxidation concentrations in the placebo group. There is no significant difference in mean changes of GPO plasma antioxidant capacity in two groups before and 24 hours after one session of resistance exercise. Inconsistency is shown in the findings of Mac Nalty et al. (2005) studies, in which they reported that resistance exercise has a significant impact on indices of oxidative stress in untrained men (Dasgupta et al, 2001)

Perhaps one of the reasons for the contradictory between their findings and the present study is, lower



intensity exercise. Their study is 1-RM 60% -40 compared to the present study 1-RM 120%. Also Zhyлга and colleagues in 2005 found no change of malondialdehyde concentration in the blood of non-athletic men (Mathew et al, 1995). They are looking for twenty introvert - extrovert contraction of knee bent of smokers, while in this study 24 contract Eccentric Strenuous, 6 repeated cycles of 4 times = 24 to show differences in age, type of exercise protocol and contrast of subjects between personal levels of agility - genetics.

In line with the results of Diskoky et al (2003) demonstrated that the intense resistance exercise significantly increased concentrations of plasma's malondialdehyde as oxidative stress in young activate men (Subhashini et al, 2004). Along the study, Lee Voss et al. 1996 investigated the effects of 2 types of different protocol of resistance exercise on markers of oxidative stress in sedentary healthy men. They have found that exercise with high intensity against lower intensities is the main reason of free radicals production and it significant increase lipid



intensity exercise. Their study is 1-RM 60% -40 compared to the present study 1-RM 120%. Also Zhyлга and colleagues in 2005 found no change of malondialdehyde concentration in the blood of non-athletic men (Mathew et al, 1995). They are looking for twenty introvert - extrovert contraction of knee bent of smokers, while in this study 24 contract Eccentric Strenuous, 6 repeated cycles of 4 times = 24 to show differences in age, type of exercise protocol and contrast of subjects between personal levels of agility - genetics.

In line with the results of Diskoky et al (2003) demonstrated that the intense resistance exercise significantly increased concentrations of plasma's malondialdehyde as oxidative stress in young active men (Subhashini et al, 2004). Along the study, Lee Voss et al. 1996 investigated the effects of 2 types of different protocol of resistance exercise on markers of oxidative stress in sedentary healthy men. They have found that exercise with high intensity against lower intensities is the main reason of free radicals production and it significant increase lipid peroxidation (Akao et al, 2009). At the same line, Steak and colleagues (2009) found results similar to this study (Mishima et al, 1998).

In line with the present results Steven et al. 2001, Narayvmas et al. 2005, Jyrahmkaran 1987 in order to defend against free radicals in the body during intense sporting activities Spirulina supplementation not only play important role in maintaining cell membrane immune, integrity and function of proteins, nucleic acids and fats Profile but also it control transfer of messages and gene expression in immune cells. (Grawish et al, 2009; Chen et al, 2008; Mittal et al, 1999). Rossi and colleagues at the lab found that spirulina extract have consistent ability to clear the hydroxyl radical (the strongest oxygen radical) (Hamidah et al, 2009). Emily et al reported that metanolic (spirulina extract) significantly increases plasma antioxidant activity. (Schwartz et al, 1988)

## CONCLUSION

Based on the results of this analysis it is suggested that probably supplementation with Spirulina can be a useful way to prevent the damage caused by oxidative stress and inhibition of lipid peroxidation in young non-athletes individuals to Prevent cell damage and free radical production.

## REFERENCES

Akao Y, Ebihara T, Masuda H, et al. Enhancement of antitumor natural killer cell activation by orally administered *Spirulina* extract in mice. *Cancer Sci*. 2009; 100 (8):1494-501. Epub 2009 May 6.

Cifferi O. *Spirulina* as a microorganism. *Microbiol Rev*. 1983; 47(4): 551-578.

Chen T, Wong YS. In vitro antioxidant and antiproliferative activities of selenium-containing phycocyanin from selenium-enriched *Spirulina platensis*. *J Agric Food Chem*. 2008 25; 56(12):4352-4358. Epub 2008 Jun 4.

Chen T, Wong YS, Zheng W. Induction of G1 cell cycle arrest and mitochondria-mediated apoptosis in MCF-7 human breast carcinoma cells by selenium-enriched *Spirulina* extract. *Biomed Pharmacother*. 2009; 27. Epub ahead of print 2009.

Characterization of Spirulina biomass for CELSS diet potential. Normal, AL.: Alabama A&M University, 1988.

Cornet JF, Dubertret G. The cyanobacterium *Spirulina* in the photosynthetic compartment of the MELISSA artificial ecosystem. Workshop on artificial ecological systems. 1990 October 24-26; Marseille, France: DARA-CNES.

Dasgupta T, Banejee S, Yadav PK, Rao AR. Chemomodulation of carcinogen metabolising enzymes, antioxidant profiles and skin and forestomach papillomagenesis by *Spirulina platensis*. *Mol Cell Biochem*. 2001; 226(1-2):27-38.

Diaz DCB. *The Discovery and Conquest of Mexico*. London: Routledge; 1928:1517-1521

Eun HL, Ji-Eun P, Young-Ju C, Kap-Bum H, Wha-Young K. A randomized study to establish the effects of spirulina in type 2 diabetes mellitus patients. *Nut Res Practice*. 2008; 2(4):295-300.

Grawish ME, Zaher AR, Gaafar AI, Nasif WA. Long-term effect of Spirulina platensis extract on DMBA-induced hamster buccal pouch carcinogenesis (immunohistochemical study). *Med Oncol*. 2009. Epub 2009.

Hamidah A, Rustam ZA, Tamil AM, Zarina LA, Zulkifli ZS, Jamal R. Prevalence and parental perceptions of complementary and alternative medicine use by children with cancer in a multi-ethnic Southeast Asian population. *Pediatr Blood Cancer*. 2009; 52(1):70-74.

Johnstone RW, Ruefli AA, Lowe SW. Apoptosis: a link between cancer genetics and chemotherapy. *Cell*. 2002; 108(2):153-164.

Kulshreshtha A, Zacharia J, Jarouliya U, Bhadauriya P, Prasad GBKS, Bisen PS. *Spirulina* in Health Care Management. *Current Pharm Biotechnol*. 2008; 9(5):400-405.

Lowe SW, Lin AW. Apoptosis in cancer. *Carcinogenesis*. 2000; 21(3): 485-495.

Mao TK, Van de Water J, Gershwin ME. Effects of a Spirulina-Based Dietary Supplement on Cytokine Production from Allergic Rhinitis Patients. *J Med Food*. 2005; 8(1):27-30.

Mathew B, Sankaranarayanan R, Nair PP, et al. Evaluation of chemoprevention of oral cancer with *Spirulina fusiformis*. *Nutr Cancer*. 1995; 24(2): 197-202.

Mishima T, Murata J, Toyoshima M, et al. Inhibition of tumor invasion and metastasis by calcium spirulan (Ca-SP), a novel sulfated polysaccharide derived from a blue-green alga, *Spirulina platensis*. *Clin Exp Metastasis*. 1998; 16(6):541-550.

- Mittal A, Kumar PV, Banerjee S, Rao AR, Kumar A. Modulatory potential of *Spirulina fusiformis* on carcinogen metabolizing enzymes in Swiss albino mice. *Phytother Res.* 1999;13(2):111–114.
- Misbahuddin M, Islam AZ, Khandker S, Ifthaker-Al-Mahmud, Islam N, Anjumanara. Efficacy of spirulina extract plus zinc in patients of chronic arsenic poisoning: a randomized placebo-controlled study. (Risk factors). *J Toxicol: Clinic Toxicol.* 2006; 44(2): 135–137.
- Sammon AM. Dietary Linoleic acid, immune inhibition and disease. *Postgrad Med J.* 1999;75(881):129–132.
- Simpore J, Zongo F, Kabore F, et al. Nutrition rehabilitation of undernourished children utilizing Spirulina and Misola. *Nut J.* 2008;(2): 20–25.
- Schwartz J, Shklar G, Reid S, Trickler D. Prevention of experimental oral cancer by extracts of Spirulina-Dunaliella algae. *Nutr Cancer.* 1988;11(2):127–134.
- Subhashini J, Mahipal SV, Reddy MC, Mallikarjuna Reddy M, Rachamalla A, Reddanna P. Molecular mechanisms in C-Phycocyanin induced apoptosis in human chronic myeloid leukemia cell line-K562. *Biochem Pharmacol.* 2004;68(3):453–462.
- Vonshak A. *Spirulina platensis* (Arthrospira). *Physiol Cell-Biol Biotechnol.* London: Taylor & Francis; 1997.
- Vousden K, Lu X. Live or let die: the cell's response to p53. *Nature Rev Cancer.* 2002;2(8):594–604.
- Wang Y, Chen-Fu C, Chou J, et al. Dietary supplementation with blueberries, spinach, or spirulina reduces ischemic brain damage. *Experiment Neurol.* 2005;193(1):75–84.
- Watanabe H, Pan ZQ, Schreiber-Agus N, DePinho RA, Hurwitz J, Xiong Y. Suppression of cell transformation by the cyclin-dependent kinase inhibitor p57KIP2 requires binding to proliferating cell nuclear antigen. *Proc Natl Acad Sci U S A.* 1998;95(4):1392–1397.

## Framework for developing human resource strategies for educational organizations with educational management approach

Zohreh Hassani

*Department of Education, Tehran, Iran*

### ABSTRACT

One of the strategic objectives in the organizations is to enhance employees' performance, develop culture of useful work and improve the quality of services that unit of human resources of organization can provide many services and in line with the strategic management plays an important role in increasing productivity applications and continuous improvement and improve the quality of employment conditions. In this study, it is tied to provide the human resource strategies using SWOT matrix for the education organization. In this regard, the conditions of this organization are evaluated in human resources dimension in the internal dimension of organization as well as the environmental conditions of organization. Within the organization, organization's strengths and weaknesses in the human resources dimension are analyzed. On the other hand and in external dimension of the organization, threats and opportunities facing the organization are analyzed. In this way and in a systematic way, strategies and tactics are offered for the organization mentioned to be able to underlie its growth and development.

**KEY WORDS:** STRATEGY, HUMAN RESOURCES, MATRIX SWOT, STRENGTHS AND WEAKNESSES, OPPORTUNITIES AND THREATS

### INTRODUCTION

The role and importance of organizations in furtherance of the purposes of governments to the development of communities is no secret. Each organization is responsible for a part of the service to the community and the country's growth and development. Every organization

has a mission and moves in line with the goals and vision that has been developed for it. Organizations have been created for this to move energy and distinct resources and separate of each other in a way that is goals and objectives of the organization and by this increase the energy and capabilities of different people and lead to advance the goals of the organization. Almost all

#### ARTICLE INFORMATION:

*\*Corresponding Author:*

*Received 30<sup>th</sup> April, 2017*

*Accepted after revision 5<sup>th</sup> Aug, 2017*

*BBRC Print ISSN: 0974-6455*

*Online ISSN: 2321-4007*



*Thomson Reuters ISI ESC and Crossref Indexed Journal*

*NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006*

*© A Society of Science and Nature Publication, 2017. All rights reserved.*

*Online Contents Available at: <http://www.bbrc.in/>*

relevant authorities are aware that trained and capable human resources are the key to progress and excellence of organization. Machinery, equipment and money by itself cannot have much value, but also creative and thoughtful human resources can use these resources and flourish the organization. The importance of planning for human resources in organizations is very necessary and important. In the past centuries, according to the relative stability that existed in conditions of environment, organizations according to a fixed and unchanged schedule advanced. But in today's competitive environment, almost all organizations affected by challenges such as new needs and demands of customers, improve the quality of existing products and services, events and job volatility, wide changes of economic, cultural, social and technological.

One of the strategic objectives in the organizations is to enhance employees' performance, develop culture of useful work and improve the quality of services that unit of human resources of organization can provide many services and in line with the strategic management plays an important role in increasing productivity applications and continuous improvement and improve the quality of employment conditions. Many approaches and methods are used in strategic management that in the meantime, SWOT analysis is the most common of the methods. SWOT analysis is an important support tool for decision making and commonly is used as an important tool for the systematic analysis of indoor and outdoor environment of the organization. SWOT analysis summarizes the most important internal and external factors of organization and the factors are known as affecting strategic factors on the future of organization. In fact, based on external and internal conditions of organization, medium term and long-term goals are defined and then by developing operational objectives, these strategies are executed.

## STATEMENT OF PROBLEM

As previously mentioned organizations play an important and effective role in the development of their communities. Officials and components making organization are human that plan for the organization and manage it. Organizations without human resources not only lose their meaning, but also will not be able to manage affairs. While the world moves toward technology and machine tools as well as the role of human resources as a vital and strategic role is evident. Accordingly, the human resources are the most valuable resource of the organization, because they form organizational decisions and solve problems and crises of organization and create efficiency. In modern management, human resource is central to success in today's competitive environment. Human has ever considered different axes to achieve a

sustainable development to achieve his goals, but what is certain without considering human resources, no system move towards the desired result and the result of such a system is not nothing but destruction and discontinuity. (Moghimi and Ramazan, 2011).

Human resource strategies are optimal solutions that help organizations to form skills, attitudes and behaviors of individuals and thereby achieve organizational goals (Gharijli, 2007). Human resource strategy is a pattern of decisions that investigates the policies and practices of human resource. The purpose of development and implementation of human resources strategies is to relate policies and procedures of human resources with strategic purposes of human resources, so that the organization be able to create internal cohesion between the subsystems of human resources and in addition, the human resource strategy with organizational strategy create external integration and cohesion (Rahmani et al., 2012)

In this study, it is tied to provide the human resource strategies using SWOT matrix for the education organization. In this regard, the conditions of this organization are evaluated in human resources dimension in the internal dimension of organization as well as the environmental conditions of organization. Within the organization, organization's strengths and weaknesses in the human resources dimension are analyzed. On the other hand and in external dimension of the organization, threats and opportunities facing the organization are analyzed. In this way and in a systematic way, strategies and tactics are offered for the organization mentioned to be able to underlie its growth and development.

## REVIEW OF LITERATURE

With regard to research in the field of developing human resources strategy, it should be said that nearly all studies accepted in this context has used one of the two strategic reference points or SWOT. For example, Abtahi and Mousavi (2009) conducted a study entitled "Developing human resources strategies with case study on one of the country's cultural organizations". In this study, for developing human resource strategy, analysis methods of SWOT, PEST is used.

Rahur (2015) in a paper investigated strategies for improving strategic planning for municipalities in the Czech Republic. The overall goal of this article was to improve strategic planning in the municipalities of southern area of Bohem province in the Czech Republic by presenting strategies. In this paper, he provided solutions in order to improve strategic planning in the municipalities of Bohem area by providing strategies such as considering new measures as well as powerful tools.

Bryson (2015) in his study investigated strategic planning in nonprofit public organizations. In this study, he provides guidance for strategic planning in public and non-profit organizations by investigating different approaches for strategic planning in organizations because planning for such organizations is different with planning for organizations that operate to make profit. Feby (2016) raised the issue of developing smart strategies and implemented it in a sample. In this approach, the strategies can adapt themselves over time and due to changes conducted in organization's environment and thus increase the effectiveness of the proposed strategies.

Hamidi Asl and Sadighzadeh (2014) in an article developed human resources strategy in Abadan Petrochemical company. In the article, HR strategy formulation process in Abadan Petrochemical Company was explained and the basis of model used in this study is integrated model (Bamberger and Mashulam). This study is performed using the model of survey research and the statistical population consisted of managers and experts and data of research through questionnaire, interview with managers and experts have been extracted. After analyzing the data obtained, strategic points of jobs were specified and suitable strategic model for every job were identified. According to the results, the right strategy for managerial jobs, research (Specialized) and original is committed strategy and to service jobs is secondary strategy.

Esmailpour and Ezatollahi (2015) in an article developed strategies for Fulad Mobarakeh Company of Esfahan based on SWOT analysis model. In this study, by putting together the information from annual reports of company and the results of discussions with experts in the steel industry and combine them that has formed the basis of this analysis, a descriptive research is largely provided. According to the analytical model, first, the company's external opportunities and threats of the firm's strengths and weaknesses were identified and in the next step by using SWOT matrix, internal and external Quantitative Strategic Planning Matrix, recognized among the best strategies, strategy of implementing projects of developing steel in the steel southern coast of the country with an average of 95 points was specified strategy.

Zahedi and Rafiei (2011) conducted a study in 2011 and entitled "Investigating the relationship between human resource strategy and strategy of ethical decision-making with organizational performance: a study in research organizations of Ministry of Agriculture". In this research, relation of strategies of human resources and strategies of ethical decision-making with organizational performance has been studied. The results showed that in 95% of confidence level, coordination between

human resources strategy and ethical decision-making strategy caused to improve performance.

## REASONS FOR ENJOYING SWOT IN THIS STUDY

Knowledge of human resource strategy, both in theoretical and applied field is a new knowledge that along with design of strategic human resource management, initial emergence of theories and models related to its formulation returns to less than two decades ago. Earlier research of human resources management had more comprehensive-oriented approach and all tasks of human resources, including selection, training, compensation, etc. were studied together. However, after a while under the influence of strategic management, each of these tasks found strategic position and each individually as strategy was discussed (Hendry and Pettigrew, 1990) and the strategic management of human resources is considered very important issue in research of the field of human resources.

As previously mentioned, a lot of approaches and methods are used in the process of strategic management that among them, SWOT analysis that is known as swot is the most popular and effective technique tool that all classes can develop acceptable strategies in organizational various positions including human resources by the help of it. SWOT analysis is a key support tool for decision-making that is usually used as a tool to systematic analysis of internal and external environments so that summarizes the most important internal and external factors that are known as strategic factors affecting the future of organization (Kangas et al., 2003). Through the analysis of internal and external environments can be realized possible dependencies among the factors. An organization can use its chances in the best way that has capabilities that using them enable to achieve excellence; otherwise opportunities to be lost or be acquired by competitors (Ulgen and Mirza, 2004).

SWOT is abbreviation of four terms of strengths, weaknesses, opportunities and threats that in this analysis, strengths and weaknesses are internal factors of organization and opportunities and threats are external factors of organization. Strengths and weaknesses are among the controllable activities of the organization that organization does them in excellent or very poor methods. They are created in the shadow of management practices within the organization, including human resource management, financial management, R & D and production and operation management. One of the main activities of strategic management is to identify the strengths and weaknesses of the departments and units of organization and assess them (David, 2010). Because the internal environment exerts considerable pressure on human resource functions these factors have been formed of concepts that

within the internal borders of the organization formed, and represents the interaction between human resource management and other departments and offices in an organization (Saebi, 2002).

In an overview, the organization for the development of their human resources strategy must look to the opportunities and threats in the external environment of organization and that an introspective look at in order to identify strengths and weaknesses. The only tool that can make it possible is the SWOT matrix. In this study, this important and effective tool can be used.

### VARIABLES INVESTIGATED AND POPULATION

Variables investigated in this study are strengths and weaknesses and opportunities and threats facing the education organization. Identify variables based on the weight of each of these variables are evaluated. The population studied in the present study is Education Organization of Tehran province.

In this study, it is necessary to be received information of certain people that have required familiarity with issue. For this reason, non-possible and targeted sampling method was used.

Also in the method, SWOT analysis and statistical methods are used to analyze the data. It should be noted that during this study, to perform the techniques considered, Excel and SPSS software are used.

Figure 1 shows the stages of investigation.

### APPROACH OF THE MOST CONSISTENCY IN STRATEGIC HUMAN RESOURCE MANAGEMENT

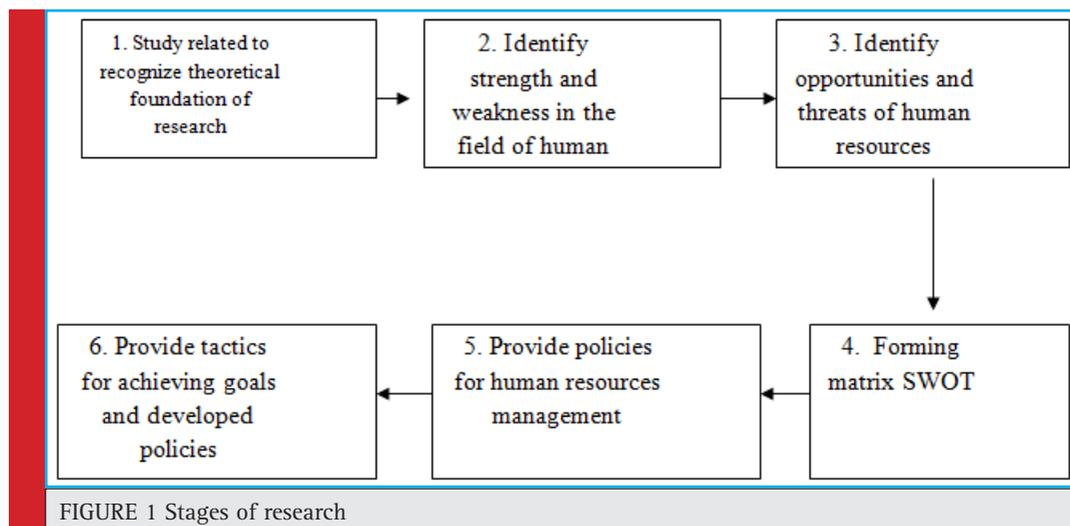
One of the main approaches in strategic human resource management is approach of the most consistency in stra-

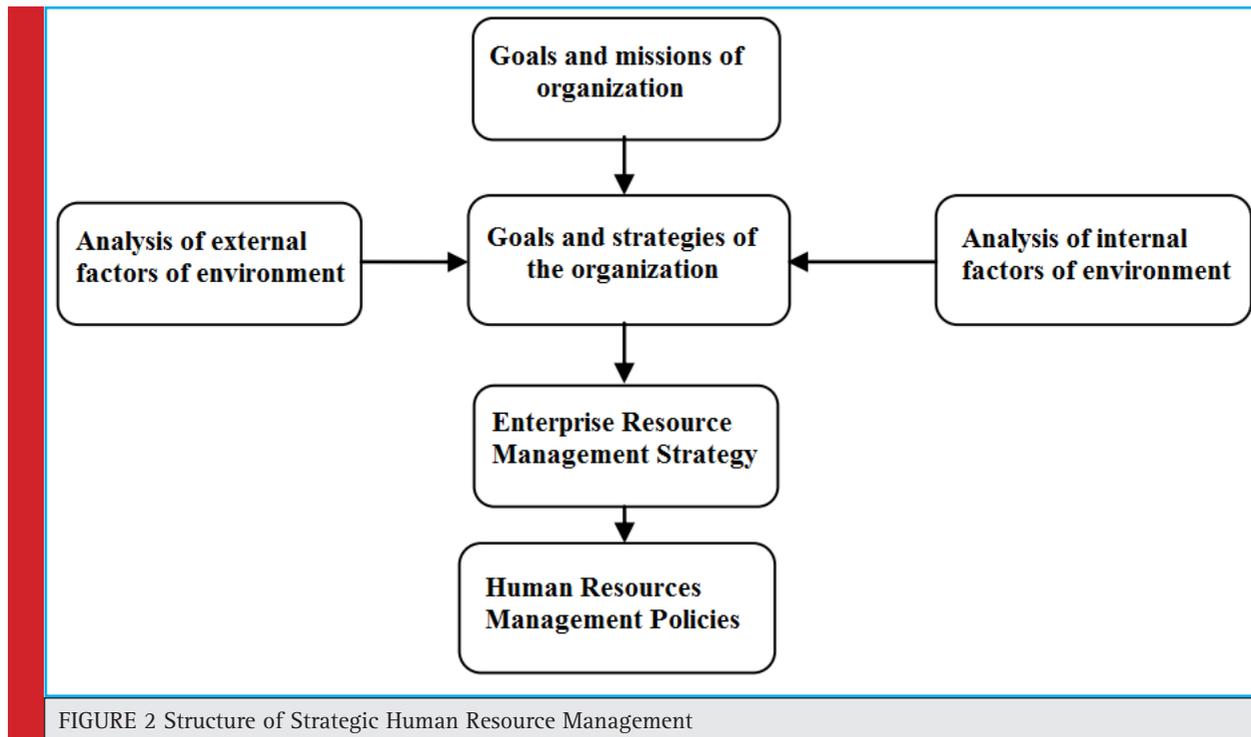
tegic management of human resources. This approach emphasizes on the importance of human resource strategies with condition of organization such as culture, operational processes and the external environment. The reason of popularity of this method is that it considers the specific needs and requirements of organizations and individuals. The origin of analysis of needs of organization is based on concern for the environment and it becomes clear what should be done and planning for human resources to be done in a manner that known needs of organization to be resolved. Figure 2 shows the framework of the strategic management of human resources.

According to contingency theory as well as behavioral perspective, human resource strategies must be combined with competitive strategies that increase organizational performance in these conditions or influence human resources as well. The concept of strategic fit, in fact, closely related to human resource strategy and organizational strategy that in a long-term framework causes to the motivation of employees, their purpose and their maintenance.

The organization's ability to implement its strategies and achieve its objectives is directly related to alignment with the human resources department of the company as well as its human resource experiences with the overall strategy and corporate business. The main goal of strategic human resource planning is to align with the HR experiences and unit of company with business strategy of the organization.

If there is harmony between overall strategies of organization and human resources strategy it causes to all of the activities that improve the human resources of organization to be supported by senior management of organization. However, if these strategies are not in one direction or even in conflict with each other, imple-





menting the policies of human resource strategy will be encountered with failing and many problems. So before developing strategy for organization, it is necessary pay attention to vision of organization and human resource strategies to be developed to this direction.

So the role of organization's strategy fit and human resources strategy is very important and effective for the success of strategies that we intend in this research.

There are several modes for the relationship between organizational strategies and human resources strategies.

\*The first model ( $H_1$ ) states that the best fit between competitive strategy and strategy of organization causes to the effectiveness of the human resources strategy.

\*The second model ( $H_2$ ) states that the effectiveness of human resources has a direct relationship with organizational performance. In fact, the concept of strategy fit states that organizations can better manage their resources more efficiently that it reduces operating costs and consequently it will be effective response to environmental threats and opportunities.

\*Model 3 ( $H_3$ ) indicates that the best fit between competitive strategy of organization and human resources strategy increases organizational performance. Many theorists of contingency theory believe that organizational performance and effectiveness of human resources increases when human resources strategies and competitive strategies of organization are aligned together.

\*Model 4 ( $H_4$ ) states that the best fit between competitive strategy of organization and human resources strategy causes to the consolidation of the relationship of organizational performance and effectiveness of human resources.

According to these models and analytics conducted, it can be concluded that in order to develop human resources strategies for the organization, it must be also paid close attention to the organization's overall strategies. So in this study before developing human resource strategy, overall strategies of Education organization to be carefully reviewed and analyzed and used as a guidance for developing overall strategy of organization.

## STEPS OF RESEARCH

In the first step; the aim was to identify strengths, weaknesses, opportunities and threats of the organization enjoying the views of management, experts of education organization. So at this stage, by doing detailed interviews with 12 experts from relevant organizations, to a large extent the opportunities, threats, strengths and weaknesses of the organization was obtained in terms of human resources. After collecting the opinions of experts and familiar with the operation and internal and external environment of organization and analyze the strengths and weaknesses, threats and opportunities, we make SWOT matrix.

Table 1 shows the organization's strengths in human resources management.

Table 1. Organization's strengths in human resources	
Line	Strengths
S1	Exist positive attitude of management of organization to employees' training
S2	Exist job security for full-time employees
S3	Exist collaboration between employees
S4	Providing welfare services to employees (formal, contractual and contractual)
S4	Exist formal and informal positive relationship between employees and managers
S4	Variations and compensation in organization
S4	Exist system of investigating complaints
S4	Having young, qualified and motivated force to achieve organizational goals
S4	Ethical and religious forces
S4	High loyalty of personnel to the organization and the desire to serve the country

Table 2 shows the weaknesses points in human resource management.

### 7-1-3- IDENTIFY THE EXISTING OPPORTUNITIES

Table 3 shows opportunities around the organization in human resource management.

Table 4 shows the threats of the organization in human resource management.

At this stage, using the strengths, weaknesses, threats and opportunities that was determined in pre-stage, appropriate policies to organizations using this matrix are offered. At this stage, it is necessary to take advantage of external opportunities using the strengths and

Table 2. Weaknesses points in human resources	
Line	Weakness
W1	Lack of mechanism and an integrated system for effective working relationships between the components of the organization
W2	Non-integration of payroll system and welfare services between the pillars and the parts of organization
W3	Non-integration of recruitment system of specialized force in the organization
W4	Non-implementation of specified regulations for the equitable distribution of amenities between all levels of job status (formal, treaty, contract, hourly, Inc.)
W5	Different occupational memberships in the organization (formal, treaty, contract, hourly, Inc.)
W6	The absence of in-service training in organizations
W7	No history, volume and diversity of training programs of organization
W8	Lack of job security for part-time specialist employees (H)
W9	Disproportion in age levels and career
W10	Lack of job promotion system based on productivity
W11	Lack of needs assessment in implementing education programs
W12	The mismatch between job and employee (in terms of qualification, personal empowerment, etc.)
W13	The lack of a comprehensive system of evaluation of human resources
W14	Lack of expert advisors and efficient in personnel matters
W15	Lack of sufficient attention to the need for training in educational programs
W16	Lack of expert and efficient experts for business analysis
W17	Lack of belief among middle and basic managers than programs of administrative change
W18	Low salaries and employee benefits compared with other organizations by having similar professionals
W19	Exist a lot of distance between senior managers, middle, operational and employees
W20	The appointment of people regardless of functional training
W21	Lack of education and training of managers and employees
W22	The lack of systematic of performance-based reward system

Line	Opportunities
01	Ability to interact and communicate with national and international research and academic centers
02	Training centers and development of human resources in community such as higher education institutions
03	Membership and participation in regional and international unions and associations, in order to protect national interests
04	Take advantage of the supports of the Ministry of Education as the main operating system (upstream)
05	The possibility of cooperation with educational institutions and universities in the use of archive data
06	Strategic documents in the country
07	The sixth program of development of country
08	The use of post-embargo opportunities
09	Take advantage of funding outside the organization to provide human resources
010	The positive attitude of the government to human resource development
011	Attention to the meritocracy system in the country

prevent threats as much as possible. It should also take advantage of external opportunities considering internal weaknesses and as much as possible avoid threats. There are many opportunities in the surrounding area of education organization that organization can improve its position significantly in the domain of human resources by using them. In the first phase, by using organization's strengths should use the opportunities in outside environment of the organization. Table 5 shows proper policy for strengths-opportunities.

In this phase, some strategies should be provided to take advantage of the strengths of the organization in order to prevent and eliminate threats. Table 6 shows proper policies for strengths-threats.

In this phase, some strategies should be provided to take advantage of potential opportunities available to

cover the weaknesses of the organization. Table 7 shows proper strategies for strengths-threats.

Table 8 shows proper strategies for weaknesses-threats.

In order to achieve the long term objective, it is necessary to take a series of medium-term and short-term steps. As strategic objectives are achieved in a relatively long-term horizon, it is required to mid-term and short-term objectives to be operational and defined to long-term objectives to be achieved via this route. Short-term objectives are known as the operational objectives and medium-term objectives known as tactics. After analysis of Swot table obtained and opinions of experts on the analysis of internal and external factors of organization, it should be identified tactics that should be developed to obtain the organization's strategies. As well as for the

Line	Threats
T4	Exist alignment system in government and low salary in expert jobs of organization
T5	Inappropriate informing the media about the activities of the organization
T6	The lack of proportionality of salary and benefits paid to employees in proportion to the activities and earnings
T7	Non-compliance with the increasing demands with possibilities of organization
T8	Lack of meritocracy in the country and spread to other organizations
T9	Lack of regulation for the payment of productivity right to employees
T10	Fluctuating economic conditions
T11	The multiplicity and instability of laws and regulations and Circulars
T12	Continuous decline in the purchasing power of employees
T13	Reduce welfares and remove welfare items from the cart welfare of employees
T14	Continuous change of laws and regulations of human resources in government

Line	Code	Title of policy
1	S101	Enjoying positive attitude of managers of organization to training in order to communicate with research and academic centers
2	S102	Enjoying positive attitude of managers to take advantage of higher education centers
3	S4013	Taking advantage of funding outside the organization to provide welfare services to employees
4	S4014	Taking advantage of the positive attitude of the government to organization's human resources in order to provide welfare services to employees
5	S8014	Use positive attitude of the government to human resource development to attract young and motivated and skilled workforce
6	S8013	Taking advantage of funding outside the organization to attract young and qualified and motivated forces
7	S8010	The use of young and expert forces to participate in national satellite projects, regional and international
8	S802	Enjoying training centers and human resource development to develop young human force
9	S801	Relationship with national and international research centers and to develop young human force
10	S8015	The use of potential of merit system in the country to attract creative and talented and young forces

implementation of tactics, it is required to be defined a series of operational objectives. In fact, the tactic is a bridge between operational objectives and strategic objectives so in this section, tactics and operational objectives required in order to achieve the strategies developed are presented.

In order to develop tactics and operational objectives based on strategies, a mechanism should be closely defined. Since the development of tactics and operational objectives based strategies are a quite specialized issue,

the Delphi technique has been used for this purpose. For this purpose, a 5-member team of experts in the field of management of organizations was invited to help us in the development of tactics and operational objectives. Finally, by doing Delphi sessions with experts of this issue, 4 tactics and a number of operational objectives for each tactic on the basis of strategies developed.

Deployment of human resources strategy of organizations project-based will be done through the following programs:

Line	Code	Title of policy
1	S2T3	Taking advantage of benefit of job security to prevent the withdrawal of the forces from organization
2	S2T13	Taking advantage of benefit of job security to offset the low level of income
3	S4T3	Giving amenities to employees in order to prevent their leaving from the country
4	S4T4	Giving amenities to employees to compensate the low income level of experts
5	S4T12	Giving amenities to employees to offset the ongoing decline in the purchasing power of employees
6	S7T3	Use different tools of compensating services to motivate employees
7	S7T4	The use of various means of compensation in order to compensate low income of expert jobs of organization
8	S7T6	The use of various means of compensation in order to compensate for the mismatch between salaries and paid benefits to employees than activities
9	S7T12	The use of various means of compensation in order to compensate low salary in expert jobs of organization
10	S7T13	Use different tools in order to compensate for compensation of reducing welfares and remove welfare items from the cart welfare of employees
11	S10T3	Strengthening high loyalty of personnel to the organization and the desire to serve the country in order to prevent the withdrawal of the country

Line	Code	Title of policy
1	W107	Creating an integrated system for creating effective working relationships between the components of the organization
2	W3014	Taking advantage of the positive attitude of the government to discuss human resource development to integration of employment system and specialist recruitment
3	W601	Interaction and relation with national and international research centers to solve the problem of the lack of in-service training centers
4	W602	Taking advantage of training centers and development of human resources in the community to solve the problem of the lack of in-service training centers
5	W605	The use of supports of the Ministry of Communications and Information Technology to establish training centers of employees
6	W8013	Taking advantage of official funding sources outside the organization to attract and formalizing part-time specialists
7	W13015	Taking advantage of the potential of attention to democracy to strength system of evaluation and assessment
8	W1401	Taking advantage of academic experts to compensate for the lack of efficient consultants
9	W1805	The support of the Ministry of Communications and Information Technology to compensate low salaries of employees
10	W18013	Taking advantage of funding outside of organization to compensate for low salaries of the employees
11	W22015	The use of potential of merit system in the country to regulate the performance-based bonus system
12	W22014	The use of potential of merit system in the country to develop managers and deserved employees

### Tactic 1: Considering human resources as the most important and valuable resource of the organization

Focus of policies, programs and function of organization should be in a way that creates a safe working environment, full of creativity and intellectual and financial concerns for employees. Operational objective: the values and principles of the organization should be informed to the employees and they should be ensured that all areas of human resource programs are developed in line with the ideals and values.

The strategies of developing this objective are:

- Notification of policies, vision and values of the organization for employees
- identify and describe the duties and responsibilities of employees for the vision and values
- Ensure communication channels and valves between management and employees to solve problems. Promote and recognize the main priorities of the organization in terms of employees, excellence and integrity as the values and principles of the organization. Actions and activities that the area of human resources to implement these strategies can do:
- Design and implementation of approaches to identify and acknowledged the employees who have a better performance than others or defined standards

- improving and promoting the quality of employees' performance management system for the establishment of better level of employees' performance with organizations' goals and programs
- In line with the programs of reward and employees' benefits with priorities of strategy of organization
- Design and deploy a simple and clear approach to appropriate answer and timely to questions of employees in various fields
- Create an integrated mechanism for managing salary based on efficiency and ensuring justice in payments

### Tactics 2: attract, train and retain employees that have high-performance

Develop and implement policies and procedures to identify, attract, recruit and retain employees that have necessary capabilities to achieve superior performance in the region and even the world, employees that their skills and knowledge and individual capabilities are aligned with the organization's strategic goals and plans.

Operational objective 1: Determine the type of human resources that organization in present and future depending on the size and type of projects of organization needs them. Development strategy of the operational objective is: Analysis of the current situation of human resources

Table 8. WT policy in the field of HR		
Line	Code	Title of policy
1	W2T11	Integration of rules and regulations in order to integrate a payroll system and utilities
2	W3T11	Integration of rules and regulations in order to integrate a system of recruitment of human resources
3	W4T13	Implementation of specified regulations for the equitable distribution of amenities and prevent removal of welfare items
4	W8T11	Create job security for part-time specialist employees and remove threat of instability of rules and regulations and the letters
5	W9T4	Create fit at the age levels: employment and solve the low salary in expert jobs of organization
6	W9T6	Create fit at the age levels: employment and solve mismatch of salary and benefits paid to employees in proportion to the activities and earnings
7	W9T12	Create fit at the age levels: employment and solve continuous decline in purchasing power of employees
8	W10T6	Create job improvement system based on efficiency in order to avoid mismatch of salary and benefits for employees to revenues and activities
9	W10T9	Create job improvement system in order to offset the lack of regulations required for the payment of productivity right of employees
10	W13T9	Comprehensive system reform of assessing human resources to meet the threat of mismatch of rights and benefits paid to employees in proportion to the activities and earnings
11	W14T3	Hire expert and efficient advisors in matters of personnel in order to prevent the outflow of skilled workers
12	W14T9	Hire expert and efficient advisors in personnel affairs to create the provisions for payment of productivity right
13	W16T6	Employment of expert and efficient experts about analysis of the jobs in order to deal with the mismatch between salaries and benefits of payment for employees than revenues and activities
14	W18T6	Proportionality of salaries and employees' benefits compared to other organizations in order to solve the mismatch between salaries and benefits of payment for employees than revenues and activities
15	W18T12	Proportionality of salaries and employees' benefits compared to other organizations in order to compensate for the continuous decline in the purchasing power of employees
16	W18T13	Proportionality of salaries and employees' benefits compared to other organizations in order to offset the decline welfare and remove welfare items from the welfare chart of employees
17	W22T4	Systematization of performance-based reward system in order to deal with the challenge of existing alignment system in the state, and low salary in expert jobs of organization
18	W22T6	Non-Systematization of performance-based reward system in order to meet the challenges of mismatch between salaries and benefits payment for employees than revenues and activities
19	W22T9	Non-Systematization of performance-based reward system to deal with the challenge of lack of regulation for the payment of productivity right of employees

of organization in line with the human resources requirements is consistent with the organization's strategic goals and plans. Actions and activities that are needed in this area to achieve this strategy are as follows:

- Identify and communicate a set of appropriate indicators to assess the performance of management process of human resources of organization and evaluate indicators periodically
- Develop and implement strategies to review periodically the status of human resources of organization in the interval identified and taking reforming actions for results
- develop a structure to define and maintain the organization's human resources capabilities in the areas of engineering, management and science based on standards of knowledge, skill and individual abilities
- achieve the necessary capabilities to analyze data needed to HRP
- Implement salary payment system based on efficiency to encourage the creative forces of organization

- Improve allocated amenities to the creative and expert forces of organizations Operational objective 2: identify and recruit the elite forces that organization needs them to succeed in operational activities.

Strategy for achieving the operational objective includes:

Developing external training programs, recruitment and retention and reward strategies to ensure optimal access in the present and future to a source of forces with appropriate capabilities to meet the strategic goals of the organization.

The purpose of outer trainings is harmony with training centers and university outside of the organization in order to train talented forces required for the organization. Actions and activities required to deploy this strategy are:

- review the human resources structure of the organization to ensure the achievement of a proper ratio of the share of the formal forces and corporate and contractual
- Taking advantage of educational and learning opportunities as a proper strategy to retain experienced forces who have felt the need to upgrade the level of their academic ability.

### **Tactic 3: step toward the organization that promotes continuous learning**

If organization creates an environment of continuous learning, it is faced with employees that constantly improve their skills and capabilities in order to meet the strategic objectives of the organization. Needed to create such an environment in the organization is the following cases:

- High quality technical education programs to employees
- Support change management in the organization
- Develop the ability of leadership of employees
- Manage career development

### **Operational objective 1: to realize that learning across the organization as a value and to support the programs and projects of the organization.**

Deployment strategy of this operational aim is as follows:

The development of strategies and learning programs across the organization so that prepare employees to work in the present and future environment of organization.

Actions and activities that should be done for the implementation of this strategy are as follows:

- Development and implementation of training programs and advanced learning in the field of management and leadership of projects
- improve employees' capabilities in the field of ICT

- Development of training and learning programs to improve technical capabilities and engineering of employees

### **Operational objective 2: developing the leadership capability of employees**

Strategy for achieving the operational goal includes:

Create a series of clear strategies to ensure that the organization has skills needed for leadership and management.

Actions and activities required to be taken in order to implement this strategy include:

- recognize the potential and create learning opportunities within the organization to enhance leadership skill of employees
- Design, develop and implement training programs in line with the latest educational practices in the field of leadership for employees and assessment its results
- Development of educational tools such as distance learning technology for the development of management and leadership of employees
- The development of coaching approach in the organization
- Partnership with other educational institutions and academia to identify problems related to the development of leadership and management in the organization

### **Tactics 4: ensure the formation of strong teams, skilled, creative and useful across the organization**

Operational target 1: Development of teams and professional employees who have the required ability to implement projects.

The strategy to achieve this operational objective is:

- The development of a competency framework of human resource to identify the major and minor capabilities of employees and its evaluation
- Design and reform technology-oriented curriculum
- Identify new ways to restore functionality of human resource

## **CONCLUSION**

The purpose of this research is to develop human resources strategies using SWOT matrix for the education organization. After a comprehensive literature review of the literature was performed, original steps of investigation were begun. In the first stage, by referring to Tehran Education Organization and enjoying the views and experiences of 12 people including managers and experts in the field of human resources of

organization, internal strengths and weaknesses and the opportunities and threats in the external environment of the organization were identified. It should be noted that additional factors could be included in this collection that given the multitude of factors, the most important and influential of them were identified and analyzed.

In the next step, by utilizing the strengths, weaknesses, opportunities and threats, the SWOT matrix was formed in four sections. Run any long term goal requires some medium-term and short-term goals. So in the next step in order to achieve the proposed strategies for the organization, four tactics were defined as medium-term objectives as well as for each of tactics short-term operational objectives.

Finally, in this study, a comprehensive roadmap for the education organization was provided in the area of human resource management to management by designing mechanisms to implement the operational goals achieve tactical and ultimately long-term strategies in the domain of the human resources.

According to the study, in future research can implement methodology provided in other organizations. Also for the Education organization can develop strategy using new approaches and compare the results with those obtained in this study. It can be also developed strategy in other areas raised in educational management and for other issues in the educational management developed the strategy.

## REFERENCES

- Abtahi, Seyed Hossein Mousavi, Seyed Mohammad. Develop Human Resource Strategies (Case Study: one of the Spiritual Organizations of country), Human Resource Management Research, 2009, Vol. 1, No. 3, pp. 23-1.
- Esmacilpour, Majid and Mohammad Ali Ezzatollahi, 2015, develop strategy for Fulad Mobarakeh Company of Esfahan based on SWOT analysis (SWOT), the first International Conference on Management, Economics and Development, Tehran. Companies, management of development, 2009, Volume 1, Number 2, pp. 19-9
- Hamidi Asl, Mohammad and Ali Reza Sadighizadeh, 2014, the development of human resources strategy, case study of Abadan Petrochemical Company, the International Conference on Development and Business Excellence, Tehran.
- David, Fred R. (2010) Strategic Management, eighteenth edition, translated by Ali Parsaeian and Seyed Mohammad Erabi, Tehran: Cultural Research Bureau.
- Rahmani, Zinolabedin, Amozadeh Khalili, Majid Gholami Avati, Ramazan, Karampour, Mohammad Ali, 2012, Strategic Human Resource Management, Publishing of Ettehad.
- Saebi, M. (2002), strategic planning of human resources, Tehran, former State Management Training Center.
- Moghimi, Seyed Mohammad Ramazan, M., 2011, Human Resource Management, Publications of Rahe Danesh.
- Bryson JM. Strategic planning for public and nonprofit organizations: A guide to strengthening and sustaining organizational achievement: John Wiley & Sons; 2015.
- Gharijli, B., 2007, Human Resource Excellence (Assessment, Planning and Improving) Institute for Productivity and Human Resources, Tehran: Saramad Publisher.
- Hendry, C.; Pettigrew, A. (1990), "The Practice of Strategic Human Resource Management", Personnel Review, Vol. 15.
- Kangas, J.; Kurtilla, M.; Kajanus, M.; Kangas, A. (2003), "Evaluating the management strategies of a forestland estate-the S-O-S approach", Journal of Environmental Management, 69, 349-358.
- Ulgen, H.; Mirze, S. K. (2004), :Strategic Management, Istanbul: Literatur Publication

## An investigation on antibiotic resistance of *Shigella* species in Javadieh's Amir-al-Momenin (PBUH) Hospital

Mehrnaz Ghafarypour Jahromi\*

Graduate School of Medicine, Islamic Azad University Central Tehran Branch, Iran

### ABSTRACT

Shigellosis is one of the most common infectious diseases worldwide. Appearance of strains resistant to antibiotics is increasing particularly in underdeveloped areas. Knowledge about the spread rate of various species of Shigellosis is based on determining antibiotic resistance in order to reduce the treatment duration and its costs. Therefore, the present study was conducted in order to investigate antibiotic resistance of different species of Shigellosis through 1998-2001 interval in Javadieh's Amir-al-Momenin (PBUH) Hospital. This study has used an analytical-descriptive and retrospective method based on stool samples collected from patients of Amir-al-Momenin (PBUH) hospital during 1998-2001 interval. According to the laboratory's results of smear investigations, stool culture tests and anti-biograms, antibiotic resistance and sensitivity of different species of *Shigella* were measured and the data was analyzed by central indices of descriptive statistical. Results of biochemical and serological tests confirmed the presence of *Shigella* in only 131 cases (62 women and 69 men) (5.06%). Results also showed that the most sensitive antibiotics were Ciprofloxacin (98.5%) and Cefotaxime (97.7%) and the most resistant antibiotic was Ampicillin (91.6%). Findings show that in the present study, the most effective antibiotic is Ciprofloxacin. Resistance rate of *Shigella* bacterium is increasing in stool samples with respect to common medicines which are used in Shigellosis (Ampicillin and Cotrimoxazole) and lack of using one antibiotic in a time period results in a reduction of resistance against it. Therefore, medications may be changed alternately each multi-year interval in order to reduce the resistance rate against antibiotics.

**KEY WORDS:** ANTIBIOTIC, SHIGELLA, RESISTANCE, STOOL, ACUTE DIARRHEA

### ARTICLE INFORMATION:

\*Corresponding Author: [m.ghafarypour@yahoo.com](mailto:m.ghafarypour@yahoo.com)

Received 30<sup>th</sup> April, 2017

Accepted after revision 5<sup>th</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

*Shigella* is a small, sedentary, non-capsulated, Gram-negative, rod-shaped bacterium and infections produced by it have caused severe problems in developed as well as developing countries. *Shigella* is the cause of dysentery disease in humans. It is common in tropical zones and it is in fact local infection of intestines. *Shigella* bacterium is considered as one of the most prevalent reasons for Shigellosis in intestinal infections. Like other members of the bacteriocin family, *Shigella* is divided into four main categories namely based on biochemical and serological properties. These categories include: *S. dysentery*, *S. flexneri*, *S. sonnei* and *S. boydii* which their basic characteristic is the ability to attack intestines epithelial cells and cause infection in humans (Niyogi 2005).

Shigellosis is a severe infectious inflammatory colitis which ranges from self-limited mild watery diarrhea to severe dysentery accompanied by blood excretion, repetitive mucus, high fever, tenesmus and cramps. Proper treatment using antibiotics shortens signs duration and prevents life-threatening side effects. Furthermore, it decreases the excretion of pathogens in the stool which results in reducing the propagation of infection. Shigellosis is still able to cause widespread epidemics with a high level of fatalities in developing countries. Spread of infections caused by *Shigella* is very easy due to low pathogenicity dose of the bacterium, its simple transfer from person to person and also indirect infection of people through using unsanitary food or water (Niyogi 2005, Sur et al, 2004). Pathogenicity is a result of invasion or penetration of the bacteria into the mucus membrane of the colon along with destruction of the epithelium and inducing a severe inflammatory colitis in Lamina propria and eventually ulceration of the intestines mucus membrane with losing blood and release of mucus and inflammatory cells into the intestines lumen. Under this situation, the bacteria avoid to absorb water in the colon and the size of stool changes and the patient is alternately stricken with dysentery and mucus diarrhea (Dutta et al, 2003, Kotloff KL et al, 1999). From infectious factors, toxins, protease, and bacteria-sticking factors are important. Studies have shown that *Shigella* is the third bacterial agent separated from children infected by diarrhea. This infection is native throughout the world. Epidemic usually takes place in areas with high population and poor health conditions (Vila et al, 1994, Shears et al, 1996). About 164.7 million people are infected by Shigellosis annually among which 163.2 million are from developing countries. Evidences show that 1.1 million people die from this infection annually, two thirds of which are children below 5 years old (Kotloff et al, 1999).

Type 1 *Shigella dysentery* is even more traumatic due to presence of the Shiga (StxA-B) toxin (Christopher 2010). Dysentery caused by the type 1 is more in populated areas due to poor public sanitation, lack of access to healthy water, lack of standard training etc. (Schroeder et al, 2008, Filliol-Toutain et al, 2011, Stoll et al, 1982). *Shigella dysentery* and *Shigella flexneri* frequently occurs in tropical regions and *Shigella sonnei* takes place frequently in industrial societies (Ghaemi et al, 2007).

Several epidemiology studies have been conducted worldwide so far in order to assess the spread, Serovar diversity and antibiotic resistance patterns in different types of *Shigella* (Filliol-Toutain et al, 2011). World Health Organization (WHO) has recently puts investigating reasons of Shigellosis infection to priority. The prerequisites for making attenuated *Shigella* vaccine provides precise information regarding frequency percentage and infection rate to prevalent types of *Shigella* bacteria (Stoll et al, 1982). Antimicrobial treatment role is variable and depends on the organism and intensity of the disease (Christopher et al, 2010). Common antibiotic treatments are generally used for infectious bacteria which play a critical role in reduction of fatalities of such infections. However, improper and frequent use of one anti biotic causes new resistant strains (Christopher et al, 2010, Hosseini et al, 2007). *Shigella* multidrug resistant species have been reported from around the world. Even though it seems that *Shigella* is sensitive to Ceftriaxone, Azithromycin, and Quinolones, resistance to these antibiotics is also increasing. By separating 82 strains of *Shigella* from 179 stool samples of patients in Shiraz et al. (2006) reported that all separated strains were sensitive to three antibiotics: Ceftazidime, Ciprofloxacin, and Ceftriaxone and these strains presented great resistance to antibiotics: Nalidixic acid, Gentamicin, Amikacin, and Cefalotin (Farshad et al, 2006).

In another study, based on sporadic strains of *Shigella boydii* samples collected from Iranian children Ranjbar et al. showed that all separated strains are resistant to antibiotics: Sulfamethaxazole, Trimethoprim, and Streptomycin (except one case) [Ranjbar R et al, 2008]. Moreover, a study on *Shigella* samples separated from patients of the Milad hospital and the Children Medical Center in Tehran, Hosseini et al. showed that Cotrimoxazole has the highest bacterial resistance. It seems that the transfer of resistance genes through bacterial plasmids is presented as a diffusion mechanism for the resistance genes (Hosseini et al, 2007).

Unfortunately, little information is available regarding the frequency of bacterial factors and their antibiotics resistance in different parts of Iran and in recent decades, irregular application of medication has made *Shigella* resistant to very common and inexpensive anti-

biotics. *Shigella* epidemiology and antibiotic sensitivity changes over time and proper treatment of Shigellosis depends on proper knowledge of resistance patterns. Therefore, updating the information available on *Shigella* sensitivity is essential. Due to the increasing resistance of bacteria to antibiotics and limited amount of reports, and according to the importance of Shigellosis treatment via antibiotics and also due to differences in its epidemiology antimicrobial sensitivity and large numbers of *Shigella* species in Iran, the present monitoring study was carried out during the interval 1998-2001 with the goal of investigating the antibiotics resistance rates of *Shigella* species in Javadieh's Amir-al-Momenin (PBUH) hospital.

### METHODOLOGY

This study used an analytical-descriptive and retrospective method based on stool samples collected from patients of Amir-al-Momenin (PBUH) hospital during 1998-2001 interval. The information was gathered over a specific period of time from the laboratories of Amir-al-Momenin (PBUH) hospital. By permission and visiting the laboratories, the resistance and sensitivity of different types of *Shigella* to antibiotics were measured using smear tests, stool culture, and antibiograms.

All stool samples of patients in Amir-al-Momenin (PBUH) hospital were used in the study. The samples were investigated based on consistency, presence or absence of mucus, presence of blood in microscopic level (red blood cells) or macroscopic level (white blood cells) and eventually they were analyzed by using wet slides.

In cases where stool contained more than 5 WBCs and any number of RBCs, it was accounted as inflammatory diarrhea. Dehydration was assessed and cured using WHO instructions. All separated strains of *Shigella* were stored in a particular environment in freezers of infectious and tropical with the temperature 70 degrees below zero to be used in experiments. Then, these samples were typed again with specific *Shigella* (Baharafshan, Iran) anti-serums. *Shigella* species were assessed by the Disk Diffusion Method (DDM) after they were identified and grouped based on sensitivity and resistance to specified antibiotics. In order to determine the antibiotics sensitivity patterns, Disk Agar Diffusion

method was used with antibiotics Tobramycin, Co-trimoxazole, Cefotaxime, Ampicillin, Gentamicin, Ciprofloxacin, Ceftizoxime, Nalidixic acid, Nitrofurantoin, and Amikacin. Concentration limits reliable for defining sensitivity or resistance of bacteria with respect to antibiotics was determined for *Shigella* based on advices of National Committee for Clinical Laboratory Standards (NCCLS) [National Committee for Clinical Laboratory Standard.1997]. Results of sensitivity analysis for separated *Shigella* were recorded and interpreted as Sensitive (S), Half-sensitive (I) and Resistant (R) states after 24 hours of plate incubation in a 37-degree stove. Then, data obtained was statistically analyzed by SPSS software (version 21<sup>st</sup>) and results were studied using central descriptive statistical indices.

### FINDINGS

Results of this research work showed that among 2588 patients from 1998 to 2001 having smear test and stool cultivation, only 131 cases were diagnosed as *Shigella* infected, which yielded total frequency of 5.06%. From 131 cases under consideration, 62 were women (47.3%) and 69 were men (52.7%).*Shigella* spread over the time period 1998-2001 was as the following: in 1998, 395 individuals had stool cultivation among which 5 cases (1.26%) had Shigellosis; in 1999, 789 individuals had stool cultivation from which 36 cases (4.5%) had Shigellosis, in 2000, 888 persons had stool cultivation from which 55 cases (6.2%) had shigellosis and in 2001, 816 persons had stool cultivation among which 35 cases (4.3%) were found having Shigellosis.

According to Table 1, in general the most cases were RBC=Many and WBC=Many and the least cases were RBC=Few, WBC=Not, or RBC=Not, WBC=Many. Results show that there is no relationship between RBC and WBC present in the stool smear and the resistance of the antibiotics.

According to Table 2, Antibiogram results of *Shigella* infected patients stool cultivation show that among 131 persons, 129 individuals (67 men and 62 women) which is 98.5% were sensitive to Ciprofloxacin and 128 individuals (68 men and 60 women) which is 97.7% were sensitive to Cefotaxime and none of these two species were resistant to this antibiotic. Considering the results

Table 1. Results of Stool smear test (based on frequency and frequency percentage)

Variable	Not (0%)	Few (1-10%)	Moderate (10-15%)	Many (>15%)
WBC	0	42 (32.1%)	19 (14.5%)	70 (53.4%)
RBC	2 (1.5%)	44 (33.6%)	30 (22.9%)	55 (42%)

Table 2. Antibiogram study: resistance, sensitivity and semi-sensitivity to antibiotics (based on frequency and frequency percentage)

Antibiotic	R%	S%	I%
Gentamicin	2 (1.5%)	82 (62.2%)	47 (35.9%)
Ampicillin	120 (91.6%)	4 (3.1%)	7 (5.3%)
Cefotaxime	0	128 (97.7%)	3 (2.3%)
Co-trimoxazole	102 (77.9%)	21 (16%)	8 (6.1%)
Tobramycin	9 (7.6%)	84 (64.1%)	38 (28.2%)
Ciprofloxacin	0	129 (98.5%)	2 (1.5%)
Ceftizoxime	2 (1.5%)	126 (96.2%)	3 (2.3%)
Nalidixic acid	7 (5.3%)	118 (90.1%)	6 (4.6%)
Nitrofurantoin	3 (2.3%)	106 (80.9%)	22 (16.8%)
Amikacin	1 (0.8%)	121 (92.4%)	9 (6.9%)

of this study, the most sensitive antibiotics were Ciprofloxacin and Cefotaxime. Additionally, from 131 persons studied, 120 individuals (64 men and 56 women) i.e. 91.6% were resistant to Ampicillin antibiotic which was the most resistant antibiotic. The sensitivity order for remaining antibiotics are as follows: Ceftizoxime 96.2%, Amikacin, 92.4%, Nalidixic acid 90.1%, Nitrofurantoin 80.9%, Tobramycin 64.1%, Gentamicin 62.6%, Co-trimoxazole 16%, and Ampicillin 3.1% (Table 2). Investigations show that resistance to Nalidixic acid, Nitrofurantoin, Amikacin and Co-trimoxazole increases over time (Table 2).

## DISCUSSION AND CONCLUSION

Bacteria resistance to antibiotics is one of the major difficulties in our society. Like other bacteria, *Shigella* has been resistant to antibiotics which were previously used to cure Shigellosis and this in turn requires using new antibiotics. It appears that experimental treatments in these patients require constant knowledge about resistance patterns in the region. At the moment, World Health Organization (WHO) has introduced Ciprofloxacin as the medication selected for treatment of Shigellosis in both children and adults and recommends Ceftriaxone and Azithromycin as proper alternatives. Reports from around the world show that, like other intestinal pathogenic bacteria *Shigella* has great tendency toward multidrug resistance (MDR) (Patwari 1994). Therefore, one of the most important issues under discussion particularly in the treatment of patients with diarrhea, is drug resistance, the increasing rate of which has been mentioned in many studies (Ranjbar et al, 2008, Mardaneh et al, 2013). Results of a 10-year interval study in Vietnam shows gradual increase in resistance of *Shigella* to different antibiotics (Anh 2001). In this current study, the most efficient antibiotic is seen to be Ciprofloxacin fol-

lowed by Cefotaxime and the most resistant antibiotic is Ampicillin.

Results of a study in Nigeria shows an increase in drug resistance of *Shigella* during 1990s. In this study, about 10% of the samples showed resistance even to Nalidixic acid (Iwalokun 2001) which is in accordance with the results of the present study. Therefore, although regarding sensitivity and resistance of bacteria the difference in laboratory conditions and antibiotic supplier company should also be taken into account in addition to properties of the bacterium (such as genetic and enzyme changes which are probably different from region to region), however, it seems that resistance to this antibiotic is increasing.

In Yaghoobi's study in Hamedan and Tabatabaei's study in Rafsanjan, high sensitivity to Ciprofloxacin and high resistance to Ampicillin was reported in urine cultivations which is in agreement with the results of this study (Yaghoobi et al, 1999, Tabatabaei 2003). In a study conducted by Parviz Ghadamli at Mofid Children's Hospital in Tehran, stool cultivation sensitivity to Nalidixic acid was reported about 90% which is in accordance with the results of the current study showing 90.1% sensitivity [Ghadamli P,1999]. In the study by Jamshidi et al. which investigated 682 samples separated from diarrhea-infected patients, 134 (19.6%) *Shigella* cases were separated. Investigating the resistance to antibiotics of these isolations show that the most resistance was to Ampicillin (100%) and the highest sensitivity was related to Ciprofloxacin (88.8%) which are in close agreement with the results of this study. In another study conducted in Bangladesh on 530 *Shigella* cases, it was reported that most species were sensitive to Ciprofloxacin and Nalidixic acid antibiotics and resistant to Ampicillin and Co-trimoxazole which this resistance was increasing over years and this observation is in accordance with findings of this study (Mache 1997).

In the study by Mates et al. on 4395 *Shigella* cases, most species were sensitive to Floxacin and only one type was resistant to Nalidixic acid and the resistance to ampicillin was reported 63.5% which has small discrepancy with amounts obtained in this study and shows that resistance to Ampicillin is in fact increasing (Mates 1990). It seems that improper and irregular consumption of Ampicillin and Co-trimoxazole especially in Iran which are less expensive and more available relative to other antibiotics, is one of the main reasons for merging resistance of antibiotics to *Shigella*. Among antibiotics investigated, in most studies almost all types were showed resistance to Ampicillin and Co-trimoxazole which verifies that these two treatments are not currently very efficient in Shigellosis. Taking into account that not consuming an antibiotic for a period of time causes a decrease in resistance to it, one may therefore

change the treatment alternately in order to decrease the resistance to antibiotics. On the other hand, considering the low resistance of *Shigella* species to Ciprofloxacin in this study and other studies in the literature, this antibiotic can be recommended as an effective treatment for Shigellosis.

As it was observed, results of studies conducted in the field are different in the country and throughout the world and some regions are similar regarding spread percentage of Shigellosis and species resistance to antibiotics whereas in some regions there is considerable discrepancy. It seems that this difference is due to the rotational pattern of this disease and Shigellosis spread is based on geographic distribution of the host. Findings of this study show that the most effective antibiotic is Ciprofloxacin and the most resistant one is Ampicillin. Results of other studies also show that resistance of *Shigella* bacterium to prevalent treatments (Ampicillin, Cotrimoxazole) are increasing in stool samples. So, based on the analysis performed high resistance of *Shigella* species to Ampicillin in Iran constraints consumption of this kind of treatment. Also, normal sedimentation of erythrocytes is in favor of viral etiology and can be considered aligned with other observations in making decisions toward stopping antibiotics consumption. In contrast, fortunately these species have shown very high sensitivity to Ciprofloxacin and Cefotaxime which can be a proper choice for treatment. Taking into account that not consuming an antibiotic for a period of time causes a decrease in resistance to it, one may therefore change the treatment alternately in order to decrease the resistance to antibiotics. Additionally, in order to prevent drug resistance and failure of treatments, antimicrobial sensitivity tests should be performed precisely considering all infectious factors and irregular use of antibiotics should be avoided.

## REFERENCES

- Anh NT, Cam PD, Dalsgaard A. Antimicrobial resistance of *Shigella* spp isolated from diarrheal patients between 1989 and 1998 in Vietnam, Southeast. *Asian J Trop Med public Health*, 2001; 32(4): 856-62.
- Christopher PR, David KV, John SM, Sankarapandian V. Antibiotic therapy for *Shigella* dysentery. *The Cochrane database of systematic reviews*. 2010(8):CD006784.
- Dutta S, Ghosh A, Ghosh K, Dutta D, Bhattacharya SK, Nair GB, Yoshida SI. Newly Emerged Multiple-Antibiotic-Resistant *Shigella dysenteriae* Type 1 Strains in and around Kolkata, India, Are Clonal. *J Clin Microbiol* 2003; 41(12): 5833-4.
- Farshad S, Sheikhi R, Japoni A, Basiri E, Alborzi A. Characterization of *Shigella* strains in Iran by plasmid profile analysis and PCR amplification of ipa genes. *Journal of clinical microbiology*. 2006 Aug; 44(8):2879-83.
- Fillioli-Toutain I, Chiou CS, Mammina C, Gerner-Smidt P, Thong KL, Phung DC, et al. Global Distribution of *Shigella sonnei* Clones. *Emerging infectious diseases*. 2011 Oct; 17(10):1910-2.
- Ghadamli P. A study on the clinical manifestation and antibiotic susceptibility for shigellosis in children in Mofid Childrens Hospital 1995-1997, *Iranian J Infect Dis Tropical Med*, 1999; 11(4):6-33.[Persian]
- Ghaemi EO, Aslani MM, Moradi AV, Dadgar T, Livani S, Mansourian AR, et al. Epidemiology of *Shigella*-associated diarrhea in Gorgan, north of Iran. *Saudi journal of gastroenterology: official journal of the Saudi Gastroenterology Association*. 2007 Jul-Sep; 13(3):129-32.
- Hosseini MJ, Ranjbar R, Ghasemi H, Jalalian HR. The prevalence and antibiotic resistance of *Shigella* sp. recovered from patients admitted to Bouali Hospital, Tehran, Iran during 1999-2001. *Pakistan journal of biological sciences: PJBS*. 2007 Aug 15; 10(16):2778-80.
- Iwalokun BA, Gbenle GO, Smith SI. Epidemiology of Shigellosis in Lagos Nigeria, trends in antimicrobial resistance *J Health Popul Nutr*. 2001; 19(3): 183-91.
- Kotloff KL, Winickoff JP, Ivanoff B, Clemens JD, Swerdlow DL, Sansonetti PJ, Adak GK, Levine MM. Global burden of *Shigella* infections: implications for vaccine development and implementation of control strategies. *Bull World Health Organ* 1999; 77(8): 651-66.
- Mache A, Mengistu Y, Cowley S. *Shigella* serogroups identified from adult diarrhoeal out-patients in Addis Ababa, Ethiopia: antibiotic resistance and plasmid profile analysis. *East Afr Med J* 1997; 74: 179-182.
- Mates A, Eyny D, Philo S. Antimicrobial resistance trends in *Shigella* serogroups isolated in Israel, 1990-1995. *Eur j clin microbial infect Dis* 2000; 19: 108-1011.
- Mardaneh J, Poor SA, Afrugh P. Prevalence of *Shigella* species and antimicrobial resistance patterns of isolated strains from infected pediatrics in Tehran. *Int J Entric Pathog*. 2013 Aug; 1(1):28-31.
- National Committee for Clinical Laboratory Standard. Performance standards for antimicrobial susceptibility test. Approved standard M2-A6. Wayne PA: NCCLS: 1997.
- Niyogi SK. Shigellosis. *J Microbiol* 2005; 43(2): 133-43.
- Patwari AK. Multidrug resistant *Shigella* infections in children. *J Diarrhoeal Dis Res*. 1994 Sep; 12(3):182-186.
- Ranjbar R, Mammina C, Pourshafie MR, Soltan-Dallal MM. Characterization of endemic *Shigella boydii* strains isolated in Iran by serotyping, antimicrobial resistance, plasmid profile, ribotyping and pulsed-field gel electrophoresis. *BMC research notes*. 2008; 1:74.
- Schroeder GN, Hilbi H. Molecular pathogenesis of *Shigella* spp: controlling host cell signaling, invasion, and death by type III secretion. *Clinical microbiology reviews*. 2008 Jan; 21(1):134-56.
- Shears P. *Shigella* infections. *Ann Trop Med Parasitol* 1996; 90(2): 105-14.

Stoll BJ, Glass RI, Huq MI, Khan MU, Banu H, Holt J. Epidemiologic and clinical features of patients infected with *Shigella* who attended a diarrheal disease hospital in Bangladesh. The Journal of infectious diseases. 1982 Aug; 146(2):177-83.

Stoll BJ, Glass RI, Huq MI, Khan MU, Banu H, Holt J. Epidemiologic and clinical features of patients infected with *Shigella* who attended a diarrheal disease hospital in Bangladesh. The Journal of infectious diseases. 1982 Aug; 146(2):177-83.

Sur D, Ramamurthy T, Deen J, Bhattacharya SK. Shigellosis: challenges & management issues. Indian J Med Res 2004; 120(5): 454-62.

Tabatabaei S.T. Frequency and Antimicrobial Susceptibility of Bacteria Isolated from Urine, Stool, and Blood Cultures of

Rafsanjan University of Medical Sciences Laboratories During 2003. JRafsanjan University of Medical Sciences.2007, 7(2):105-112. [Persian].

Vila J, Gascon J, Abdalla S, Gomez J, Marco F, Moreno A, Corachan M, Jimenez de Anta T. Antimicrobial resistance of *Shigella* isolates causing traveler's diarrhea. Antimicrob Agents Chemother 1994; 38(11): 2668-70.

Yaghobi M, Rasol Yousefi M. A survey on relationship between bacterial agents and laboratory findings in adults UTI and antibiotic susceptibility testing of microorganisms isolated from patients referred to the hospitals in Hamedan from 2006-2007, J Kordistan Med Univ, 1999; 3(12):7-10. (Persian).

## Feasibility study of a construction dam of Karun II Hydro Power Plant Project

Mahdi Zandi

*Iran Water & Power Resources Development Company (IWPCO) Iran*

### ABSTRACT

Large Dams are symbols of national pride and domination of man genius over nature, providing electricity, food and water, controlling floods, deserts developer and guarantor of national independence of each country. This research was carried out to study the feasibility of Dam construction and Karun-2 Power Plant. The aim of this study was to investigate the geographical location, economic evaluation, technical feasibility and financial assessment of Karun-2 dam. The method is based on the methods of documentary research and field observations. The results indicated that dam projects away from little damage to the environment and damage caused by construction of reservoir led to high efficiency. Among its advantages were providing drinking water, industrial water, electricity, employment and capital increase which did not restricted to the main plan investor and would increase the financial strength of the region meeting the needs of project stakeholders that this was one of the main issues of project management knowledge.

**KEY WORDS:** DAM, DAM CONSTRUCTION, KARUN DAM 2, KHUZESTAN, EMPLOYMENT

### STATEMENT OF THE PROBLEM

The importance of dam and dam construction is not a secret to anyone. For thousands of years people of different countries to inhibit water and drinking water supply, irrigation and water industries recently attempted to construct the dam. During the 1950s, coinciding with the expansion of population and the growth of economic activities, dams as appropriate tools to meet the needs of water and energy supply are taken into consideration,

and since then, at least 45,000 large dams in different countries are constructed. Now almost about half of the world's rivers have at least one large dam. The construction of dams and their socio-economic consequences as a global issue have been proposed in the international community. The effectiveness of dams on communities and nearby villages, the livelihood of people and residents of areas surrounding and ecosystem are among these issues which are considered. (Rahmati, Alireza and Nazarian Asghar (1389)) Khuzestan province with large

### ARTICLE INFORMATION:

*\*Corresponding Author:*

Received 29<sup>th</sup> April, 2017

Accepted after revision 5<sup>th</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

rivers has always been the focus of the government to build a dam. One of the dams in the Khuzestan province with the possibility of construction is Karun dam 2. The main objective of the dam plan and Power Plant 2 is exploiting hydropower energy generation potential of Karun River in the interval between Reservoir dam of Karun 3 and Shahid Abbaspour. With the construction of this, dam hydropower energy generation capacity of the country is increased 648 MW. The average annual power of dam is 2144 GWH and the average of annual sustainable energy is 1475 GWH. In addition, construction of the dam will be the source of positive developments in the area as follows (Project management according to PMBOK standard, studies contained in the Water DEZ Consultant Engineering Site, upstream activities impact on Arvand River and Karun River water quality; ewrc.sharif.ir, Technical specifications and basic information of dam projects by plan consultants, Karun 2 Information Websites moe.gov.ir; dated 20/09/2015, Karun 2 investment opportunity, Websites moe.gov.ir; dated 20/09/2015, Karun 2 Total investment forecast, Websites moe.gov.ir; dated 20/09/2015, Karun 2 investment return rate, Websites moe.gov.ir; dated 20/09/2015)

- Creating jobs in the region
- Prevention of migration
- Increasing popular culture
- Higher levels of health
- Establishment of a tourist area

It is noteworthy that the plan of Karun 2 in the downstream of Karun 3 and the estimated long-term annual average about 11.4 billion cubic meters, in a flow with a minimum volume operations and very low reservoir damage will be built. Therefore, as economic indicators in the plan show, the project in the terms of economic feasibility is high. Hence, this is important to accelerate the start of operations. According to the description mentioned above, in this paper the feasibility of Karun construction and power plant 2 will be examined. (Publication 682, design manual and construction and operation of dams in 2016, General technical specifications of the dam in the year 2013, Engineering Economic book, an economic assessment authoring doctor Mohammad Mehdi Askonezhad)

## GOALS

The overall goal:

### Feasibility of Karun-2 Dam construction and Power Plant

Partial goal:

- Check the geographic location of Karun-2 Dam
- Economic evaluation of Karun-2 Dam

- Check the technical feasibility of Karun-2 Dam
- Financial evaluation Karun-2 Dam

## LOCATION OF SITE AND ACCESS WAYS

Karun and Dez River are originated from high Zagros Mountains in southwestern of Iran and after entry into Khuzestan plain and joining together form large Karun and continue their way to the Persian Gulf within the plain. Great Karun Basin covers an area about 68500 square kilometers which about 70% is located in the mountain areas and foothills and the remaining 30% is located in Khuzestan plain. Great Karun Basin is shown in Figure 1. In this figure in addition to the position of Dam and Power Plant Flow Karun 2, the positions of exploited dams, under construction and study dams as well as the status of water transfer plans between basins have also been shown. (Studies contained in the Water DEZ Consultant Engineering Site, Karun 2 investment return rate, Websites moe.gov.ir; dated 20/09/2015)

1. Dam site and power plant of Karun-2 in Khuzestan province, Izeh city above the Susan plain on the Karun River is located. Dam geographical location between the dams of Shahid Abbaspour and Karun 3 is based on UTM coordinates in length of 402527 M.E and width of 3537376 M.N. Location of the dam and access road network in the surrounding area is shown in Figure 2. In the current situation, access road to the construction site is the existing road of Izeh- Susan village. This road after passing a distance about 64 km of paved road and crossing the Susan desert, Susan bridge and leaving behind Galal, Bardzar and Keftegalleh villages enter into the second part of its way, with the help of car which consists of a dirt road that continues to the axis (figure 2). The length of this portion of path is about 5 km. To use this route during the construction of dam, there is a need to improvement and widening the major part of the route. According to the studies available, the best option available at runtime is the same option of available road, (Journal of Applied Economic Research of Iran, dated 1.05.2015)

### Specifications of Karun-2 dam

2. The river in the construction site of Karun-2 dam through limestone high layers of Asmari- Jahrum formations created a narrow valley almost perpendicular to the axis of Pardeh anticline. The length of valley in the narrowing area is about 385 meters. The topography slope of valley on the left bank of river is up to level 690 meters about 40 degrees and from level 690 to 850 meters is about 28 degrees. In the right Bank, the valley slope from river up to

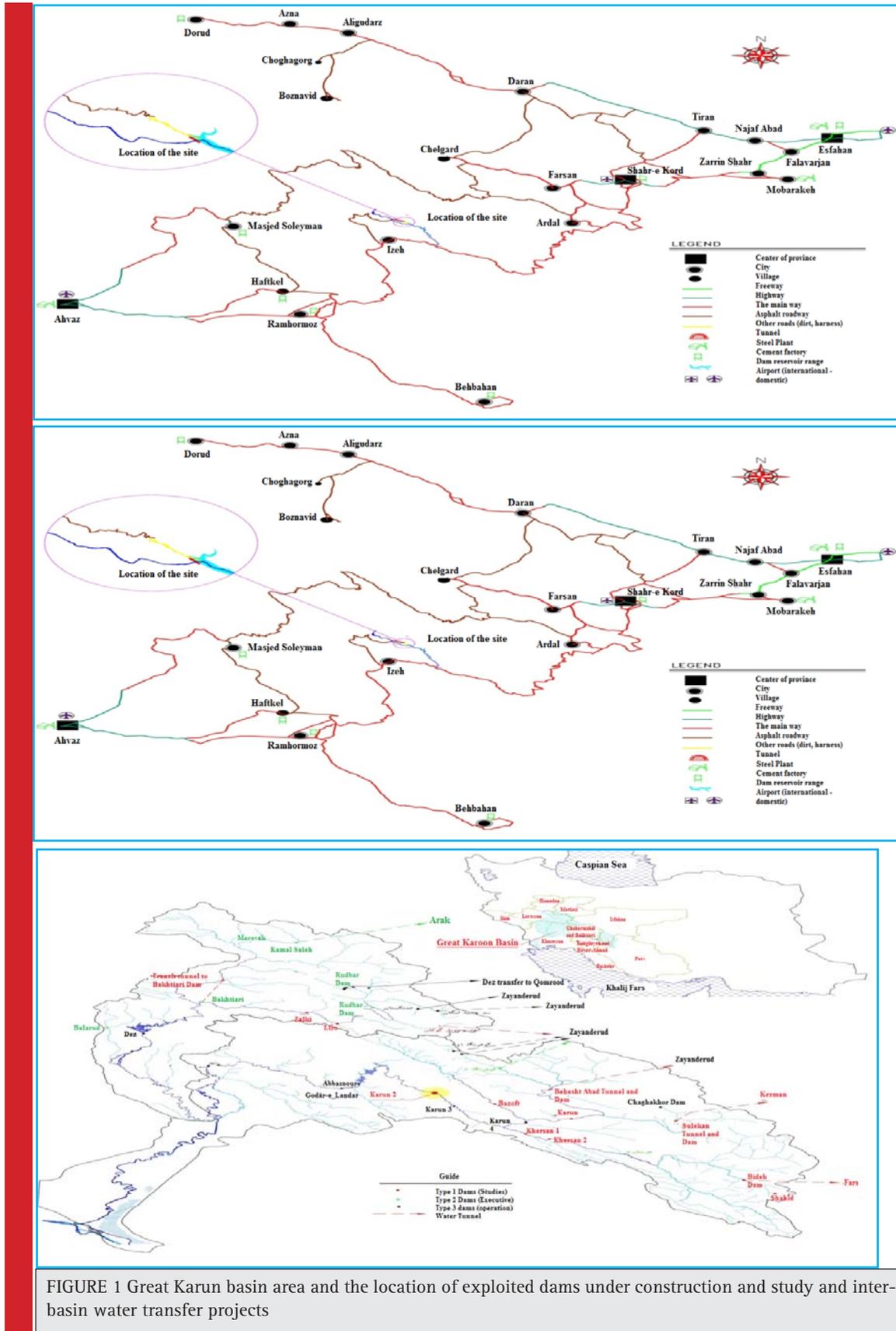


FIGURE 1 Great Karun basin area and the location of exploited dams under construction and study and inter-basin water transfer projects



FIGURE 2 Dirt road of Keftegalleh - Karun site 2

level 690 is about 54 degrees and from level 690 to 850 meters is about 21 degrees. The highest elevation on the right bank, 1160 and left bank, 960 meters above sea level is. River bed elevation at around 563 meters above sea level and river axis at the axis is about 40 to 50 meters. The direction of river flow is above N144 site which about 300 meters from the site with a twist on site shift to the N242. Economic assessment of hydroelectric power plants In country reservoir dams; Journal of Applied Economic Research of Iran, dated 1/05/2015)

At the right domain of site due to the high slope, slag is not formed and devoid of substantial vegetation. On the left bank Due to less steep, slag is formed

in some parts of the bedrock and makes it qualified for scattered oak trees. Waterways are not within the scope of site. A few small waterways are in parallel channels along the stratification which created due to marl layers erosion or more erodible argillaceous limestone. Economic assessment of hydroelectric power plants In country reservoir dams; Journal of Applied Economic Research of Iran, dated 1/05/2015)

To select the type of dam body, various types of dam body and other structures have been studied on the site as below.

- Double-arch concrete dam
- Gravity arch concrete dam

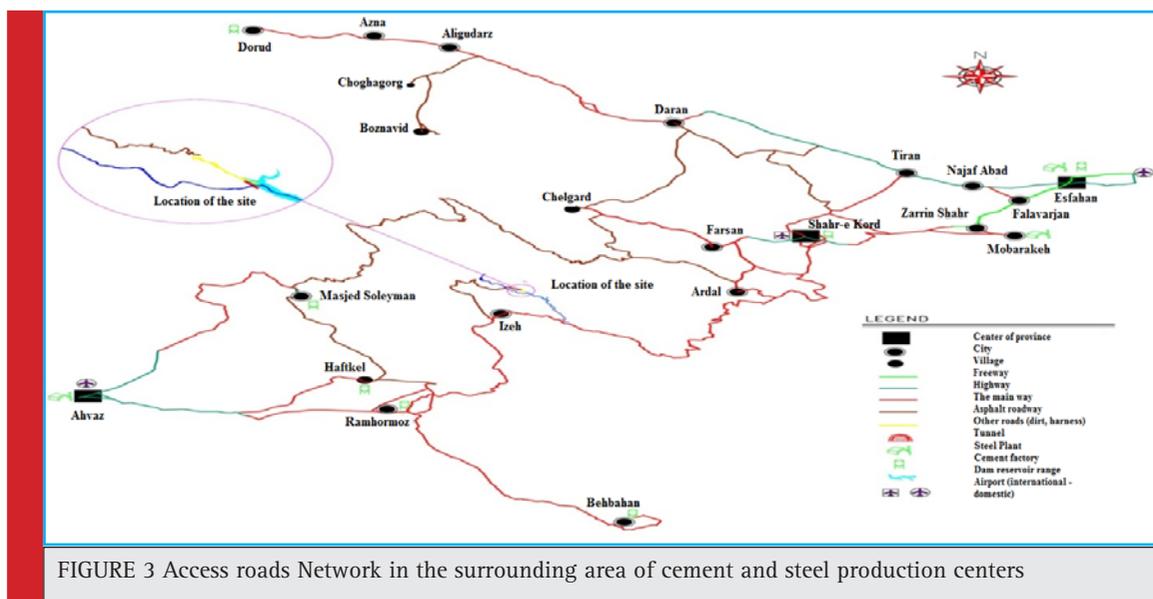


FIGURE 3 Access roads Network in the surrounding area of cement and steel production centers

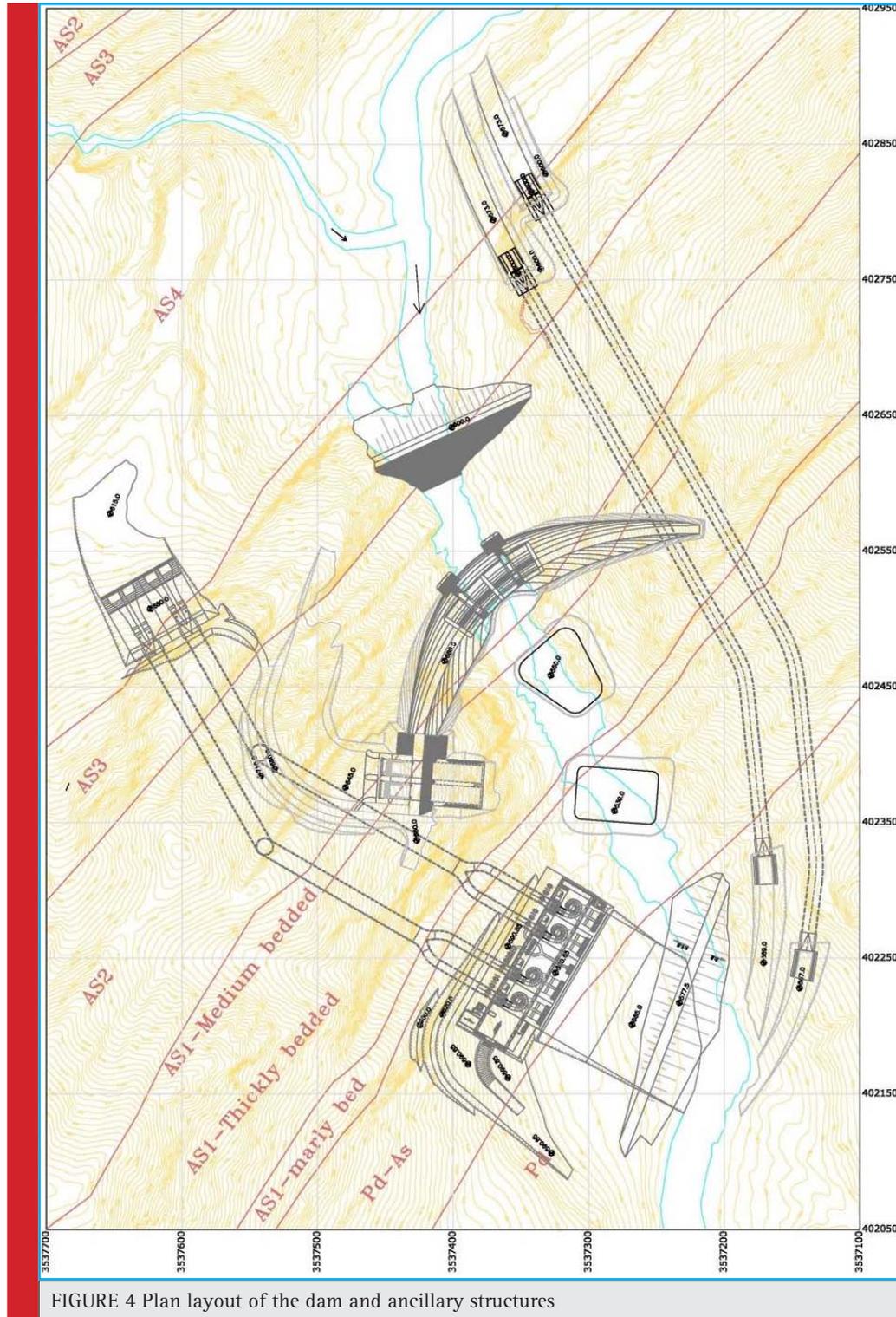


FIGURE 4 Plan layout of the dam and ancillary structures

- Roller concrete dam
- Dock fill dam with clay core
- Rockfill dam with concrete surface

According to studies conducted double-arch concrete dam option compared to the other option has lower

administrative expenditure with more attractiveness for application and was introduced as the preferred option to continue studies. Plan layout of this option is shown in Figure 4. Details of this project are summarized as follows. (Publication No. 120, Iranian concrete code

(ABA) 2000, Publication No. 126 Iranian concrete code manual (ABA) 2002, Publication No. 247, Protection and safety instructions In the dam construction workshops 2002,

**Hydrology**

• The average natural discharge of the river	364.1	Cubic meters in
• Average medium-term adjustment discharge	279.2	Cubic meters in
• Average long-term adjusted discharge	265.3	Cubic meters in
• Natural annual flow	11482	Million cubic meters
• medium-term adjusted input flow to	8805	Million cubic meters
• long-term adjusted input flow to	8367	Million cubic meters
• drainage basin area	24764	Square kilometers
• Maximum flood discharge with return period	10510	Cubic meters in
• Probable maximum flood (PMF)	13450	Cubic meters in
• 50-year-old sedimentation volume	20.91	Million cubic meters

**Reservoir Profile**

Normal level	670	Meters from the surface
Minimum level	666	Meters from the surface
total volume of Reservoir	278	Million meters
Reservoir useful volume	30.1	Million meters
Reservoir area	7.82	Square kilometers
Lake Length	25	kilometer

**Power Plant**

	Main units		Small units (environmental)	
• Type of Power Plant	Shallow		Shallow	
• Location of Power Plant	right side		right side	
• type of turbine	Francis with vertical axis		Francis with vertical axis	
• Installed Capacity	648	megawatt	21	megawatt
• Functional coefficient	25	Percent	65.9	Percent
• Number of units	4		1	
• annual power generation	2021	GWH	123.3	GWH
• Annual Sustainable Energy	1384	GWH	90.9	
• Annual secondary energy	637	GWH	32.4	GWH
• Design head unit	98	Meter	102	Meter
• Design flow rate per unit	186	Cubic meters per second	24	Cubic meters per second
• Tailwater elevation of Power Plant	571.5	Meters from the surface	565.3	Meters from the surface

**Water diversion system**

• Position	Left side	
• Number	Two strings	
• inner diameter	9.5	Meter
• Length of the tunnel (first and second)	430 and 530	Meter
• Height and type of upstream cofferdam	38	meters (sand and cement)
• Height and type of downstream cofferdam	15.5	meters (rockfill with clay core)

**Power plant water tunnel and penstock**

• Position	Left side	
• Number	Two streams	
• inner diameter	11.5	Meter
• Length of the tunnel (first and second)	405 and 429	Meter
• Number of branching end of the tunnel	2	Number
• inner diameter penstock	5.5	Meters
• Length of penstock (any branch)	48	Meters

**Dam Profile Spillway**

• Type	Overhead	Gated	
• position	Over body	On the right support	
• The number of spans	4		2
• Dimensions (width × height)	4*16=64	Meter	12.5*15 Meters × meters
• designed flow	3557	cubic meter	5392 Cubic meter
• Maximum flow rate	5445	cubic meter	6432 Cubic meter

**bottom outlet**

• Position	Inside body	
• Number	Two streams	
• Length of duct	30.25	Meter
• Initially duct dimension dimensions (height x width)	4.5*8	Meters * Meters
• Finally duct dimension dimensions (height x width)	3*4	Meters * Meters
• Arc valve dimensions (height x width)	3*4	Meters * Meters
• The position of alignment	597	Meters from the surface
• Design flow rate per channel (at normal level)	374	Cubic meters per second

**Reservoir damage**

• The number of households living in the reservoir area	24	Households
• The population living in the reservoir area	106	Person

3. Journal of Applied Economic Research of Iran, dated 1/05/2015)

**RESULTS OF COST ESTIMATES**

4. The estimated cost of different implementation of Dam and Karun- 2 Power Plant are summarized in Table 2. The basis of cost estimates, price list of dam construction have been undertaken by Plan and Budget Organization since 2016. The cost of purchase, transportation and installation of electromechanical equipment in the Power Plant according to studies and data collection projects implemented or under study in the country is considered. Journal of Applied Economic Research of Iran, dated 1/05/2015)

**PLAN INVESTMENT TERM**

1. The cost of investment required for the Karun-2 Dam and Power Plant according to Table 2 has been estimated 15,956,760 million Rials. According to the schedule of the justification, the construction year has been considered 7 years. The initial investment during the construction period is shown in Figure 6.A comprehensive economic review of hydroelectric plants, second national conference of country power plants, Year 2008, Technical and economic assessment of Great

Table 1. Estimated cost of different implementation of Karun-2 Dam and Power Plant

Total cost (Million Rials)	Cost	Row
1,832,035	Dam body	1
480,206	Sealing and drainage curtain	2
673,897	gated spillway and the right abutment block trust	3
557,208	Submerged pond	4
279,978	upstream cofferdam and downstream cofferdam	5
656,054	diversion tunnel and inlet and outlet structures	6
997,964	Water tunnel on the Power Plant and entrance structure	7
1,137,088	Power Plant building	8
35,623	Construction operation of drainage	9
744,105	access road and Residential- office camp	10
7,394,158	Civil total costs in the first year of 2016	
183,750	Total costs of hydro mechanical equipment	
7,286,350	Total electromechanical cost of Power Plant and drinage	
1,040,498	Engineering services and miscellaneous costs	
15,904,756	Total investment costs	
52,004	reservoir damage costs	
159,048	Operating and annual maintenance costs	
Exchange Rate: 1 US\$ = 35000 Rials (1 to 9)		

Plains salty branch in improving quality of Karun River, the third conference on water management; Year 2008, Economic evaluation algorithm of water transfer projects; the second conference on water resources management; Year 2006, Technical - Economic feasibility studies of power plant projects as a useful strategy In the Power Plant Projects Management; First International Conference on Project Management, Year 2004, Rahmati, Alireza and Nazarian Asghar (1389).

**ECONOMIC EVALUATION PLAN**

In the Feasibility Study of Karun-2 Dam and Power Plant, the economic viability of the project by comparing energy production in hydroelectric power plants with thermal power plant has been done. So in this evaluation, the cost of thermal power plants or hydroelectric power plants as an alternative solution is calculated and considered as an income for the project. According

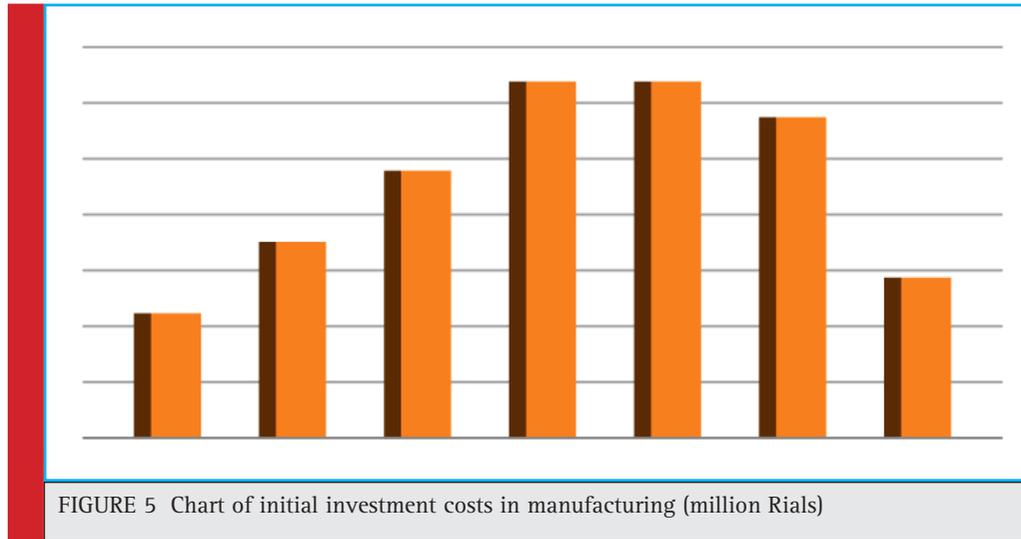


FIGURE 5 Chart of initial investment costs in manufacturing (million Rials)

to Water resources planning studies, amount of power generated by the power plant dam 2 at normal level is provided in Table 3. The installed capacity and estimated costs for thermal power plants of Karun 2 is provided in Table 4. The cost of thermal power plants using technical and economic information of country power plants is calculated. (13 to 21)

In the economic analysis, dam and power plant concession period is considered 50 years. Revenues and costs of the project cash flow chart is shown in Figure 7.

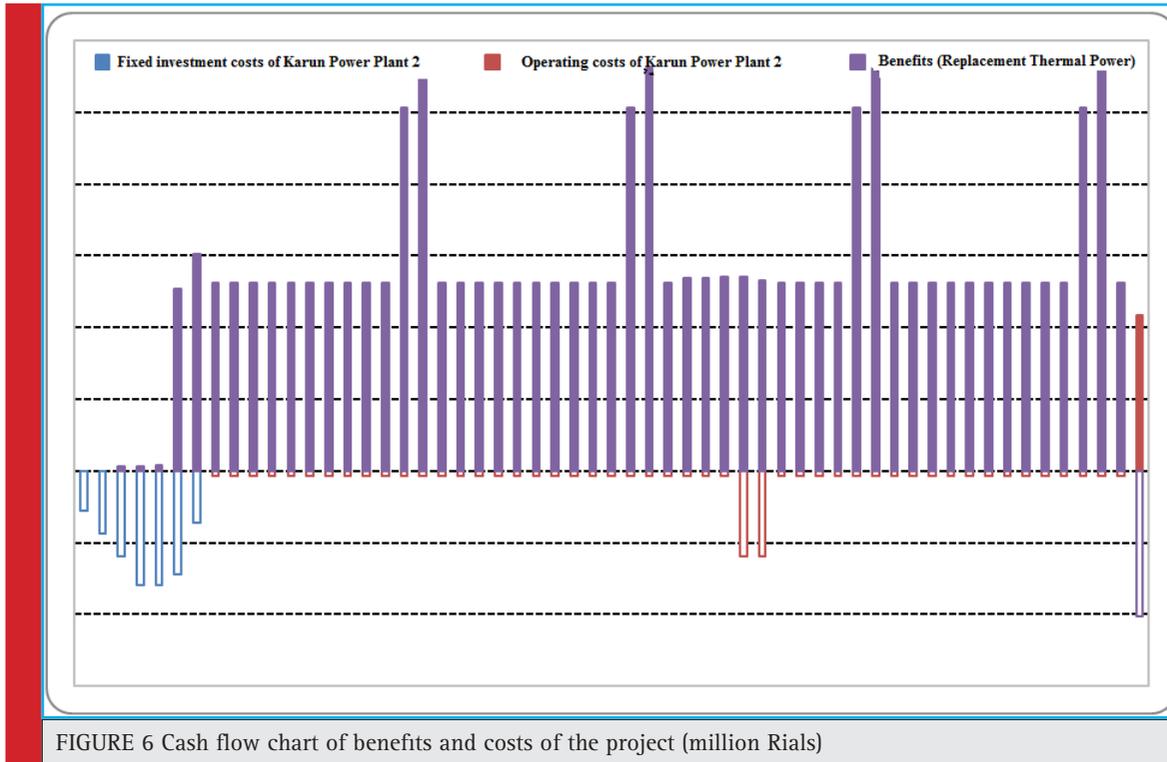
A comprehensive economic review of hydroelectric plants, second national conference of country power plants, Year 2008, Technical and economic assessment of Great Plains salty branch in improving quality of Karun River, the third conference on water management; Year 2008, Economic evaluation algorithm of water transfer projects; the second conference on water resources management; Year 2006, Technical - Economic feasibility studies of power plant projects as a useful strategy In the Power Plant Projects Management; First

Table 2. The amount of energy produced in Karun-2 power plants and the energy change

Generated energy (GWH)		Plant power capacity installation (MW)	Plant power factor	Option
Sustainable	Total			
1384	2021	648	0.25	Karun 2 (main units)
91	123	21	0.659	Karun 2 (small units)
1475	2144			Total

Table 3. estimated costs of thermal power plant for Karun 2

Annual costs (million rials)			Power plant constructn cost (million rial)	Plant power capacity installation (million rial)	Plant power type
environmental Total energy	Fuel	repair and maintenance			
126,737	3,589,510	3,617,850	10,862,109	758	Gaseous
8,366	197,270	198,538	684,288	22	Steam
59,954	1,164,858	1,173,033	0	0	Combined Cycle
195,057	4,951,639	4,989,421	11,546,397	780	Total



International Conference on Project Management, Year 2004).

Figure 7 shows the B / C cash flow which is Benefit ratio to Cost. In the first years due to the construction of 7-year period with the cost of Karun 2 fixed investment is shown in blue color. Following that, exploitation period starts which 20-year has been inserted for repayment of capital in the financial model. In the figure, useful life period of 50 years for hydroelectric power plant is considered which then need to overhaul power plant again. During the exploitation period, costs for power plant are considered which is shown in red color. Benefit from electricity sales after the launch of power plant (after a construction period of 7 years) is specified with purple color. Figure 7 shows sums according to the financial model output in which the parameters as IRR and all other relevant factors in the entire period of construction and operation have been formulated (Safety management in development workshops, Publication No. 447, Deputy of Strategic Planning and monitoring of president ,Health, Safety, Security and Environment Guidelines (HSSE), Iran Water and Power Resources Development Company, Publication No. 55, Technical and General Specifications of construction works (second edition) published by the Management and Planning Organization, 2004, Publication No. 101, Technical and general Specifications of road - the revision of the 2013, Department of country Planning and

Strategic Supervision (Time), Publication No. 415, geometric design code of Iran roads, 2012 Publication No. 234, asphalt pavement code of Iran roads 2012).

### ECONOMIC INDICATORS OF PROJECT

In economic studies, economic indicators based on the preferred option is done and are including benefit-cost ratio (B / C) to determine the economic benefits and costs of the project and the difference of benefit and cost (B-C) to determine the best option among several alternatives. Although there are different techniques for economic evaluation of different options; however, according to the same results, the above criteria as economic parameters were selected. A comprehensive economic review of hydroelectric plants, second national conference of country power plants, Year 2008, Technical and economic assessment of Great Plains salty branch in improving quality of Karun River, the third conference on water management; Year 2008, Economic evaluation algorithm of water transfer projects; the second conference on water resources management; Year 2006, Technical - Economic feasibility studies of power plant projects as a useful strategy In the Power Plant Projects Management; First International Conference on Project Management, Year 2004.

Results of economic evaluation Karun 2 dam is summarized in Table 5.

Table 4. Summary Results of Economic Evaluation Karun-2 Dam and Power Plant

Value	Unit	Index
61,192,892	Milion rials	Present net profit value (NPV)
3.77		Benefit ratio to cost(B/C) (B/C)
26.67%	Persent	Internal Rate (IRR) Return
904	Rials	The cost of energy per Kg watt hours

Given that the cost of per kWh energy is around 904 rials, B / C ratio, the ratio of benefits to costs is above 1 that this represents an effective and justified plan.

Since NPV indicates that the present value of net income (with deduction of costs) is a number more than 3 times the cost of profit investment with internal return rate (IRR) about "27 percent, then by examining the economic feasibility of the project, this plan in the terms of economy is acceptable. (Safety management in development workshops, Publication No. 447, Deputy of Strategic Planning and and monitoring of president ,Health, Safety, Security and Environment Guidelines (HSSE), Iran Water and Power Resources Development Company,Publication No. 55, Technical and General Specifications of construction works (second edition) published by the Management and Planning Organization, 2004,Publication No. 101, Technical and general Specifications of road - the revision of the 2013, Department of country Planning and Strategic Supervision (Time).

## CONCLUSION

According to the water and electricity requirements in the countries and regions, construction of a dam on the Karun River suggest that the plan should be implemented. Every major project anywhere in the world except the profitability and return of investment at the specified time with a bit of difference creates employment and experience for educated and prepared human resources, the culture and incentives for young and improving education that they all the beneficiaries of the project. It also cause financial turnover in the range of plans, cities and villages. Also, the feasibility of projects and big plans presents comprehensive information including economic, technical and financial feasibility for the investor and employer to make careful decisions and give special attention with high sensitivity to the issue that this is carried out for Karun 2. The results indicated that dam construction plans away from poor damages to the environment due to reservoir damage cause enormous amount of productivity. These benefits are supply drinking water, industrial water, electricity, employment

and increased investment. They are not restricted to the main investor of the plan and will increase the financial strength of the region and also meet the needs of the project stakeholders which are one of the main issues in the field of project management knowledge.

## REFERENCES

- A comprehensive economic review of hydroelectric plants, second national conference of country power plants, Year 2008
- Economic assessment of hydroelectric power plants In country reservoir dams; Journal of Applied Economic Research of Iran, dated 1/05/2015
- Engineering Economic book, an economic assessment authoring doctor Mohammad Mehdi Askonezhad
- Economic evaluation algorithm of water transfer projects; the second conference on water resources management; Year 2006
- General technical specifications of the dam in the year 2013
- Health, Safety, Security and Environment Guidelines (HSSE), Iran Water and Power Resources Development Company
- Karun 2 Information Websites moe.gov.ir; dated 20/09/2015
- Karun 2 investment opportunity, Websites moe.gov.ir; dated 20/09/2015
- Karun 2 Total investment forecast, Websites moe.gov.ir; dated 20/09/2015
- Karun 2 investment return rate, Websites moe.gov.ir; dated 20/09/2015
- Master Plan of flood control in floodplain of Dez and Karun river, 25 August 2006
- Publication No. 55, Technical and General Specifications of construction works (second edition) published by the Management and Planning Organization, 2004
- Publication No. 101, Technical and general Specifications of road - the revision of the 2013, Department of country Planning and Strategic Supervision (Time)
- Publication No. 120, Iranian concrete code (ABA) 2000
- Publication No. 126 Iranian concrete code manual (ABA) 2002
- Publication No. 415, geometric design code of Iran roads, 2012
- Publication No. 247, Protection and safety instructions In the dam construction workshops 2002
- Publication No. 234, asphalt pavement code of Iran roads 2012
- Project management according to PMBOK standard
- Publication 682, design manual and construction and operation of dams in 2016
- Rahmati, Alireza and Nazarian Asghar socio-economic and environmental effects of settlements subject to displacement due to dams (Case Study: Upper Gotvand Dam in Karun River), environment studies journal, First Year, Issue 2, Pages 53 to 66.
- Safety management in development workshops, Publication No. 447, Deputy of Strategic Planning and and monitoring of president

## Mahdi Zandi

studies contained in the Water DEZ Consultant Engineering Site

Technical specifications and basic information of dam projects by plan consultants

Technical and economic assessment of Great Plains salty branch in improving quality of Karun River, the third conference on water management; Year 2008

Technical - Economic feasibility studies of power plant projects as a useful strategy In the Power Plant Projects Management; First International Conference on Project Management, Year 2004

upstream activities impact on Arvand River and Karun River water quality; ewrc.sharif.ir

## Content analysis of men's graffiti in toilets of inter-city terminal in Tehran

Abdolreza Bagheri Bonjar<sup>1</sup> and Mohammad Reza Heshmati<sup>2</sup>

<sup>1</sup>Faculty Member of Shahed University

<sup>2</sup>MA Student of Shahed University, Tehran Iran

### ABSTRACT

Graffiti is a social phenomenon that has been observed in ages and shapes and different types of human societies. Although the history of this phenomenon dates back to the caveman era, but a new form that is observed during the Industrial Revolution in Western societies. In fact, when inequalities and discrimination reached its peak, people tried to insert their demands and slogans on the walls to drain their mental pressures as if his demands are not met. According to the type of society and its culture, graffiti has its own style. Objective of this study was to examine the phenomenon of destruction and attitude to graffiti in the toilets and content analysis of graffiti in Men's Toilets intercity terminal in Tehran. Present study was descriptive-exploratory using content analysis. Content analysis research tool was a reversed questionnaire. Findings were analyzed using descriptive statistics using SPSS software. Most of the graffiti was observed in the West Terminal with 297 cases (45%), while the graffiti in the South Terminal was 136 cases (20%) and 114 cases in East Terminal (17%) and 120 cases in Argentina terminal (18%). Most graffiti in toilets 39.7% (265 slogan) were are political and the lowest frequency 1.3% (9 slogan) was advertisement. Also sexuality, 18% (29 cases), numbers and cultivars 10.6% (71 cases) memorabilia 16.9% (113 cases) Ethnicity 2.5% (17 cases) interest in the country and place of residence 2.7% (18 cases) the distortion of 4% (27 cases) satire and profanity 1.8% (12 cases) moral imperatives 2.2% (15 cases) and advertising 1.3% (9 patients) were observed in the toilets.

**KEY WORDS:** GRAFFITI, TOILETS, CONTENT ANALYSIS, TERMINAL

### ARTICLE INFORMATION:

\*Corresponding Author: [dranismoradi@gmail.com](mailto:dranismoradi@gmail.com)

Received 29<sup>th</sup> April, 2017

Accepted after revision 3<sup>rd</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

Increasing human sin, especially the younger generation, not only reflects the feeling of oppression and helplessness, anger, aggression and rioters, it represents the social and prescriptions imposed by external forces, violent and repressive society that instead of considering the attitudes, beliefs, behaviors and patterns of individual, group, class or generation, prescribing attitudes and patterns of them (Mohseni Tabrizi, 2004).

Vandalism is especially for those who live in large cities and densely populated is a tangible and visible and a stark reality phenomenon and yet is inevitable as one of the aspects of social life and mechanization of modern society. In all major cities every day we witness the deliberate destruction and irresponsible behavior and antisocial vandals to destruct what is beautiful and what is belonged everybody. Paintings exhibited in galleries, artefacts and antiques in museums, monuments and religious sites, statues installed in squares, parks and public places, vacant houses, parks and public gardens, street lights, bus seats and Metro, library books, public phones and dozens of other degradation issue are issues that have been damaged by vandalism, (Mohseni, 2004).

Graffiti is one of the vandalism actions that damage to property and the national capital, although the history of this phenomenon dates back to caveman era, but its new form has been observed in the Industrial Revolution in Western societies. In fact, when the inequality and discrimination is increased, people tried to insert their demands and slogans on walls to evacuate their mental stress as if not meet their demands. In Iran also, the first graffiti occurred in the Constitutional era. Of course, these graffiti were mostly political and propaganda than destruction and today's the social and political slogans are replaced by previous graffiti, (Sistani, 1999).

Graffiti can be considered as an effect, which includes a set of phenomena and interpretation of this phenomenon and this phenomenon strongly is influenced by cultural, economic and political conditions of a community and its causes is also different from society to society. The purpose of this study was content analysis of the graffiti in intercity terminal of Tehran. (Including East, West, Argentina and South Terminals) The main objectives of this research are:

## THE MAIN OBJECTIVES

Content analysis of graffiti in the toilets of intercity terminals of Tehran

## SECONDARY OBJECTIVES

1. Determine the maximum amount of graffiti in terminals

2. Examine the concepts inscribed on the wall of Toilets
3. The evaluation of gender issues in Toilets
4. The evaluation of political issues in Toilets
5. Evaluation of memorabilia posted on the wall of Toilets
6. Evaluation of cultivars numbers written on the wall Toilets
7. The highest content of slogans

## REVIEWING LITERATURE

Psychologists or sociologists are not alone sufficient in explaining the causes of human behavior and often bound to narrow, single-cause and theoretical areas and theoretical prejudices. In sociology schools, organizations, social and cultural structures and institutions are accounted as social facts of human behavior and delinquent behaviors are social and knows cultural structures as effect of cultural and social structures, in contrast, psychologists and psychiatrists in particular considered it as the effects of internal rebellious forces.

A group of experts pointed to the interaction between the individual and society in the process of behavior. their approach is much closer to social psychology and individual and society and behavioral trends are involved in interactions in general and insists on the principle that human beings while building community and social realities is under the influence of their own production, and in the words of Ian Taylor, the relationship between man and society at all stages is dialectic and consider it in all stages of the wrong behavior. (Taylor, 1973).

## THE RESULTANT CLARCK'S THEORY

Clarck has tried to presenting a descriptive model of causal-path analysis cluster of social and psychological interaction in the process of its formation vandalistic behavior, (Clarck, 1991). Clarck using social psychological approach noted variables external origin and which one's inner nature as independent variables (cause) that affect delinquent behavior (vandalism). Clarck put a set of variables interacting in eight independent groups as well as relevant regulatory model and displays each group comprising eight variables: The first group of variables is the first experiences of childhood environment and upbringing. The second group presents the role of heredity in the occurrence of abnormal behavior and perverse and the third group is devoted to forming the personality of the offender. Hence Clarck provided in the upper diagram, the group variables 1 to 3, according to the variables that psychologists often rely on them.

For example, early childhood experiences, early environment and upbringing and development of the first conditions and the kind of encouragement, support, inquiries, emotional, and learning punitive discipline from

their parents, the values taught to him during the early stages of socialization. Type the characters that individual forms of aggressive, extroverted and reaction earns and finally genetic and hereditary factors that affect a person's personality and behavior, including factors that are 1 to 3 groups of variables. The fourth group includes those factors, demographic, social and economic such as age, sex, marital status, class and social status, sociology of crime and delinquency is essential for any analysis. This group of factors but factors that are broad opportunities to achieve success and satisfaction in life a person runs. They also established optimal use of the opportunities and the means to achieve cultural objectives and compliance with the rules of social behavior is expected and a photo of his non-compliance of norms and regulations and social criteria to become a social delinquent involved.

The fifth group of variables in a wider context of a sociological analysis of the process of socialization and learning criminal behavior and delinquency notice. In this group, such as the status and current conditions of life that parents control over their children the freedom that the children in their daily activities and affairs. An area in which one lives (residential neighborhood), where he is studying the type of school, playmates and peers type of person, he is a member of both groups and whether the group of criminal groups are considered and finally how to use one of leisure and how to spend it according to the fields of taste, preferences and interests that affect the truth or he is the person's deviant behavior. In Clarck model, the proposed variables in the group 1 to 5, the requirements are intended to provide grounds tendency of a person to delinquency. Groups of 6 to 8 variables in the model variables have been specified that directly on the decision and desire of person in committing crimes such as vandalism effective special goats.

In the six variables that are categorized as critical and events, some of the factors that directly or indirectly affect patients' preference is given to vandalism. Clarck believes that the initial willingness to commit an act of vandalism and mental preparation is likely to be due to a general ill feeling, distress, depression, and anger is odd. This sentiment also turned their conditions, misery and life crises and problems are in the seventh group of variables, the clock of the conditions, situations and special situations calls vandalistic behavior is more likely. For example, poor areas, streets, places no police patrols, dilapidated and abandoned spaces, dark alleys and deserted, empty houses and places where vandalism in their history and finally objects and subjects that have already been destroyed by vandals, are more prone to vandalism and the destruction involved.

Finally, cognitive and perceptual Clarck trends and scenarios and situations on the individual's motivation as the eighth group of related variables raises vandalistic behavior.

Vandalism Clarck says whether the person decides to take action or not depends on whether, how he perceived opportunities in special situations and subsequently action will take action. (Clarck, *ibid* quoted by Mohseni Tabrizi, 2004).

## RESEARCH METHOD

In this study, the content analysis method has also been used. One of the practical methods of social science research, systematic descriptive and quantitative content analysis approach usually gives the content of the communication. Basis on the accurate identification of the subject content analysis, population and sample definition of the categories, criteria and rules by which content data are in the same category, the definition of content units, a system of categories and the reliability and validity of the research questionnaire prepared reverse. (Validity and reliability). Through content analysis can be newspapers, magazines, books, tapes and presentations will be analyzed from a comparative perspective. (Saroukhani, 1998). Bernard Burleson: content analysis technique to describe the objective research revealing connections used regularly and quantity of content. (Motamed Nejad, 1976).

## STATISTICAL SOCIETY

Society, real or imagined, which consists of all members are interested to extend our findings to them, (Delavar 1995) In other words, society is a group of people, objects or events with at least one trait or characteristic in common. (Delavar 2001) Statistical society the original population from which the sample is obtained or views or reagents. (Saroukhani 1993) In present study statistical society consisted of all toilets men's available in four terminal East, West, and South and Argentina.

## SAMPLING

Sampling means that the number of people, events and objects of a defined society as representative of the society. In other words, the choice of sampling percent of a Society to represent the community.

When we gathered information about the society we take that two ways:

1. The use of census method.
2. The use of sampling method

Census, i.e. Statistical society of the method of measuring everyone...

Census is used when a limited and specified Statistical society, but in communities where unlimited and uncountable, sampling should be used. (Goudarzi 2008)

In this study, a census method was used, which means that the toilets men's four terminals (East-West-Argentina and South) fully investigated.

## RELIABILITY IN CONTENT ANALYSIS

Reliability exists when repeated measurements of a phenomenon decisions or reach similar results. The reliability between coders the level of agreement between coders separate the coding units are encoded content refers Tool. If you do not see results of reliability between coders a source of error in coding guidelines, defining categories, the unit of analysis, or a combination of these factors there, (Wimmer and Dominique 2005).

1. by the same authors intervals
2. by other researchers

### Reliability table

Validity	Secondary coding	Initial coding
+	60	80

## VALIDITY

The order of the validity of a study, the accuracy of indicators and criteria that have been developed in a way to measure the phenomenon. Credit Research in content analysis can be identified in the following ways to increase the accuracy of the results:

1. The content validity or nominal
2. Prognostic validity
3. Symmetric validity
4. Instruments validity.

“The content validity” under the name of “face validity” also is used frequently backing content analysis; for example, if the goal is merely described researcher, is sufficient content validity (Dewas 2003). The experts agreed on an index or a criterion of content validity or nominal known. Face validity of the agreement can be due to several specialists, he said. In this study, the credibility of the experts who have worked in this field has been measured.

## CATEGORIZATION

In a content analysis categories and set the stage categorization system, and thus the research is subject to specific instructions to select a category. Usually choose categories or relying on a standardized format that the idea of the plan is derived, is carried out, or researcher there is evidence that the context and similarities that can be seen among other issues, categories chooses.

Due to the multiplicity and variety of themes and concepts related to the theoretical fundamentals and the absence of a standard framework for categorizing system, content of each of the toilets was revised and sent all the slogans notes and the implications of each of the toilets separately was taking notes and a total of 10 categories slogans written in this four terminal was encrypted. Based on the similarities that existed between

the themes, first 31 variables were explored using pilot study and then these variables divided in ten categories and each of the categories were in his class and was trying to determine the precise definitions and boundaries, objectivity and regulatory conditions be met.

In the present study ‘content’ as the unit of analysis was considered. “The order of the content of a particular message from the sender that the message is” (Sarookhani, 2006) Theme, assertion affirmation, or proposition, on the Subject. The theme can be linked with a sentence or a paragraph. For example, when a specific theme is repeated three or four times in one paragraph, is taken into account only once, however, if in one paragraph there are two or three different themes each one of them once count. (De Verzhue, 1996). Graffiti content analysis techniques used in order to collect technical information questionnaire. This descriptive study based on content analysis technique of reverse questionnaire<sup>(1)</sup> in information collected is used. The unit of analysis in this study is its toilets. Spss statistical software to drag tables one and two-dimensional and excel in connection with any of the variables.

**Graffiti:** the images or letters used on surfaces such as walls or bridges in public areas that are visible to the public, it is said. (Kosari, 2009)

**Sexuality:** whatever is sexual matters related to sexual acts?

**Political issues:** what about the state, the government, or the attitude of the people to the government with all its components

**Ethnocentrism:** a common conceptual model whereby every person’s own culture is considered as the best culture in the world and from the perspective of her internalized social values to the referee deals with other social values. In other words, ethnocentrism is a trend often invisible unwarrantable person for value judgments about other cultures and societies, (Nik Gohar, 2001).

**Advertise:** In the simplest definition of propaganda by doctor Daniel “Estorich” is presented. He believes advertisement display that is spread by a certain person or an institution, and its purpose is to influence the opinions and actions of people. (Tajari, 2006).

**Picture:** what is the value in the mirrors or mirror what processes similar representation, reflected. Therefore, second thing that the echo image or representation of “truth” or “reality” is different. (Culture Dehkhoda).

**Smut:** smut literally means humor (humor) and is rant, but in terms of literature, the poetry or short story and is something to be said for fun few people enjoy it. The purpose of addressing smut, which sometimes outside the boundaries of ethics and literature are only trivial and ephemeral entertainment. (Smut like headless stories and jokes empty today as the common people) (Azimi, 2001).

**Profanity:** cursing, bad words, what is worthy and not worthy (adjective)

1. Unfit abusive disqualified 2. Immodest ghoulish collectors: profanity profanity (the height.) versus deserved reward 3. Work badly wrong (Dehkhoda).

**Homeland:** accommodation person and where it was born, homeland, origin

1. (Infinitive) living in somewhere. 2. Stay somewhere. 3. (Poison) rather than stay accommodation. (Dictionary Dehkhoda).

**Numbers:** Numbers, the sum (culture Dehkhoda)

**Advertise:** deliver, deliver or affirmation messages, message or report delivery (infinitive) to deliver (the message affirmation contents to the public) notification. 2. Subject to the news release (founded newspapers such as radio and television, etc.) in the public mind the rampant off. Total: Advertising (culture Dehkhoda)

**Memento:** (noun) 1. Whatever is the memorial and memorial. 2. Anything that day as a memorial gift favoritism. 3. Whatever is written on the walls or on the carving of trees. Or memento writing. Write a sentence or a poem on the land and buildings at the office with someone. (Culture Dehkhoda)

**Defaced:** scratched, damaged (noun) 1. Scratched scratched. 2 - Has been tempted. 3 - Occupied (a written sentences and phrases) (Culture Dehkhoda)

### OPERATIONAL DEFINITIONS OF VARIABLES

The images of women and men	Sexual topics
Image of male and female sexual organs	
Expressed as illicit sexual relations	
Slogans against the government	Political topics
Slogans against government entities	
Time	Numbers
Date	
phone number	
Days of the Week	
Miscellaneous	Memories
Signature	
Type Names	
Individual	
Collective	
The combination of a relic of history -memories by Symbol	Advertisement
Fitness-advertising advertising for Gold quest	
Ethnicity	Ethnic
Rejecting Ethnicity Other	
Satire	Satire
Interest in the city	Home land
Interest in the neighborhood	

### ANALYSIS

Information the above table shows that most graffiti of 45% (297 cases) belong to the West Terminal graffiti least 17% (114 cases) belong to the East Terminal.

Information the above table shows, the highest posts in the toilets terminals 39.7% (265) had the lowest frequency political 1.3% (9 cases) have been reserved for advertising.

Information the above table shows, the highest percentage of existing political slogans in toilets 65.9% (172 cases) includes slogans against the government and the lowest percentage of persons 35.1% (93 cases) against the government.

Information the above show that the highest percentage of sexual slogans in toilets 65% (78 cases) of sexual slogan and the lowest percentage of 5.8% (7 cases) also has the images of women and men. Male and female

Table 1. Frequency distribution of sample society based on the number of graffiti

Percent	Frequency	
45	297	West
17	114	East
20	136	South
18	120	Argentina
100	667	Total

Table 2. Distribution of sample society according to the type of posts available in four terminal

Frequency	Percent	
265	39.7	Political
120	18.0	Sexual
71	10.6	Number
113	16.9	Memories
17	2.5	Ethnic
18	2.7	Interest to home land and resident
27	4.0	Scratched cases
12	1.8	Satire
15	2.2	Moral orders
9	1.3	Advertisement
667	100.0	Total

Table 3. Distribution of sample society in terms of political rhetoric in the four terminal

Percent	Frequency	
64.9	172	Against government entities
35.1	93	Against government
100.0	265	Total

sexual organs as well as pictures of 29.2% (35 cases) has accounted.

Information the above table shows that most of the figures in the toilets 66.2% (47 cases), telephones and lowest percentage of 4.2% (3 cases) was also mentioned during the week.

Information the above table shows that the highest percentage of memento in the toilets (about 62.54%) are signatures with the combination of name and date and the lowest 15% (17 cases) was also signature.

Information the above show that the highest percentage of ethnic issues in toilets 82.4% (14%) was negation of other ethnicity and the lowest percentage of 17.6% (3 cases) is also proud to ethnicity.

Information the above show that the highest percentage of patriotism in toilets 77.8% (14) were related to the city and the lowest percentage of 22.2% (4 cases) was also related to the neighborhood.

Information the above table shows that the highest percentage of distortion cases in the toilets 81.5% (22 cases) were entries Stripe and the lowest percentage of 18.5% (5 cases) have been Stripe.

Table 4. Distribution of sample society in terms of gender issues in the four terminal

Frequency	Percent	
7	5.8	The images of women and men
35	29.2	Images of male and female sexual organs
78	65.0	Sexual slogan
120	100.0	Total

Table 5. distribution of sample society according to the figures available in four terminal

Percent	Frequency	numbers
66.2	47	phone number
23.9	17	Date
4.2	3	Week
5.6	4	Miscellaneous
100.0	71	Total

Table 6. Society distribution according to the amount of memento available in four terminal

Frequency	Percent	
15.0	17	Signature
30.1	34	Names
54.9	62	Signed by a combination of name and date
100.0	113	Total

Table 7. distribution of sample according to ethnic issues in four terminals

Percent	Frequency	Ethnic minorities
17.6	3	Proud to ethnicity
82.4	14	Other Ethnicity rejection
100.0	17	Total

Table 8. the distribution of the sample in terms of patriotism in four terminals

Frequency	Percent	
77.8	14	Town
22.2	4	Neighborhood
100.0	18	Total

Table 9. Distribution of sample according to the distortion of the four terminals

Frequency	Percent	Defaced cases
18.5	5	Stripe
81.5	22	Stripe Posted
100.0	27	Total

Table 10. Distribution of sample in terms of advertising in the four terminals

Percent	Frequency	Advertisement
77.8	7	Advertisement for teams
22.2	2	Commercial advertisement
100.0	9	Total

Information the above show that 77.8% (7 cases) were related to advertising for teams and 22.2% (2 cases) were related to commercials advertising.

Information the above show that 100% (15 cases) indicators related to messages in all four terminals were moral messages.

Information the above show that 100% (12 cases) was smut and invective.

Table 11. Distribution of sample according to the moral messages in four terminals

Frequency	Percent	Moral messages
100.0	15	Moral messages
100.0	15	Total

Table 12. Distribution of sample in terms of smut and invective in four terminals

Frequency	Percent	Satire
100.0	12	Satire
100	12	Total

## AN OVERVIEW OF THE RESEARCH FINDINGS

### 1. Most graffiti is related to which terminal?

Findings of this research suggest that the most graffiti and slogans were related to West Terminal with 297 cases (45%), while this ratio was 136 cases in the South Terminal (20%) and 114 cases in East Terminal (17%) and 120 cases in Argentina terminal (18%).

### 2. What concepts written on the walls of toilets?

In connection with the concepts written on the walls of toilets, following concepts were discovered:

1. Political issues (antigovernment slogans and against government entities)
2. Sexual matters (the images of women and men, the image of male and female sexual organs, the expression for illicit sexual relations)
3. Figures (time, date, phone numbers, days of the week, miscellaneous matters)
4. Memento (signature, name, individual, collective, combined with the history of the memento - memento by Symbol)
5. advertisements (Fitness-Advertising of Gold Quest)
6. Ethnicity (ethnocentrism, rejection of other ethnicity)
7. Smut and profanity
8. Homeland (love the city, love the neighborhood)

### 3. Where the situation of figures in graffiti?

Out of 667 slogans (10.6%), 71 cases were related to figures and the largest percentage of numbers and figures on toilets 66.2% (47 cases) were telephones, and the lowest numbers 4.2% (3 cases) were date and 23.9 % (17 cases) were miscellaneous matters 4.6% (5.6).

### 4. Amount of sexual slogans written on the walls in the toilets?

There is a motto that the total 667 120 cases (18%) and the highest percentage of sexual problems sexuality 65% (78 cases), sexual slogans, and the lowest 5.8% (7 cases) the images of men and women, as well as 29.2 % (35 cases) were also images of the sexual organs of men and women.

### 5. Amount of political slogans written on the walls of public toilets is how much?

There is slogan that 265 of 667 (39.7%) belong to political issues and political matters largest percentage of 64.9% (172 cases) slogans against government entities, and least 35.1% (93 cases) against the government.

### 6. Amount of memorabilia on the walls of public toilets what is written?

A total of 667 slogans that there are 113 cases (16.9%) belong to the memento and the highest percentage of

memento 15% (62 cases) signed, and the lowest rate of 15% (17 cases) signed and 30.1% (34 cases) had been the names.

### 7. Most contain slogans or themes?

The results indicate that most writings in the toilets terminals 39.7% (265 cases) had the lowest frequency political 1.3% (9 slogan) is owned by advertising. Also sexuality 18% (29 cases), numbers, 10.6% (71 cases), Guestbook 16.9% (113 cases), ethnicity 2.5% (17 cases), interest in homeland and condo 2.7% (18 cases), the distorted 4% (27 cases), smut and profanity 1.8% (12 cases), smut and profanity 1.8% (12 cases), moral commands 2.2% (15 cases) and advertising 1.3% (9 patients) to be allocated.

## RESEARCH LIMITATIONS

Surely, anything is associated with problems. Therefore, this project has not been free of problems and limitations directly or indirectly involved in the research. However, it seems necessary to mention the following:

1. lack of familiarity of respondents with the culture of research and probably not the right answer to a question from them
2. Limit the investigation to the geographical area identified due to lack of facilities
3. Do not use combined research methods
4. Toilets despite the difficulty of entering the huge crowds
5. Not having the necessary means to carry out extensive research
6. Financial constraints and expensive costs
7. The survey is limited to Tehran.

## RECOMMENDATIONS

Graffiti can be like any other social question manifestation of lack of balance between, disorganization, lack of proper functioning of some of the relevant institutions in society. If social problems such as illness in our society, in this case, solutions and recommendations can be offered to solve it.

1. Purpose of that policy officials and senior managers of major adverse and society, to reform social structures, the production and reproduction of violence, vandalism and hooliganism in general and specifically involved. The most important of these strategies and policies include:
2. importance of the role of family and education: Since the two institutions play an important role in the development of personality, basic planning for the operation of attention and

- positive part in shaping the character of these two institutions, important role in the causation and prevention of social deviance, such as vandalism there and given that the majority of the population of young people are formed and their problems will be given special attention.
3. Given that the adolescents and young adults age appropriate, high emotional force, discharge ducts emotional energy necessary for them to be provided. Also basic planning for celebrations of joy and Youth, the youth collective behaviors necessary to improve them. In total, providing suitable conditions for releasing the emotional power of these forces prevent condensation.
  4. Broadcasts joy and celebration can help to discharge aggressive and emotional forces.
  5. Promoting awareness among youth on how to choose a friend and informing parents to control their youth and their relations with their friends.
  6. Use the minimum possible in order to carry out competitions in various fields of sports, science and faith can be effective to satisfy need for independence and effectiveness of youth is healthy and reduce the occurrence of abnormal forms and self-expression
  7. creating grounds for public participation in solving the problem of vandalism, for example, in Sweden, students in schools and public places invited during which the cleaning equipment.
  8. Training Advertising: Attention to the Education and Propaganda, on the subject of vandalism is another solution to solve the social problem in some countries.
  9. given the effect of religious commitment on abnormalities, it is necessary for families to strength their relationship with the school and mass media including radio, television, cinema, newspapers and publications through messages in the thinking and behavior of individuals in the society. If messages from the media inclined towards religious values society, it can be effective in the religious education of the young generation.
  10. Strengthen resources, especially science fiction books and books on youth issues.
  11. observing strength and suitable physical form (in terms of degradation, equipment, facilities and public places
  12. optimizing environmental conditions: Due to the construction of property and construction of aesthetics in public places (in many ways) and improvement and beautification of the environment, discourage vandals handling vandalism and can be applied as a solution to deal with vandalism.
  13. Install wall or whiteboard paper written for the people in toilets
  14. Create social and political participation of the people and obtain their trust in the political system.
  15. Provide the necessary measures to reduce the sense of relative deprivation in the community.
  16. The protection of property of public training through the mass media
  17. Increasing the religious beliefs in order to boost the morale of the fight against waste, the culture of consumption and destruction
  18. content analysis of graffiti in the buses of Azadi Terminal
  19. The content analysis of the slogans that is written in the car as a case study in Tehran and city
  20. Compare the concepts of graffiti in the toilets in Tehran and small towns

## REFERENCES

- Buck, A. J. Hakim, S. , & Rengert, G. F. (1993). Burglar alarms and the choice behavior of burglars: A suburban phenomenon. *Journal of Criminal Justice*, 21(5)
- Cohen(1971) la deviance, gemblox, duclot,
- Cohen, S. (1973). Property destruction: Motives and meanings. In C. Ward (Ed.)
- Delavar, Ali (1995) theoretical and practical training in the humanities and social growth Press, third edition.
- Delavar, Ali (1997) Research Methods in Psychology and Education, First Edition, Tehran: Virayesh Publication.
- De-SDI (1997) survey on social research, translation by Houshang Nayebi, Publication of Fi, Tehran
- Hjelle L, Ziegler DG (1992). Personality theories: Basic assumptions research and applications. McGraw Hill, ed 3.
- Kosari, Masoud (2007) graphite and protest culture, *Journal of Cultural Studies*
- Maghsoudi, Soudeh. Bani Fatemeh Zahra (2003) content analysis graffiti in classrooms School of Kerman, article published in the University Jihad
- Mohseni T. et al (2001) A survey of knowledge, attitudes and cultural and social behaviors in Tehran, *mirror Research*, Tehran, Institute of Culture, Art and Communication
- Mohseni Tabrizi, Ali Reza (1991) alienation, a social sciences Volume 2. (2), Tehran University Press
- Mohseni Tabrizi, Ali Reza (2004) On vandalism University publications
- Mohseni Tabrizi, Alireza (1987) theoretical principles vandalism, social sciences, No. 7.
- Mohseni Tabrizi, Alireza (1995) Evaluation of vandalism in Tehran, Institute for Social Studies and Research, Tehran University, Tehran.
- Mohseni, Manouchehr (2007) sociology of deviance, publication of Tahoori

Mrton,R,H (1976),,Theoretical sociology, N.Y: the free press

Nikolaenko, N. N. , Formation of the Inner Lexi\_ con in the 7-10\_Year Old Children, *Dokl. RAN*

Rafipour, F. (1998) anomie or social disorganization, Soroush Publications, First Edition.

Rafipour, Faramarz (1997) Development and conflict, Shahid Beheshti University, publication of Faram

Sarmad, Zohreh and others (1999) behavioral science research methods, Tehran: Agah, Third Edition

Sistani, Leila (1999) graffiti in classes of Kerman Islamic Azad University academic thesis for a bachelor's degree, academic year 1998-1999

Zanjani, Aboutaleb (2001) "The alchemy of happiness" scholarly publishing

## Studying the effects of cooperative learning on development of social skills of grade 2 girl students of Ardabil high schools

Hamideh Faraji Niri

### ABSTRACT

The present research was carried out with the purpose of determining the role of cooperative learning method on development of social skills of the students. Quasi test method with pretest-post test with control and test groups was used in this research. The test group was taught with cooperative learning method and control group did not receive and variables. Statistical society was grade 2 girl students randomly and 25 students were selected randomly as a test group and 25 students selected randomly as a control group and answered to questionnaire of Matson, Ratatori and Helcel social skill measurement. Based on findings of this research we can conclude that teaching with cooperative learning method has effect on development of social skills of students and responsibility, respect to others, group activity, and friend finding skills and improves these elements. Therefore, this research proposes using social patterns such as cooperative learning method for improving social skills.

**KEY WORDS:** SOCIAL SKILL, COOPERATIVE LEARNING RESPONSIBILITY, RESPECT TO OTHERS

### INTRODUCTION

Today, learning structure is in threshold of historical revolution and separation from current condition due to passing from modernism stage. Learning system needs to review teaching and learning process due to the necessity of adaptation with variations which we observe in all areas, because using traditional methods such as mere lecture, don't provide needed fields for social

developments and personality of students and educating in active students dependent on memories cannot prepare them for future complex world. In traditional methods, the teachers are often speakers and expect students to listen to them. Group discussion has not suitable position in classroom and of a question is asked, it does not make the students think about lesson materials, the main purpose is that the students are prepared for the test, (Sepehrian Azar, 2016).

#### ARTICLE INFORMATION:

\*Corresponding Author: [mmohammadnuri@icloud.com](mailto:mmohammadnuri@icloud.com)

Received 1<sup>st</sup> May, 2017

Accepted after revision 10<sup>th</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

Tiwari believes that according to educational specialists, the students who learn by using active learning method, not only learn better but also they enjoy the learning more, because they cooperate actively in learning instead of being mere listeners and consider themselves as responsible for their learning (Tiwari, 2008). Shafer (2008) says "of active methods which has attracted the attention of educational specialists, is cooperative learning". Research evidences indicate that most of problems which are in traditional and inactive method are limited in cooperative approach (Shafer, 2008).

The studies related to cooperative learning began since 1970 and providing the models which were applicable in 1980 decade attracted most of specialists (Karamati, 2006). Roger and Avid Johnson, Robert Slavin, Nil Davidson and Spencer Kagan are of the most famous specialists of this group (Joice, Vil, Kalhon 2014). Johnson and Johnson (1997) and Slavin (2002) believe that when the success of the student depends of help and cooperation of the members of the group. They act more cooperatively. This cooperation in activities can lead to social development of the students, because one of the social development elements is school and learning method of the students.

Active learner has a specific position in educational discussion. Based on educational specialists, the student, who learn by using an active learning method, they not only learn better, but also they enjoy the learning more, because they cooperate actively in learning process and consider themselves responsible for their learning instead of being mere listeners (Gardner, Jewler & Barefoot, 2010). In cooperative activities, the learner keeps his/her independence and get more positive relations with their counterparts and higher scientific success. In such classes, the purposes have been programmed based on success and the learner is aware of priorities and values which exercised by the teacher and social pressure on classroom environment. Such structured classes effects on exiting conditions of the student (Pritchard and Woolard, 2014).

Active approaches of learning indicate that instinct features of the human being, prepare him/her for active tackling with social and physical environment. Based on these approaches, the human being is an active a creature and interested in learning and internalizing the knowledge. These instinct and innate willing to searching and learning knowledge can be an important means for directing learning and development of human personality is social dimension. Social dimension of development and preparing of children for cooperating with others has attracted the attention of the educators. The researches of sociologists and developing educational sociology at school and attention of the teachers to social dimension of education in this field have had spe-

cific effects. One of the important measures in selecting lesson materials, organizing the materials, determining educational purposes, adopting suitable methods in teaching is measuring the progress of students and social development dimension (Shariatmadari 2010).

Matson, Matson & Rivert (2007) consider skills of using suitable communication methods for treating with probable conflicts and adabation with social environment as social skill. These social skills are collection of purposeful interrelated and suitable with conditions which are learnable and under control of the person (Hargie 2012) and have deep effect on nature of interaction with others (Segrin & Taylor, 2014). Cooperation with others, helping, beginner of a relationship, asking help, praising others, thanking and appreciating are samples of social skills (Garsham and Elliot, 2015).

Due to necessity of having social skills, especially for adolescence and young ages which face them with a variety of situations, the role of schools and teachers is been clear a person who studies not only he/she must make use of his/her scientific knowledge, but also he must act his/her social duties and know which action is suitable and unsuitable in social relation in specific conditions (Livarjani, Golmohammadnejad and Shahanagi, 2014). The studies have indicated that cooperative learning have positive effects on increasing and developing social skills (Sepehrian Azar, 2016).

Nevertheless, less attention has been paid to the effect of cooperative learning on social skills of the students, which this research is done by the purpose of studying this matter in order to clarify the efficiency of cooperative learning methods in addition to other elements such as educational progress, self-esteem and etc in developing social skills of the students. It is hoped that the results of this research provide the awareness of programmers and educational authorities and the parents for learning social skills to the students so that they can be successful in playing the role of citizenship in the society.

## LITERATURE

### COOPERATIVE LEARNING METHOD

Among different teaching and learning methods, which have been proposed by the specialists, the cooperative learning method seems more effective than other methods and has more research support. Slavin (1991) Considers the cooperative method as a means for supporting thinking skills and promoting the level of learning, a substitution for grouping the students based on their abilities and a means for improving the relations of different race students and preparing them for playing a role in group activities. The origin of cooperative learning, is the definition of cooperation (Kagan, 1990).

He considers Cooperative situation as a situation that every person can reach the aim when all of the individuals reach their aim. He believed that cooperative interactions make the participants have a clear experience of common interests and trings, equal distribution of power, trust and truthfulness. In fact Arensone et al (1997), presented a technique, division of a matter into different parts for presenting a practical pattern of a cooperative situation in learning by using his definition about cooperative situation. The nature of this technique is that, it requires the students to work together, teach one another, and be dependent to one another to reach their aims, In this model, the students are placed in 5 or 6 member group and each student takes the responsibility of teaching a specific part of daily lesson to other members of the group. In this technique, each student has only one specific part of the lesson and other students don't have that information, therefore it makes dependency in the group.

The students are dominated on the discussion related to themselves and discuss about teaching that part to other members of their groups and probable questions which the members of the group may ask them. In cooperative learning, the teacher is a facilitator instead of presenting the lesson and cooperates with the students in teaching and learning process and each student must have an active cooperation instead of being dependent on the teacher in actively cooperative learning pattern has had a variety of changes during the two recent decades by using the results of different researches for development and has been divided into different branches which each one has specific use. It must paid attention that, doing different techniques of cooperative learning is not simple as it is said in theory, it may face with difficulties.

## CHALLENGES OF COOPERATIVE LEARNING

One of the problems is different understanding which each of the teachers have about cooperative learning based on their attitudes and their backgrounds. For example, some of the teachers consider the cooperative learning as a suitable alternative for severe controlling the classroom by the teacher and some of the teachers consider the cooperative learning as a solving problem for making social interactions and friendship among the students. The other problem is that all of the students don't adapt with a cooperative structure easily and some of them because of having several years experiences participation on traditional and competitive classes, they prefer to learn alone and some of the cooperative student compete and make disorders. The other problem which Jefner et.al (1978) consider for using cooperative method, is that controlling the class traditionally is easier than cooperatively and maybe some teachers may

not have any motivation for using cooperative learning, although, it is clear that all of above problems are not insolvable and the aware and interested and aware of cooperative learning methods can overcome with these problems easily.

### The effects of using cooperative learning.

1. Learning new techniques and strategies from their classmates (Hand, 1990)
2. Improving critical thin king in the students (Davidson,1992)
3. Empowering sense of responsibility of the students for his learning and the others (Bromes,1995).
4. Empowering positive attitudes of the students toward science and knowledge (Ronald,1997).
5. Empowering self-directed skills of the students (Ronald,1997)
6. Empowering assiduity of the students for solving the lesson problems (Ronald,1997).
7. Empowering verbal, relational, and social skills of the students (Fari,1999).
8. Empowering creative and intelligent behaviors of the students (Farl,1999).
9. Increasing educational progress of all the students (Harid,2000).

### 4-1-Four techniques of cooperative learning.

1. Group studying with group reward for individual learning:  
In this method, the students work as a group and the reward is given to the group, but the Group reward is based on the mean scores which the students gain.
2. Group studying with group reward for group out put:  
In this method, the students work as a group and produce a common product and the reward is given to the group without paying attention to the rate of work of each student.
3. Group studying with individual reward: The students learn in different groups cooperatively, but their reward is not as a group. In the end of all students studies, the reward is given to a limited numbers of them based on the scores they obtain.
4. Specialty in group homework or reward for individual learning (The technique of dividing a subject into different parts): Each student in an incongruent group, has a specific subject that he or she must obtain specialty. The students who have one subject (each student from each group takes part in a specific discussion in specialty group and discusses his or her subject, then teaches the things he or she has learned in the specialty group, to his or her group. At last all of the students are tested

about all subjects of the test, the reward is given to a group based on mean scores of the students.

There are not many background about cooperative and social skills. The result of a study about comparing cooperative and traditional learning indicated that cooperative learning increases self esteem, rate of focus on homework, enjoying the class, school and love to learning and decreases the dependency on the teacher (Garsham and Elliot, 2015).

Johnson and et.al (2007) point to 16.4 studies about social and cooperative learning which about 28% of them have been done since 1990. The rest of them since 1970 and all levels of education (46% in primary level, 20% in high school, 11% in higher education, 24% in adults). These researches have been carried out in north America, Europe, middle east, Asia, and Africa. In relation to measuring the effectiveness of Cooperative learning some researches have proposed some methods.

Ten of them which are considerable are complex instruction (Cohen, 1994), constructive controversy (Johnson and Johnson, 1979) cooperative integrated reading and composition, (Steven, Hadden, Slavin, Farnish, 1986), cooperative, learning structures, (Kagen, 1985), group discovery (Sharan and Sharan, 1992), Jigsaw (Aronson and et.al. 1978), learning together (Johnson and Johnson, 1974, 1999), student teams achievement divisions (Slavin, 1978),

Teams-games tournaments (De vries, Ed words, 1974), and team accelerated instruction (Slavin, Madden and Leavey, 1986, Johnson and Johnson, 2000). In Tilestons (2016) study, the effect of three approaches of structured cooperative learning non structured cooperative learning and individual learning on social skill of the primary school students, it was indicated that the social skill of the students in structured cooperative condition, is 50% more than in individual condition.

There are a few researches about cooperative learning in Iran.

Hervi Karimoy, Jadid Milani, and Rezheh (2010), carried out a research, the effect of lecturing teaching and group discussion methods on rate of nurse student learning in society health by quasi test method had been done in 49 nurse students that 24 people with group discussion and 25 people with lecturing method during 16 sessions of 105 minutes, the results indicated that the rate of learning has been increased in both of methods significantly, but the rate of learning in group discussion was more than lecturing method.

Fahami and Ezzati (2011) carried out a research, "The effect of cooperative learning on social skills of girl students of grade 5 primary school" about elements such as respect to others, responsibility, friend finding and cooperation in group activities with quasi-test method

on 320 students. The results of the research indicated that cooperative learning had significant effect on social skill development.

Shekari (2014) in a research, "the effect of cooperative learning on social skills of the students" selected 10 boy students from two classes of a school randomly. He used cooperative learning method in one group and traditional learning method in the other group. He used social skill development test of matson for collecting data. The results indicated that there was a significant difference between the two groups in suitable social skill development.

Jafari Sani et al (2016) in a research, "the effect of discussion group learning on social skills in primary school students with quasi test method by pretest post test with control and test group, indicated that teaching by using group discussion teaching method had effect on social skill development of the students and suitable social skills, non social behavior, aggression, and concussive behavior, priority, having more confidence and relation with their classmates and improved these elements.

## RESEARCH METHODS

This quasi experimental research has been carried out in grade 2 girl students of Ardabil high schools who were studying in 2016-2017 educational year. Non profitable and Shahed high schools were not included in this research. Among governmental high schools, girl high school, and 180 grade 2 classes (totally 2064 students), two classes selected as statistical sample including 50 grade 2 high school students randomly. One class including 25 students was taught by cooperative learning as a test group for 6 sessions, the other class including 25 students was taught by traditional and inactive method as a control group. Pre test and post test were taken of the two groups.

Pretest was carried out before exercising treatment variables and post test was carried out after the experiment. Social skill development test of Matson was used for collecting data. Since fast gathering data was not possible by observation method, social skill development questionnaire of Matson was used in this research. Matson, Ratory and Helcel created this measure for 4-18 years old people. The primary form of this measure included 62 expressions which its reliability and validity were studied by Khayyer and Yousefi (2002) in Iranian culture and decreased to 56 expressions. Answering was based on 5 grade likes (variation of 1 (never) to 5 (always)).

This questionnaire was given to the related specialists in order to study its content validity after translation and its content validity was verified. Factor analysis was used for determine structural validity which Khayyer and Yousefi (2004) had evaluated its validity acceptable.

Alpha Cronbach and half dividing were used for measuring reliability of this measure which was equal, 0.86 for all of the measure. In addition, the domain of reliability coefficient in mini measures was between 0.34-0.81 and half dividing coefficient was between 0.49-0.78. The results indicated the suitable reliability and validity and acceptability of this measure for measuring social skills of Iranian adolescents (Khayyer and Yousefi, 2004). Reliability coefficient with alpha Cronbach was 0.83 in pretest and 0.92 in posttest.

## RESULTS AND DISCUSSION

Descriptive statistic methods (mean scores, standard deviation) and inductive statistic methods (variance analysis test by repeated measurement) based on SPSS21 software were used in data analysis. Main hypothesis: Cooperative learning has effect on social skills of grade 2 girl students of Ardabil high schools.

Table 1 indicates that calculated T which is 5.67 with 49 Freedom level and 0.001 probable level is bigger than T of table. In other world cooperative learning method increases social skill development of grade 2 girl students of Ardabil high schools.

Therefore, by verifying main hypothesis, it can be said that the resulted progress has been due to doing

cooperative learning method. First hypothesis: Cooperative learning has effect on responsibility of grade 2 girl students of Ardabil high schools.

Table 2 shows that calculated T which is 2.96 with 49 Freedom level and 0.05 probable level is bigger than T of table, in other words, cooperative learning method increases suitable responsibility development in grade 2 girl students of Ardabil high schools. Therefore by verifying the main hypothesis, it can be said that the resulted progress has been due to doing cooperative learning method.

Second hypothesis: Cooperative learning has effect on respecting to others in grade 2 girl students of Ardabil high schools.

Table 3 shows that calculated T which is 3.75 with 49 Freedom level and 0.001 probable level is bigger than T of table. In other words, cooperative learning method increases respecting to other development in grade 2 girl students of Ardabil high schools.

Therefore by verifying the main hypothesis it can be said that the resulted progress has been due to doing cooperative learning method.

Third hypothesis: Cooperative learning has effect on friend finding skill in girl-students of Ardabil high school.

Table 4 shows that calculated T which is 6.68 with 49 freedom level and 0.0001 probable level is bigger

Table 1. T test for comparing social skill of test and control groups

Group	Number of sample	Mean difference	Standard deviation	Calculated T	Freedom level	Probable Level
Test	25	3.37	1.23			
Control	25	2.20	0.91	5.67	49	0.001

Table 2. T test for comparing suitable responsibility of grade 2 girl students of Ardabil high school.

Group	Number of sample	Mean difference	Standard deviation	Calculated T	Freedom level	Probable Level
Test	25	3.81	1.34	2.96	49	0.15
Control	25	2.81	1.22			

Table 3. T test for comparing respecting to others in test and control group

Group	Number of sample	Mean difference	Standard deviation	Calculated T	Freedom level	Probable Level
Test	25	3.18	0.92	3.75	49	0.001
Control	25	2.57	0.84			

Table 4. T test for comparing friend finding skill in test and control group.

Group	Number of sample	Mean difference	Standard deviation	Calculated T	Freedom level	Probable Level
Test	25	3.67	0.81	6.68	49	0.0001
Control	25	2.50	1.07			

Group	Number of sample	Mean difference	Standard deviation	Calculated T	Freedom level	Probable Level
Test	25	3.67	0.81	6.86	49	0.0001
Control	25	2.50	1.07			

than T of table. In other words cooperative learning method increases friend finding skill development in grad 2 girl students of Ardabil high school. Therefore by verifying the main hypothesis, it can be said that the resulted progress has been due to doing cooperative method.

Fourth hypothesis: Cooperative learning method has effect on cooperation in group activities in grade 2 girl students of Ardabil high schools.

Table 4 shows that calculated T which is 6.86 with 49 Freedom level and 0.0001 probable level is bigger than T of table. In other words, cooperative learning method increases cooperation development in group activities in grade 2 girl students of Ardabil high schools. Therefore by verifying the main hypothesis, it can be said that the resulted progress has been due to doing cooperative learning method.

## CONCLUSION

Today all dimensional personality development of a person has been one of the basic purposes of educational systems and social dimension is one of personality development dimensions. Cooperation in group activities can result in social skill development of the students, because one of the social development elements is school and way of learning of the students. The present research has been carried out by the purpose of studying the effect of cooperative learning method on social skill development of the students. The results of the students. The results of the research indicated that there is a significant difference between social skill scores in test and control group. Total score of social skill development in test group has been increased. Therefore cooperative learning teaching method has been effective in social skill development of the students. This result accords with the results of Getash (2015), Shekari (2014), and Fahami and Ezzati (2011).

## RECOMMENDATIONS

Studies have shown that inactive and lecture teaching methods are weaker in social skill development of the students compared with cooperative learning method.

Using active methods especially cooperative learning method is recommended for increasing the power of making a suitable relationship with others.

1. Cooperative learning to be used in most of lessons.
  2. It is recommended that all of the methods to be studied in all of the classes and grades so that the most effective and suitable method to be known.
  3. More time to be considered for teaching
- Research recommendations

1. Similar researches to be done in non profitable and non governmental schools.
2. The effect of other methods of cooperative learning method to be measured.
3. Similar researches to be done in other educational grades.
4. The effect of this method to be measured on different levels and areas of learning.

## REFERENCES

- Geltash, Abbas (2015). Studying the effect of cooperative learning method on social skill development of grade 5 students of primary school. M.A thesis, Tarbiyat Moallem University, Tehran.
- Harji, Own (2012). Social skills in intrapersonal relations. Roshd publication.
- Herri Karimoy, Majid, Milani Jaded, Maryam Rezheh, Nahid (2010). The effect of lecture and group discussion teaching method on the rate of learning of nurse students in health of society lesson. Iranian journal of learning in medical science, No.11. pp.52-56
- Jafari Sani, Hosein, Jejazi, Zahra, and Zmehrzi, Zahra (2016), studying the effect of group discussion teaching method on social skill development of the students. Quarterly journal of cognitive and learning strategies, fourth year, no,7. pp.23-41.
- Joice, Broice, Weil, Marsha and Calhon, Emilly (2014). Teaching models. Translator, Behrangi, Mohammadreza, Vol,8. Tehran,Kamal-e-Tarbiyat.
- Livarjani Sholeh, Golmohammad Nejad, Gholamreza and Shahanagi, Gasseem (2014). Studying the relation between emotional intelligence and relational skill of perspicacious and normal girl high school students of Khoy city. Review of educational science, No,2,pp.185-210.

## Hamideh Faraji Niri

Mafhami Reyhameh and Ezzati Mohsen (2011), Studying the effect of cooperative learning on development of social elements of grade 5 students of primary school of Isfahan in 2010-2011. Quarterly journal of new strategies in educational management, No.1.pp.63-76.

Sepehrian Azar, Firoozeh (2016) The effect of jigsaw learning method on psychological needs of the students.

Research on school and virtual learning. Fourth year, No.13. pp. 21-30

Shariatmadari, Ali (2010). Society of education, Tehran, Amir Kabir.

Shekari, Abbas (2014).The effect of cooperative learning method on relational skill development of the students. Quarterly journal of educational strategies. No.5.pp.31-37.

## An investigation on the quality of closed air of Bahman Ghareghozli Primary School with emphasis on parameters of air pollution index

Shahrzad Mohammadkhani Ghale Hashemkhani<sup>1</sup>, Nooshin Sadjadi<sup>2\*</sup> and Mojgan Zaeimdar<sup>3</sup>

<sup>1</sup>M. Sc. Environment Management, Technical & Engineering Faculty, Islamic Azad University, North Tehran Branch, Tehran, Iran

<sup>2,3</sup>Department of Environment, Technical & Engineering Faculty, Islamic Azad University, North Tehran Branch, Tehran, Iran

### ABSTRACT

Today, the problem of air pollution inside buildings in educational environments such as schools has been considered, because it is a much more serious and dangerous issue for students' health. The presence of indoor airborne contaminants in schools can cause serious skin, pulmonary and heart damage, or even death for students. In this research, the quality of closed air of Bahman Ghareghozali Primary School was studied with emphasis on parameters of air pollution index. In-house air sampling was carried out to analyze pollutants of formaldehyde, carbon monoxide, suspended particles, nitrogen dioxide and nitrogen emissions. Sampling was carried out once two months in January and March of 1392 and March of 1395. To analyze NO<sub>2</sub>, the Aeroqual device was used. To analyze PM<sub>10</sub>, an Aerocet device was used; and for formaldehyde analysis, HPLC was used. The results of the analyses showed that the average NO<sub>2</sub> concentration in the class was 0.19 and in the library was 0.13 ppm; the mean concentration of PM<sub>10</sub> in the class was 1.12 and in the library was 1.48 micrograms per cubic meter; and the mean concentration of formaldehyde was 0.15 in the class environment and 0.09 ppm in the library environment. Results of one-way analysis of variance showed that there was a significant difference between the concentrations of pollutants in different months ( $P < 0.05$ ) and there was a significant relationship between their monthly variations. Also, there was a significant difference between the concentrations of pollutants in the classroom and library environments ( $P < 0.05$ ), so that their concentrations in the library were higher. Overall, the results showed that quality of indoor air in Ghareghozali Primary School is not favorable and has negative effects on students. The most important factors that cause these pollutants include the movement of motor vehicles and their fuel, and the presence of various industries around the primary school, the presence of factors such as chimneys, heating systems and woodwork in the interior.

**KEY WORDS:** AIR QUALITY INDEX, FORMALDEHYDE, NITROGEN DIOXIDE, SUSPENDED PARTICLES, GHAREGOZALI ELEMENTARY SCHOOL

### ARTICLE INFORMATION:

\*Corresponding Author: [dranismoradi@gmail.com](mailto:dranismoradi@gmail.com)

Received 27<sup>th</sup> April, 2017

Accepted after revision 29<sup>th</sup> July, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal  
NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

The air is the ocean we breathe in. 99.9% of the air consists of nitrogen, oxygen, water vapor and inert gases. Human activities can bring substances into the air, some of which can cause problems for humans. Closed air is the air that is enclosed in a space or place and does not have free movements like free air. Therefore, the entry of any kind of pollutants into it is much more dangerous than the free air and causes the negative effects of these pollutants on the environment. The main cause of the problem of poor air quality in closed environments such as inside the school is release of gases or suspended particles inside the environment. The lack of proper ventilation can increase the amount of contamination in indoor environments several times (Dabiry, 2010).

Lack of entry of sufficient quantities of outside air, which dilute pollutants from domestic sources, is one of the causes of the increased pollution of the interior spaces. On the other hand, the concentration of contamination will become intense and lasting without any extraction and full transfer of contaminated inside air to the outside. The amount of moisture and high temperature also affect indoor air, causing pollutants to accumulate and pollution to increase. Various factors cause pollution in closed environments like school. Varied types of furniture, tables and chairs also bring different kinds of contaminants to the school, which reduce the quality of indoor air (Shariat Panahi, 2004).

For example, asbestos used in insulating materials or carpets and rugs that, if humid, are a place for the life of the mites, are the main cause of allergies. Cabinets, libraries and buffets made from artificial and pressed wood products also cause internal contamination. The solvent gases from adhesives and resins used in building artificial wooden products gradually enter the air and infect the indoor environment. Other sources of indoor air pollutants include bleaching agents, cleaning materials for household appliances, floor cleaners for kitchen and bathrooms, and disinfectants. Also, materials used in building paintings (poor colors with solvent base), and adhesives are from these categories of pollutants. Health products such as perfumes, various sprays, colognes and the like, the use of cold and hot incense, as well as intake air through central cooling and heating equipment, also cause indoor air pollution (Masjedi et al., 2011). Therefore, it is very important to pay attention to the factors causing pollution in the closed school environment and the negative effects of these pollutants on students, and to study the type of contaminants and their causative factors, so that the pollution can be avoided among the students. In this regard, extensive research has been carried out.

Karimi et al. (2013) studied the concentration of formaldehyde contaminants and suspended particles in the

closed air of Apadana Hospital in Tabriz. Their results showed that the formaldehyde concentration was  $49.45 \mu\text{g m}^{-3}$  and the suspended particles of 5.2 PM and 10 PM were  $52.23$  and  $78.11 \mu\text{g m}^{-3}$ , respectively. Wilson et al. (2014) studied the air pollution (formaldehyde, carbon monoxide, and suspended particles) in closed air at a hospital. Their results showed that the concentration of formaldehyde and suspended particles of 10 PM was  $47.09$  and  $71.25 \mu\text{g m}^{-3}$ , respectively.

## MATERIAL AND METHODS

This is a cross-sectional study. In order to demonstrate the quality of indoor air inside the school, pollutants such as formaldehyde, nitrogen dioxide and suspended particles were sampled in a closed air in Bahman Gharegozali Primary School in the city of Baghestan. Regarding the taxi and bus stations and the excessive traffic of vehicles around the area, it seemed that the area would be considered in terms of air pollutants. For this purpose, a sample of closed school air was taken to analyze pollutants. Sampling of enclosed air in the classroom and library in this primary school was conducted in December 2014, January 2015 and April 2015. The following methods were used for sampling and analysis of formaldehyde, NO and suspended particles of PM10 contaminants. There are several methods to sample gases and vapors. Knowing the contaminant properties, such as solubility, vapor pressure and reactivity, can be a guide to choose the appropriate collection method. There are two general methods to sample gases and vapors:

1. Continuous or long-term sampling
2. Immediate or abduction sampling

In continuous sampling, air sampling is continued for a certain period of time and the pollutant is collected by a suitable medium such as solid surface gravity and absorbent solutions. In the instantaneous and immediate method, using gases and vapor collectors such as flasks or vacuum bottles, a certain volume of air is collected at a specific pressure and temperature. For statistical analysis, Excel 2010 and SPSS 2019 software were used. Excel was used to draw charts. One-way analysis of variance (ANOVA) was used to compare the concentration of pollutants in different months. To compare the concentration of pollutants in classroom and library environments, t-test was used. The concentration of gases was measured based on ppm and suspended particles concentration in micrograms per cubic meter.

## RESULTS

The concentration of contaminants in the entrance, in and end of the classroom, and also in the entrance door,

Formaldehyde	PM2.5	PM10	NO <sub>2</sub>	SO <sub>2</sub>	Co	O <sub>3</sub>		
13.0±04.0	003.0±23.0	42.0±02.0	04.0±08.0	-	01.0±41.0	00.0	Entrance door	Class
07.0±02.0	006.0±14.0	54.0±01.0	15.0±61.0	01.0±09.0	06.0±32.0	00.0	Inside the class	
02.0±11.0	002.0±08.0	21.0±08.0	08.0±41.0	-	08.0±25.0	00.0	End of class	
11.0±05.0	004.0±13.0	39.0±04.0	09.0±31.0	01.0±09.0	05.0±01.0	00.0	Average	
08.0±06.0	004.0±07.0	25.0±11.0	13.0±08.0	02.0±05.0	07.0±54.0	00.0	Entrance door	Library
02.0±12.0	002.0±06.0	08.0±42.0	05.0±07.0	0	04.0±35.0	-	The area	
00.0	004.0±21.0	08.0±04.0	01.0±31.0	0	01.0±09.0	01.0±0.03	Book delivery desk	
02.0±12.0	003.0±12.0	14.0±25.0	06.0±17.0	02.0±05.0	04.0±0.34	01.0±0.03	Average	

inside and near the book delivery desk in the library, as well as their average with the standard error in December 2014, is shown in Table 1. The concentration of NO<sub>2</sub> in the closed environment of the class was between 0.04 and 0.15 and the average of 0.09 ppm, which was higher in the classroom than the entrance and the end of the class. Its concentration in the library was obtained between 0.01 and 0.13 and at an average of 0.06 ppm, which was higher in the vicinity of the entrance door than inside the area and near the delivery desk. The concentration of PM10 in the closed environment of class was between 0.21 and 0.54 and an average of 39.0µg/m<sup>3</sup>, which was higher in the classroom than the entrance and the end of the class. Its concentration in the library ranged from 0.08 to 0.25 with an average of 0.14 micrograms per cubic meter, which was higher in the vicinity of the entrance door than in the enclosure and near the delivery desk. The formaldehyde concentration in the closed environment of class was between 0.02 and 0.13 and an average of 0.11 ppm, which was with a higher concentration close to the entrance door of the class than the inside and the end of the class. Its concentration in the library ranged between 0.02 to 0.08 and an average of 0.02 ppm, which was higher in the vicinity of the entrance door than inside the area and close to the book delivery desk.

Other air quality indicators or indexes such as CO, SO<sub>2</sub> and O<sub>3</sub> are also given in the table below. The concentration of O<sub>3</sub> in most cases was zero, and only near the book delivery desk of library, its concentration of 0.01 ppm. The study of carbon monoxide gas (CO) also showed that its average was 0.05 ppm in the classroom and 0.04 ppm in the library. SO<sub>2</sub> gas was also measured in the class 0.01 and in the library at 0.02 ppm.

The concentration of pollutants in the entrance, inside and end of the classroom, also in the entrance door, inside and near the book delivery desk in the library, as well as their average with the standard error in January 2015, is shown in Table 2. The concentration of NO<sub>2</sub> in the closed environment of the class was between 0.05 to

0.24 and an average of 0.14 ppm, which entrance door of the class had a higher concentration than the area and the end of the class. Its concentration in the library was between 0.01 to 0.16 and an average of 0.10 ppm, which was higher in the interior of the area than the entrance door and near the book delivery desk. The concentration of PM10 in the closed environment of class was between 0.41 and 0.60 and an average of 0.58 micrograms per cubic meter, which was higher inside the classroom than the entrance and the end of the class.

Its concentration in the library ranged from 0.84 to 0.95 and with an average of 0.91 micrograms per cubic meter, which had a higher concentration in the vicinity of the book delivery desk than the inside of the enclosure and the entrance door of the library. The concentration of formaldehyde in the closed environment of the class was between 0.03 to 0.16 and the average of 0.08 ppm, which near the entrance door of the class had a higher concentration than the inside and the end of the class. Its concentration in the library was between 0.04 and 0.06 and an average of 0.04 ppm, which near the entrance door had a higher concentration than the inside of the enclosure and near the book delivery desk.

The concentration of O<sub>3</sub> in most cases was zero, and only near the book delivery desk of the library, its concentration was 0.01 ppm. The measurement of carbon monoxide (CO) gas also showed that its average was 0.16 ppm in the class and 0.11 ppm in the library. The average concentration of SO<sub>2</sub> gas was measured in 0.17 in the class and 0.09 ppm in the library.

The concentration of contaminants in the entrance, inside and end of the classroom, also in the entrance door, inside and near the book delivery desk in the library, as well as their average of the standard error in January 2015, is shown in Table 1. NO<sub>2</sub> concentration in the closed environment of the class ranged from 0.25 to 0.33 and an average of 0.19 ppm, which the entrance door of the class had a higher entrance concentration than the area and the end of the class. Its concentration in the library was between 0.08 and 0.21 and an aver-

Formaldehyde	PM2.5	PM10	NO <sub>2</sub>	SO <sub>2</sub>	Co	O <sub>3</sub>		
16.0±21.0	007.0±51.0	41.0±51.0	24.0±23.0	19.0±23.0	08.0±01.0	00.0	Entrance door	Class
07.0±34.0	008.0±32.0	63.0±09.0	13.0±08.0	15.0±07.0	23.0±51.0	00.0	Inside the class	
03.0±31.0	007.0±51.0	60.0±07.0	05.0±03.0	00.0	18.0±08.0	00.0	End of class	
08.0±28.0	007.0±48.0	58.0±28.0	14.0±11.0	17.0±12.0	16.0±22.0	00.0	Average	
06.0±06.0	006.0±62.0	86.0±05.0	15.0±07.0	13.0±05.0	11.0±04.0	00.0	Entrance door	Library
04.0±08.0	009.0±32.0	84.0±41.0	16.0±03.0	09.0±21.0	16.0±34.0	-	The area	
00.0	005.0±12.0	95.0±54.0	00.0	06.0±06.0	05.0±52.0	00.0	Book delivery desk	
02.0±08.0	006.0±08.0	91.0±08.0	10.0±03.0	09.0±12.0	11.0±28.0	00.0	Average	

age of 0.13 ppm, which was higher in the area than the entrance door and near the book delivery desk.

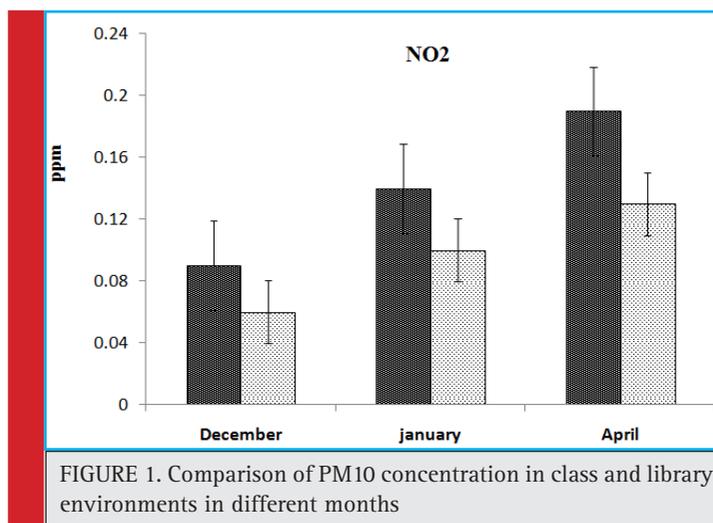
The concentration of PM10 in the closed environment of the class was between 0.83 and 1.38 and an average of 1.12 micrograms per cubic meter, which was higher in the classroom than the entrance and the end of the class. Its concentration in the library ranged from 0.81 to 1.83, and with an average of 1.48 micrograms per cubic meter, which was higher inside the area than the entrance door and near the book delivery desk. Formaldehyde concentration in the closed environment ranged from 0.09 to 0.24 and an average of 0.15 ppm, which near the entrance door of the class had a higher concentration than the inside and the end of the class. Its concentration in the library was between 0.11 and 0.17 and an average of 0.09 ppm, which was higher in the vicinity of the entrance door than inside the area and close to the book delivery desk. Comparison of NO<sub>2</sub> concentration in the classroom and library environment in different months

The result of ANOVA analysis showed that nitrogen dioxide (NO<sub>2</sub>) concentration has a significant difference in different months in both classroom and library environments (P <0.05). Its concentration in the classroom and library environments was measured in different months as April > January > December, with its highest concentration in April.

The average concentration of suspended particles of PM10 in the classroom and the library environments between different months is shown in Fig. 2. The result of ANOVA analysis showed that PM10 concentration had a significant difference in the both class and library environments of the primary school in different months (P <0.05). Concentration of suspended particles in different months in the library environment was higher than the classroom environment. Its concentration in different months was measured as April > January > December, which the highest concentration was obtained in April.

The average formaldehyde concentration in the classroom and the library environments between different months is shown in Fig. 3. The result of one-way ANOVA analysis to compare the formaldehyde concentration in different months showed that formaldehyde concentration in the classroom was significantly different in different months (P <0.05). Also, formaldehyde concentration was significantly different in the library environment in different months (P <0.05). Formaldehyde concentration was measured in both class and library environments in different months as April > December > January, which the highest concentration of which was obtained in April and the lowest in January. The results of this analysis also showed that there is a significant relationship between the formaldehyde concentration and the

Formaldehyde	PM2.5	PM10	NO <sub>2</sub>	SO <sub>2</sub>	Co	O <sub>3</sub>		
24.0±51.0	006.0±08.0	83.0±05.0	33.0±32.0	13.0±71.0	35.0±04.0	00.0	Entrance door	Class
09.0±43.0	039.0±07.0	38.1±02.0	25.0±54.0	19.0±15.0	28.0±06.0	00.0	Inside the class	
13.0±08.0	018.0±31.0	91.0±03.0	ND	11.0±01.0	16.0±07.0	00.0	End of class	
15.0±23.0	021.0±15.0	12.1±04.0	19.0±45.0	14.0±42.0	27.0±06.0	00.0	Average	
17.0±03.0	016.0±54.0	43.1±08.0	21.0±41.0	10.0±53.0	21.0±02.0	00.0	Entrance door	Library
ND	043.0±03.0	83.1±01.0	11.0±08.0	07.0±07.0	12.0±13.0	-	The area	
11.0±02.0	009.0±07.0	81.0±05.0	08.0±07.0	06.0±09.0	08.0±06.0	00.0	Book delivery desk	
09.0±06.0	023.0±34.0	48.1±05.0	13.0±23.0	08.0±28.0	14.0±06.0	00.0	Average	



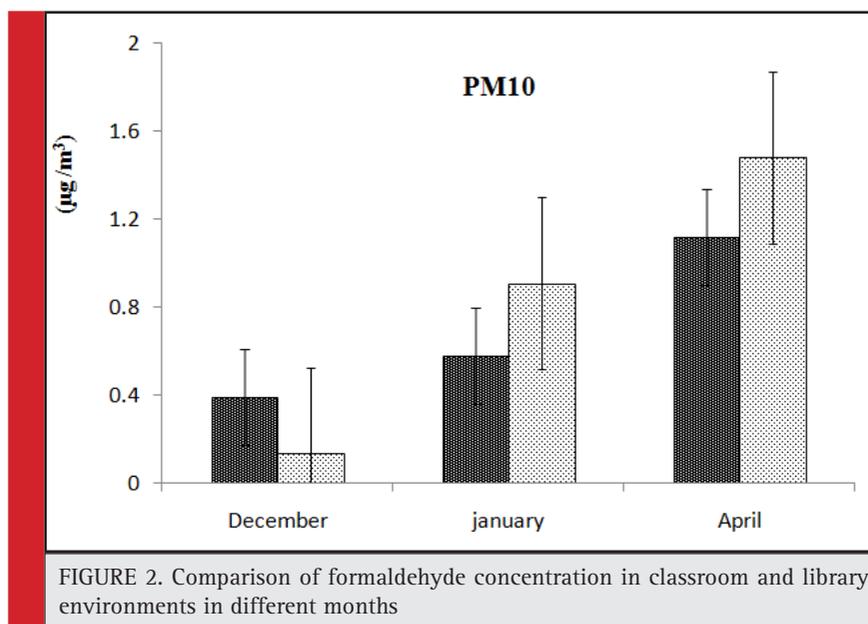
severity of its contamination with monthly changes. Comparison of the concentration of various pollutants in the classroom and library environments.

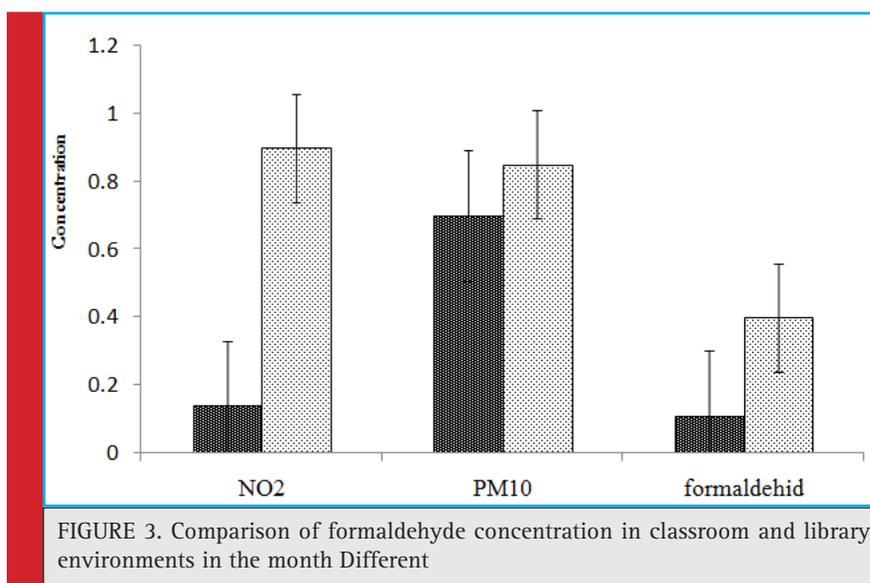
The concentration of formaldehyde, suspended particles and NO<sub>2</sub> in both class and library environments is shown in Figure 3. The result of the comparison of the mean formaldehyde concentration in the both classroom and library environments showed that formaldehyde concentration was significantly different in the two environments ( $P < 0.05$ ) and its mean concentration in the library environment was higher than that of the classroom. Also, comparison of mean NO<sub>2</sub> concentration in both classroom and library environments showed that NO<sub>2</sub> concentration in the two environments were significantly different ( $P < 0.05$ ) and its mean concentra-

tion in the library environment was higher than that of the classroom. But there was no significant difference between the mean concentration in the both classroom and library environments ( $P > 0.05$ ), but the mean of it was higher in the library environment during the sampling and analysis period.

#### Comparison of pollutants' concentrations with standards

According to the results, it was found that O<sub>3</sub> level in this study is lower than standard amounts. The concentration of CO was higher than standards (from 15 minutes to 1 hour). The SO<sub>2</sub> concentration in this study was also higher in the classroom and library areas than the standards. Comparison of NO<sub>2</sub> gas showed that in all cases, its level was higher than standards. Comparison





of suspended PM<sub>2.5</sub> and PM<sub>10</sub> particles with standards showed that the concentration of this pollutant was higher than the standards. The investigation of formaldehyde amount in this study showed that the concentration of this pollutant in the classroom and the library of the primary school was lower in December and January and higher in April than 24-hour standard.

Therefore, the results of this study showed that concentration of pollutants, especially NO<sub>2</sub>, PM<sub>10</sub> and formaldehyde in the classroom and library environments were higher than standards, and this primary school is contaminated with these pollutants.

### Comparison between class and library

Also, a comparison between the amount of contamination in different parts of the class and library showed that near the entrance door of the classroom and the library, the amount of contaminants has a higher concentration. Since the concentrations of pollutants vary from place to place, the classroom and library environments are sampled from different parts and at different intervals, and the mean of the different parts of the class and library has been considered. By comparing the mean in the classroom and the library, it was found that the concentration of pollutants between the two environments was significantly different ( $P < 0.05$ ). The concentration of pollutants in the library environment is higher than the classroom environment. This can be attributed to the increased flow of students to the library compared to the class, the availability of sources of pollutant generation as higher than class, to being close to the outside environment or having more contact with the outside environment than class. Due to the fact that the library's breadth was more than class, the use of wood tools, heating systems and chimneys was higher and, as a result, pollutant concentrations were higher.

Table 4. Standards for free air as a guide for Europe (in milligrams per cubic meter)

The average time	Concentration	Kind of compound
15 min	100 mg/m <sup>3</sup>	Carbon monoxide (CO)
30 min	60 mg/m <sup>3</sup>	
1 h	30 mg/m <sup>3</sup>	
8 h	10 mg/m <sup>3</sup>	
8 h	120 mg/m <sup>3</sup>	Ozen (O <sub>3</sub> )
1 h	200 mg/m <sup>3</sup>	(NO <sub>2</sub> )Nitrogen dioxide
annual	40 mg/m <sup>3</sup>	
10 min	500 mg/m <sup>3</sup>	Sulfur dioxide (SO <sub>2</sub> )
24 h	125 mg/m <sup>3</sup>	
annual	50 mg/m <sup>3</sup>	
24 h	150 mg/m <sup>3</sup>	particles PM <sub>10</sub>
annual	50 mg/m <sup>3</sup>	
24 h	35 mg/m <sup>3</sup>	particles PM <sub>2.5</sub>
24 h	10 mg/m <sup>3</sup>	Formaldehyde

### CONCLUSION

Due to the fact that the environment of the Gharegozali Primary School is contaminated with pollutants, these pollutants have the following effects on the students. Carbon monoxide breathing for longer period can cause many complications such as dizziness and nausea. Health studies have shown a significant relationship between exposure to fine particles and premature

death due to cardiovascular and pulmonary diseases. Tiny particles can exacerbate cardiovascular and pulmonary diseases and are related to the effects of: cardiovascular symptoms, cardiac arrhythmias, heart attacks, respiratory symptoms, asthma attacks and bronchitis. These effects can increase the illness of students and the absence of school and, eventually, their academic failure. Nitrogen dioxide causes burning in the lungs, and reducing the resistance of the respiratory system. Sulfur dioxide also causes respiratory failure, a decrease in the lung defenses, and an exacerbation of cardiovascular and pulmonary diseases. Ozone causes the loss of lung tissue and its function, chest pain and cough, and exacerbates asthma attacks, especially in students and children.

Formaldehyde is very likely to be carcinogenic to humans. Formaldehyde is a very important chemical material that is widely used by various industries, including construction materials and woodworking industries. Therefore, considering the effects of these pollutants on students, violation of these pollutants from students' standards is at serious risk. Given that the concentration of NO<sub>2</sub> and PM10 as well as of formaldehyde in April is higher than standards, these students are at high risk for these diseases. When there is some air pollution, people become more aggressive, angrier and less tolerant. That is, although they had these problems in the past, they now react more quickly and responsibly to stress. Air pollution is associated with reduced energy and drowsiness, and provides an area for aggression. In fact, when a person is bored due to the effects of air pollution, one of which is a lack of oxygen, he is unable to control his anger and behaves in a nervous way. As the amount of oxygen supply to the brain decreases, some critical points of the brain are stimulated, resulting in disturbances such as aggression and, of course, depression, disturbance in concentration and slower mental performance.

Air pollution in the long run can also change students' personality. For example, if an individual is extroverted, he/she becomes an introverted person and no longer as a former social and lively one; while, according to researchers, in the polluted air, due to oxygen depletion and impaired brain function, the person

over time not only loses his social skills, but also he/she will continue to forget anything, and this can be the cause of Alzheimer at old ages, even middle ages. Air pollution has a double psychological effect on depressed patients, their decision-making power weakens, and the person becomes energy less, bored and tired. All of these factors make depression more severe. At the same time, in anxious and so-called stressed people, air pollution worsens the situation, so that the person, in addition to bearing stress, is more likely to suffer from some physical symptoms, such as palpitations and shortness of breath that has a nervous origin. On the other hand, air pollution also causes obsessive-compulsive patients to become more concerned and constantly suspect they have become ill. The same feeling of exacerbation and obsessive compulsion will give rise to another disease called "self-sickness."

According to the results, the air quality of this primary school is in an unfavorable situation and in order to prevent the effects of these pollutants on students, serious measures should be taken to reduce pollution and eliminate the sources of their dissemination.

## REFERENCES

- Dabiry, M. 2010. Environmental Pollution (air-water-soil-sound), publication of the alliance
- Karimi, A. Abbaspour, A. 2013. A study on the Concentration of Formaldehyde Contaminants and Suspended Particles in the Closed Air of Apadana Hospital in Tabriz. Master's Thesis on Environmental Issues, Tabriz Azad University.
- Masjedi, M.R. Jamaati, H.R. Dokoohaki, Puneh Ahmadzadeh, Z. Linejad Taheri, S. Bigdeli, Massoud. Agin, Khosrow. Qavam, Massoud. Rostamian, Abdolrahman. Izadi, Shirin 2015
- Investigation of Correlation between Air Pollution and Acute Cardiovascular and Respiratory Attacks, Journal of Research in School of Medicine, Shahid Beheshti University of Medical Sciences and Health Services, No. 1, Pages 25-33
- Shariat Panahi, M. 2004. Basics of Environmental Health. Tehran University Press.
- Wilson, G., Radir., Y. 2014. Review of atmospheric metallic elements in Asia during 2000-2004", Atmospheric Environment, 43: 543-552.

## Social and economic factors affecting the teaching and learning of high school students in Ardabil

Vahid Abolhasanzadeh<sup>1\*</sup>, Elham radmehr<sup>2</sup>, Shahram Mahmoudi<sup>3</sup>, Ali Danesh<sup>4</sup> and Mohammad Reza Abdollahi<sup>5</sup>

<sup>1</sup>Master of Bachelor, Department of Sociology, Yazd University, Iran

<sup>2</sup>Ph.D Student University of Kharazmi, Meshkinshahr Payam Nur University

<sup>3</sup>Master of Bachelor, Department of Civil Engineering Structures, Azad University of Ahar, Iran

<sup>4</sup>Master of Bachelor, Department of Sociology, Yazd University, Iran

<sup>5</sup>Master of Bachelor, Department of Psychology, Azad University of Ahar, Iran

### ABSTRACT

Student learning is one of the main objectives of the educational system in the modern era has been faced with several factors linked together, can contribute to its improvement. Accordingly, in the present study were to measure the social and economic factors affecting student learning. The research method is measurement one and data collection instrument is questionnaire. Study statistical society includes high school boy students on Ardebil and among them; we have selected a sample about 384 persons by random cluster method. Theoretical framework of the research was coli and Goffman's theories. Analysis includes an independent variable of material resources, human resources, expectations and norms, social capital and community professionals. Based on the analysis of research data all five research hypotheses were confirmed. Of the five independent variables, expectations and norms by a factor of 59 percent impact student learning is the most important explanatory. We can say that learning is primarily a response to social expectations rather than responding to specific situations and or to school classroom. The more variables and material resources, social capital, community, professional and human resources to explain further the students are learning.

**KEY WORDS:** EXPECTATIONS, MATERIAL RESOURCES, SOCIAL CAPITAL, PROFESSIONAL COMMUNITY, HUMAN RESOURCES AND STUDENT LEARNING

### ARTICLE INFORMATION:

\*Corresponding Author: [vabolhasanzade@gmail.com](mailto:vabolhasanzade@gmail.com)

Received 1<sup>st</sup> May, 2017

Accepted after revision 5<sup>th</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

World transformation and rapid changes of this century, new challenges in the field of education has created, (Fraser, 2001) The current community to meet this challenge, more appropriate means, legitimate and more efficient than training does not have, (Yinger, 2005) Education is a basic prerequisite for sustainable development of any society is being considered. Expect and hope for all stakeholders of education is to lead the process of learning, (Baruque, 2004). Learning process, a continuous process that involves changes in individual potential behavior is relatively stable. It always varies from person to person and from person to person capacity that is allocated. Of course, one cannot ignore the influence of the environment and it's a tradeoff, because learning is affected by internal factors such as the addition psychological characteristics, motivations, emotions, goals, and aspirations of the individual is, the external factors including education, study methods, study hours influenced by stimulus around, (Henry, 1993).

Learning is the result and consequences of planned or experimental educations in which has been embodied due to practices and continuous encountering on persons and does have outer representation on person's behavior in which based on different schools, learning on any time and place and on any topic requires special skills, (Cercone et al, 2008). Therefore, experts learning skills such as critical thinking know set of skills, interactive and effective communication, creativity and risk-taking, interpersonal skills, personal responsibility, social and civic, flexibility and adaptability. (Trilling, 2008) Trilling and Fardl also mainly report these skills as earning skills and innovation, communication and collaboration, life skills and social skills, ( Naylor, 2010).

It seems that, during the recovery process of the formation of individual action always takes place in a social context. Each person by specifying what others have or are planning what to do, namely get the concept of their operation, regulate their practice. He has set his action on such an interpretation of the actions of others, (Tavassoli, 2006). A review of the literature indicates that researchers and teachers learning to build skills in this century, decided on various measures and various solutions have been used. Therefore, some traditional methods of teaching and learning, the role of passive learners in the educational environment, based upon the increased volume of data, permits and meet the training needs of present and future generations know and thoughts freely, creatively and critically, to learn to train their recommendations, (Darling-Hammond, et al. 2005). Others are self-directed role, Khvdkarayy, self-regulation and self-learners and teachers and students rely urge to apply these principles, (Kampala et al, 2010). Some real-

world tools to make effective use of technology and information and communications technology, a cross-cultural skills, multicultural education and promote global awareness are valued, (Kahraman et al 2012).

The fact that students how they think and what factors and elements affect learning in this century, several studies have been conducted around the world and our country, (Lin, 2007). Report of the International Commission on emphasizing that learning to live together and coexist peacefully, through the teaching-learning strategies should be based on cooperation and interaction between the family and the school to be taught by (Mashayekh, 2013).

Realizing the fact that learning is largely dependent on the individual events in his life interactions with them, it enables us to learn as events that can be examined more closely and more deeply understand. Learning events that happen just naturally occurs but also affect conditions View, So that conditions can change and control, and this study provides a scientific method of learning events, So that the conditions in which learning occurs, observed, (Henry, 1993). By taking an active role in learning and critical learning experiences and this we do not know which of the elements of our students to value their learning and seriously, this study was designed. The aim of this study was the first to receive comments and attitudes of students learning elements in the present century, as a phenomenon affecting education and then compare the perceptions of students who participated in the study.

## THEORETICAL BASIS

Recent studies about schools and student learning, less material resources focused on organizational constraints and the organizational structure and processes such as leadership, cooperation and efficiency among teachers in the school have been emphasized. This literature is based on the tradition of efficient and effective schools (eg Edmonds, 1979; Pork and Smith, 1983) the key conditions at the school level, including the consensus on the purpose, high expectations for student learning, school director (Manager), emphasis on basic skills, and monitor the students' progress. In the tradition of effective schools, numerous studies show consistency between environmental conditions and demonstrate student learning. For example, BRIC and Driscoll (1998), a strong positive correlation between student achievement in mathematics and social indicators (common) school - Teachers will work together and work together, or please support the work of teachers, and so on.

Similarly, Lee and Smith (1995, 1996) showed that student achievement in high school where teachers understand the effectiveness and a greater sense of

responsibility on their students' learning, And in schools where teachers are involved in reconstruction activities, including training team, restructuring grouping, flexible scheduling and so on is higher. This kind of work, from research on effective schools and effective reconstruction studies, the ambiguity of causal mechanisms and even the causal direction is limited. If expectations (expectations, expectations are) above are associated with high achievement, for example, which is another cause? Research on effective schools, there is little attention to the actual mechanisms through which they dictate the terms of school success. How do you expect more than usual, were the consensus on goals, etc., and how these conditions are associated with student learning?

Maureen (2000) Lee and Smith (1996) argued that students are more successful when their teacher, to accept collective responsibility for student learning. Lee and Smith by showing the relationship between teachers and students learn a sense of responsibility demonstrated their claims. In fact, however, scientific processes could run in the opposite direction: Teachers in schools may be more likely to accept and take responsibility for their learning levels are higher. According to Goffman, people see the facts indirectly through institutions, the actions and others to interpret. The social world itself has not arranged and the meanings inherent in the behavior do not exist, but its meanings people ascribe to it. So each situation on its own people defines themselves by them and has been innovated. People understanding from the situations are of cultural norms and expectations of society and others. In his view "their" never have true self, but rather a collection of selves variable that is trying to adjust to different situations. In fact, a person is constantly is influenced by the other, (George Ritzier, 2006).

Newman's study (1996) of 24 schools was started with the idea that the levers are in school when they are pressed, leading to better teaching and learning are more. What the researchers found was very different. All 24 schools were structurally innovative features, but little conclusive evidence demonstrated extraordinary high quality teaching and learning. The most successful schools were those in which coaches were committed to academic quality and intellectual experiments in which this commitment was the driving force behind institutional reforms. Student learning is responses (answers) to their training and instruction. The idea, stemming from research that documents has the impact of changes in education on student learning, including the effects course taking (Gamvran, 1987), to cover content (time and Drybn, 1983; Gamvran, Porter, Smithsonian and White, 1997; Rowan and Miracle, 1983) to show solidarity educational and interactive teacher and student (Gamvran, Nystrnd, Brands and Lepore, 1995). As well

as organizational resources, affect student learning, but only to the extent that they are used by teachers in classrooms that this aspect of the research is based on Drybn and Bar. (1983; see also Gamvran and Drybn, 1986).

These studies showed that when resources are important learning resource teachers are employed to teach classes. A lot of research on the effects of school as a framework incorporated. However, our model does not include all aspects of the school grounds. We have focused on three categories of resources: material, human, and community. (Anderson, 1996; Newman, 1998; Spillane and Thompson, 1997).

## MATERIAL RESOURCES

Despite inconsistent empirical support for the impact of expenditures on students' achievement, material resources constitute an important condition in the organizational context of teaching. Such resources include curriculum materials, equipment, and supplies; time available for teaching, planning and preparation; expenditures for personnel, particularly instructional staff; and the authority to expend funds for other purposes related to teaching and to learning. Material resources have no direct connection to learning because their impact depends on how they are used. Typically, educators at the school level have little discretion over the allocation of funds. According to the study of restructured schools, even when funding decisions are made at the school level, resources may not be used in ways that improve teaching (Newmann & Associates, 1996). However, some schools used resources in ways that improved instruction by allocating extra time for collaboration among teachers, by supporting professional development, and by providing tutoring sessions for students who needed extra help. A variety of literatures support the conclusion that the effects of material resources are contingent on use. Resources devoted to instruction, not surprisingly, are more likely to pay off for student learning than resources directed in other ways (Newmann & Associates, 1996). Even when resources are allocated toward instructional needs, however, their benefits depend on how they are applied. Reducing class size, for example, may be the most common application of additional resources, yet a research literature consisting of hundreds of studies has yielded widely varying results.

As Slavin (1989, 1990) has argued, reducing the number of students in a class is unlikely to yield any differences in student learning unless teachers are engaged in practices that are enhanced by working with fewer students at a time. When teachers carry out standard routines of lecture and recitation, it matters little whether there are 15, 20, or even 30 students in the class. Class

size is likely to affect learning when instruction emphasizes more interactive involvement such as project work, extensive writing, and discussion, which may foster more intensive participation and feedback when there are fewer students at hand, contingent on use. Resources devoted to instruction, not surprisingly, are more likely to pay off for student learning than resources directed in other ways (Newmann & Associates, 1996). Even when resources are allocated toward instructional needs, however, their benefits depend on how they are applied. Reducing class size, for example, may be the most common application of additional resources, yet a research literature consisting of hundreds of studies has yielded widely varying results.

When teachers carry out standard routines of lecture and recitation, it matters little whether there are 15, 20, or even 30 students in the class. Class size is likely to affect learning when instruction emphasizes more interactive involvement such as project work, extensive writing, and discussion, which may foster more intensive participation and feedback when there are fewer students at hand. A similar argument can be made about time for instruction, another application of material resources. Generally, the research indicates that more time for teaching results in more learning for students (e.g., Brophy & Good, 1986). The implicit mechanism underlying the findings, as Barr and Dreeben (1983) explained, is a nested layers model: when teachers have more time available, they use it to cover the curriculum more extensively or in greater depth, and this yields enhanced learning for students. However, the pattern is not invariant. For example, when more time is allocated to first-grade teachers, they use it to advance their highest priority, the reading curriculum (Gamoran & Dreeben, 1986). They do not use additional time for other subjects, such as mathematics, science, or social studies (Gamoran, 1988).

Thus time, a resource allocated by administrators to teachers, is an essential element in the context of first-grade reading instruction, but it has limited implications for first-grade teaching in other subjects. More generally, the impact of time as an organizational resource clearly depends on how that time is allocated by teachers within classrooms. Because the impact of resources depends on how the resources are used, control over material resources is also an important consideration. According to one view, because teachers have the closest contact with students, they know best what resources are needed to meet students' needs. This perspective sees teachers as knowledgeable professionals and suggests that the greater teachers' control over the allocation of resources, the more effectively the resources will be used (Gamoran, Porter, & Gahng, 1995). However, research to date has found little evidence for effects of teacher

control over resources on teaching or learning (Park, 1998).

## HUMAN RESOURCES

Some perspectives on schooling assume that differences among teachers in how they have been trained or in what they know have little to do with the effects of instruction on learning. Older notions of teacher-proof curricula (see Brophy & Good, 1986) have counterparts in the most extreme view of standards-based reform, which emphasizes standardized curricula as the key to successful teaching and student testing as the means of ensuring that the curriculum is taught (see Borman, Cookson, Sadovnik, & Spade, 1996). The input-output model of schooling similarly ignores the teaching process in considering the production of learning (see Figure 2.1). These views are consistent with a highly bureaucratized model of schooling in which teachers adhere to standard procedures to maximize efficiency (e.g., Callahan, 1962). Research evidence depicts teaching as an activity that, in some cases, is highly routinized. Jackson (1968) observed that teaching tends to be preactive, or scripted in advance, rather than reactive, or responsive to students. Many writers have documented the extent to which classroom life is dominated by teachers (e.g., Gamoran *et al.*, 1995; Goodlad, 1984; McNeil, 1986).

As loose-coupling theorists have shown, this attempted routinization has gaps—points at which teaching may or may not coincide with what students need for learning. Nonetheless, a logic of confidence allows teachers to proceed without being troubled by a mismatch between script and students (Hemming & Metz, 1991; Meyer & Rowan, 1978). Recent research on teaching, however, indicates that the logic of confidence does not always prevail and that teachers' knowledge makes a difference in the quality of instruction and, in particular, teachers' abilities to respond to students (Cohen, 1990). Drawing on findings from cognitive science, education researchers posit three types of knowledge that are essential for teaching: pedagogical knowledge, in which teachers know general strategies of teaching; content knowledge, what teachers know about their subject matters; and pedagogical content knowledge, the knowledge of how to teach a particular subject matter in a way that fosters students' understanding (Shulman, 1987). Following this argument, then, we propose that teachers' human resources—their knowledge, skills, and dispositions—constitute an important resource that may shape the quality of their teaching and their students' learning. Studies of teacher knowledge in specific areas of pedagogic content indicate that the implementation of a new instructional approach improves as teachers come to understand it more deeply (Tharp & Gallimore, 1988).

The emphasis on human resources implies a different model of change than that favored by a model focused on material resources. If human resources are important, then teacher development may be a central element of reform activities (Tharp & Gallimore, 1988). Given the high degree of teacher autonomy in the classroom, a perspective that emphasizes teachers' learning over material resources seems especially promising. Principal leadership is another type of human resource found in schools. Research in the effective schools tradition emphasized leadership, but empirical corroboration for the salience of principal leadership for student learning is weak (Good & Brophy, 1986). A key limitation of this work is its failure to specify the mechanisms by which leadership may stimulate better learning. Current research on leadership emphasizes of the principal's role in creating a community with a common purpose (Newmann & Associates, 1996). Successful principals provide a vision that sets forth a particular mission for the school and galvanizes commitment from teachers and from students. At the same time, the principal may be able to select staff members who accept the school's mission. In this way, a principal's leadership may result in a schoolwide instructional emphasis on common goals. Interestingly, this view of leadership is more compatible with the loose-coupling model than with nested layers. Rather than viewing the allocation of resources as the key mechanism for the impact of leadership, as implied by the nested layers view, this perspective on leadership emphasizes its symbolic attributes, which are central to loose-coupling theory (Meyer & Rowan, 1978).

Even though selecting staff is a technical activity, it has symbolic implications when acceptance of a common vision is a chief criterion for selection. According to loose coupling, structure and technical work are weakly connected, but rituals and symbols, including those that define the school's mission in the wider society, play an important role in pulling together and legitimizing the school in its social context. Following this view, principal leadership may affect the work of teachers by shaping a purpose for the school through selection of staff and articulation of a guiding vision.

## SOCIAL RESOURCES

Our argument about social resources comes neither from loose coupling nor from the nested layers model. Both views stress the isolation and autonomy of teachers within their classrooms, differing in that nested layers studies have shown that material resources allocated to classrooms and used by teachers can affect student learning (e.g., Gamoran & Dreeben, 1986). According to these perspectives there is little to be gained from collegiality among the faculty of a school, except per-

haps the pleasures of a friendlier workplace. Similarly, these widely followed theories would lead one to expect few benefits of teacher participation in collective decisions about school policies. According to loose coupling, school policies simply have little relevance for what goes on in classrooms. According to the nested layers view, policy decisions are managerial activities whose impact occurs through the allocation of resources, regardless of how allocative decisions are made. For different reasons, neither perspective supposes that relations among teachers matter for instructional practices. In contrast, an emerging literature about the social organization of schools suggests that under certain conditions, social relations among educators may profoundly influence teachers' classroom work and thereby affect student learning.

As Rowan (1990) explained, when teaching is viewed as complex and interactive, dynamic and changing as opposed to routine, an organic system of management that relies on developing commitment rather than imposing controls may lead to more successful teaching and learning. Organic management means encouraging social relationships of trust, shared responsibility, collective decision making, and common values as mechanisms for bringing about change. When these activities are focused on student learning, they may indeed matter for instruction and for achievement (Newmann & Associates, 1996). Thus, aspects of the social environment of the school, including shared values, collaboration, and collective decision making, constitute social resources on which educators may draw to bolster their teaching. At the same time, social resources may also emerge from experiences in the practice of teaching. Teachers who refrain from regarding instruction as a standardized, routine activity are faced with the uncertainties of finding successful ways of meeting students' needs. This uncertainty is always present in teaching, but typically it is obscured by the logic of confidence that promotes following prescript routines that avoid being deflected by students' responses. Recognition of uncertainty may lead teachers to talk with one another—breaking down the usual isolation of teaching—as they search for better solutions to the problems of teaching and learning that appear in their classrooms. These discussions about instruction may strengthen the collective ties among teachers and teachers and in turn may help address their concerns about teaching.

Although Newmann and Associates' (1996) findings are consistent with the view that social resources matter for teaching, an alternate interpretation of the evidence cannot be rejected. Even when social relations among teachers emerge out of practical experience, these social relations may have little bearing on instruction because teachers are autonomous in their classrooms. Under this

scenario, social relations would be a correlate of successful teaching but not a causal factor. Research to date cannot adjudicate among the alternative interpretations.

**PROFESSIONAL COMMUNITY:** One way of characterizing social resources in a school is as a professional community of educators. Several recent writers claim that a strong professional community provides the capacity for improving instruction and ultimately for enhancing student learning. Talbert and McLaughlin (1994) distinguished between professionalism and community: professionalism includes technical knowledge, an ethic of service, and commitment to the profession, and community refers to collaboration and continuous learning among teachers. Their view of professionalism is akin to our notion of human resources, except that they examine the collective, shared presence of technical knowledge, finding that teacher collaboration and learning promote a technical culture in the school. Newmann and Associates (1996) explored the contribution of professional community to authentic pedagogy, an instructional focus on disciplinary content, students' construction of knowledge, and relevance.

Professional community, in their view, consists of shared purpose, a collective focus on student learning, collaboration, reflective conversations about teaching, and deprivatized practice (i.e., breaking the usual isolation of teaching by observing one another's teaching). They found more authentic pedagogy in schools with stronger professional communities. Secada and Adajian (1997), using a similar view of professional community but adding collective control over key decisions to the concept, provided a case study of an elementary school that illustrates how one schoolwide professional community helped teachers improve their teaching of mathematics.

Findings from studies of professional community are provocative, but several caveats are in order. First, the studies are based on small samples of schools. Second, particularly in the case of Newmann and Associates (1996), generalization from the evidence is difficult because the schools were selected especially for their unique features. Third, most studies of professional community have implicitly adopted the nested layers view that professional community enhances teaching and thereby improves learning; yet it is also possible that professional community is a by-product of enhanced teaching, rather than a stimulus. Secada and Adajian (1997) suggested that teachers' professional community and instructional practice may affect one another, but their empirical analysis was limited to one causal direction: the influence of professional community on instruction.

Similarly, Louis, Kruse, and Marks (1996) acknowledged that the connections between social relations among teachers and classroom instruction are complex:

[Our analysis] cannot prove that professional community causes teachers to engage in more authentic classroom practice. A skeptic could plausibly argue that teachers who are making efforts to increase authentic pedagogy are more likely to seek support for this difficult task from colleagues, thus creating professional community.

**2-SOCIAL CAPITAL:** We may also think of social resources in a school as a form of social capital. Social capital in a school refers to trust, expectations, shared understandings, and a sense of obligations that may characterize networks of relationships among educators (see Coleman, 1988 for a more general definition). In contrast to schools in which teachers work in isolation, teachers in some schools form relationships with one another around academic concerns of teaching and learning. These social networks constitute resources on which teachers can draw in their efforts to improve teaching (Kilgore & Pendelton, 1993). Collaboration, collegial relations, and opportunities for reflective discussion about teaching help build social capital. In such schools, teachers are likely to work together, even in the classroom; in this way, teaching becomes deprivatized and the typical isolation of teaching is overcome. Administrative support, such as advice and consultation about teaching and school policies, also builds social resources on which teachers can draw.

Coleman (1988) explained that social capital can facilitate the development of human capital. In the case of schools, social capital among teachers helps them improve their knowledge and skills (i.e., their human capital) by providing a normative environment that encourages experimentation, offers a place to discuss uncertainties, and rewards improvement. This portrait differs substantially from the standard picture of schools in which teachers' activities are largely unseen by other adults and their unique contributions are unrecognized and unacknowledged.

More broadly, it is important to recognize the potential interplay between material, human, and social resources (which may also be termed economic, human, and social capital; see Spillane & Thompson, 1997). Just as social capital may promote human capital, teachers with particular knowledge and dispositions may be more likely to forge relations of social capital in the first place. Moreover, economic capital may be essential for developing both human and social capital, as teachers' learning and collaboration require infusions of time, materials, and expertise from outside the standard worklife of a school and its staff. Perhaps most important, economic resources devoted to teachers' professional development may stimulate both human and social capital as well as their interplay. This possibility is reflected in the arrows in Figure 2.4, which run in both directions between organizational resources and professional development.

Table 1. Correlation matrix of socio-economic Factors on student learning

Dimensions	learning	Human resources	social capital	professional community	expectations	material resources
Student learning	1					
Human resources	0/423**	1				
social capital	0/496**	0/459**	1			
professional community	0/427**	0/351**	0/435**	1		
Expectations	0/765**	0/355**	0/433**	0/397**	1	
material resources	0/458**	0/269**	0/372**	0/147**	0/349**	1

## STUDY METHOD

In this study, the aim of our social and economic factors affecting student learning is, measurement method was used. In order to collect data from the questionnaires and gather information related to theoretical discussions of Internet search and Library Studies (documentary) is used. In this study to measure variables of the questionnaire and Fldr and sylvmnv questionnaire was used. Item reliability of the questionnaire was estimated through the formal validity of the content. Our samples of 384 students in Ardabil selected by cluster sampling and were measured. In the present study, using data from preliminary test (pre-test) and with the help of computers and software spss, Cronbach's alpha was calculated for variables that were prepared for construction. To chart a path analysis software is used Amos.

### The coefficient of correlation between independent variables with student learning

There is a relationship Between the resources of the Organizational (independent variables) and student learning. To determine the effect of organizational resources and student learning was used Pearson correlation coefficient. The results of which are shown in the table below.

coefficient	R Square	Adjusted R Square
0/812	0/659	0/65

Based on the above table, There is a positive and significant correlation between the Organizational resource and the students learning. In other words, whatever the organizational resources such as human resources, material resources and social capital increases its impact increases on student learning rate. That the result confirms the hypothesis. Another result of this study was observed a significant positive correlation between the norms and expectations of people and student learning. We can say that the expectations people had the greatest impact on student learning.

### Regression

In this section, the multivariate regression was used to explain the factors set. Multivariate regression is a statistical method that considers how independent variable Explained dependent variable changes as well as how much is the effect of each of them. To achieve this goal were used the stepwise regression methods. The results of the regression relevant social and economic factors affecting student learning step by step method shown in the table below.

Table 2. Results of multivariate regression analysis to assess the effect of independent variables on Teaching and Learning

Dimensions	B	Std. error	Standardized coefficients	T	Sig
			Beta		
Expectations	0/841	0/051	0/594	16/578	0/000
material resources	0/375	0/070	0/180	5/384	0/000
social capital	0/113	0/047	0/091	2/397	0/017
professional community	0/140	0/053	0/092	2/630	0/009
Human resources	0/158	0/061	0/090	2/568	0/011

Table 3. Goodness of Fit Index for supposed model

Index	RMR	RMSEA	NFI	CFI	AGFI	GFI	X <sup>2</sup> /df	X <sup>2</sup>
-	0/449	0/061	0/99	0/99	0/96	0/98	2/24	19/53

Table 4. Direct impact, indirect impact and the total impact of predictor variables

Variables	direct impact	indirect impact	total impact
on expectations			
Social capital	0/194** (3/65)	-	0/194**
human resources	0/126** (2/54)	-	-0/126**
Material resources	0/211** (4/51)	-	0/211**
Professional associations	0/241** (4/94)	-	0/241**
On Perception			
Social capital	-0/196** (3/93)	0/068*	-0/129**
human resources	0/159** (3/42)	0/044*	0/203**
Material resources	0/433** (9/77)	0/074*	0/507**
Professional associations	-0/123** (2/65)	0/084*	-0/039*
Expectations	0/348** (7/38)	-	0/348**
On intuitive			
Social capital	0/113** (2/58)	0/175*	0/288**
human resources	-0/164** (3/83)	0/041*	-0/123**
Material resources	-	0/026*	0/026**
Professional associations	-	0/187**	0/187**
Expectations	0/732** (16/37)	-0/088*	0/644**
On Sense			
Social capital	0/214** (4/33)	0/024*	0/238**
human resources	0/190** (4/04)	0/016*	0/205**
Material resources	-	0/026*	0/026*
Professional associations	0/286** (6/19)	0/030*	0/316**
Expectations	0/123** (2/62)	-	0/123**
On Learning			
Social capital	-	0/221**	0/221**
human resources	0/036* (3/85)	0/123*	0/160**
Material resources	0/031** (3/20)	0/251**	0/281**
Professional associations	-	0/243**	0/243**
Expectations	0/032* (2/48)	0/555**	0/587**
Perceptual learning	0/429** (40/84)	-0/137*	0/292**
Intuitive Learning	0/539** (48/40)	-	0/539**
Sense learning	0/480** (51/18)	-	0/480**

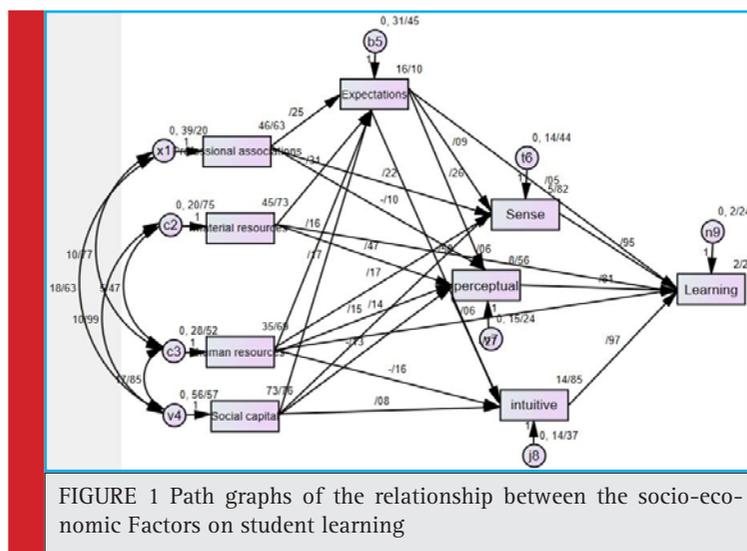
\*P<0/050/01 \*\*P<

Based on the above table, the coefficient of correlation between independent variables and Teaching and student Learning variable equal to  $R=0/812$  and Adjusted R Square equal to  $R=0/65$  is obtained. And indicates that 65% of the variance of Teaching and student Learning variable determined by the independent variables. The regression model explained by ANOVA, linear and significant. Because the F-test for independent variables explain a significant effect on teaching and student learnings equal to 145/890 with significance level  $P = 0/000$ . Finally, with respect to Beta values of the independent variables in the table above; expectations

Beta = 0/594, material resources Beta = 0/180, social capital Beta = 0/091, professional community Beta = 0/092, Human resources Beta = 0/090 Have the greatest impact on Teaching and student Learning. Finally, expectations and norms are the most influential variables that alone explained 58% of the variance student learning.

**The findings related to structural equation modeling assumptions**

In this section, findings related to the main hypothesis and sub-hypotheses of hypothetical model presented.



**The Result of main hypothesis study**

The purpose of this research is to achieve clearer understanding of how socio-economic Factors on student learning. Path analysis will show whether the main hypothesis of this study – model fit with data obtained from the sample of study- will be confirmed? Although simple relationships between variables revealed to us some hints, but manifold and complex relationships between variables revealed through the Path analysis. The results of Path analysis based on correlation matrix between the variables showed that The model have a Good fitness with the data.

The Result of the secondary hypothesis study: In the table below, the direct and indirect effects of the aspects of socio-economic Factors on student learning has been shown. The numbers in parentheses indicate the t test. As can be seen, variables of the expectations, material resources, social capital, professional community and Human resources have direct and indirect significant impact on the dependent variable. Variables of the expectations, material resources, social capital and Human resources have a direct impact on the student learning.

**CONCLUSION**

In this study, 384 male students in Ardabil city were studied. In terms of family income, your family income below 65 percent of students reported one million in which shows family’s incomes are not on feasible conditions. The first hypothesis was that if school facilities including updated equipment and other school facilities and school services are good will impact on student learning and students will learn fast. The research

is in order to verify the hypothesis. Coleman and colleagues, outlines a process of economic production in which student learning output, reacts to the economic inputs, including costs, facilities, equipment, records of teachers. In this model, the school has a black box has not been opened. If the manufacturing process, simple and predictable performance of production input - output can be a reasonable way to study the impact of school resources. In addition, in developing countries, where the level of resources, such as trained teachers, textbooks and facilities vary widely, the relationship between such resources and student achievement than the United States of America and in other developed countries, tend to have been stronger. (Fuller, 1987, Fuller and Clarke, 1994).

Another hypothesis was that no matter how much students have qualified teachers and experienced management and careful planning be done on them, the same degree of student learning is reinforced in the present study were approved. Brick and Driscoll (198) has seen a strong positive relationship between student achievement in mathematics and social indicators (common) Teachers will work together and work together, or please support the work of teachers, and so on. Similarly, Lee and Smith (1995, 1996) showed that student achievement in high school where teachers understand the effectiveness and a greater sense of responsibility on their students’ learning, and in schools where teachers are involved in reconstruction activities, including training team, restructuring grouping, and flexible scheduling and so on is higher.

Another hypothesis is a positive relationship between social resources for teachers and students learning, which was approved. The social capital of teachers so that common understanding, expectations, confidence

and a sense of commitment and professional community, including common goals, collective focus on student learning and teachers collaborate with each other more, the same amount will have a positive impact on improving student learning. In a school social capital, trust, expectations, common understanding and a sense of commitment refers to the network of relationships between coaches may be specified (Coleman, 1988) In contrast, there are schools in which teachers work in isolation. Teachers in some schools that their relationships with each other, learning about the scientific issues of the day. These resources make up social networks where teachers can benefit from their efforts to improve education (Kylgv and Yndltn, 1993). As Rowan (1990) is described as an interactive teaching as a complex, dynamic and changing and an organic system that relies on the development of management commitment, instead of controlling seen, May be result in more successful teaching and learning.

Organic management means encouraging social relationships of trust, shared responsibility, and collective decision-making, shared values as a mechanism to make changes. When these activities are focused on student learning, they may be effective for education and success. (Newman et al., 1996). Therefore, the social aspects of the school environment make up such as shared values as cooperation, and collective decision-making, community resource where educators may be drawn to the strengthening of their training. Lee and Smith (1996) argued that students are more successful when their teacher, to accept collective responsibility for student learning. Lee and Smith by showing the relationship between teachers and students learn a sense of responsibility demonstrated their claims.

Another subsidiary hypothesis was the relationship between expectations and norms of society and student learning, which was approved. That no matter how expectations around student are more than he will have a great impact on student learning mutually. The student's parents of your child expect to be a doctor in the future, mutually students will make great efforts to respond to the wishes of their parents, which will enhance student learning. According to Parsons Socialization process takes place basically through the generalized mechanisms, duplication and replication in which are very important, Flows motivation in learning mechanisms are imported as part of the social mechanisms through the participation of children in a complementary roles expectations, has been organized. (Parsons, 1962, 227) Learning Theory Bandura also believes that learning through observing the behavior of others to learning. t the same time describing the concept of reciprocal determinism of the individual, the social cognitive learning caused him to be active interaction between the

person, behavior, and environment knows (Lotfabadi, 2001).

According to Bandura's theory can be said that students observing the behavior of others and expect them to be, people react to what they expect student, is crucial. If people expect that in the future the individual student should be mutually successful students will try to respond to people's expectations, In contrast, if people expect from a person who has no talent can propel students to the expectations of those around him. According to multivariate regression analysis, the variables, expectations and norms, material resources, human resources and social capital, social and professional statistically significant relationship with the dependent variable was demonstrated student learning, and regression analysis variables in the model have about 65% of the variance in student learning variables explain that the strongest predictor of popular expectations and norms, material resources, social capital, community, professional and human resources respectively. So we can say that expectations and social norms, is one of the most influential variables that can predict the dependent variable is teaching and student learning.

## REFERENCES

- Anderson, C. W. (1996). Reform in teacher education as building systemic capacity to support the scholarship of teaching. Paper presented at the International Workshop on Reform Issues in Teacher Education, Taipei, Taiwan.
- Barr, R., & Dreeben, R. (1983). *How schools work*. Chicago: University of Chicago Press.
- Baruque LB, Melo RN. Learning theory and instructional design using learning objects. *Journal of Educational Multimedia and Hypermedia*. 2004;13:343-370.
- Brophy, J., & Good, T. L. (1986). Teacher behavior and student achievement. In M. C. Wittrock (Ed.), *Handbook of research on teaching* (3rd ed., pp. 315-375). New York: Macmillan.
- Bryk, A. S., & DriscoU, M. E. (1988). *The high school as community: Contextual influences, and consequences for .students and teachers*. Madison, WI: National Center on Effective Secondary Schools.
- Callahan, R. (1962). *Education and the cult of efficiency*. Chicago: University of Chicago Press.
- Cercone K. Characteristics of adult learners with implications for online learning design. *AACE Journal*. 2008;16: 137-159.
- Charlie Naylor. 21st century learning-widening the frame of focus and debate: A BCTF Research discussion paper. Available from:U/RL:http://www.21learn.org/site/wp-content/uploads/Schools-in-the-Future-April-2010.pd.
- Cohen, D. K. (1990). A revolution in one classroom: The case of Mrs. Oublier. *Educational Evaluation and Policy Analysis*, 12, 311-330.

- Coleman, J. S. (1988). Social capital in the creation of human capital. *American Journal of Sociology*, 94, S95-S120.
- Darling-Hammond L. *Powerful learning—what we know about teaching for learning*. New York: Jossey-Bass Press; 2006.
- Edmonds, R. (1979). Effective schools for the urban poor. *Educational Leadership*, 37, 15-27.
- Fraser SW, Greenhalgh T. Coping with complexity: educating for capability. *BMJ*. 2001;323:799-803.
- Fuller, B. (1987). What school factors raise achievement in the Third World? *Review of Educational Research*, 57, 255-292.
- Fuller, B., & Clarke, P. (1994). Raising school effects while ignoring culture? Local conditions and the influence of classroom tools, rules, and pedagogy. *Review of Educational Research*, 64, 119-157.
- Gamoran, A. (1988). Resource allocation and the effects of schooling: A sociological perspective. In D. W. Monk & J. Underwood (Eds.). *Microlevel school finance: Issues and implications for policy* (pp. 207-232). Ninth Annual Yearbook of the American Educational Finance Association. Cambridge, MA: Ballinger.
- Gamoran, A., & Dreeben, R. (1986). Coupling and control in educational organizations. *Administrative Science Quarterly* 31, 612-632.
- Gamoran, A., Porter, A. C, Smithson, J., & White, P. A. (1997). Upgrading high school mathematics instruction: Improving learning opportunities for low-income, low-achieving youth. *Educational Evaluation and Policy Analysis*. 19, 325-338.
- George R, *Contemporary sociological theory*. Translation Mohsen S. tehran: Academic. 2013
- Good, T. L., & Brophy, J. E. (1986). School effects. In M. C. Wittrock (Ed.), *Handbook of research on teaching* (3rd ed., pp. 570-602). New York: Macmillan.
- Hemmings, A., & Metz, M. H. (1991). Real teaching: How high school teachers negotiate societal, local community, and student pressures when they define their work. In R. N. Page & L. Valli (Eds.), *Curriculum differentiation: Interpretive studies in U.S. secondary schools* (pp. 91-112). Albany, NY: State University of New York Press.
- Henri SG, *Psychology of Success*, Translation Ardabili Y, Tehran. Rozaneh Press. 2011
- Kahraman A, *Prospective Elt Teacher's Sense of Writing Self-Efficacy and its Effects on Writing Achievement*. *Procedia-Social and Behavioral Sciences*. 2012;46:711-714.
- Kampylis S, Panagiotis G, Valtanen J. *Redefining Creativity—Analyzing Definitions, Collocations, and Consequences*. *The Journal of Creative Behavior*. 2010;44:191-214.
- Kilgore, S. B., & Pendelton, W. W. (1993). The organizational context of learning: Framework for understanding the acquisition of knowledge. *Sociology of Education*, 66, 63-87.
- Lee, V. E., & Smith, J. B. (1995). Effects of high school restructuring and size on early gains in achievement and engagement. *Sociology of Education*, 68, 241-270.
- Lee, V. E., & Smith, J. B. (1996). Collective responsibility for learning and its effects on gains in achievement for early secondary students. *American Journal of Education*, 104, 103-147.
- Lin J. *Love, peace, and wisdom in education: Transforming education for peace*. *Harvard Educational Review*. 2007;77:362-365.
- Maureen Th. *Handbook of the Sociology of Education*. Kluwer Academic/Plenum Publishers, New York, 2000.
- Meyer, J. W., & Rowan, B. (1978). The structure of educational organizations. In M. Meyer & Associates, *Environments and organizations*. San Francisco, CA: Jossey-Bass.
- Newmann, F. M., & Associates. (1996). *Authentic achievement: Restructuring schools for intellectual quality*. San Francisco, CA: Jossey-Bass.
- Park, B.-J. (1998). *Teacher empowerment and its effects on teachers' lives and student achievement in the U.S. high school*. Unpublished doctoral dissertation. University of Wisconsin, Madison.
- Porafkari N. Atkinson and Hiligard's Hiligard's Introduction to Psychology. Smith E, Nolen-Hoeksema S. 14th ed. Tehran: Shahrab Press; 2003. [Persian]
- Purkey, S. C, & Smith, M. S. (1983). Effective schools: A review. *Elementary School Journal*, 83, A21-Ai2.
- Rowan, B., & Miracle, A. W., Jr. (1983). Systems of ability grouping and the stratification of achievement in elementary schools. *Sociology of Education*, 56, 133-144.
- Secada, W. G., & Adajian, L. B. (1997). Mathematics teachers' change in the context of their professional communities. In L. Fennema & B. S. Nelson (Eds.), *Mathematics teachers in transition* (pp. 193-219). Mahwah, NJ: Lawrence Erlbaum Associates.
- Shulman, L. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review*, 57, 1-22.
- Slavin, R. E. (1989). Class size and student achievement: Small effects of small classes. *Educational Psychologist*, 24, 99-109.
- Tavasoli GA, *Sociological Theories, The Organization Study and Compilation of Humanities Books (samt)*, 2010; 285.
- Tharp, R. G., & Gallimore, R. (1988). *Rousing minds to life*. Cambridge, England: Cambridge University Press.
- Trilling B, Fadel C. *21st century learning skills*. San Francisco: John Wiley & Sons Press; 2009.
- Yinger RJ. The promise of education. *Journal of Education for Teaching*. 2005;31: 307-310.

## Ultrastructural studies on apoptotic forms of seminiferous tubules and levels of certain hormones in testes of Wistar rats exposed to Sertraline

Laleh Pasha, Mokhtar Mokhtari<sup>1\*</sup>, Saeed Khatamsaz and Mehrdad Shariati<sup>1</sup>

<sup>1</sup>Department of Biology, Islamic Azad University, Kazerun branch, Kazerun, Iran

\*Department of Biology, Islamic Azad University, Fifth Kilometer of Bushehr Road, Kazerun, Fars, Iran. P.O Box 73135-168.

### ABSTRACT

Sertraline antidepressant medication despite widely used, has side effects on different parts of the body including the endocrine system. There are few studies on the ultra-structural alterations of male germ cells following administration of Sertraline (antidepressant). The current paper aims to examine ultra-structural changes of apoptotic forms of male rat germ cells treated by various doses of Sertraline as well as Pituitary-testicular hormone changes. The current experimental study was conducted on 40 male adult Wistar rats in 4 groups of 10. The controls did not receive any medication treatments. The sham received 2 ml of distilled water as a medication solvent per day. The experimental groups received 50 and 10 mg/kg Sertraline orally. After 21 days, testicle in all groups was dissected and apoptosis was evaluated with the help of electron microscope (TEM). Blood tests were taken from all groups and LH, FSH, Testosterone, Dihydrotestosterone serum concentration measurements were done by Radioimmunoassay (RIA) method. Moreover, ultra-structural study of testicular seminiferous tubules tissue was conducted on groups. The results were analyzed and compared using ANOVA statistical method by SPSS software.  $p < 0.05$  was considered as significant. The levels of LH, FSH, Testosterone and Dihydrotestosterone in the experimental groups receiving 50, 10 mg/kg Sertraline were significantly reduced compared to the controls. Sertraline injection induced ultra-structural features of apoptosis in all groups. Changes were observed in the group receiving 50 and 10 mg/kg Sertraline like lateral nuclei of germ cells hyperchromatic, especially spermatogonia, germ cells nuclei deformations, Sertoli cells and apoptotic bodies shrinkage, reduce the size of the endoplasmic reticulum, deformed mitochondria (the abnormal ring), increased Sertoli cell fat vacuoles and Disruption of cell-cell junction in spermatogonial cells. The medication Sertraline can cause disorders of sexual reproduction by decreased serum concentrations of LH, FSH, Testosterone, Dihydrotestosterone as well as ultra-structural changes at the level of testicular tissue cellular organelles.

**KEY WORDS:** SERTRALINE, GONADOTROPINS, TESTOSTERONE, DIHYDROTESTOSTERONE, APOPTOSIS, SPERMATOGENESIS, RAT

### ARTICLE INFORMATION:

\*Corresponding Author:

Received 18<sup>th</sup> April, 2017

Accepted after revision 21<sup>st</sup> July, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

Apoptosis is programmed cell death that naturally occurs in different stages of embryonic tissue morphogenesis and adulthood. Testicular germ cells apoptosis occurs during life stages and in spermatogenesis similar to other tissues (Billig et al., 1996 Loveland 2000). The incidence of testicular germ cell apoptosis increases in some pathological conditions such as genetic alterations as Bcl2 family, Fas Ligand, P53, and heat (Ohta et al 2003), exposure to ionizing radiation (Shuttlesworth et al., 2000) drugs and toxics, hormone and growth factor deprivation (Tohda et al., 2001; Omezzine et al., 2003) cryptorchidism (Ohta et al., 2003). Cells are morphology round and wrinkled with dense Chromatin during the apoptosis process and nuclear membrane gradually loses its continuity, moreover the cell nucleus breaks into several pieces or body chromatins as the result of DNA decomposition. Some medications and chemicals can induce apoptosis in testicular germ cells. Sertraline is a selective serotonin reuptake inhibitor effective to treat depression (Miki et al., 2006).

Other studies reveal that specific serotonin inhibitors medications cause reproductive system dysfunction by reducing the production of testosterone (Montgomery and Kasper 1995). Testicles function as a reproductive endocrine is controlled by pituitary gonadotropin (Oksanen 1975). Follicle Stimulating Hormone (FSH) regulates spermatogenesis process by setting the function of Sertoli cells, and luteinizing hormone (LH) controls the activity of Leydig cells (Moore, 1991). Antidepressants have side effects on reproductive system and thus gonadal dysfunction and decreased sex hormones lead to insufficient production of the spermatozoa. There are few studies conducted on ultra-structural changes in cells lining of testicular seminiferous tubules tissue following administration of Sertraline. Evidences show that transmission electron microscope is one of the most important tools for the detection of apoptotic cells and can be used as standard methods of apoptosis detection among morphological methods because it is able to show apoptotic bodies to different stages of apoptosis progress (Ballester et al., 2004).

The current study aims to examine ultra-structural changes of apoptotic forms of male rat germ cells treated by various doses of Sertraline. Given the impact of antidepressants on infertility in men, the current study investigates the effect of Sertraline on LH, FSH, Testosterone, Dihydrotestosterone as well as testicular germ cell ultra-structural changes in rats.

## MATERIALS AND METHODS

The current experimental study was conducted on 40 male adult Wistar rats weighted approximately 220-

250gr, aged 2.5 to 3 months from Shiraz Namazi Hospital breeding animal center. Rats were grouped randomly in 4 groups of 10, two controls and two experimental groups, kept in separate cages in Animal house. The first group, one control group received no treatment except enough food and water, the second sham, received 2 ml of distilled water as a medication solvent per day. The experimental groups received 50 and 10 mg/kg per body weight (Jafarzadeh et al. 2010) Sertraline orally. After 21 days, heart blood samples were taken and blood samples tubes were centrifuged for 15 minutes by 3000. Blood serum, separated from clot was kept in -20 until transported to the laboratory to measure hormones serum levels. Also do testes tissue for primary fixation for electron microscopy was kept in 2.5% Glutaraldehyde solution and 4% Paraformaldehyde (Khatab, 2007; Hagar Hashish. 2015).

Electron microscopic tissue subculture: the samples were incubated at 4 °C during the night in the primary fixative, then washed with phosphate buffer 0.2 M (pH =7.4). Osmium tetroxide 2% was used for the specimen's secondary fixation. The specimens were molded in Spar resin after tissue processing, then thin slices with the thickness of approximately 1  $\mu$ m were prepared using Ultramicrotome and stained with Toluidine blue solution (Boom et al. 2009). Thinner slices of the specimens were prepared and placed on copper grades and the cellular changes were assessed using the electron microscope (Zeiss EM-10).

## STATISTICAL ANALYZES

Data was analyzed using SPSS version 22 software, One-way ANOVA tests and Tukey at  $p < 0.05$  significance level.

## RESULTS

The mean concentration of serum LH in the experimental groups receiving 10 and 50 mg / kg Sertraline is  $5.5 \pm .1$ , and  $5.7 \pm .18$ , respectively significantly reduced compared to that of the controls by  $6.8 \pm .13$  and  $6.75 \pm .87$ , respectively (table 1). The mean serum FSH in the experimental groups receiving 50 and 10 mg / kg Sertraline is  $3.77 \pm .12$ , and  $3.63 \pm .08$ , respectively significantly reduced compared to that of the controls by  $4.9 \pm .16$  and  $4.6 \pm .014$ , respectively (table 1). The mean serum Testosterone concentration in the experimental group receiving 50 and 10 mg / kg Sertraline is  $1.82 \pm .51$ , and  $1.71 \pm .52$ , respectively significantly reduced compared to that of the controls by  $7.41 \pm 1.6$  and  $4.05 \pm 1.17$ , respectively (table 1). The mean serum Dihydrotestosterone concentration in the experimental group receiving 10 and 50 mg/kg Sertraline is  $506.6 \pm 63.9$ , and  $700 \pm 53.4$ , respectively significantly reduced compared to

Table 1. Comparison of the effect of Sertraline on the mean serum concentration of gonadotropin hormone, Testosterone, Dihydrotestosterone on male adult rats				
Dihydrotestosterone (ng/dl)	Testosterone (nmol/L)	FSH (IU/L)	LH (IU/L)	Experimental
1064.6±117.3	7.41 ±1.6	4.9 ±.16	6.8 ±.13	Control
953.3 ±45.6	4.05 ±1.17	4.6 ±.014	6.75 ±.87	Sham
*506.6± 63.9	*1.82± .51	*3.77± .12	5.5±0 .1*	Experimental 110mg/kg
*700 ±53.4	*1.71 ±.52	*3.63 ±.08	5.7 ±.18*	Experimental 250mg/kg

All data were expressed as mean ± standard deviation.  
The \* shows significant difference between experimental groups and control groups at P<0.05.

that of the controls by  $1064.6 \pm 117.3$  and  $953.3 \pm 45.6$ , respectively (table 1).

### ULTRA-STRUCTURAL STUDY OF SEMINIFEROUS TUBULES CELLS

The ultra-structural study of seminiferous tubules cells on the experimental group treated by 10 mg/kg Sertraline revealed that the cell has been changed slightly compared to the control groups (Figures 1 and 2). Seminiferous tubules basement part is natural and Sertoli cells with nuclei were natural with spherical mitochondria. Deformed mitochondria were observed in margins of some Sertoli cells (Figure 3). The ultra-structural study of seminiferous tubules cells on the experimental group treated by 50 mg/kg Sertraline revealed the cell has been changed slightly more compared to the experimental group treated by 10 mg/kg Sertraline. In this group, Sertoli cells nuclei is changed. Deformed mitochondria from Spherical shape to large spiral with irregular ridges were the most significant change on the cells body. Deformed

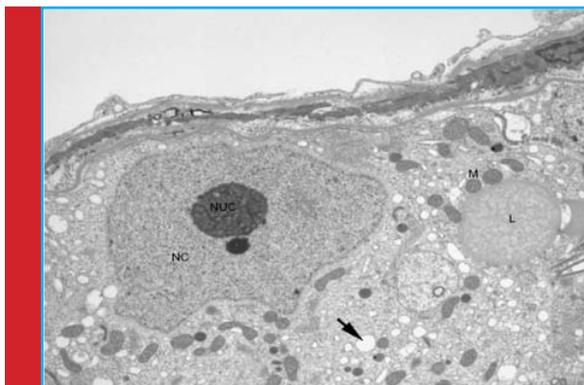


FIGURE 1. Electron Photo micro-graph of a part of seminiferous tubules of rats in the control group. Sertolicell with large nucleus (NC); and clear nucleoli (NUC) can be seen. Heterochromatin is in close contact with nucleoli. Numerous spherical mitochondria (M) and wide Endoplasmic reticulum can be seen in the cytoplasm (arrows). A fat vacuoles (L) is also observed in the cytoplasm.  $\times 5800$

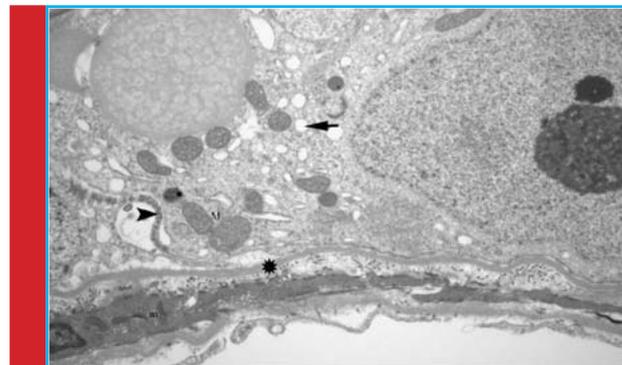


FIGURE 2. Electron Photo micro-graph of a part of seminiferous tubules of rats in the sham group. Natural Sertoli cells at the junction with basement membrane (\*) Sertoli cell-cell junction complex is observed (arrow-head). Myeloid cell (m) and cytoplasm are observed beneath the basement membrane; Endoplasmic reticulum (arrows), mitochondria (M).  $\times 9700$

mitochondria were most observed around the big fat vacuoles (Figure 4). Seminiferous tubules cells membrane was more irregular with increased large amounts of collagen strands compared with control groups (Figure 5). Spermatogonial stem cells were on the basement membrane with hyperchromatic nucleus compared with the control group with the spaces between the cells

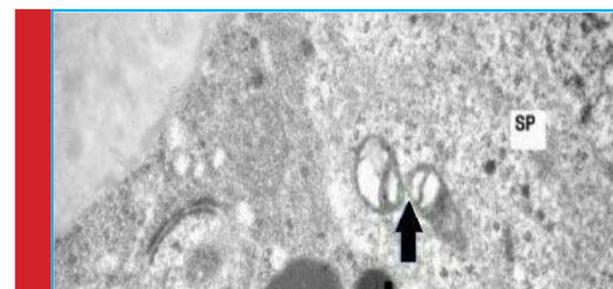


FIGURE 3. Electron Photo micro-graph of a part of seminiferous tubules of rats in the experimental rats treated by 10 mg / kg Sertraline. Sertoli cells deformed mitochondria adjacent to the spermatids cell mitochondria are visible (arrowhead).  $\times 5800$

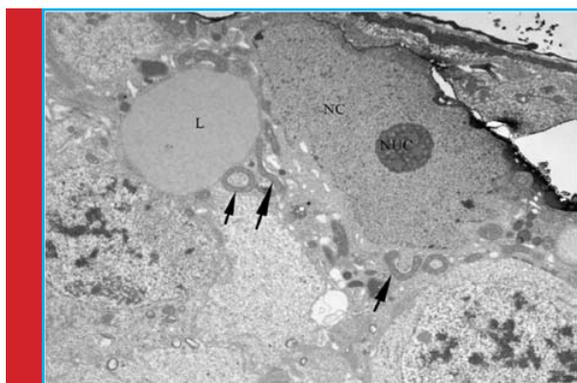


FIGURE 4. Electron Photo micro-graph of a part of seminiferous tubules of rats in the experimental rats treated by 50 mg / kg Sertraline. Sertoli cells with irregular nucleus (NC) and round nucleoli (NUC). Vacuolated cytoplasm, lipid droplet(L) and mitochondria (arrows).  $\times 5800$

and the adjacent germ cells. Other germ cells showed transformed and pale nucleus compared to the control groups that can be an early stage of apoptosis (Figure 6).

## DISCUSSION

Spermatogenesis is the essential process in human reproduction and impaired sperm production and function is among the most common causes of male infertility (Pandey et al 2005). Reproductive health is affected by physical, biological and chemicals conditions that may cause physiological dysfunction (Sharma and Agarwal 1996). Antidepressants can disrupt the process of spermatogenesis. The current paper aimed at examining the effects of Sertraline on serum concentration of LH,

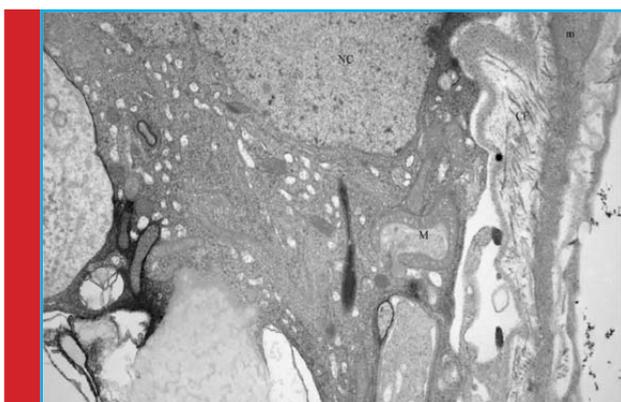


FIGURE 5. Electron Photo micro-graph of a part of Sertoli cells of the testis tissue of rats in the experimental rats treated by 10 mg / kg Sertraline. Morphological change on basement membrane (\*) and increased the amount of collagen fibers (CP) are visible; Myeloid cell (m) Sertoli cell's nucleus (NC).  $\times 9700$

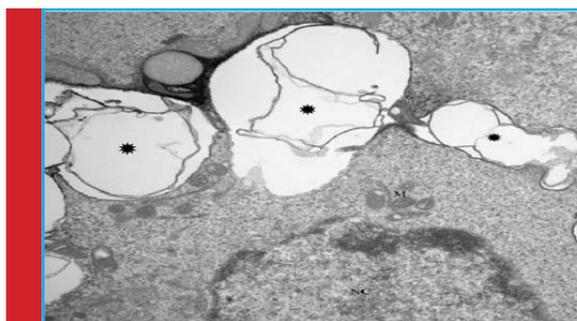


FIGURE 6. Electron Photo micro-graph of a part of Sertoli cells of the testis tissue of rats in the experimental rats treated by 50 mg / kg Sertraline. Abnormal nuclear chromatin in spermatogonial cell. Increased intercellular space (\*) indicates reduced cell attachment and cell shrinkage; cell nucleus (NC), Mitochondria (M).  $\times 9700$

FSH, Testosterone, Dihydrotestosterone as well as ultra-structural changes of the testes of male adult rats. The results showed the medication intake by a specified dose at the end of Day 21 indicate a significant decrease in serum levels of LH and FSH hormones compared to two control groups. Serotonin is effective Neurotransmitters on Hypothalamic-pituitary-gonadal (Fikret et al. 2014).

Das et al (1985) showed that Serotonin reduces serum levels of these hormones by LH receptors on Leydig cells inhibition (Das et al., 1985). Other researchers results on the effects of serotonin on anterior pituitary in culture show, serotonin can inhibit induced LH release by GnRH. Serotonin can also reduce the release of GnRH (Das TK 1987). Callas et al., (2010) studied 18 to 21-day Wistar rat embryo and showed that LHRH and FSHRH producing neurons formation and proliferation is inhibited under the influence of serotonin (Kolevzon et al., 2006) and thus decreases in the amount of LH and FSH hormones. The current paper results reports a significant reduction in the mean serum concentration of Testosterone and DHT in the both experimental groups treated by 50 and 10 mg/kg Sertraline compared to the controls (Hedger et al., 1995).

FSH to LH stimulates the production of androgens; thereby reducing serum levels of gonadotropins can decrease Testosterone production by the testes (Orth et al; 1979). Other studies have shown that Sertraline by inhibition of enzymes intervening in testes steroid production pathway decreases Testosterone and Dihydrotestosterone (Alex M. Gray. 2002). Falehi et al., (2003) reported that Sertraline increases Beta endorphin in the pituitary (Falehi et al., 2003). Beta endorphin decreases LH receptors on Leydig cells sensitivity and inhibits Steroids production by increasing the nitric oxide (Mir-damadi et al., 2001 Sagud and Pivac 2002).

Other studies suggest Sertraline increases opioids in the pituitary and thus inhibits LH and FSH release. There

are many studies on serotonergic system impact on Hypothalamic-pituitary-adrenal axis. In fact, medications increasing the release of serotonin in the brain increase the performance of Corticotrophin-releasing hormone (Maes and Meltzer 1995 and Holsboer (1995), and Dinan 1996). Some studies show sertraline reduces the number of LH receptors on Leydig cells by overexpression of glucocorticoid receptors and also inhibits some enzymes on the steroids production pathways (Van de Kar 1989).

Therefore, Testosterone, Dihydrotestosterone production gets reduced. Other findings suggest Sertraline increases prolactin. Moreover, serotonergic neurons are involved in the release of prolactin regulation (Dell *et al.*, 1996). Prolactin by increasing nitric oxide inhibits the conversion of cholesterol to Pregnenolone, on the other hand nitric oxide inhibits the process of Steroidogenesis in Leydig cells (Simsek 2014). Studies show that Sertraline can inhibit StAR protein synthesis in Leydig cells by increasing melatonin synthesis and thus disrupt the Steroidogenesis (Ching *et al.*, 2001; Atkin *et al.*, 1989).

Sertraline has an inhibitory effect on the activity of the 5-alpha reductase enzyme. The enzyme activity reduction reduces the plasma concentrations of the hormone Dihydrotestosterone. Furthermore Sertraline reduces tissue sensitivity to androgens and consequently reduces the activity of androgens including Dihydrotestosterone by aromatase enzymes. The current paper, the ultra-structure study of the cells in the seminiferous tubules of the walls of seminiferous tubules showed major testicular changes including irregularities on basement wall of seminiferous tubules, disruption of intercellular junctions and deformed mitochondria in some Sertoli and Spermatogonia cells. The thickening of the basement membrane can cause an increase in seminiferous tubules wall thickness. In this study, changes in testicular tissue basement membrane were observed in rats treated with sertraline. Increased wall thickness of seminiferous tubules cells is the result of the increased volume of collagen fibers leading to disruption on the process of spermatogenesis. The increased volume of collagen fibers indicates impaired activity of fibroblasts cells around the seminiferous tubules and interstitial connective tissue (Cameron 1985; Hutson. 1984, Orth, Murray, Bardin. 1979).

Spermatogonial cells are on the basement membrane and nucleus of the cell in the experimental groups compared to the control group and sham was hyperchromatic. Other germ cells had abnormal nucleus can be early signs of apoptosis. Deformed mitochondria from round to abnormal forms of elongated, with crystal lumps and reduced smooth endoplasmic reticulum were observed in some Sertoli cells. Sertoli cells also play an important role in controlling normal functioning of the testes. Reduction in the size of smooth endoplasmic reticulum on Sertoli cells represent change in the

activities of these organelles is a steroid hormone production. Increased number and size of fat vacuoles in the cytoplasm of Sertoli cells in the testis tissue of mice receiving sertraline shows the reduced steroidal activity of these cells. The results of the current study show a direct correlation between ultra-structural changes of Sertoli cells Spermatogenesis and the incidence of hormonal changes in Pituitary-testicular axis and all are the results of structural and functional changes of testicular tissue following Sertraline received. The medicine disrupts the Spermatogenesis process in rats (Hassan *et al.*, 2001). Obviously, generalization of the results observed in the current paper to human testicular tissue changes as well as the possible mechanisms involved that could explain the relationship between the side effects of antidepressants and fertility disorders requires more research is cellular and molecular dimensions.

## ACKNOWLEDGMENTS

We appreciate the officials and employees of Islamic Azad University Mr Kazeroon Dr. Majid Asadi of Electron Microscopy Center, Kerman University of Medical Sciences for their help and cooperation in this research.

## REFERENCES

- Abdul Muttalip ,Saban Mimaroglu. Sinan Levent Kirecci, Relationship between plasma melatonin levels and the efficacy of selective serotonin reuptake inhibitors treatment on premature ejaculation. 8 April 2014.
- Aitken, RJ J S Clarkson and S Fishel. Generation of reactive oxygen species, lipid peroxidation, and human sperm function. *Biology of Reproduction* July 1, 1989 vol. 41 no. 1 183-197.
- Alex M. Gray. The effect of fluvoxamine and Sertraline on the opioid withdrawal syndrome:: A combined in vivo cerebral microdialysis and behavioural study. *European Neuropsychopharmacology*. June 2002, Pages 245-254.
- Ballester J, Muñoz MC, Domínguez J, Rigau T, Guinovart JJ, Rodríguez-Gil JE Insulin-dependent diabetes affects testicular function by FSH- and LH-linked mechanisms. *J Androl*. 2004 Sep-Oct;25(5):706-19.
- Billig H, Chun SY, Eisenhauer K, Hsueh AJ. Gonadal cell apoptosis: hormone-regulated cell demise. *Hum Reprod Update*. 1996 Mar-Apr;2(2):103-17.
- BoomiManivannan, Ruchi Mittal. *et al.* Sperm characteristics and ultrastructure of testes of rats after long-term treatment with the methanol subfraction of carica papaya seeds. *Asian Journal of Andrology*. 2009, Pages 11:538-599.
- Cameron DF, Murray FT, Drylie DD. Interstitial compartment pathology and spermatogenic disruption in testes from impotent diabetic men. *Anat Rec*. 1985 Sep;213(1):53-62.
- Ching-Shyi Wu, Sew-Fen Leu, Hsi-Yuan Yang, Bu-Miin Huang. Melatonin Inhibits the Expression of Steroidogenic Acute Reg-

- ulatory Protein and Steroidogenesis in MA-10 Cells. *ANDROLOGY* 4 March 2001.
- Das TK, Mazumder R, Biswas NM. Effect of intraventricular injection of 5,6-dihydroxytryptamine on spermatogenesis and plasma Testosterone levels in the rat. *J Endocrinol.* 1985 Sep; 106(3):395-400.
- Del Punta K1, Charreau EH, Pignataro OP. Nitric oxide inhibits Leydig cell steroidogenesis. *Endocrinology.* 1996 Dec;137(12): 5337-43.
- Dinan TG. Noradrenergic and serotonergic abnormalities in depression: stress-induced dysfunction? *J Clin Psychiatry.* 1996;57Suppl 4:14-8.
- Faletti AG, Mohn C, Farina M, Lomniczi A. Interaction among beta-endorphin, nitric oxide and prostaglandins during ovulation in rats. *Reproduction* 2003;125:469-477.
- Fikret Erdemir, Dogan Atilgan, Fatih Firat. *et al.* The effect of Sertraline, Paroxetine, Fluoxetine and Escitalopram on testicular tissue and oxidative stress parameters in rats. *IBJU* 2014; 40(1):100-108.
- G Hassan, T Abdel Moneium. Structural changes in the testes of streptozotocin-induced diabetic rats. *Suez Canal Univ Med J,* 2001;4(1):17-25.
- Hagar A Hashish. Evaluation of histopathological and ultrastructural changes in the testis of tadalafil treated adult male albino rats. *Journal of Histology & Histopathology* 2015.
- Hedger, MP S, Khatib, G, Gonzales and Kretser DM de. Acute and short-term actions of serotonin administration on the pituitary-testicular axis in the adult rat. *Reproduction, Fertility and Development* 7(5) 1101 - 1109 Published: 1995 .
- Holsboer F, Lauer CJ, Schreiber W, Krieg JC (1995) Altered hypothalamic-pituitary-adrenocortical regulation in healthy subjects at high familial risk for affective disorders. *Neuroendocrinology* 62: 340-347.
- Jafarzadeh Z, Asgari A. *et al.* Abortifacient effect of stachyslavandulifoliavahl in mice. *J. J. Shahrekord Uni. MED Sci* 2010; 11:26-31. (Persian).
- JC Hutson. Altered biochemical responses by rat Sertoli cells and peritubular cells cultured under simulated diabetic conditions. *Diabetologia* 1984;26:155-8.
- JM Orth, FT Murray, CW Bardin. Ultrastructural changes in Leydig cells of streptozotocin-induced diabetic rats. *Anat Rec* 1979;195:415-30.
- K Aydos, MC Güven, B Can, A Ergün. Nicotine toxicity to the ultrastructure of the testis in rats. *BJU Int* 20001;88:622-6.
- Khattab F and I. Khattab (2007). Histological and ultrastructural studies on the Testis of Rat after Treatment With Aluminium chloride. *Australian Journal of Basic and Applied science*, 1(1):63-72, 2007.
- Kolevzon A1, Mathewson KA, Hollander E. Selective serotonin reuptake inhibitors in autism: a review of efficacy and tolerability. *J Clin Psychiatry.* 2006 Mar;67(3):407-14.
- Maes MH and Y. Meltzer, The Serotonin Hypothesis of Major Depression, In: F. E. Bloom and D. J. Kupfer, Ed., *Psychopharmacology: The Fourth Generation of Progress*, Raven Press, New York, 1995, pp. 933-944.
- Marina Sagud Nela Pivac. Effects of Sertraline Treatment on Plasma Cortisol, Prolactin and Thyroid Hormones in Female Depressed Patients. *Neuropsychobiology* 2002 February; 45(3): 139-43.
- Marta E. Apfelbaum. Effect of serotonin on the basal and gonadotrophin-releasing hormone-induced release of luteinizing hormone from rat pituitary glands in vitro. 26 October 1987, Pages 2069-2076.
- Miki Yamauchi, Takako Miyara, Tetsuya Matsushima, Taiichirolmanishi. Desensitization of 5-HT<sub>2A</sub> receptor function by chronic administration of selective serotonin reuptake inhibitors. 5 January 2006, Pages 164-169.
- Mirdamadi R. *Internal Gland.* 1th.ed. Tehran Tabib Publication. 2001;P.122.
- Montgomery, S. A.; Kasper, S. Comparison of compliance between serotonin reuptake inhibitors and tricyclic antidepressants: a meta-analysis. *International Clinical Psychopharmacology*: January 1995.
- Ohta H, Aizawa S, Nishimune Y. Functional analysis of the p53 gene in apoptosis induced by heat stress or loss of stem cell factor signaling in mouse male germ cells. *Biol Reprod.* 2003 Jun;68(6):2249-54. Epub 2003 Jan 22.
- Oksanen A. Testicular lesions of streptozotocin diabetic rats. *Horm Res.* 1975;6(3):138-44.
- Omezzine A, Chater S, Mauduit C, Florin A, Tabone E, Chuzel F, Bars R, Benahmed M. Long-term apoptotic cell death process with increased expression and activation of caspase-3 and -6 in adult rat germ cells exposed in utero to flutamide. *Endocrinology.* 2003 Feb;144(2):648-61.
- Pandey RS1, Singh BK, Tripathi YB. Extract of gum resins of *Boswelliaserrata L.* inhibits lipopolysaccharide induced nitric oxide production in rat macrophages along with hypolipidemic property. *Indian J Exp Biol.* 2005 Jun;43(6): 509-16.
- Print CG1, Loveland KL. Germ cell suicide: new insights into apoptosis during spermatogenesis. *Bioessays.* 2000 May;22(5): 423-30.
- Sharma RK1, Agarwal A. Role of reactive oxygen species in male infertility. *Urology.* 1996 Dec;48(6):835-50.
- Shuttlesworth GA, de Rooij DG, Huhtaniemi I, Reissmann T, Russell LD, Shetty G, Wilson G, Meistrich ML. Enhancement of A spermatogonial proliferation and differentiation in irradiated rats by gonadotropin-releasing hormone antagonist administration. *Endocrinology.* 2000 Jan;141(1):37-49.
- Tohda A1, Matsumiya K, Tadokoro Y, Yomogida K, Miyagawa Y, Dohmae K, Okuyama A, Nishimune Y. Testosterone suppresses spermatogenesis in juvenile spermatogonial depletion (jsd) mice. *Biol Reprod.* 2001 Aug;65(2):532-7.
- Van de Kar LD. Neuroendocrine aspects of the serotonergic hypothesis of depression. *Neurosci Biobehav Rev.* 1989 Winter;13(4):237-46.
- Ward DN, Bousfield GR, Moore KH. Gonadotropins. In: Cupps PT, Editor. *Reproduction in domestic animals.* San Diego California Academic Press;1991.P.25-67.

## The relationship between the level of iron serum and the development of cardiovascular disease in Iran: A systematic review and meta-analysis

Ehsan Shabani<sup>1</sup>, MSc; Ali Delpisheh<sup>2</sup>, PhD; Samiramiss Gavam<sup>3</sup>, MD; Behzad Badakhsh<sup>3</sup>, MD; Shoboo Rahma<sup>1</sup>, MSc and Kourosh Sayehmiri<sup>\*4</sup>, PhD

<sup>1</sup>MSc. Epidemiology Student Research Committee, Faculty of Health, Ilam University of Medical Sciences, Ilam, Iran

<sup>2</sup>Professor of Epidemiology, Faculty of Health, Ilam University of Medical Sciences, Ilam, Iran

<sup>3</sup>Assistant Professor, Department of Cardiology, Faculty of Medicine, Ilam University of Medical Sciences, Ilam, Iran

<sup>4</sup>Associate Professor, Psychosocial Injuries Research Centre, Ilam University of Medical Sciences, ILAM, Iran

### ABSTRACT

Numerous studies have focused on investigating the role of iron serum in the emergence, and development, of cardiovascular diseases (CVD); these studies have produced varying results. The present systematic meta-analytical review was aimed at investigating the relationship between the level of iron serum and the development of CVDs. The present study conducted a systematic meta-analytical review of the articles published between 2001-2015. In so doing, two independent researchers used appropriate keywords to search medical databases of SID (Scientific Information Database), Mag Iran, Iran doc, Med lib, Iran med ex, Direct Science, Scopus, Google, and Pub Med; collected data, then, was analyzed using SPSS 16.0. According to the results of the meta-analysis study, mean serum iron was  $84.56 \pm 24.57$   $\mu\text{mol/L}$  in heart disease group; thus, there turned out to be a significant difference, with a confidence level of 95% ( $P = .001$ ), between the groups with and without heart disease in this regard. The mean level of ferritin serum was  $107.078 \pm 60.208$   $\mu\text{mol/L}$  in the heart disease group, indicating a significant difference between two groups ( $P = .001$ ). As an essential element, iron is needed to maintain the natural structure of cells and cell viability; moreover, regardless of other risk factors, ferritin, as the representative of total iron in the body, turned out to be more common in cardiovascular patients compared to the group without the disease, which can be attributed to the probable role of iron storage in causing CVD.

**KEY WORDS:** IRAN, IRON, HEART DISEASE, META-ANALYSIS

### ARTICLE INFORMATION:

\*Corresponding Author: Sayehmiri@razi.tums.ac.ir

Received 3<sup>rd</sup> May, 2017

Accepted after revision 4<sup>th</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal  
NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

Cardiovascular disease is the most common cause of death, and one of the major causes of disability, in most countries, including Iran. Despite rapid diagnostic and treatment advances, one-third of patients who suffer heart attacks still die and the other two third who survive never neither fully recover nor go back to a completely normal life. These diseases impose substantially huge costs on the health care systems of different countries. However, cardiovascular disease is one of the most preventable human non-communicable diseases (Roger *et al.* 2012).

Cardiovascular disease causes mortality, morbidity, and disability in the population of Iran and more than 50% of annual deaths go back to this factor (Hatmiet *al.*, 2007). While the rate of the mortality-by-age of cardiovascular disease is decreasing in developed countries, the evidence suggests the increasing rate of 25-40% for this disease in Iran (Hadaegh *et al.*, 2009). It is known that in taking iron might expose body cells to oxidative damages (Jomova and Valko 2011). And it is associated with the emergence of inflammation (Depalma *et al.*, 2009). Studies have shown that excessive iron intake is associated with increasing the risk of CHD and strokes (Kaluza *et al.*, 2013). Numerous empirical studies have reported the relationship between the level of iron in the body and cardiovascular disease; HFE, which contains a mutation in HFE gene, is the first known hereditary hemochromatosis gene enhances the absorption of iron.

Research has reported the incidence of CHD in people who carry this mutated gene (Lian *et al.* 2013; Pardo, *et al.* 2010). Transition metals, such as iron, are essential elements in the human body because they are key components of several enzymes involved in many cellular processes (Vashchenko 2013; Muñoz-Bravo 2013); ferritin is a serum representative serum of total body iron stores (Qi *et al.*, 2009). While iron serum is the measurement of the circulation of iron in the body, TIBC represents the concentration of transferrin, an iron-transport protein, into body cells. (Anderson and Vulpe 2010).

Since, unlike developed countries, the rate of cardiovascular disease mortality has experienced a 25 to 40% increase in Iran (Hadaegh *et al.* 2009), given the fact that cardiovascular disease, to the incidence of which many factors contribute, is the first and most common cause of death and inability (Roger *et al.* 2012), and iron plays the role of a risk factor recently discovered to have association with this disease (Hunnicut *et al.*, 2014), and, finally, because various studies have produced varying results and findings in this regard, (Muñoz *et al.*, 2013), the present study was conducted to investigate the relationship between the level of iron, ferritin, and TIBC and cardiovascular diseases in order to provide as compre-

hensive an outcome as possible in the form of a meta-analysis review.

## MATERIAL AND METHODS

The present study is a systematic meta-analysis focusing on the relationship between the level of iron, ferritin, and TIBC and cardiovascular diseases in Iran. Both Persian and English articles published up to 2015 were included in the study. Medical databases of SID (Scientific Information Database), Mag Iran, Iran doc, Med lib, Iran med ex, Direct Science, Scopus, Google, and Pub Med were searched during the initial process. In so doing, keywords like iron, heart disease, meta-analysis, and their derivatives and their relationship with keywords like heart disease, TIBC, and ferritin were searched in mentioned databases. All articles were extracted by two completely independent researchers. Resource lists of all articles found during searching phases were evaluated to include other potential - Afterward, those articles quite irrelevant to the present study's question were crossed out through reviewing the summary of the articles and relevant researchers were selected after thorough examination of their content.

Finally, articles which met the inclusion criteria were selected out of initially chosen articles. It should be noted that all phases of evaluating quality evaluation were carried out by two independent researchers. The study's inclusion criteria included access to the complete content of the English and Persian articles, not being carried out on special groups and samples for those studies which had been conducted in Iran, covering sufficient participants, not focusing on iron-related diseases, and the absence of risk factors relevant to iron and cardiovascular diseases in participants.

Required data was collected based on a questionnaire through a checklist including information, such as the study type, conduction year, age group, gender, study location, sample size, and the average of blood iron, ferritin, and TIBC. Distribution of the studies' levels was carried out using weighted average. Random effects model was utilized in order to integrate the results in a meta-analysis. Funnel plot method was used to draw the graphs; I<sup>2</sup> index Cochran's test was applied to measure the inconsistency of the studies; and, finally, funnel chart was used to detect publication bias. Data analysis was carried out through SPSS 16.0.

## RESULTS AND DISCUSSION

222 articles were selected out of medical databases to enter into meta-analysis review. Then, two independent researchers scrutinized the title and reviewed the sum-

mary of the articles, based on which 101 articles turned out to be irrelevant to the present study's topic; 44 review articles were removed 71 studies, out of which 4 English and 3 Persian ones published before 2001, remained. Then, 71 articles went under thorough consideration and investigation, resulting into the extraction of required data providing they meet inclusion criteria. In this phase, 18 articles were labeled as irrelevant and hence eliminated. Twelve studies which included only demographic data, six studies reporting merely regression analysis, and 14 repetitive articles were removed. Two studies were eliminated for not focusing on iron. Ultimately, 12 studies which qualified according to inclusion criteria were considered in the present study (See Table 1).

All articles were examined by two independent researchers in each phase; when the opinion of two independent researchers varied on a certain article, a third researcher would be referred to in order to issue the final decision (See Graph 1). The meta-analysis carried out on 12 articles focusing on the relationship between iron and CVDs indicated that serum iron might have a significant relationship with this disease. Due to the high level of homogeneity among 4 studies focusing on iron, fixed effects model was used to combine the results. The result of combining our studies with a sample size of 1,163 people was 42, with a confidence level of 95% (See Graph 2) ( $I^2=0.0\%$ ,  $P=0.519$ ,  $SMD=.42(.31-.5)$ ).

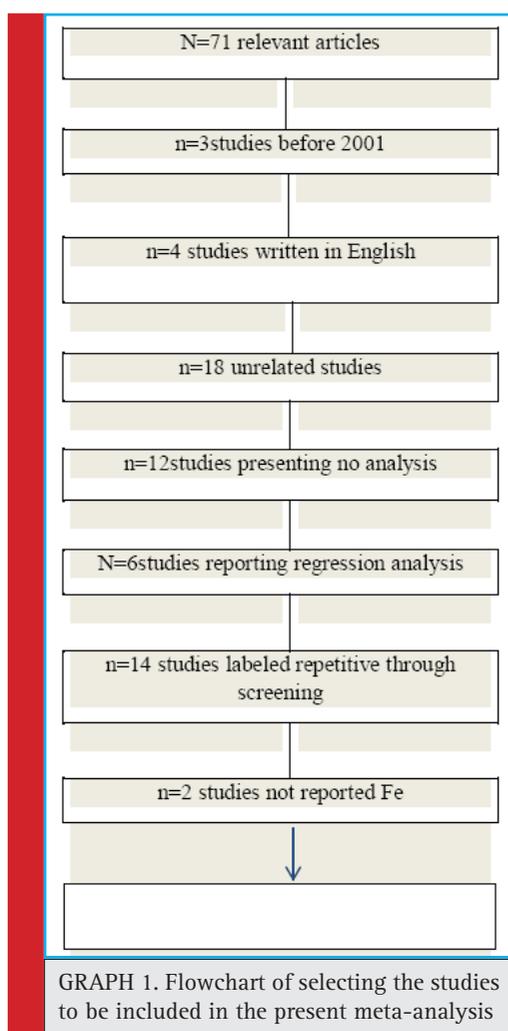
If the analysis was conducted according to the type of the studies, it was observed that the level of iron was higher among cardiovascular patients, as it was the case with the cross-sectional study carried out by Rostami with 607 participants, which, in turn, indicated that cardiovascular patients who had experienced a stroke had a higher level of iron; this relationship turned out to be significant, with a confidence level of 95%. Using Edging ton's normal methods, the results of the present meta-analysis indicated that this relationship was significant in three combined studies. ( $P=0.001$ )

Other studies; i.e.cross-sectional and case-control, also showed the increased possibility of this risk ( $P=0.001$ ,  $SMD=.45(.28-.61)$ ). Ferritin is a representative index of iron in the body. The results of combining 6 studies with a sample size of 1,403 people indicated a significant relationship with a confidence level of 95% ( $SMD=.88(.31, 1.44)$ ). Due to the heterogeneity of studies, random effects model was utilized ( $P$  for heterogeneity= $0.001$ ,  $I^2=95.5\%$ ), indicating a difference between patients with and without CVDs in terms of the level of ferritin (See Graph 3).

According to Edging ton's normal method, the relationship turned out to be significant in 6 combined studies ( $P=0.001$ ) included in present meta-analysis review. TIBC is another iron index. According to the results of the present meta-analysis, there was no significant dif-

Table 1. The characteristics of the observational studies selected in the present meta-analysis

Variable	MEAN	SD	AGE	SEX	sample n	Country	year	Study Type	Study
Fe	92.3	32.8	40-77	Male-female	241	2002	Iran	Case control	DOUSTAN <sup>15</sup>
Fe	84.2	34.5	18-50	Male-female	140	2010	Iran	Cross sectional	H Aidaribani <sup>16</sup>
Fe	132.2	45.3	50-80	Male-female	607	2008	Iran	Cross sectional	Rostami <sup>17</sup>
Fe	11.85	4.5	45-65	Male-female	175	2012	Iran	Cohort	Noogh <sup>18</sup>
Ferritin	106.95	107.95	40-77	Male-female	241	2002	Iran	Case control	DOUSTAN <sup>15</sup>
Ferritin	51.4	27.05	18-50	Male-female	140	2010	Iran	Cross sectional	H Aidaribani <sup>16</sup>
Ferritin	124.7	77.7	50-80	Male-female	607	2008	Iran	Cross sectional	Rostami <sup>17</sup>
Ferritin	113.5	75	45-65	Male-female	175	2012	Iran	Cohort	Noogh <sup>18</sup>
Ferritin	54.06	10.02	45-70	Male-female	240	2007	Iran	Cross sectional	Nozari <sup>19</sup>
TIBC	255.75	41.2	20-44	Female	160	2006	Iran	Cross sectional	Amirkhizi <sup>34</sup>
TIBC	363.46	54.95	18-50	Male-female	140	2010	Iran	Cross sectional	H Aidaribani <sup>16</sup>
TIBC	304.1	47.95	40-77	Male-female	241	2002	Iran	Case control	DOUSTAN <sup>15</sup>



ferent between patients with and without CAD in terms of the average concentration of serum TIBC (See Graph 4) in three combined studies. However, this difference was significant in two other combined studies. ( $P=.007$ ). Since some articles investigated the role of iron, some others focused merely on the role of ferritin, and several other studies examined the role of two elements together, it is better to measure each individual factor separately and then combine the results in order to provide statistically significant findings.

According to the findings of the present study, there is a significant relationship between serum iron, ferritin, and cardiovascular disease (Hunnicuttt *et al.*, 2014; Dustan *et al.* 2002; Heidari *et al.*, 2008; Noogh 2012; Nozari and Nabati 2007). Some other studies have presented the possible incidence of the cardiovascular disease under the influence of iron and ferritin; however, it is likely that higher ferritin increases the rate of iron, resulting in oxidation in itself (Lee *et al.* 2010). According to some studies, increase in the level of body iron

enhances plasma MDA concentration which, in turn, can increase the risk of the incidence of cardiovascular disease (Amirkhizi *et al.* 2008). several risk factors that increase the risk of cardiovascular disease have been identified so far. Zagrin's systematic review showed a significant relationship between serum markers of iron status and cardiovascular disease (Zegrean 2009).

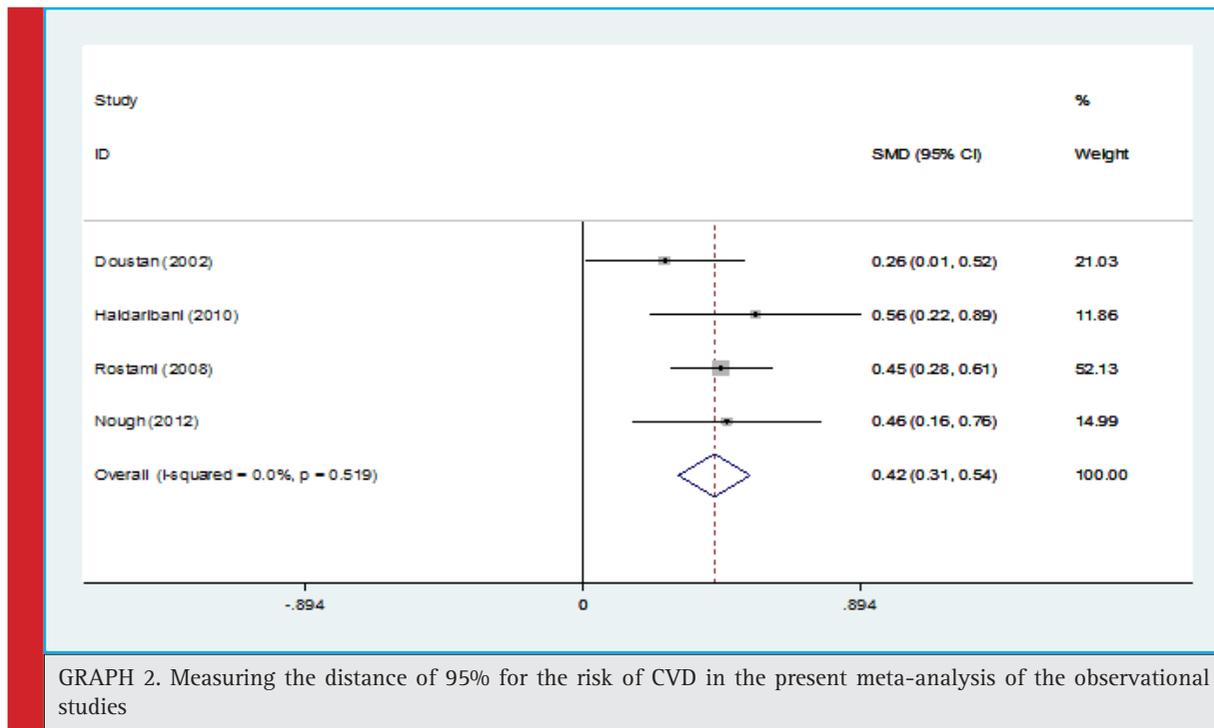
In a study conducted by Menke *et al.*, there turned out to be a moderate relationship between ferritin with peripheral arterial disease (Menke *et al.*, 2009). The ratio of iron intake increases the risk of cardiovascular diseases. According to Rajapurkar *et al.* study, the serum iron level is higher in cardiovascular patients in comparison to healthy individuals (Rajapurkar *et al.* 2012). Based on the results of Sung *et al.* study, serum ferritin plays a key role in increasing the incidence of cardiovascular diseases independently, regardless of other risk factors (Sung *et al.*, 2012). Merono *et al.* indicated a significant relationship between iron overload and increased risk of cardiovascular disease (Merono *et al.*, 2011).

According to the findings of Holay *et al.*, there is a significant relationship between the level of serum ferritin and acute myocardial infarction, in comparison with the control group (Holay *et al.*, 2012), which, in turn, shows that ferritin level is increased when the patient is having a stroke, giving rise to the acute phase of a heart attack. Thus, increased level of ferritin serum is witnessed at the time of the incidence of a stroke, through the accomplished meta-analysis and based on the articles done in Iran (Dustan *et al.*, 2002; Heidari *et al.*, 2010; Rostami *et al.*, 2008; Noogh 2012; Nozari and Nabati 2007), we found that the people who have had heart strokes had a high amount of Ferritin and Iron of serum; but the time when it increases is not clear as well as whether it is risen due to the heart stroke or it has risen before the heart stroke.

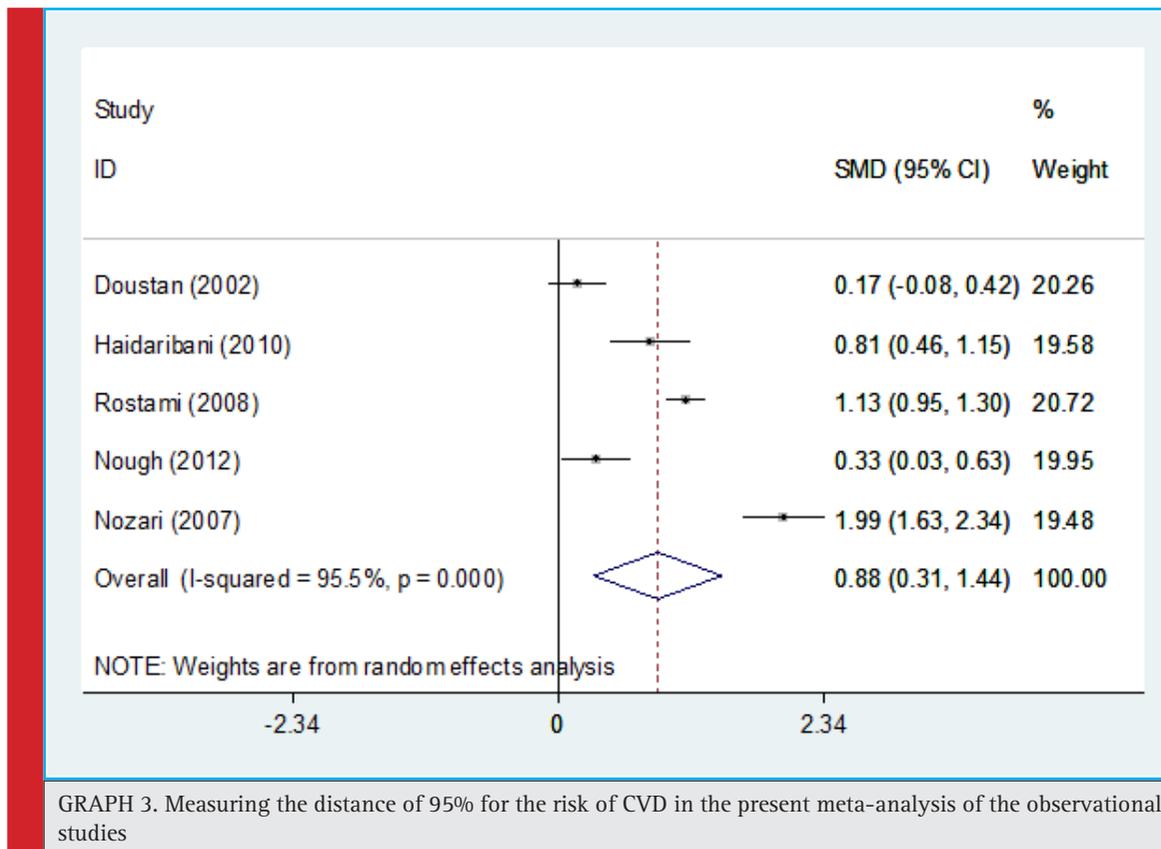
It is not mentioned in previous studies and it will have to be noticed in the future studies. Although some studies have proved the correlation between serum iron markers, intaking nutrition rich in iron, and ferritin serum with infarction and cardiovascular disease (Johnson 2007; Zhang *et al.* 2012; Shi *et al.* 2011), Sudeep *et al.* meta-analysis yielded no significant relationship between iron and ferritin serum with cardiovascular diseases (Das *et al.*, 2014). There was found no significant relationship between ferritin serum and CVD in another study (Friedrich *et al.* 2009).

The findings of Sun *et al.* study, which were conducted on women, showed that excessive iron overload is not associated with cardiovascular diseases (Sun *et al.*, 2008). TIBC is another iron serum indicator which showed no significant relationship with cardiovascular diseases (Dustan *et al.*, 2002; Heidari *et al.*, 2010; Amirkhizi *et al.* 2006), the reason being the insuffi-

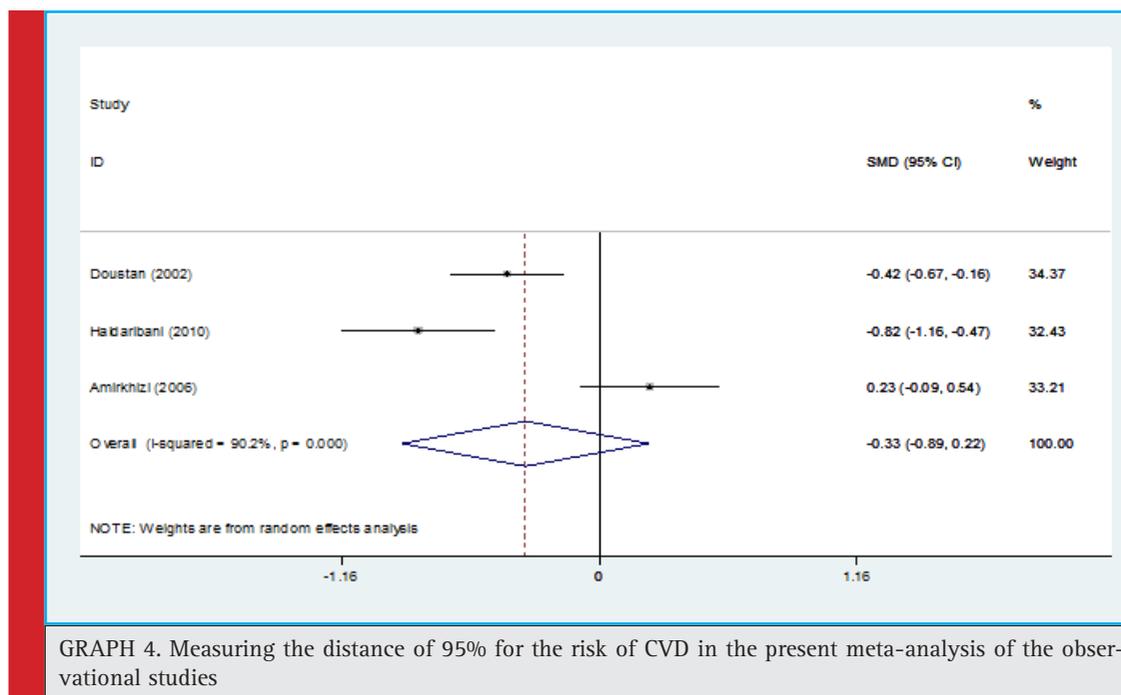
Fe



Feritin



## TIBC



GRAPH 4. Measuring the distance of 95% for the risk of CVD in the present meta-analysis of the observational studies

ciency of the number of three articles which reported the correlation between TIBC and CVD. Although some studies had reported the relationship between iron and ferritin to be significant, such findings are not comparable, and since there was reported no significant relationship between TIBC and CVD, it cannot be claimed that TIBC is efficient in decreasing the risk of heart attack.

The 2015 meta-analysis study did not report any significant relationships between TIBC and CVD (31). According to the findings of Kang et al study, there was a weak relationship between TIBC and decreased CAD risk (Kang et al., 2012). Considering several reports focusing on the role of iron intake on increased risk of cardiovascular diseases, it can be stated that the presence of other iron serum representatives, such as ferritin, might, also, enhance the risk of the incidence of such diseases.

## CONCLUSION

According to the findings of the present study, there is a significant relationship between the higher level of iron and ferritin serum in patients who have suffered from heart attacks in comparison to the control group; this is consistent with the results of above-mentioned studies. Therefore, it is recommended for cardiovascular patients to monitor and limit the consumption of iron, and intake of ferritin, as much as possible in their diets.

## ACKNOWLEDGEMENT

Thereby, honored deputy of IlamUniversty of Medical Sciences, helpful instructors, and all other individuals who helped the completion of the present research in one way or another are deeply thanked and their efforts are appreciated.

## CONFLICT OF INTEREST

There is no conflict of interest.

## REFERENCES

- Amirkhizi F, Siassi F, Minaie S, Djalali M, Rahimi A, Dorosty AR, et al. Plasma iron is associated with lipid peroxidation in women. *ARYA Atherosclerosis Journal*. 2006; 2:134-137.
- Amirkhizi F, Siassi F, Minaie S, Djalali M, Rahimi A, Dorosty AR, et al. Association between Iron Status and Lipid Peroxidation in Obese and Non-Obese Women. *IranianJ Publ Health*. 2008; 37: 103-8.
- Anderson PGJ, Vulpe PCD. The cellular physiology of iron. In: YehudaS, Mostofskyron DI, editors. *Iron deficiency and overload*. New York: Humana Press;2010. p. 3-29.
- Depalma RG, Hayes VW, Chow BK, Shamayeva G, May PE, Zacharski LR. Ferritin levels, inflammatory biomarkers, and mortality in peripheral arterial disease: a substudy of the Iron (Fe) and Atherosclerosis Study (FeAST) Trial. *J Vasc Surg*. 2010;51:1498-503. doi:10.1016/j.jvs.2009.12.068. PubMed PMID: 20304584.

- Dustan F, Eghtesadi S, Rahbaninobar M, Salehi R, Tata M, Jamshidi P, et al. Evaluation of iron status in patients with coronary atherosclerosis. *Scientific Journal of Lorestan University of Medical Sciences*. 2002;6:17-25. Persian.
- Das De S, Krishna S, Jethwa A. Iron status and its association with coronary heart disease: systematic review and meta-analysis of prospective studies. *Atherosclerosis*. 2015;238:296-303. doi: 10.1016/j.atherosclerosis.2014.12.018. PubMed PMID: 25544180.
- Friedrich N, Milman N, Völzke H, Linneberg A, Jørgensen T. Is serum ferritin within the reference range a risk predictor of cardiovascular disease? A population-based, long-term study comprising 2874 subjects. *Br J Nutr*. 2009;102:594-600. doi: 10.1017/S000711450922085X. PubMed PMID: 19203421.
- Hatmi ZN, Tahvildari S, GafarzadehMotlag A, SabouriKashani A. Prevalence of coronary artery disease risk factors in Iran: a population-based survey. *BMC CardiovascDisord*. 2007;7:32. doi: 10.1186/1471-2261-7-32. PubMed PMID: 17971195; PubMed Central PMCID: PMC2200651.
- Hadaegh F, Harati H, Ghanbarian A, Azizi F. Prevalence of coronary heart disease among Tehran adults: Tehran Lipid and Glucose Study. *East Mediterr Health J*. 2009;15:157-66. PubMed PMID: 19469439.
- Hunnicutt J, He K, Xun P. Dietary iron intake and body iron stores are associated with risk of coronary heart disease in a meta-analysis of prospective cohort studies. *J Nutr*. 2014;144:359-66. doi: 10.3945/jn.113.185124. PubMed PMID: 24401818; PubMed Central PMCID: PMC3927548.
- HeidariBeni M, EbrahimiMamaghani, Hajimaghsod M, Tarzamani MK, Mohtadinia J. The association between iron status and carotid intima-media thickness for the prediction of early-stage atherosclerosis. *Scientific Journal of Tehran University of Medical Sciences*. 2010;6:374-380. Persian.
- Holay MP, Choudhary AA, Suryawanshi SD. Serum ferritin-a novel risk factor in acute myocardial infarction. *Indian Heart J*. 2012;64:173-7. doi: 10.1016/S0019-4832(12)60056-X. PubMed PMID: 22572495; PubMed Central PMCID: PMC3861068.
- Jomova K, Valko M. Advances in metal-induced oxidative stress and human disease. a review. *Toxicology*. 2011;283:65-87. doi: 10.1016/j.tox.2011.03.001. PubMed PMID: 21414382.
- Johnson DW. Intravenous versus oral iron supplementation in peritoneal dialysis patients. *Perit Dial Int*. 2007;27:255-60. PubMed PMID: 17556315.
- Kaluza J, Wolk A, Larsson SC. Heme iron intake and risk of stroke: a prospective study of men. *Stroke*. 2013;44:334-9. doi: 10.1161/STROKEAHA.112.679662. PubMed PMID: 23306319.
- Kang P, Liu T, Tian C, Zhou Y, Jia C. Association of total iron binding capacity with coronary artery disease. *ClinChimActa*. 2012 ;413:1424-9. doi: 10.1016/j.cca.2012.05.018. PubMed PMID: 22652366.
- Lee KR, Sweeney G, Kim WY, Kim KK. Serum ferritin is linked with aortic stiffness in apparently healthy Korean women. *CritPathwCardiol*. 2010;9:160-3. doi:10.1097/HPC.0b013e3181eb64f5. PubMed PMID: 20802271.
- Lian J, Xu L, Huang Y, Le Y, Jiang D, Yang X, et al. Meta-analyses of HFE variants in coronary heart disease. *Gene*. 2013;527:167-73. doi: 10.1016/j.gene.2013.06.034. PubMed PMID: 23792061.
- Menke A, Fernández-Real JM, Muntner P, Guallar E. The association of biomarkers of iron status with peripheral arterial disease in US adults. *BMC CardiovascDisord*. 2009;9:34. doi: 10.1186/1471-2261-9-34. PubMed PMID: 19650928; PubMed Central PMCID: PMC2733106.
- Meroño T, Gómez L, Sorroche P, Boero L, Arbelbide J, Brites F. High risk of cardiovascular disease in iron overload patients. *Eur J Clin Invest*. 2011;41:479-86. doi: 10.1111/j.1365-2362.2010.02429.x. PubMed PMID: 21128934.
- Muñoz-Bravo C, Gutiérrez-Bedmar M, Gómez-Aracena J, García-Rodríguez A, Navajas JF. Iron: protector or risk factor for cardiovascular disease? Still controversial. *Nutrients*. 2013; 5:2384-404. doi: 10.3390/nu5072384. PubMed PMID: 23857219; PubMed Central PMCID: PMC3738979.
- Noogh H. Evaluation of Iron Status in Patients with atherosclerosis. *Scientific Journal of Rafsanjan University of Medical Sciences*. 2012;1:1-7. Persian.
- Nozari Y, Nabati M. Assessment of iron stores in candidates for coronary angiography. *Scientific Journal of Tehran University of Medical Sciences*. 2007;65:47-51. Persian.
- Pardo Silva MC, Njajou OT, Alizadeh BZ, Hofman A, Witteman JC, van Duijn CM, et al. HFE gene mutations increase the risk of coronary heart disease in women. *Eur J Epidemiol*. 2010;25:643-9. doi: 10.1007/s10654-010-9489-6. PubMed PMID: 20640879; PubMed Central PMCID: PMC2931632.
- Polin V, Coriat R, Perkins G, Dhooge M, Abitbol V, Leblanc S, et al. Iron deficiency: from diagnosis to treatment: a review. *Dig Liver Dis*. 2013;45:803-9. doi: 10.1016/j.dld.2013.02.019. PubMed PMID: 23582772.
- Qi L1, van Dam RM, Rexrode K, Hu FB. Heme iron from diet as a risk factor for coronary heart disease in women with type 2 diabetes. *Diabetes Care*. 2007;30:101-6. doi: 10.2337/dc06-1686 PubMed PMID: 17192341.
- Roger VL, Go AS, Lloyd-Jones DM, Benjamin EJ, Berry JD, Borden WB, et al. Executive summary: heart disease and stroke statistics--2012 update: a report from the American Heart Association. *Circulation*. 2012;125:188-197. doi: 10.1161/CIR.0b013e3182456d46. PubMed PMID: 22215894.
- Rostami M, Aberomand M, Khairallah A, Jorfi M. Evaluation of serum iron and ferritin in myocardial infarction patients in Imam Ali hospital of Andimeshk in 2008-2009. *Scientific Journal of Jundishapur University of Medical Sciences*. 2008;1:1-8. Persian.
- Rajapurkar MM, Shah SV, Lele SS, Hegde UN, Lensing SY, Gohel K, et al. Association of catalytic iron with cardiovascular disease. *Am J Cardiol*. 2012 ;109:438-42. doi: 10.1016/j.amjcard.2011.09.032. Pubmed PMID: 22071209.
- Shi Y, Zhou L, Huang LH, Lian YT, Zhang XM, Guo H, et al. Plasma ferritin levels, genetic variations in HFE gene,

and coronary heart disease in Chinese: a case-control study. *Atherosclerosis*. 2011;218:386-90. doi: 10.1016/j.atherosclerosis.2011.05.040. PubMed PMID: 21696736.

Sung KC, Kang SM, Cho EJ, Park JB, Wild SH, Byrne CD. Ferritin is independently associated with the presence of coronary artery calcium in 12,033 men. *ArteriosclerThrombVasc Biol*. 2012 ;32:2525-30. doi: 10.1161/ATVBAHA.112.253088. PubMed PMID: 22837473.

Sun Q, Ma J, Rifai N, Franco OH, Rexrode KM, Hu FB. Excessive body iron stores are not associated with risk of coronary heart disease in women. *J Nutr*. 2008;138:2436-41. doi: 10.3945/jn.108.097766. PubMed PMID: 19022969; PubMed Central PMCID: PMC2635523.

Vashchenko G, MacGillivray RT. Multicopper oxidases and human iron metabolism. *Nutrients*. 2013;5:2289-313. doi: 10.3390/nu5072289. PubMed PMID: 23807651; PubMed Central PMCID: PMC3738974.

Zegrean M. Association of body iron stores with a development of cardiovascular disease in the adult population: a systematic review of the literature. *Can J CardiovascNurs*. 2009;19:26-32. PubMed PMID: 19226888.

Zhang W, Iso H, Ohira T, Date OC, Tanabe N, Kikuchi S, et al. Associations of dietary iron intake with mortality from cardiovascular disease: the JACC study. *J Epidemiol*. 2012;22:484-93. doi: 10.2188/jea.JE20120006. PubMed PMID: 22986645; PubMed Central PMCID: PMC3798559.

## The relationship between industrial noise exposure and smoking on hearing threshold levels in a steel industry workers

Abbas Mohammadi<sup>1,2</sup>, Behzad Fouladi Dehaghi<sup>3\*</sup>, Ghasem Mardi<sup>4</sup> and Amel Saki<sup>5</sup>

<sup>1</sup>Environmental Technologies Research Center, Department of Occupational Health, Health Faculty, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

<sup>2</sup>Assistant Professor, Department of Occupational Health Engineering, Faculty of Health, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, IR Iran

<sup>3</sup>Assistant Professor, Department of Occupational Health Engineering, Faculty of Health, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, IR Iran

<sup>4</sup>M.Sc. Student, Department of Occupational Health Engineering, Faculty of Health, Ahvaz University of Medical Science, Ahvaz, Iran

<sup>5</sup>Assistant Professor, Department of Bio-statistic, Faculty of Health, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, IR Iran

### ABSTRACT

Noise is a physical risk factor and smoking is a behavioral risk factor; that they can lead to auditory damage. The aim of this study was to investigate the relationship between industrial noise exposure and smoking on the hearing threshold workers. In this study, 200 male workers in the four groups (smoker with and without noise exposure, non-smoker smoker with and without noise exposure) were involved. To assess noise exposure used calibrated sound level meter model Cel-450 and noise dosimeter model TES-1345. The results showed that worker' mean age and history were  $36.5 \pm 5.2$  and  $15.25 \pm 5.9$  year, respectively. Hearing loss in worker group with smoking and noise exposure was significantly difference ( $p < 0.05$ ). Also in the groups that had been exposed to noise levels of 85 dB and smoking, bilateral hearing loss was higher. With the increase in the number of cigarettes per day and year and the exposure to noise, the effects of damage to the auditory system become more severe.

**KEY WORDS:** HEARING LOSS, WORKERS, INDUSTRIAL NOISE, SMOKING

### ARTICLE INFORMATION:

\*Corresponding Author: [fouladi-b@ajums.ac.ir](mailto:fouladi-b@ajums.ac.ir)

Received 20<sup>th</sup> April, 2017

Accepted after revision 29<sup>th</sup> July, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

Noise is one of the most common work-related risk factors (Nilandand Zenz 1994; Rosenstock et al., 2004). It is estimated that about 600 million workers worldwide are exposed to occupational noise (Albert, 1998). Long term exposure to noise often damages in inner ear and hair cells of the organ of corti in particular (Dobie 2001). Finally lead to a disease called noise-induced hearing loss (NIHL). Progressively hearing are declines in adjacent frequencies specially 4000 to 8000 Hz (Rosenstock et al., 2004 Merluzzi 1991. (NIHL also can impose heavy social and economic burden on society. Because skilled and experienced workers, that are most valuable asset and manufacturing of any country, much earlier than the stipulated time ejected of the production cycle (Berger, 2003; Rom and Markowitz 2007).

On the other hand cost of workers treatment and disability compensation to billions of dollars each year (Hétu et al., 1994). The World Health Organization estimates that about 250 million people worldwide are suffering from hearing loss. This disability is fifteenth cause of disability in people. Disorders of ear are invisible disabilities (Daniell et al., 1998). It can reduce the quality of life, increased incidence of depression, loneliness, social seclusion and Communication Disorders (Nomura et al., 2005). Also, smoking is other risk factors that cause hearing loss. More than one billion and three hundred million people worldwide are diagnosed with smoking and over 80 percent of them (800 million) are in developing countries (Ramkissoon and Cole 2011).

Many researchers were reported harmful effects of tobacco smoking on the cochlea (the organ of Corti) resulting in hearing loss (Daniell et al., 1998, Ramkissoon and Cole 2011, Gangwisch et al., 2013; Kim et al., 2009). Hearing damage or some degree of hearing loss is determined usually with audiometry pure tone test (PTS). Many researchers reported the effects of smoking on hearing loss. But in most of these studies have not examined the combined effect of smoking and sound (Kim et al., 2009; Jansen et al., 2009).

Also, a study in 2014 showed smokers in normal and high frequencies more lose their hearing in exposure to noise compared with non-smokers the same conditions (Mehrparvar et al. 2014). By contrast, very few studies have shown that smoking has no effect on hearing loss (Brant et al. 1996; Gates et al., Cobb et al. 1993). Thus, this study was aimed to investigate the relationship between industrial noise exposure and smoking on the threshold of Industrial workers of hearing.

## MATERIALS AND METHODS

This cross sectional and epidemiological-analysis study was in industrial environment with high noise. The

sound pressure levels (SPL) in study area were measured at each defined station, characterized on the designed grid map (1\*1 m<sup>2</sup>), using sound level meter CEL.450 calibrated with CEL-110.2 and based on ISO-9612 and ISO- 11200 methods (ISO (The International Organization for Standardization).2009). Due to the movement of employees in the units, amount of receiving dose will be measured during 8 hours using dosimeter TES-1345 model. Then of workers were interviewed and individual and job information were collected such experience of previous exposure to noise, the duration of exposure to noise, experience of consumption ototoxic drugs, smoking, experience of systemic diseases such as diabetes, thyroid disorders and experience of repeated or severe ear infection and Information of eating habits. Then, by a qualified audiometry expert After 14 hours of last activity in high sound, of them pour tone audiometry (PTA) conducted bilaterally using a standard audiometer Model CA 86 (Pajvak Ava Company) with accuracy of 5 dB and at room acoustics at frequencies of 500, 1000, 2000, 3000, 4000, 6000 and 8000 Hz through air conduction (air-conduction) and bone (bone conduction).

All smokers male participated in the study which them had exposure to noise (> 85 dB-A) and the control group of smokers with no exposure to noise. The participants were divided in 4 groups as follows: Smoker and noise exposure, smokers and no exposure to noise, non-smokers and noise exposure and non-smokers and no exposure to noise. The aim of the study was fully explained to the workers and they were free to leave the experiments whenever they wanted.

## RESULTS

The average age of surveyed workers was  $36.5 \pm 5.2$  with a minimum age of 25 and maximum age 58. Average work experience was  $15.2 \pm 5.9$  with a minimum of 5 and a maximum of 30 years. In 1548 measured stations, most measured stations results showed higher than 85dB. Most of the studied area was in the range of risk with levels above 85 dB A. summary of results shown in Table 1.

Mean and standard deviations of hearing threshold levels in right and left ear in two groups (smokers and nonsmokers with noise exposure) are presented in tables 2 and 3.

According to two ways ANOVA test, compared to smoker and non-smoker workers with noise exposure, result showed hearing thresholds in right and left ears in smoker worker was significantly increase ( $P < 0.05$ ).

Table 4 shows threshold levels of noise induced hearing loss in both ears in workers with different sound pressure level exposure and duration of smoking.

Table 1. Results of sound pressure levels in different workplaces

Workplace	Numbers of station	Sound Pressure level-dB		Hours of work	Leq8h dB-A	D%
		MIN	Max			
New central powerhouse	24	83	90	8	88	199
old central powerhouse	28	81	87	8	87	158
hydraulic system 1 Adjacent balancing	32	86	90	8	88	199
Balancing system	24	81	90	8	90	314
Compressed air station	16	82	90	8	90	312
hydraulic system	31	91	93	8	91	630
Electric power steering Hall 21 East	90	70	88	8	88	137
Electric power steering lounge area of East 21	60	54	63	8	-	-
Material storage, mechanical workshop	28	59	62	8	-	-
Facilities and furnaces Hall 26	32	52	62	8	-	-
Incinerations plant and fans	32	82	93	8	90	316
Transportation	45	75	84	8	-	-
Machinery and electrical appliances motor repair workshop	54	65	86	8	-	-
Hall 25 workshop renovation and lathing	40	65	73	8	-	-
Generator room	14	65	101	8	100	316
seaside Pumping station	12	84	85	8	83	100
production line	621	71	88	8	88	313
Landscaping main diesel generators	24	89	104	8	102	267
Lower floor the powerhouse	17	88	93	8	90	210
Warehouse Services	20	83	89	8	90	180
Area under the furnace 1	79	82	88	8	87	134
Furnaces Hydraulic station No. 1	26	86	91	8	90	210
High-pressure water station	30	87	99	8	90	210

Table 2. Right ear hearing threshold levels in two groups

Groups		Frequency(Hz)						
		500	1000	2000	4000	6000	8000	
Smokers and exposure to noise	N=100	Mean	13.2	15.5	18.25	34.95	34	32.5
		deviation	6.29	8.27	8.94	16.19	16.34	18.5
Non-smoking and exposure to noise	N=100	Mean	12	12.3	13.4	23.7	24	23.8
		deviation	7.3	5.7	5.8	11.7	13.3	17.5
P-value			0.03	0.05	0.05	0.06	0.05	0.001

Table 3. Left ear hearing threshold levels in two groups

Groups		Frequency(Hz)						
		500	1000	2000	4000	6000	8000	
Smokers and exposure to noise	N=100	Mean	13.9	15.6	19.2	35.1	37.5	35.4
		deviation	5.9	6.6	8.6	13.7	16.4	20.4
Non-smoking and exposure to noise	N=100	Mean	12.4	12.7	14.1	23.9	24.2	25.8
		deviation	7.2	4.9	6.4	11.4	16.2	19.5
P-value			0.003	0.07	0.05	0.07	0.05	0.001

Tabl 4. Results of hearing loss and duration of smoking in two groups

Hearing loss		N	NIHL right ear dB	NIHL left ear dB	NIHL Total dB	N	NIHL right ear dB	NIHL left ear dB	NIHL Total dB
Smoking years									
Less than 5 years	mean	24	14.7	12.4	12.5	18	15.4	16.3	15.5
	SD		5.8	2.3	1.8		3.3	3.8	3.3
	min		11.2	10	-		10	10	-
	max		32.7	16.2	-		20	23.7	-
5 to 10 years	mean	58	16.	15.	15.2	42	19.7	20.2	19
	SD		4.5	4.4	4.3		3.7	4.6	3.5
	min		10	10	-		15	13.7	-
	max		35	28.7	-		28.7	30	-
10 to 15 years	mean	15	19.9	18.2	18.4	15	18.5	22.2	18.9
	SD		7.3	6.9	6.9		4.1	9	4.5
	min		13.7	11.2	-		12.5	15	-
	max		35.	30.	-		23.7	42.5	-
15 to 20 years	mean	2	27.5	25	25.4	17	25.1	24.2	24.2
	SD		-	-	-		8.5	8.7	8.6
	min		27.5	25	-		15	13.7	-
	max		27.5	25	-		42.5	42.5	-
20 to 25 years	mean	4	12.7	14.4	13.9	8	29.5	25.9	24.8
	SD		-	0.6	0.1		22.4	10.3	12.5
	min		13.7	13.5	-		17.5	17.5	-
	max		13.7	15	-		83.7	47.5	-
P-value			0.01	0.001	0.006	0.03	0.007	0.003	

Table 5. results of hearing loss and number of cigarettes daily use in two groups

Hearing loss		N	NIHL right ear dB	NIHL left ear dB	NIHL Total dB	N	NIHL right ear dB	NIHL left ear dB	NIHL Total dB
number of cigarettes									
1 to 10	mean	69	16	14.5	14.5	66	18.5	19.2	18.5
	SD		5.8	5	4.8		3.8	5.7	3.6
	min		10	10	-		10	10	-
	max		35	30	-		27.5	42.5	-
10 to 20	mean	29	17.5	16.8	16.7	29	23.2	22.9	21.7
	SD		4.8	4.1	4.2		12.7	7.5	8.2
	min		12.5	11.2	-		12.5	13.7	-
	max		27.5	25	-		83.7	47.5	-
20 to 30	mean	2	13.7	11.2	11.6	5	29.5	28.2	28.4
	SD		-	-	-		13.8	13.8	13.7
	min		13.7	11.2	-		15	15	-
	max		13.7	11.2	-		42.5	42.5	-
P-value			0.02	0.002	0.002	0.005	0.009	0.006	

According to the table 4 and based on the post-test-Kruskal-Wallis, mean hearing threshold in both ear in workers without exposure to noise for all frequencies in groups with different smoking years has a significant difference ( $P$ -value  $< 0.05$ ). Also mean hearing threshold in both ear in workers that exposed to noise (above 85 dB) for all frequencies in five groups of smoking years has a significant difference ( $P$ -value  $< 0.05$ ).

Results of hearing loss and number of cigarettes daily used by workers with different noise levels exposure are presented in table 5.

According to the results table based on Kruskal-Wallis test mean hearing threshold had significant difference for two ears in 3 groups of workers with different cigarette daily use and without noise exposure ( $p$ -value  $< 0.05$ ). Also, the same results were observed in smoker workers with noise exposure ( $p$ -value  $< 0.05$ ).

## DISCUSSION

This study showed that smoking increases the threshold of hearing in all frequencies which is more noticeable at high frequencies. Sumit et al showed that smokers hearing threshold at frequencies of 4, 8 and 12 kHz is significantly higher than non-smokers, while there was no significant difference in the frequency of 1 kHz (Sumit et al. 2015), Nomura et al pointed in a review article in the period 1966 to 2003 that 9 studies indicated positive relation between smoking and hearing loss (Nomura et al., 2005).

Gaur et al (2012) concluded that tobacco and smoking were significantly associated with middle and inner ear disease among middle-aged people. Kumar et al have also shown that smoking is associated with hearing loss and Sensory-neural hearing loss was observed mainly among smokers of light (dB 40-26) (Kumar et al., 2013). Mizoue et al showed that the effect of cigarette smoking is more pronounced in frequencies of 4000 Hz and above So that the threshold at frequencies of 4000, 6000 and 8000 Hz is more than others frequencies (Mizoue et al., 2003).

The results of these studies were consistent with the results of the present study. Other studies also show that smoking can cause hearing loss at low frequencies (Sung et al. 2013). And the results of this study showed that smoking-induced hearing loss is high frequencies. Also results showed that the number of years smoking is associated with an increase in the threshold of hearing. The results obtained corresponded with the study of Sumit et al., 2015). The results obtained like the right ear corresponded with studies of Tao et al., (2013) and Rahimpour et al., (2011). Results concluded to increase the number of cigarettes consumed in both groups (Smokers with

no exposure to industrial noise and smokers exposed to industrial noise) has been an increase in NIHL. These results are similar with Mohammadi et al study which show increased smoking increases the disability both ears (Mohammadi et al 2010). According to Tao et al in 2013 who carried out their work in China to study the interactive effect of smoking and sound in the hearing loss, they concluded that smoking causes additive effect noise-induced hearing loss (Tao et al. 2013). Also, the results obtained of the present study are similar. This study showed a dose-response relationship of smoking and NIHL. And the interaction between noise and smoke was also endorsed that is consistent with findings of this study and other studies (Uchida et al., 2005; Ransen et al. 2008).

## CONCLUSION

Smoking itself raises the hearing thresholds in smokers also by increasing smoking, effects resulting from it increases on hearing system. Smokers exposed to industrial noise, smoking results in synergistic effect on the effects of noise on hearing system which has direct relationship with the number of cigarettes smoked and also experience of smoking. Considering the conflicting results obtained in studies, further studies are needed to better understand the effect of smoking on noise induced hearing loss.

## ACKNOWLEDGEMENTS

This article was derived from a thesis by Ghasem Mardi as a part of M.sc degree in the field of occupational health engineering. Ahvaz Jundishapur University of Medical Sciences.

## REFERENCES

- Alberti P. Noise, the most ubiquitous pollutant. *Noise and Health*. 1998;1(1):3.
- Berger EH. *The noise manual*: Aiha; 2003.
- Brant LJ, Gordon-Salant S, Pearson JD, Klein LL, Morrell CH, Metter EJ, et al. Risk factors related to age-associated hearing loss in the speech frequencies. *Journal of the American Academy of Audiology*. 1996(7):152-60.
- Daniell WE, Fulton-Kehoe D, Smith-Weller T, Franklin GM. Occupational hearing loss in Washington state, 1984–1991: II. Morbidity and associated costs. *American journal of industrial medicine*. 1998;33(6):529-36.
- Dobie RA. *Head and Neck Surgery-Otolaryngology*. 4th ed. Philadelphia: Williams and Wilkins Press; 2001.
- Fransen E, Topsakal V, Hendrickx JJ, Van Laer L, Huyghe JR, Van Eyken E, et al. Occupational noise, smoking, and a

- high body mass index are risk factors for age-related hearing impairment and moderate alcohol consumption is protective: a European population-based multicenter study. *J Assoc Res Otolaryngol* 2008; 9(3): 264-76
- Gates GA, Cobb JL, D'Agostino RB, Wolf PA. The relation of hearing in the elderly to the presence of cardiovascular disease and cardiovascular risk factors. *Archives of Otolaryngology-Head & Neck Surgery*. 1993;119(2):156-61.
- Gangwisch JE, Feskanich D, Malaspina D, Shen S, Forman JP. Sleep duration and risk for hypertension in women: results from the Nurses' Health Study. *American journal of hypertension*. 2013; 26(7):903-11.
- Gaur K, Kasliwal N, Gupta R. Association of smoking or tobacco use with ear diseases among men: a retrospective study. *Tobacco induced diseases*. 2012;10(1):1-4.
- Hétu R, Getty L, Quoc HT. Impact of occupational hearing loss on the lives of workers. *Occupational medicine (Philadelphia, Pa)*. 1994;10(3):495-512.
- ISO (The International Organization for Standardization). Acoustics, Determination of occupational noise exposure engineering method, engineering method. ISO 9612:2009(E).
- Jansen E, Helleman H, Dreschler W, de Laat J. Noise induced hearing loss and other hearing complaints among musicians of symphony orchestras. *International archives of occupational and environmental health*. 2009;82(2):153-64.
- Kim MG, Hong SM, Shim HJ, Kim YD, Cha CI, Yeo SG. Hearing threshold of Korean adolescents associated with the use of personal music players. *Yonsei medical journal*. 2009;50(6):771-6.
- Kumar A, Gulati R, Singhal S, Hasan A, Khan A. The Effect of Smoking on the Hearing Status—A Hospital Based Study. *Journal of clinical and diagnostic research: JCDR*. 2013;7(2):210.
- Merluzzi F. *Encyclopedia of Occupational Health and Safety*. Luigi Parmeggiani Press; 1991.
- Mehrpourvar AH, Mirmohammadi SJ, Hashemi SH, Davari MH, Mostaghaci M, Mollasadeghi A, et al. Concurrent effect of noise exposure and smoking on extended high-frequency pure-tone thresholds. *International journal of audiology*. 2014(0): 1-7.
- Mizoue T, Miyamoto T, Shimizu T. Combined effect of smoking and occupational exposure to noise on hearing loss in steel factory workers. *Occupational and Environmental Medicine*. 2003;60(1):56-9.
- Mohammadi S, Mazhari MM, Mehrparvar AH, Attarchi MS. Cigarette smoking and occupational noise-induced hearing loss. *The European Journal of Public Health*. 2010;20(4):452-5.
- Niland J, Zenz C. Occupational hearing loss, noise and hearing conservation. *Occupational Medicine* 1994; 21:258-9.
- Nomura K, Nakao M, Morimoto T. Effect of smoking on hearing loss: quality assessment and meta-analysis. *Preventive medicine*. 2005;40(2):138-44.
- Rahimpour F ME, Attarchi MS, Mohammadi S. Association between Cigarette Smoking and Occupational Noise Exposure on Hearing Loss and Hearing Impairment. *Journal of Babol University Of Medical Sciences*. 2011;14(1):56-63
- Rosenstock L, Cullen M, Brodtkin C, Redlich C. *Textbook of clinical occupational and environmental medicine*. 2004.
- Rom WN, Markowitz SB. *Environmental and occupational medicine: Lippincott Williams & Wilkins*; 2007.
- Ramkissoon I, Cole M. Self-Reported Hearing Difficulty Versus Audiometric Screening in Younger and Older Smokers and Nonsmokers. *Journal of clinical medicine research*. 2011;3(4):183.
- Sumit AF, Das A, Sharmin Z, Ahsan N, Ohgami N, Kato M, et al. Cigarette Smoking Causes Hearing Impairment among Bangladeshi Population. *PLoS one*. 2015;10(3).
- Sung JH, Sim CS, Lee C-R, Yoo C-I, Lee H, Kim Y, et al. Relationship of cigarette smoking and hearing loss in workers exposed to occupational noise. *Annals of Occupational and Environmental Medicine*. 2013;25(1):8.
- Tao L, Davis R, Heyer N, Yang Q, Qiu W, Zhu L, et al. Effect of cigarette smoking on noise-induced hearing loss in workers exposed to occupational noise in China. *Noise and Health*. 2013;15(62):67.
- Uchida Y, Nakashimat T, Ando F, Niino N, Shimokata H. Is there a relevant effect of noise and smoking on hearing? A population-based aging study. *Int J Audiol* 2005; 44(2): 86-91.
- Weitzman M, Govil N, Liu YH, Lalwani AK. Maternal Prenatal Smoking and Hearing Loss Among Adolescents Prenatal Maternal Smoking and Later Hearing Loss. *JAMA Otolaryngology-Head & Neck Surgery*. 2013:1-8

## Examination of Frequency of Substance Abuse in Surgical and Internal Patients Referred to Imam Reza and Shahid Motahari and Shahid Faghihi Clinics in Shiraz (based on new criteria DSM-5)

Jamshid Ahmadi<sup>1</sup>, Ebrahim Moghimi<sup>2</sup>, Atoosa Moradi<sup>3\*</sup>, Marjan Dehghanian<sup>4</sup> and Saba Kheirandish<sup>4</sup>

<sup>1</sup>Professor of Psychiatry, Department of Psychiatry, Shiraz University of Medical Sciences, Shiraz, Iran

<sup>2</sup>Assistant Professor, Department of Psychiatry, Shiraz University of Medical Sciences, Shiraz, Iran

<sup>3</sup>Student Research Committee, School of Medicine, Shiraz University of Medical Sciences, School of Medicine, Shiraz, Iran

<sup>4</sup>Student Research Committee, School of Medicine, Shiraz University of Medical Sciences, Shiraz, Iran

### ABSTRACT

Substance abuse is one of the socio-economic and cultural problems in all countries. Due to human knowledge about its complications, the use of these substances is frequent among all classes of different communities, especially patients. Which can effect on internal mental states such as mood and on outward activities, i.e. behavior. The prevalence rate of drug use in the Iranian population aged 15-64 is estimated to be 65.2%. In this study, we aimed to investigate the use of substance abuse in physical patients, while obtaining an initial assessment of the state of abuse in these patients, take steps to prevent and treat substance abuse in these patients. In this cross-sectional descriptive-analytical study, 200 patients (100 women and 100 men) were randomly selected from patients aged 18 years and older to Imam Reza and Motahhari clinics of Shiraz through random cluster sampling (cluster of surgical and internal patients) and interviewed. A questionnaire based on DSM-5 was compiled to collect patient information, which included demographic information and drug related questions. The informed consent form was completed by all patients or with them. Data were analyzed using SPSS software version 16. P values less than 0.05 were considered significant. The most commonly used substances were smoking and tobacco, alcohol, and opium. Substance use was higher in men than in women ( $p < 0.05$ ). Alcohol consumption was more common in

### ARTICLE INFORMATION:

\*Corresponding Author: [atoosamoradi12@gmail.com](mailto:atoosamoradi12@gmail.com)

Received 29<sup>th</sup> April, 2017

Accepted after revision 2<sup>nd</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal  
NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

the group under the age of 35 than in the rest of the population. The most common causes of the onset of curiosity are patterning, relieving stress and gaining pleasure; and the most common causes of continued use of substances are the need for emotion, pleasure and relief from stress. Taking occasional tobacco use in the group with gastrointestinal problems, and occasional and sometimes opioid use was significantly more common in the asthma and chronic obstructive pulmonary disease (COPD) group. The results of this study were in some cases consistent with and in some cases different from international studies. According to the results of this study, it is reasonable to educate, identify, diagnose, and treat adequately patients with substance abuse.

**KEY WORDS:** SUBSTANCE ABUSE - PATIENTS - SURGICAL AND INTERNAL

## INTRODUCTION

Substance abuse is one of the social, economic, and cultural problems in all countries and one of its consequences is that it can create psychiatric symptoms that are indistinguishable from symptoms of common psychiatric disorders without a specific cause, such as schizophrenia and mood disorders. This condition can be understood to mean that mental disorders and drug abuse disorders are related to Substance abuse (Kavian *et al.* 2015). Substance abuse results in irreversible health and social consequences such as suicide, Homicide, birth weight, congenital anomalies, violence, incident, family disorder and physical illness. In a study that done in 188 countries worldwide on mortality data in 2013 (GBD 2013 Mortality and Causes of Death Collaborators. 2015), substance use disorders caused deaths of 127,000 people, while it was 51,000 people in 1990. Cocaine abuse disorder caused the death of 4300 people, amphetamine disorder caused the death of 3800 people and alcohol related disorders caused the death of 139,000 people. Drug abuse is the use of any kind of substance that causes physical, psychological, emotional and social harm to the consumer or others. In this way, the use of any prohibited or controlled substance, without the purpose of therapy, is abusive. Abuse means that although one does not addict to drugs, he uses it with knowledge of harm. Disorders of the substance include disorders due to substance abuse (dependence of substances and substance abuse) and substance abuse disorders (substance poisoning, deprivation of substances, etc.). In today's world, drug use is rising not only in psychiatric patients but also in physical patients. Drug use has devastating effects both on the body and on the brain (Jackson 1998), causing physical illnesses and mental illnesses. Drug use causes permanent changes in the brain, heart, lung and other organs. People of all ages are at risk of being addicted (Chang *et al.*, 2015; Koechl *et al.*, 2012).

A number of drug addicts are diverted to pain relief, not behavioral deviations, into substance abuse, which must be considered for the prevention and treatment of addiction. Drug use causes permanent changes in the brain, heart, lung and other organs. People of all ages

are at risk of being addicted (Ahmadi *et al.*, 2008). A number of drug addicts are diverted to pain relief, not behavioral deviations, into substance abuse, which must be considered for the prevention and treatment of addiction. People who used opioid for relieving pain, had a healthier psychologically personality and less psychiatric problems in this group, and addiction was an inappropriate behavior (Trescot *et al.*, 2008). Using marijuana to help treat symptoms such as pain, nausea, vomiting, and loss of appetite are called medical marijuana. Usually people with cancer, AIDS, injuries and MS use medical marijuana (Holliday *et al.*, 2013). The use of cigarettes, alcohol and drugs in psychiatric and physical patients such as transplant candidates is a major concern for the transplant team, (Salsitz, 2016).

The prevalence of drug use in the Iranian population aged 15–64 is estimated at 65.2% (Ahmadi and Sharifi 2013). In the studies conducted in Iran by the presenter, the prevalence of substance abuses in patients with physical injury, heart disease and stomach cancer was higher than normal population (Ahmadi and Sharifi 2013, Ahmadi *et al.*, 2014). In a study that performed by Ahmadi (writer) and Sharifi in 2003 on the Shiraz community and through cluster sampling in 15 clusters, the most substance abused by injecting drug addicts was smoking and alcohol (Ahmadi *et al.*, 2003). Considering the high prevalence of smoking and the history of narcotic use in these patients and their low awareness of the effect of these substances, it is necessary to study the frequency of abuse in this category of patients and to hold training programs, serious measures to quit smoking and addictive substances. Therefore, in this study, we aimed to investigate the use of substance abuse in patients with substance abuse in our patients, while also obtaining an initial assessment of the state of abuse in these patients, to prevent and treat substance abuse in these patients.

## MATERIALS AND METHODS

This cross-sectional descriptive-analytic study was performed on physical patients referred to Motahari and Imam Reza clinics due to various physical (and not

psychological) complaints in Shiraz. Sample size with  $\alpha = 5\%$  and According to previous studies, 200 cases were determined. The subjects (100 females and 100 males) were randomly interviewed from the above-mentioned clinics more than 18 years old.

In this study, the removal of samples from the study was not carried out. A cluster random sampling method was used to examine the hypotheses. In the study population, two groups of women and men were considered as two clusters and in each cluster two groups of surgical and internal patients were considered. Patients were randomly selected in each internal and surgical cluster. Patients were interviewed with the patient in a completely confidential manner and in addition to the interview form, consent was made to allow the patient to attend the research merely if they wished and consent. A questionnaire was developed based on DSM-5 (25) to collect patient information. Patients' demographic information was only asked about age, sex and type of disease.

The second part of the questionnaire included questions about drug use, which included questions about drug consumption, intake rate, reason for starting a drug and the reason for continuing drug use. The method for collecting information was an interview that the researcher personally interviewed with patient or Companion patient. At first, all patients completed the informed consent form for participation in the study. Also, patients who did not have the ability to participate together with the Companion patient completed the informed consent form.

Finally, the data were analyzed and analyzed using SPSS19 software. Chi square test or Fischer's exact test was used to analyze the qualitative data and t-test was used to compare the mean in quantitative data. P values less than 0.05 were considered significant.

## RESULTS

In this study, 100 female patients and 100 male patients were examined, demographic characteristics of which were shown in Table 1.

As shown in Table 1, age, internal disease, occupation and income have a significant difference in gender ( $p < 0.05$ ), but there are no significant differences in other demographic and clinical characteristics. In the study of the prevalence of substances used by humans, it was found that there is a significant difference in the use of all substances except LSD or other hallucinogenic substances, in which the prevalence of substance use was higher in men than in women.

Considering the results obtained in the study of the frequency of substances currently used by individuals

continuously (every day), they are presented by gender, Intake of tobacco (user) and opium (user, dependent) the drug using frequency were significantly higher in men than women ( $p < 0.05$ ). In addition, the frequency of substances used by people occasionally (by gender) in frequent smoking (frequent, abuser) and opium (frequent) and alcohol (frequent) frequencies was significantly higher in men than in women ( $P < .005$ ).

Also, the study of the reasons for the onset and continued use (by gender) showed that the prevalence of men's need was significantly higher than women. The results of material abundance that sometimes people take, by surgical patients showed that frequent consumption of tobacco percent prevalence of GI problem is significantly higher than other groups. In people who have ever consumed even once in the opium group, the prevalence of intakes in patients with lung otitis media is significantly higher than in other groups. ( $P < 05$ ). In those with occasional use, there was no significant difference in the use of any of the materials in terms of internal patients. The results showed that in people who have ever consumed even once, by age, only the percentage of alcohol in the age group under 35 years (1934-19) was significantly higher than in other groups, and in people who Constantly (daily), there was no significant difference in the consumption of any substance among the age groups, and in people consuming drugs occasionally, only in alcohol, the percentage of the group under 35 years old (34-19) was significantly higher than other groups ( $p < 05$ ).

## DISCUSSION AND CONCLUSION

In this study, the most commonly used substances were smoking, tobacco, alcohol, and opium. In most domestic and foreign studies, these three are the most commonly used cases (Ahmadi and Sharifi 2013, Ahmadi *et al.* 2003, Razzaghi *et al.* 1999, American Psychiatric Association (APA) DSM-5 (Diagnostic statistical manual of mental Disorder Version 5, USA 2015. Probably cheaper access and less costly reasons for such an outbreak, while cultural issues will also be involved. As many of the hallucinogens that are prevalent in western culture have not yet been used in Iranian culture, and less than 10 percent in our study. The aforementioned outbreak is similar in our study on consumption for one-time use, consumption and dependence. In the study of Dr. Ali Qalaei ha and his colleagues, opium is the most consumed substance that has been referred to by patients with substance abuse. There is also the possibility of the presence of opium with heroin, and it should be borne in mind that patients with substance abuse Due to the severity of the consequences in the law for heroin

	Demographic characteristics	Male N=100	Female N=100	total	p-value
Mean age		49/5217/92	41/55±14/34	45/54±16/67	/002
Internal Disease	Diabetes	18(15/6)	12(23/5)	30(28/3)	/001
	Thyroid dx	5(11/9)	18(35/3)	23(21/7)	
	HTN	4(7/3)	6(11/8)	10(9/4)	
	COPD+Asthma	14(25/5)	1(2)	15(14/2)	
	GI ulcer	6(10/9)	4(7/8)	10(9/4)	
	Other	8(14/5)	10(19/6)	18(17)	
Surgery	Hernia	8(18/6)	9(18/4)	17(18/5)	/314
	Fissure hemorrhoid	14(32/6)	8(16/3)	22(23/9)	
	GI problem	12(27/9)	14(28/6)	26(28/3)	
	Pilonidal cyst	3(7)	8(16/3)	11(12)	
	Other	6(14)	10(20/4)	16(17/4)	
job	Un employed	6(6)	5(5)	11(5/5)	/000
	House keeper	0(0)	67(67)	67(33/5)	
	employed	32(32)	18(18)	50(25)	
	Self employed	62(62)	10(10)	72(36)	
education	Illiterate	23(23)	21(21)	44(22)	/836
	Primary school	32(32)	32(32)	64(32)	
	High school	26(26)	23(23)	49(24/5)	
	Higher education	19(19)	24(24)	43(21/5)	
Marital status	Single	13(13)	14(14)	27(13/5)	1
	Married	86(86)	85(85)	171(85/5)	
	Divorced	1(1)	0(0)	1(/5)	
	Widow	0(0)	1(1)	1(/5)	
Income	Less than 500,000	33(33)	82(82)	115(57/5)	/000
	Between 500,000 and 2 million	60(60)	18(18)	78(39)	
	More than 2 million	7(7)	0(0)	7(3/5)	

abuse, perhaps they have been refused to say about abusing it (Ali *et al.*, 2010).

In a study by Ahmadi *et al.* on drug abuse in 600 patients admitted to Shiraz hospitals in 2008 (Drug Control Headquarters, 1997), smoking and opium were the most commonly used drugs by patients. No reports of substance use such as cocaine and hallucinogens were

reported, and the authors concluded that Western culture did not affect substance abuse at that time on Iran. The role of gender in drug abuse in most of domestic and international studies, has often been reviewed.

Unlike foreign studies, which have often considered the role of gender to be ineffective (Gulliver *et al.*, 2000; Hah *et al.*, 2015; Koyyalagunta *et al.*, 2013), in most of

Substance	Even disposable (%n)			X <sup>2</sup>	p-value
	Male N=100	Female N=100	Total N=200		
Tobacco	64(64)	33(33)	97(48/5)	19/237	/000
Opium	34(34)	3(3)	37(18/5)	31/869	/000
Alcohol	35(35)	11(11)	46(23)	16/262	/000
Heroin	4(4)	0(0)	4(2)	4/082	/043
Glass or crystal	4(4)	0(0)	4(2)	4/082	/043
Cannabis or marijuana or grass	10(10)	0(0)	10(5)	10/526	/001
LSD or other hallucinogenic substances	2(2)	0(0)	2(1)	2/02	/155

the internal studies and earlier writings, substance abuse was reported more often in men. The reason for this can be attributed to the Iranian culture, in which substance abuse is unsatisfactory for women. In this study, the use of all materials in males was significantly different from that of females, except for the hallucinogenic substances, this difference was not significant, which was due to very few cases (two cases). In this study, the role of age in different groups was studied on the type of substance used. The only significant finding is that alcohol consumption is case-by-case and occasionally is in the age group under 35 years. In other reviewed studies, the role of age has been studied, (Koechl *et al.*, 2012; Koyyalagunta *et al.*, 2013; Goodbye 2004), but the relationship between the type of substance abuse with age has not been specifically addressed. In these studies, lower age has increased the risk of drug abuse and dependence, especially cigarettes and opioid drugs.

In this study, due to population-based bias, the society in question was not homogeneous in terms of age, and thus expected results could not be obtained. The reasons for starting and continuing drug use were studied in two separate questions in this study. The most common causes of drug intake, according to patients are curiosity, patterning, relieving stress and gaining pleasure. The most common causes of continued use of the substance were the same as need, pleasure and relief from stress. The only reason that showed a significant difference in both sexes was the need for sensation that was more common in men. Given the subjective nature of the question, the interpretation of this difference is not easy and needs to be further investigated. In the similar study of Ahmadi and Sharifi in 2003, the most common causes of drug addiction were curiosity, the acquisition of pleasure and the influence of friends and community (Ahmadi and Sharifi 2003).

There was no significant difference in the majority of groups in the analysis of substance abuse in different surgical procedures, except that the frequent use of tobacco (not permanent or vice versa) was significantly more common in the group with digestive problems. The close association between various substance abuse with gastrointestinal tract in the internal and external literature reviewed (Goodbye 2004; Frasch, *et al.*, 2013; DeAlba, Samet, & Saitz, 2004; Dickey *et al.*, 2002), but in a very comprehensive multinational study (Frasch *et al.* 2013), gastrointestinal diseases are mainly related to opioid use. There was no significant difference in most of the groups in the study of substance abuse in different internal diseases, except that the use of the case as well as the occasional use of opium was significantly more common in the group with asthma and chronic obstructive pulmonary disease (COPD). The close association of various substance abuse with lung patients

in the literature reviewed (Frasch *et al.*, 2013 ; DeAlba, *et al.*, 2004; Dickey *et al.*, 2002), but in the very comprehensive multinational study of Faresh *et al.* (Frasch *et al.* 2013), gastrointestinal diseases were mainly related to Tobacco use and antidepressants.

Thenon-meaningful relationship between the abuse of many substances and various diseases in this study can be due to the low number of patients and multiple branches. The limited number of patients examined was a major limiting factor in obtaining meaningful information. Despite the fact that the two clinics of Motahari and Imam Reza are the center for referral of internal and surgical patients from the south of the country, there will certainly be limits to the analysis and reporting due to the limited choice of society.

## ACKNOWLEDGEMENT

The present article was extracted from the thesis written by Atoosa Moradi and was financially supported by Shiraz University of Medical Sciences (88/1015).

## REFERENCES

- Ahmadi J *et al* Substance Use Disorders in Patients with Lung or Heart Diseases. *Sch J App Med Sci*, 2014; 2(1A):111-120.
- Ahmadi J, Benrazavi L, Babaebeigi M, Ghanizadeh A, Ghanizadeh M, Pridmore S. Substance use in a sample of medical patients. *J Psychoactive Drugs*. 2008;40(3):315-9.
- Ahmadi J, Sharifi M. Prevalence of heroin abuse in Shiraz, Iran. *Arch Iranian Med*. 2003; 6(4):304-306.
- Ahmadi J, Sharifi M. Lifetime and current prevalence of tobacco smoking. *J Addiction Research Therapy*. 2013;4(2):145
- Ali Ghalehi, Mohammad Kazem Zarabian, Dr. Mohammad Haghghi, Dr. Mohammad Hassan Bahrami. Frequency of Substance Abuse in Patients Admitted to Psychiatric Wards of Farshchian Hospital in Hamadan. *Journal of Hamedan University of Medical Sciences & Health Services*. Volume 17, Number 1, Spring 2010.
- American Psychiatric Association (APA) DSM-5 (Diagnostic statistical manual of mental Disorder version 5), USA 2015.
- Chang SC, Ma CC, Lee CT, Hsieh SW. Pharmacoepidemiology of chronic noncancer pain patients requiring chronic opioid therapy: A nationwide population-based study. *Acta Anaesthesiol*. 2015;53(3):89-94.
- DeAlba, I., Samet, J. H., & Saitz, R. Burden of medical illness in drug- and alcohol-dependent persons without primary care. *American Journal of Addictions*. 2004;13, 33-45.
- Dickey B, Normand SL, Weiss RD, Drake RE, Azeni H. Medical morbidity, mental illness, and substance use disorders. *Psychiatr Serv*. 2002;53(7):861-7.
- Drug Control Headquarters. The Antinarcotics law of the Islamic Republic of Iran (as amended November 1997). Drug

- Control Headquarters, Tehran, Iran. Available from: <http://www.refworld.org/docid/4c35b0a52.html>.
- Frasch K, Larsen JI, Cordes J, Jacobsen B, Wallenstein Jensen SO, Lauber C, et al. Physical illness in psychiatric inpatients: comparison of patients with and without substance use disorders. *Int J Soc Psychiatry*. 2013;59(8):757-64.
- GBD 2013 Mortality and Causes of Death Collaborators. Global, regional, and national age-sex specific all-cause and cause-specific mortality for 240 causes of death, 1990-2013: a systematic analysis for the Global Burden of Disease Study. *Lancet*. 2015 10;385(9963):117-71.
- Goodbye B. The role of physical illness in the incidence and incidence of addiction. *Quarterly Journal of Sabzevar University of Medical Sciences (Secrets: 2004; Volume 11, Issue 2, 32, pp. 59-66.*
- Gulliver SB, Kalman D, Rohsenow DJ, Colby SM, Monti PM, Eaton CA. Smoking and drinking among alcoholics in treatment: Cross-sectional and longitudinal relationships. *Journal of Studies on Alcohol* 2000;61 (1): 157-63.
- Hah JM, Sharifzadeh Y, Wang BM, Gillespie MJ, Goodman SB, Mackey SC, Carroll IR. Factors Associated with Opioid Use in a Cohort of Patients Presenting for Surgery. *Pain Res Treat*. 2015;2015:829696.
- Holliday S1, Hayes C, Dunlop A. Opioid use in chronic non-cancer pain--part 1: known knowns and known unknowns. *Aust Fam Physician*. 2013;42(3):98-102.
- <http://www.unodc.org/pdf/iran/publications/RSA2000SUMMARY.pdf>9- Salsitz EA. Chronic Pain, Chronic Opioid Addiction: a Complex Nexus. *J Med Toxicol*. 2016 Mar;12(1):54-7.
- <https://www.unodc.org/documents/islamicrepublicofiran/publications/Mass%20Media.pdf>
- Jackson T. Acute and chronic pain-in: practical manual of physical medicine and rehabilitation. Mosby; 1998p.607-644.
- Kavian M, Lavasani F, Rahimi Moghrear, Hosseini M, Goldian J, Tehrani et al. Handbook of Drug Abuse Prevention for Mass Media Practitioners. Office of the United Nations Office on Drugs Control. Available at:
- Koechl B, Unger A, Fischer G. Age-related aspects of addiction. *Gerontology*. 2012; 58(6):540-4.
- Koyyalagunta D, Bruera E, Aigner C, Nusrat H, Driver L, Novy D. Risk stratification of opioid misuse among patients with cancer pain using the SOAPP-SF. *Pain Med*. 2013;14(5):667-75.
- Razzaghi E, Rahimi A, Hosseini M, Chatterjee A. Rapid Situation Assessment (RSA) of Drug Abuse in Iran. Tehran, Islamic Republic of Iran: Prevention Department, State Welfare Organization, Ministry of Health, I.R. of Iran and United Nations International Drug Control Program, 1999. Available from:
- Trescot AM, Glaser SE, Hansen H, Benyamin R, Patel S, Manchikanti L. Effectiveness of opioids in the treatment of chronic non-cancer pain. *Pain Physician*. 2008;11(2 Suppl): S181-200.

## Studies on changes in lead and cadmium concentrations of urban landfill soils around Ardebil

Reza Fekri<sup>1</sup>, Masoume Mollaei<sup>1</sup>, Aboutaleb Ghaffari<sup>1</sup>, Roghayeh mohammadpour<sup>2</sup> and Malihe Shahmorad Moghanlou<sup>3\*</sup>

<sup>1</sup>Department of Environment and Energy, Science and Research Branch, Islamic Azad University, Tehran, Iran

<sup>2</sup>Graduated of Evaluation and Land Use Planning, Department of Environment and Energy, Science and Research Branch, Islamic Azad University, Tehran, Iran

<sup>3</sup>Young Researchers Club, Ardabil Branch, Islamic Azad University, Ardabil, Iran

### ABSTRACT

Soil is one of important and valuable resources of nature and its pollution has inevitable effects on environment. The household garbage with industrial waste is taken to the landfill site. The landfill sites produce leachate that contaminates the superficial and underground waters. This research was conducted through descriptive-analytical method to measure the lead and cadmium concentrations and also some important physiochemical parameters around landfill soils of Ardebil city in two time series of spring and summer in 2015. Sampling, preparation, and analysis the samples were conducted by standard method from 16 determined stations of soils around landfill to the radius of 500m. Results showed that the mean physiochemical parameters except acidity were in normal level in 1% sig. level. The mean acidity in both periods was higher than global standards. The results of geo-accumulation index calculation showed that this region soil is non-polluted to semi-polluted according to accumulation of heavy metals such as cadmium and lead. This region soil is alkaline, and sanity and concentration of solved materials are less than the global standards.

**KEY WORDS:** HEAVY METALS, LANDFILL, SOIL, ARDEBIL

### ARTICLE INFORMATION:

\*Corresponding Author: [atoosamoradi12@gmail.com](mailto:atoosamoradi12@gmail.com)

Received 3<sup>rd</sup> May, 2017

Accepted after revision 3<sup>rd</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

Generally, using the burned garbage landfill is the last choice for garbage removal in the developed countries. However, this technique is still used in the developing countries at least to remove non-recyclable waste or waste materials from waste incinerators. The reason of extensive usage of hygienic burned landfills in most parts of the world is the comparative studies among the garbage burning choices in various countries that showed this technique has less cost economically than the other choices and is affordable (Lema *et al.*, 1998). The landfill sites with non-controlled gas and leachate may express environmental effects. The produced leachate in landfills includes the great amounts of pollutions including organic materials (such as oily acids and alcohols), non-organic materials such as metals and nitrogen ammonium (Andreottola and Cannas., 1992). Any changes in the constitutional elements of soil as to make it unusable are called pollution. Soil is the most important and extensive purification substance of water and recycler of wastes, but it has limited capacity (Fattaei, 2011).

The balance and equilibrium of nature was damaged in recent years as a result of execution some economic, industrial, agricultural, and service plans in various parts of the world which have gone along with defects in local, regional, and even global scales (Taaebi and Eshaghi, 2001). The environment pollution including soil pollution is one of the important defect causing imbalance of nature. The most important soil pollutants includes heavy metals, acidic rains, and organic materials among which, heavy metals are mentioned for significant cancer-causing, accumulative effects, high toxicity, and non-degradable effects. Various activities disrupt soil performance as a part of the earth's crust. Therefore, soil pollution is significantly mentioned environmentally that soil is considered as a natural filter (Renzoni and Fossi. 1994, Mico *et al.*, 2006).

Garbage is considered as one of the most important pollutant factor of soils. Garbage can penetrate inside soil and also pollute the waste resources, while it is called "dirty gold" in the developed countries and garbage takes added-value by recycling and producing composts from garbage (Dabiri, 1996). Heavy metals are derived from soil natural compounds or result of human activities. The rich mineral regions by metals, metal melting, metalworking, smoke of cars, using fossil fuels, fertilizers and pesticides, and urban wastewater production are the most important human activities polluting soil with great amounts of toxic metals (Seward, *et al.*, 1990). Heavy metals are sustainable in the environment and are toxic for the living creatures. They tend to accumulate in animal and plant textures. These metals are

accumulated by artificial methods such as making fossil fuels, mines extraction, agricultural wastewaters, the accumulated superficial waters, factories wastewaters, transportation etc. (Bahaskar *et al.*, 2010; Ahmad *et al.*, 2009). The penetration of metals to the lower soil layers depends on accumulation, movability, various factors such as water and soil acidity. Oxidation potential, soil materials, concentration, and the type of ion exchanger, the presence of organic or mineral ligands, the content of organic material, soil particles sizes, and plant features through metals absorption and desorption (Egiarte *et al.*, 2006).

Soil pollution by lead is one of the most important environmental pollutions in many countries that make serious dangers for environment and human health. The extra pollution by lead brings incurable diseases for human. The lead damage is resulted by its low movement in environment and its high aggregation. (Reeres and Baker, 1997 and Garbisu and Alkorta, 2001). Alloway (2001) found that the toxicity potential of heavy metals in environment depends on its concentration in soil solution. More metal concentrations in solution phase leads to more absorbance of them by plant. The danger of heavy metal toxicity in solution is more than non-solution phase, and elements are assumed completely accessible in soil soluble phase for being bio-accessible. Accessibility depends on cases such as acidity, oxidation, and reduction conditions, nature of absorption and its properties, concentration of other materials in solution and ion hydration radius (Babel and Kurniawan, 2004). The total critical concentration for lead and cadmium in soil was 200 and 8 mg/kg, respectively and toxic concentration range for lead and cadmium in plant was reported 30-500 and 5-30 mg/kg, respectively (Chaney, 1989). The essential policies to reduce the effect of leachate pollution from landfill of Ardebil were made in this research for the first time that was made for the adjacency of landfill to rural and urban areas and its potential environmental dangers by the made leachates from Ardebil landfill on soil of this region.

## MATERIALS AND METHODS

The present study was conducted by descriptive-analytical method and measurement of the heavy metals concentrations and also some physiochemical parameters of soil around Ardebil landfill site, 26km far from Ardebil northwest (Ralen Ghashlaghi village).

Sampling of soil was done in two time series in spring and summer seasons of 2015. 16 soil samples were taken to measure the soil pollutions around the landfill site. Sampling from landfill site was conducted up to the radius of 500m from there (Taleb Gheshlagh

village). Soil samples were taken from 0-15cm depth from each station. The soil samples were dried in air and were passed through 2.5mm sieve, and were prepared for analysis. Soil texture (sand, Silt, and clay %) were measured by hydrometric technic and Ec by Ec-meter and samples pHs in saturated mud of soil by pH-meter (Klute, 1986). Perkin Elmer atomic absorption spectroscopy was transferred to the measurement site to measure lead and cadmium concentrations in soil after preparing extracts (Jones, 2001). The mean concentration and the mentioned parameters were indicated by comparison with the global standards after experiments and data record. Data statistical analysis was by SPSS software. Mean comparison test with constant number (T-test) was used to compare mean of each parameters with the drinking and agricultural water standards.

## RESULTS AND DISCUSSION

Geographical coordinates and the results of obtained means by chemical and physical analysis of the studied parameters and their comparison to the global standards are shown in table (1), (2), and (3) by classification based on stations and sampling time.

According to table (2), the results of descriptive statistics of the studied physiochemical parameters and the measured heavy metals such as lead and cadmium on soil of this region showed that the mean lead element was in zero level and lower than the EPA (Environmental Protection Agency, 1991), and Iran standard and have significant difference about 99%. In addition,

the mean cadmium element in two time series was less than the global and Iran standards. Results of table (3) show that the mean values of lead and cadmium metals in soil in summer and spring seasons for two elements was in the state of  $cd > pb$  in most stations. The mean acidity parameter in the first series and soil electric conductivity in the second series have the maximum level in comparison to Germany soil. Opaluwa et al. (2012) by measuring heavy metals in soil and leaves of plants and green and vegetative products around Lafia burial place in Nigeria concluded that all the measured heavy metals (As, Cd, Co, Cu, Fe, Ni, Pb, and Zn) for samples had less than WHO (World Health Organization, 2003) level. However, it is essential to have more survey for the dependency of this region dwellers to the agricultural lands that are in agreement with the obtained results in this research. According to the measured soil acidity as 11 and 7.5 for the first and second series, respectively, increasing soil acidity increases accessibility to elements such as aluminum and manganese. Consequently, it stops plant growth. Another reason for soil high acidity of this region can be for salt removal from garbage. The mean obtained results from measurement to determine region soil texture showed 49% clay, 36% sand, and 15% silt; therefore, the soil texture of this region is considered clay-sandy.

Geo-accumulation index that was introduced by Muller et al. (1969) is an index able to determine soil pollution grade and is calculated by the following relation:

$$I_{geo} = \log_2 \left( \frac{C_n}{1} \cdot 5B_n \right) \quad (1)$$

Table 1. Geographical coordinates of soil sampling stations

Station no.	Longitude	latitude	Position
1	38° 26/505	48° 13/490	Inside landfill
2	38° 26/518	48° 13/554	Inside landfill
3	38° 26/552	48° 13/738	Inside landfill
4	38° 26/557	48° 13/434	Inside landfill
5	38° 26/605	48° 13/645	Inside landfill
6	38° 26/561	48° 13/640	Inside landfill
7	38° 26/374	48° 13/817	Around landfill
8	38° 26/357	48° 13/522	Around landfill
9	38° 26/448	48° 13/279	Around landfill
10	38° 26/760	48° 13/245	Around landfill
11	38° 26/532	48° 14/083	Around landfill
12	38° 26/737	48° 13/478	Around landfill
13	38° 25/305	48° 15/207	Around landfill up to radius of 500m
14	38° 24/511	48° 12/330	Around landfill up to radius of 500m
15	38° 27/506	48° 12/303	Around landfill up to radius of 500m
16	38° 27/798	48° 13/899	Around landfill up to radius of 500m

Table 2. results of the studied parameters in the soil

Parameter		St. dev	maximum	minimum	Mean	Skewness	Kurtosis	Variance
Cadmium	Spring	-0.035667	0.081	0.00	0.02319	0.00	-1.00	0.001
	Summer	-0.031483	0.89	0.00	0.01444	1.00	1.00	0.001
Lead	Spring	1.00	4.00	0.00	0.00	3.00	11.00	1.00
	Summer	1.062366	2.00	0.00	0.00	1.00	0.00	1.00
PH	Spring	15	71	6	11	3	15	253
	Summer	0.00	8	6	7.5	-0.064	0.00	0.00
EC	Spring	445	1691	209	792.06	0.00	0.00	198404
	Summer	547	1904	201	1048	0.00	-1.00	299344
TDS	Spring	405	1551	207	713	0.00	0.00	164260
	Summer	401	1404	296	836	0.042	-1.00	161200

Table 3. comparison the obtained results from T-test of the studied parameters in soil with the global standards

Standard	Parameter	Series	Mean	T-test	Df	Sig. level	Mean difference	95% sig. level	
								Minimum	Maximum
EPA 50	Pb	First	0.00	-163	15	** 0.000	-49.00	-50.00	-48.00
		Second	0.00	86	15	** 0.000	-49.00	-49.00	-48.00
Europe 300	Pb	First	0.00	-987	15	** 0.000	-299.00	-300.00	-298.00
		Second	0.00	1127	15	** 0.000	-299.00	-299.00	-298.00
Iran 15/0	Pb	First	0.00	0.00	15	** 0.000	0.000	0.000	0.000
		Second	0.00	1	15	** 0.000	0.000	0.000	0.000
EPA 1	Cd	First	0.0231	109	15	** 0.000	0.000	0.000	0.000
		Second	0.0144	-12	15	** 0.000	0.000	-1.00234	0.000
Europe 2/0	Cd	First	0.0231	19	15	** 0.000	0.000	0.000	0.000
		Second	0.0144	-23	15	** 0.000	0.000	0.000	0.000
Iran 03/0	Cd	First	0.0231	0.00	15	** 0.000	-0.0068	-0.02582	0.01219
		Second	0.0144	-1	15	ns 0.067	-0.0155	-0.03234	0.00121
Germany 6/6	PH	First	11	1.00	15	** 0.000	4.00	-3.00	13.00
		Second	7.5	9.098	15	** 0.000	0.00	0.00	1.00
Germany 8/0	EC	First	792.06	7.00	15	** 0.000	791.00	553.00	1028.00
		Second	1048	7.00	15	** 0.000	1047.00	756. 0959	1339.00
Germany 9/2	EC	First	792.06	7.087	15	** 0.000	789.00	551.00	1026.00
		Second	1048	7.00	15	** 0.000	1054.00	753.00	1337.079

\*\* and ns shows sig. level in 1% and 5% p-level.

Based on Igeo of Muller, Cn is concentration in aggregation and soil and Bn is basis concentration (Muller et al., 1969). Using relation (1), Igeo, geo-accumulation index, was calculated for the studied soil and the maximum geo-accumulation was for spring series to station 8 with 0.026 ppm, and the maximum geo-accumulation for cadmium was in summer season for station 16 with 0.1 ppm. According to Muller index evaluation table, geo-accumulation for the region soil pollution grade was determined as non-polluted to semi-polluted (0-1)

### CONCLUSION

According to the results of t-test, it can be concluded that absorbance the heavy elements of cadmium and lead in the studied soil was in lower level than global standard showing this region soil proportion for plant growth and agricultural products in the present condition. The mean acidity (pH) in the first series was 11 that show high capability of the soil of this region. Studies have shown that higher soil acidity leads to the slower heavy mental absorbance. Salinity (EC) in the second

series was in the maximum level of (1047)  $\mu\text{siemens/cm}$ . there is reverse relationship between acidity and salinity based on results. It means alkaline soils have less salinity. In addition, higher soil salinity of this region shows more usage of the underground waters in the lower raining seasons. Moreover, it is as the result of soil leaching and aggregation of elements in the lower levels of soil. The result of Igeo was obtained the aggregation of non-polluted to semi-polluted soil for this region. Generally, it is concluded that production leachate from Ardebil landfill hasn't imposed undesirable effects in the case of heavy metals such as lead and cadmium (two studied elements) on this region soil fortunately in the present conditions for the freshness of the landfill. However, more extensive studies and essential decisions must be made to control and reduce the harmful effects of the produced leachate in near future.

## REFERENCES

- Ahmad AK, Mushrifah I, Othman MS. 2009. Water quality and heavy metal concentrations in sediment of Sungai Kelantan, Kelantan, Malaysia: a baseline study. *Sains Malaysiana*. 2009; 38(4): 435-442.
- Alloway B.J. 2001. Heavy metal in soil. New York: John Wiley and sons Inc; 2001. P.20-28.
- Andreottola, G. Cannas, P. (1992). Chemical and Biological Characteristics of Landfill Leachate. In: Christensen, H., Cossu, R., Stegmann, R. (Eds.), *Landfilling of Waste: Leachate*: 65-88.
- Babel, S and T. A. Kurniawan. 2004. Cr (VI) removal from synthetic waste water from synthetic waste water using coconut shell charcoal and commercial activated carbon modified with oxidizing agent and chitosan. *Chemosphere* 52(7), 851- 867.
- Bahaskar CV, Kumar K, Nagendrappa G. 2010. Assessment of heavy metals in water samples of certain locations situated around Tumkur, Karnataka, India. *E-J. Chem.* 2010; 7(2): 349-352.
- Chaney, R.L. 1989. Toxic element accumulation in soils and crops. P 140-158, In: Bar, I.M., B. Yosef, N.J. Barrow and J. Goldshmid (eds), *protectina soil fertility and agricultural food chains, Inorganic contaminants in the Vadose zone*, Berlin-springer-Verlag.
- Dabiri, M., 1996. *Environment pollution (air, soil, sound)*, first edition, Ettehad publication, pp: 331-338
- Egiarte G, Camps Arbestain M, Ruiz-Romera E, Pinto M. 2006. Study of the chemistry of an acid soil column and of the corresponding leachates after the addition of an anaerobic municipal sludge. *Chemosphere*. 2006; 65(11):2456-67.
- Environmental Protection Agency EPA (1991), RCRA Ground Water Monitoring Technical Enforcement Guidance Document Draft Final.
- Fattaei E., 2011, cognition the natural resources and the environment. First Edition. Publication of Islamic Azad University, Ardebil branch, pp: 243-244.
- Garbisu, C. and I. Alkorta., 2001; Phytoextraction: cost-effective plant based technology for the removal of metals from the environment. *Bio resource Technology*, 779 (2001) PP: 229-236.
- Jones, J.B. 2001. *Laboratory Guide for Conducting Soil Tests and Plant Analysis*. CRC press Boca Raton FL. Pp: 199-201.
- Klute, A. 1986. *Methods of soil analysis, part I, physical and mineralogical methods*. Second edition. Soil Science Society of America INC. Wisconsin. USA.
- Lema. J.M., Mendez, R., Blazquez, R. (1998). Characteristics of landfill leachate and alternatives for their treatment: a review. *Water Air Soil Pollut.* 40, 223-250 Masterson w, slowink I. *Chemical principles*. fifth editon; 1981 pp (317-330).
- Mico', C., L. Recatala', M. Peris, J. Sa'nchez. 2006. "Assessing heavy metal sources in agricultural soils of a European Mediterranean area by multivariate analysis". *Chemosphere*. Vol. 65:863-872.
- Muller, G. (1969). Index of geo-accumulation in sediments of the Rhine river. *Geological Journal*, 2(3), 108-118.
- Opaluwa OD, Aremu MO, Ogbo LO, Abiola KA, Odiba IE, Abubakar MM, Nweze NO (2012). Heavy metal concentrations in soils, plant leaves and crops grown around dump sites in Lafia Metropolis, Nasarawa State, Nigeria. *Advances in Applied Science Research*, 2012, 3 (2):780-784.
- Reeres, R. D., and A. J. M Baker., 1999; *Metal-accumulating plant*. In *phytoremediation of toxic metals: Using plants to clean up the environment*, eds. I.Raskin and B. D. Ensley, PP 1930; John Wiley& Sons Inc. New York, NY.
- Renzoni, A and M. Fossi.1994. *Contaminants in the Environment*, Lewis. 1991 EPA).
- Seward, M. R. D. and D. H. S. Richardson. 1990. *Heavy Metal Tolerance in Plants: Evolutionary Aspects*. CRC Press., Florida.
- Taaebi A., R., Eshaghi, 2001, *An attitude toward the Environment and the Establishment of Industries in the Big Isfahan*. *Proceedings of the First Conference on Land Improvement*, Amir Kabir University of Technology.
- World Health Organization. WHO 2003. *Reducing risks, promoting health life: The world health report*. Geneva: World Health Organization; 2003. Translated to Persian by: Ahmad-vand A, et al. 2003.p.162- 163. [Persian].

## Acute phase of stroke and dysphagia: A cross-sectional study in Shiraz, Iran

Sima Farpour<sup>1</sup> and Hamid Reza Farpour<sup>2\*</sup>

<sup>1</sup>*MSc Speech and Language Therapy, Shiraz Geriatric Research Center, Shiraz University of Medical Sciences, Shiraz, Iran*

<sup>2</sup>*Assistant Professor of Physical Medicine and Rehabilitation, Health Policy Research Center, Department of Physical Medicine and Rehabilitation, Shiraz University of Medical Sciences, Shiraz, Iran*

### ABSTRACT

Stroke is one of the causes of oropharyngeal dysphagia which can lead to various complications. Although, swallowing disorders can increase the probability of morbidity and mortality, the standard of care for these patients is insufficient and there is little routine planning for dysphagia screening and management in our country. The aim of this study was to investigate oropharyngeal dysphagia in acute ward of stroke to evaluate this hazardous complication of stroke. There were 121 stroke patients recruited in this study. According to our inclusion and exclusion criteria, 100 patients were evaluated in the first 7 days after stroke by the Mann Assessment of Swallowing Ability and an Interview Checklist. The data were statistically analyzed by means of SPSS (version 22) using descriptive, Mann – Whitney, and Chi-square test. Fifty five percent of patients had dysphagia in various severities and more severity was found in females. The patients' mean age was 60.82 years old. Mean length of hospital stay was 11.43 days which was associated with the presence of dysphagia ( $p=0.03$ ). The incidence of dysphagia in our study was in line with other countries, but there is insufficient planning for diagnosis and management of these patients. The age of stroke patients and the length of hospital stay are considerably higher than other countries. There are some recommendations to increase the quality of care for these patients and decrease the length of hospital stay.

**KEY WORDS:** DYSPHAGIA, ACUTE WARD, STROKE, DEGLUTITION, DEGLUTITION DISORDER

### ARTICLE INFORMATION:

\*Corresponding Author: [farporh@sums.ac.ir](mailto:farporh@sums.ac.ir)

Received 3<sup>rd</sup> May, 2017

Accepted after revision 10<sup>th</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

Stroke is the second cause of death globally and the first cause of permanent disability in the developed countries. Over 80% of deaths caused by stroke in the world occur in the developing countries. Three main categories are at risk of oropharyngeal dysphagia (elderly people, patients with neurological or neurodegenerative diseases, and patients with head and/or neck diseases); the stroke patients are amongst these categories, (Hosseini et al., 2010, Naghavi et al., 2013, Gandolfi et al., 2014, Clavé and Shaker 2015).

Prevalence of swallowing disorders in CVA patients differs in various studies (22 – 85%), due to differentiations in sampling, diagnosis methods, time of the evaluation, definition of dysphagia, and the number and type of stroke patients (Clavé et al., 2014; Zheng et al., 2014; Bakhtiyari et al., 2015, Brogan et al., 2014, Edmiaston et al., 2014, Mandysova et al., 2011). Dysphagia can lead to various complications, such as choking, pneumonia, malnutrition, dehydration, weight loss, increased healthcare cost, increased length of hospital stay, psychosocial problems, diminished quality of life, and finally high risk of morbidity and mortality (Clavé et al., 2014; Zheng et al., 2014; Bakhtiyari et al., 2015, Brogan et al., 2014, Edmiaston et al., 2014, Mandysova et al., 2011, Martino et al., 2009, Hinchey et al., 2005; Wirth et al., 2014; Ickenstein et al., 2010). As the result of these severe complications its early detection in stroke patients is of great importance (Gandolfi et al., 2014; Hinchey et al., 2005). Stroke guidelines such as American Heart Association/American Stroke Association guideline emphasize the early dysphagia screening as an initial step for early stroke management (Martino et al., 2009; Ickenstein et al., 2010; Daniels et al., 2015).

Iran is a developing country which is located in the Middle East with about 70 million populations. The incidence rate of people who experienced ischemic stroke for the first time amongst all age groups in Iran is 43.12/100,000 people/year. However, the incidence of new and recurrent stroke annually is reported at 22.7/100,000 population and 84.16 to 103.23/100,000 over four years. CVA was slightly more common in females (51% - 53%) in all age ranges than males, but more common in young males of 15 – 45 years old (52%) and in boys (59%) (Hosseini et al., 2010).

Despite the high incidence rate of stroke in Iran and the importance of dysphagia screening as the primary step to manage these patients, there is no routine program in hospitals to screen and recognize swallowing problems of patients. The main aim of this study was to investigate oropharyngeal dysphagia in acute stroke settings in Shiraz/Iran. The purpose was to highlight the necessity of screening dysphagia in these patients and

to develop a well- coordinated multidisciplinary team in hospitals. Our second goal was to yield a report on the status of oropharyngeal dysphagia in our social and cultural setting.

## METHODS

In this cross-sectional study, all CVA/TIA patients who were admitted in acute stroke ward of the two referral governmental hospitals in Shiraz were invited to participate in this study. To investigate the swallowing condition of the patients in acute phase, we screened all of them during the first 7 days after stroke, according to two facts in our country: 1- in some parts of Iran more than 90.00% of imaging (CT OR MRI) for confirming stroke is conducted within 7 days and 89.20% is conducted within 3 days (Azarpazhooh et al., 2010) and 2- there is great variation in the time taken by patients to present to hospitals based on patients' location and its distance to the hospital, ability to pay, education, and cultural, social or religious beliefs of these patients (Brainin et al., 2007).

Inclusion criteria were: being 18 years or older; presence of ischemic stroke or transient ischemic attack (TIA) which were diagnosed by the attending neurologist; stable vital and physiological conditions of the patient which was confirmed by the attending neurologist; being alert and able to follow speech and language pathologist (SLP) instructions. Exclusion criteria included: presence of any neurologic problems other than CVA/TIA or any cause of dysphagia other than CVA/ TIA like craniofacial malformations, head and neck cancers or trauma and history of oropharyngeal dysphagia due to previous CVA/TIA.

This study was approved by the ethics committee of Health Policy Research Center of Shiraz University of Medical Sciences. All patients or their caregivers provided a written informed consent before being enrolled in the study.

Since there is no instrumental or formal clinical evaluation of dysphagia in the acute wards of the hospitals for the patients, two questionnaires were provided to determine the condition of patients. The first one was an Interview Checklist (IC) which was prepared by the researchers in this study with the aim of determining the demographic information of the patients. The other one was the Persian version of the Mann Assessment of Swallowing Ability (MASA) to describe the swallowing status of the patients.

After confirmation of stroke (CVA/TIA) by the patient's physician and observing the ethical issues, the SLP filled the IC and after that they were screened for dysphagia through MASA.IC consisted of items filled by

the SLP alone or with the assistance of a physician. This general questionnaire contained items on the patients' demographic information, such as full name, his/her code in the study, sex, age, handedness, patient's physician name, reason(s) for hospitalization, confirmation of stroke (CVA/TIA), previous stroke, change in the secretion of saliva before stroke, presence of other neurologic disease, presence of other disorders which could be the cause of dysphagia, and their telephone number, date of stroke, hospitalization, screening, and discharge. To fill the discharge item, the SLP contacted the hospital approximately one month after screening to confirm the exact date of discharge.

### MANN ASSESSMENT OF SWALLOWING ABILITY (MASA)

MASA is a valid and reliable clinical assessment tool of acquired neurological oropharyngeal swallowing disorders. It comprises of 24 clinical items which highlights 3 main areas: 1) evaluation of oromotor/sensory component of swallowing and prerequisite skills, 2) functional assessment of swallowing and, 3) dietary recommendation and a predictive risk rating on swallowing integrity. The evaluation took about 15-20 minutes in moderately impaired patients. Two types of scores were extracted from the MASA for each patient: 1) a total scale score out of 200 and, 2) an ordinal scale for both aspiration and dysphagia (MASA, Mann, 2002). In order to use MASA in our hospitals, we obtained the permission of the developer of the test (Prof. Mann) to use it in Iran. Then, we did the forward and backward translation of the test in Persian via WHO translation protocol.

### STATISTICAL ANALYSES

Quantitative and qualitative variables were described by mean  $\pm$  Standard Deviation (SD) and frequency (percent). Mann-Whitney and Chi-square tests were applied where appropriate. All analyses were done using SPSS Inc (version 22).

### RESULTS AND DISCUSSION

A total of 121 patients were interviewed and based on our inclusion criteria 100 patients were enrolled in this study (Fig. 1). Fifty five percent of the patients had dysphagia in various severities (mild= 14%, moderate= 22%, severe= 19%). Mean age of all participants was 60.82 years (SD= 15.88; Minimum= 22.00 and Maximum= 98.00) and the median age of the patients was 63.00 (Inter Quartile Range, 50.00 to 71.75 years). The mean length of stay at hospital was 11.43 days (SD= 9.25; Minimum= 2.00 and Maximum= 58.00), and it seems

that dysphagia has increased the Length of Stay (LOS) at hospital. Fifty five percent of patients were females. Most of the patients were right handed (96%). Seventy three percent of the patients were experiencing CVA/TIA for the first time. The number of patients with CVA was more than the ones with TIA (Table 1).

There was a difference between the mean length of stay in patients with dysphagia and those without it ( $P=0.03$ ). Furthermore, the type of ischemia can make a difference in the ability of patients to swallow ( $p=0.001$ ) (Table 1). There were no significant differences in the handedness and previous history of CVA/TIA between the patients with or without dysphagia ( $p=0.22$  and  $0.15$ , respectively) (Table 1). Although, there were no association between sex and presence of dysphagia ( $p=0.48$ ) (Table 1), there was a link between sex and the severity of dysphagia ( $p=0.01$ ). The number of females was more than males in severe category of dysphagia [15 females (78.95%) versus 4 males (21.05%)], and in moderate category [13 (59.09%) versus 9 (40.91%)]. In the mild category, the number of females was less than males [4 (28.57%) versus 10 (71.43%)] (Fig. 2).

Dysphagia after stroke is a prevalent symptom that can complicate the patients' condition. Evidence and guidelines of stroke show that there should be a formal dysphagia screening protocol to be offered for all stroke patients regardless of their stroke severity (Hasan et al., 2010). The presence or absence of dysphagia is different in various studies due to differences in methodology such as the screening tool and the differentiations between the samples (Johnson et al., 2014). In our study, the incidence of dysphagia (55%) was in line with the reports of other studies in this field which used the clinical testing (51 – 55 %). Although the golden standard of diagnosing dysphagia is instrumental assessments and the diagnosis tool will change the rate up to 78%, there were no availability of these instruments in our hospitals and the MASA was the only available tool to diagnose the swallowing problems of the patients. Our data emphasize the need to compliment our hospitals with other diagnostic tools either clinical or instrumental ones to have better consideration of the patients' dysphagia conditions.

The average length of stay (LOS) at our study was approximately twice as much 11.43 days vs. 3.10 – 6.80 days (Bettger et al., 2015). Specifically, patients with dysphagia stayed at hospital approximately 4 days more than patients without dysphagia. This data can be a good predictor for the amount of burden which is inflicted upon stroke and dysphagia patients/their families as well as the society. There is a need for further research to investigate the economical and emotional problems imposed on the stroke patients with dysphagia, their families and the society in Iran. The most impor-

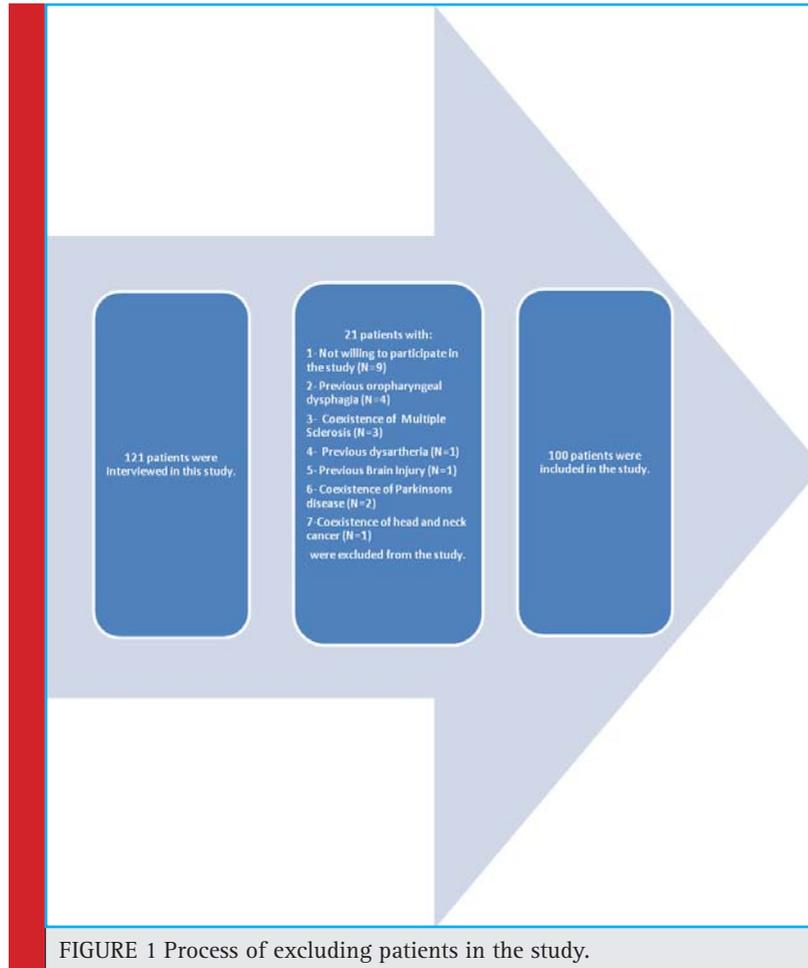


FIGURE 1 Process of excluding patients in the study.

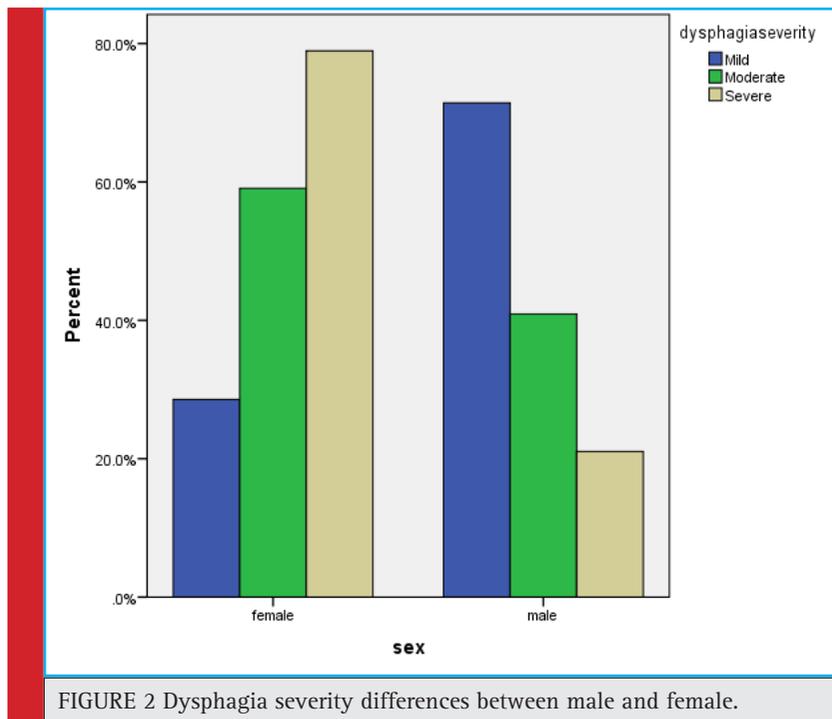


FIGURE 2 Dysphagia severity differences between male and female.

Table 1. Demographics of patients and the relationship of the characteristics with the presence of dysphagia.				
	All patients N= 100	Patients with dysphagia N= 55	Patients without dysphagia N= 45	P-Value
Age	60.82 (15.88)	64.74 (17.43)	56.02 (12.33)	0.002 <sup>d</sup>
LOS <sup>a</sup> at hospital	11.43 (9.25)	13.19 (10.33)	9.31 (7.34)	0.03 <sup>d</sup>
Sex				
Female	55.00 (55.00%)	32.00 (58.20%)	23.00 (51.10%)	0.48
Male	45.00 (45.00%)	23.00 (41.80%)	22.00 (48.90%)	
Handedness				
Right	96.00 (96.00%)	54.00 (98.20%)	42.00 (93.30%)	0.22
Left	4.00 (4.00%)	1.00 (1.80%)	3.00 (6.70%)	
Previous history of CVA <sup>b</sup> /TIA <sup>c</sup>				
HAS	27.00 (27.00%)	18.00 (32.70%)	9.00 (20.00%)	0.15
HAS NOT	73.00 (73.00%)	37.00 (67.30%)	36.00 (80.00%)	
Type of Ischemia				
TIA	26.00 (26.00%)	7.00 (12.70%)	19.00 (42.20%)	0.001 <sup>d</sup>
CVA	74.00 (74.00%)	48.00 (87.30%)	26.00 (57.80%)	

<sup>a</sup>LOS = Length of Stay <sup>b</sup>CVA = Cerebral Vascular Attack <sup>c</sup>TIA = Transient Ischemic Attack <sup>d</sup>P - Value < 0.05: there is a significant difference between patients with dysphagia and without dysphagia. Quantitative variables presented by mean (SD) and they were compared among patients with and without dysphagia by Mann - Whitney. Qualitative variables presented by frequency (percent) and Chi- Square were employed to compare patients with and without dysphagia.

tant reason for the shorter LOS in some countries is the availability of post- acute care services (PACS) or the stroke inpatient rehabilitation centers to which patients are referred to reach their pre - stroke status condition (Suhail et al. 2014 and Bettger et al., 2015).

To the best of our knowledge, there is a lack of sufficient post - acute care services or stroke inpatient rehabilitation centers in Iran and there is a need to establish such centers to increase the quality of care for the patients and decrease the burden of stroke and dysphagia on the patients, their families and society. The patients' in our study (mean age= 60.82, SD= 15.88) was similar to our neighboring countries like Iraq (mean age= 60.55, SD= 11.81) and Pakistan (mean age= 59.09, SD= 13.38) (Johnson et al., 2014; Schwamm et al., 2009), but there are some important differences between our age and some developed countries (Wiedmann et al., 2015; Bonita et al., 2004).

Our median age was 63.00 years (Inter Quartile Range, 50.00 to 71.75 years) compared with that in the United States of America: 74.00 years (Inter quartile Range, 61.00 to 82.00 years) (Wiedmann et al., 2015), Germany: 75.00 (Inter quartile Range, 66.00 to 82.00 years), Poland: 73.00 (Inter quartile Range, 63.00 to 80.00 years), Scotland/UK: 76.00 (Inter quartile Range, 66.00 to 83.00 years), Autonomous community of Catalonia/Spain: 77.00 (Inter quartile Range, 68.00 to 84.00 years), Sweden: 78.00 (Inter quartile Range, 69.00 to 85.00 years), England/Wales/N-

Ireland, UK: 78.00 (Inter quartile Range, 69.00 to 85.00 years) (25). These data confirmed the reality that patients in developing countries suffer from stroke/TIA and its complications (e.g. dysphagia) far much earlier than the developed countries (Bonita et al., 2004; Walker et al., 2003; Sridharan et al., 2009).

Result of the present study supports previous findings from Cho et al., (2015) indicating that both female and male are susceptible to dysphagia (Cho et al., 2015). But in this study its severity was more in females than males. This could be due to differences in the anatomy of swallowing between genders. Loth et al. (2015) showed that there was a considerable sexual dimorphism in dimensions and shape of the hyoid and larynx (Loth et al. 2015). However, there is an ambiguity of the impact of sex on swallowing physiology (Watts CR, Kelly B. 2015) that should be targeted for further research.

In conclusion, the incidence of dysphagia among stroke patients in Shiraz/Iran is in line with other studies in other parts of the world. To the best of our knowledge, there is a lack of screening and assessment tools in our hospitals to formally consider dysphagia in stroke patients and MASA was the only one which was used for the first time for the patients in our study. Therefore, there is a need to equip our hospitals with other tools, specially the instruments like video fluoroscopy (VFS) or fibrotic endoscopy (FEES) to have a better insight to dysphagia in these patients.

On the other hand, for increasing the quality of care and decreasing the length of stay at hospital our recommendation is to establish rehabilitation centers in which the health professionals (including: physiatrist, ENT specialist, speech and language pathologist, neurologist, gastroenterologist, radiologist, rehabilitation nurses) work together in a multidisciplinary manner to cover all the needs of stroke patients with dysphagia. Also, there is a need to conduct studies about knowledge, attitude and practice (KAP studies) of health care providers and patients/families in dysphagia field to understand the needs of these groups and maximize the quality of care in these centers. We do not know exactly how patients struggle with dysphagia after discharge; further research is also needed to investigate the problems of patients with dysphagia after discharge.

## CONFLICT OF INTEREST

No potential conflict of interest was reported.

## ACKNOWLEDGMENT

The authors would like to thank the Research Consultation Center (RCC) of Shiraz University of Medical Sciences for their invaluable assistance in analyzing the data and editing the manuscript.

## REFERENCES

- Azarapazhooh MR, Etemadi MM, Donnan GA, Mokhber N, Majdi MR, Ghayour-Mobarhan M, Ghandehary K, Farzadfar MT, Kiani R, Panahandeh M, Thrift AG. Excessive incidence of stroke in Iran evidence from the Mashhad stroke incidence study (MSIS), a population-based study of stroke in the Middle East. *Stroke*. 2010; 41(1):e3-10.
- Bakhtiyari J, Sarraf P, Nakhostin-Ansari N, Tafakhori A, Logemann J, Faghihzadeh S, Harirchian MH. Effects of early intervention of swallowing therapy on recovery from dysphagia following stroke. *Iran J Neurol*. 2015; 14(3):119.
- Bettger JP, McCoy L, Smith EE, Fonarow GC, Schwamm LH, Peterson ED. Contemporary trends and predictors of postacute service use and routine discharge home after stroke. *J Am Heart Assoc*. 2015; 4(2):e001038.
- Bonita R, Mendis S, Truelsen T, Bogousslavsky J, Toole J, Yatsu F. The global stroke initiative. *Lancet Neurol*. 2004; 3(7):391-3.
- Brainin M, Teuschl Y, Kalra L. Acute treatment and long-term management of stroke in developing countries. *Lancet Neurol*. 2007; 6(6):553-61.
- Brogan E, Langdon C, Brookes K, Budgeon C, Blacker D. Respiratory infections in acute stroke: nasogastric tubes and immobility are stronger predictors than dysphagia. *Dysphagia*. 2014; 29(3):340-5.
- Cho SY, Choung RS, Saito YA, Schleck CD, Zinsmeister AR, Locke GR, Talley NJ. Prevalence and risk factors for dysphagia: a USA community study. *Neurogastroenterol Motil*. 2015; 27(2):212-9.
- Clavé P, Shaker R. Dysphagia: current reality and scope of the problem. *Nat.Rev.Gastroenterol.Hepatol*. 2015; 12(5):259-70.
- Daniels SK, Pathak S, Stach CB, Mohr TM, Morgan RO, Anderson JA. Speech pathology reliability for stroke swallowing screening items. *Dysphagia*. 2015; 30(5):565-70.
- Edmiaston J, Connor LT, Steger-May K, Ford AL. A simple bedside stroke dysphagia screen, validated against videofluoroscopy, detects dysphagia and aspiration with high sensitivity. *J Stroke Cerebrovasc Dis*. 2014; 23(4):712-6.
- Gandolfi M, Smania N, Bisoffi G, Squaquara T, Zuccher P, Mazzucco S. Improving post-stroke dysphagia outcomes through a standardized and multidisciplinary protocol: an exploratory cohort study. *Dysphagia*. 2014; 29(6):704-12.
- Hasan ZN, Al-Shimmery EK, Taha MA. Evaluation of neurogenic dysphagia in Iraqi patients with acute stroke. *Neurosciences*. 2010 15(2):90-6.
- Hinchey JA, Shephard T, Furie K, Smith D, Wang D, Tonn S, Stroke Practice Improvement Network Investigators. Formal dysphagia screening protocols prevent pneumonia. *Stroke*. 2005; 36(9):1972-6.
- Hosseini AA, Sobhani-Rad D, Ghandehari K, Benamer HT. Frequency and clinical patterns of stroke in Iran-Systematic and critical review. *BMC neurology*. 2010; 10(1):1.
- Huang KL, Liu TY, Huang YC, Leong CP, Lin WC, Pong YP. Functional outcome in acute stroke patients with oropharyngeal dysphagia after swallowing therapy. *J Stroke Cerebrovasc Dis*. 2014; 23(10):2547-53.
- Ickenstein GW, Riecker A, Höhlig C, Müller R, Becker U, Reichmann H, Prosiegel M. Pneumonia and in-hospital mortality in the context of neurogenic oropharyngeal dysphagia (NOD) in stroke and a new NOD step-wise concept. *J Neurol*. 2010; 257(9):1492-9.
- Johnson DN, Herring HJ, Daniels SK. Dysphagia management in stroke rehabilitation. *Curr Phys Med Rehabil Rep*. 2014; 2(4):207-18.
- Loth A, Corny J, Santini L, Dahan L, Dessi P, Adalian P, Fakhry N. Analysis of Hyoid-Larynx Complex Using 3D Geometric Morphometrics. *Dysphagia*. 2015; 30(3):357-64.
- Lozano R, Naghavi M, Foreman K, Lim S, Shibuya K, Aboyans V, Abraham J, Adair T, Aggarwal R, Ahn SY, AlMazroa MA. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. *The Lancet*. 2013; 380(9859): 2095-128.
- Mandysova P, Škvrňáková J, Ehler E, Černý M. Development of the brief bedside dysphagia screening test in the Czech Republic. *Nurs Health Sci*. 2011; 13(4):388-95.
- Mann G. MASA, the mann assessment of swallowing ability. Cengage Learning; 2002.

- Martino R, Silver F, Teasell R, Bayley M, Nicholson G, Streiner DL, Diamant NE. The toronto bedside swallowing screening test (TOR-BSST) development and validation of a dysphagia screening tool for patients with stroke. *Stroke*. 2009; 40(2):555-61.
- Poorjavad M, Jalaie S. Systemic review on highly qualified screening tests for swallowing disorders following stroke: validity and reliability issues. *J Res Med Sci*. 2014; 19(8):776-85.
- Schwamm LH, Fonarow GC, Reeves MJ, Pan W, Frankel MR, Smith EE, Ellrodt G, Cannon CP, Liang L, Peterson E, LaBresh KA. Get With the Guidelines—Stroke is associated with sustained improvement in care for patients hospitalized with acute stroke or transient ischemic attack. *Circulation*. 2009; 119(1):107-15.
- Sridharan SE, Unnikrishnan JP, Sukumaran S, Sylaja PN, Nayak SD, Sarma PS, Radhakrishnan K. Incidence, types, risk factors, and outcome of stroke in a developing country the trivandrum stroke registry. *Stroke*. 2009; 40(4):1212-8.
- Suhail R, Ahmed S, Nabi S, Iqbal M. The burden of dysphagia and chest infection in acute ischemic stroke in a tertiary care hospital of islamabad capital territory. *Pakistan J Neurolog Sci*. 2014; 9(4):9-13.
- Walker RW, Rolfe M, Kelly PJ, George MO, James OF. Mortality and recovery after stroke in the Gambia. *Stroke*. 2003; 34(7):1604-9.
- Watts CR, Kelly B. The effect of bolus consistency and sex on electrophysiological measures of hyolaryngeal muscle activity during swallowing. *Dysphagia*. 2015; 30(5):551-7.
- Wiedmann S, Hillmann S, Abilleira S, Dennis M, Hermanek P, Niewada M, Norrving B, Asplund K, Rudd AG, Wolfe CD, Heuschmann PU. Variations in acute hospital stroke care and factors influencing adherence to quality indicators in 6 European audits. *Stroke*. 2015; 46(2):579-81.
- Wirth R, Smoliner C, Jäger M, Warnecke T, Leischker AH, Dzielwas R. Guideline clinical nutrition in patients with stroke. *Exp Transl Stroke Med*. 2013; 5(1):1.
- Zheng L, Li Y, Liu Y. The individualized rehabilitation interventions for dysphagia: a multidisciplinary case control study of acute stroke patients. *Int J Clin Exp Med*. 2014; 7(10):3789-94.

## Identification and assessment of factors affecting decline in the quality of construction projects in a phased approach with solutions to improve

Dara Parsa<sup>1</sup> and Saber Shiri Pour<sup>2</sup>

<sup>1</sup>Graduate Student in Civil Engineering, Construction Management Orientation, Non-profit Tabari University of Babol, Mazandaran, Iran

<sup>2</sup>Assistant Professor in Industrial Engineering, University of Science and Technology of Mazandaran, Mazandaran, Iran

### ABSTRACT

High quality execution of construction projects is one of the major factors influencing the reduction of costs And the execution of construction projects, so identifying factors that affect the quality of construction projects is essential. As well as studies in the field of quality management can greatly reduce costs caused by quality defects, so the aim of this study is to identify and prioritize the factors influencing the decline in the quality of construction projects. 250 engineering community Marivan city (including employers, contractors, consultants, students, etc.) as a prototype study to randomly selected and then respond to the initial questionnaire with 73 items, to determine the factors influencing responded and the second one 12 experts using snowball sampling were identified in 5 companies that have paired comparison questionnaire. 7 factors influencing the exploratory factor analysis using SPSS software was detected and then using confirmatory factor analysis (software Smart PLS) was reduced to 5 of the 27 items. Also to become fuzzy numbers and quality of the classic mode and quantitative (numerical) being used triangular fuzzy numbers. Finally, Chang fuzzy analysis was used to prioritize criteria. The results of exploratory factor analysis, five factors, including those related to the employer, factors related to consultants, agents of the contractor, Factors related to the lack of manpower and machinery and materials as factors influencing the reduction in the quality of construction projects were identified Confirmatory factor analysis, five factors, according to the goodness of fit of reliability (validity and reliability verification), respectively.

**KEY WORDS:** CONSTRUCTION PROJECTS, QUALITY, FUZZY HIERARCHICAL ANALYSIS

### ARTICLE INFORMATION:

\*Corresponding Author: [hasanmatinhomae@gmail.com](mailto:hasanmatinhomae@gmail.com)

Received 3<sup>rd</sup> April, 2017

Accepted after revision 13<sup>th</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

Developing countries to achieve growth, are forced to increase investment in infrastructure sectors. In addition to providing the basic needs of these sectors has a positive effect on accelerating economic development. Given the importance of project management, in recent years, various standards have emerged in this field. The standards include basic principles and requirements for the successful management of a project or an organization's project management system implementation seems necessary. The most famous and most widespread standard among standards for project management, project management body of knowledge (Khanjani, 2014).

This standard, for guiding successful projects, 9 knowledge areas to be included. Of these areas, project scope management, project time management, project cost management and project quality management as the main areas to be considered. Based on PMBOK standard quality, integrity is the hallmark of a category that is related to its ability to fulfill the needs specified and implied. Project Quality Management includes the processes required to ensure they meet the needs that have been pledged for the project. These processes interact with each other and also processes other areas of knowledge. Should be the main approach of the ISO quality management with the International Organization for Standardization ISO 9000 and 10000 series of standards and guidelines are consistent announced. It should also be dedicated approach to quality management such as those by Deming, Juran, swineherd, as well as the general approaches such as Total Quality Management TQM environment. Project Quality Management must address the management of project and product management project (Heydari, 2006). Project management team should be aware that modern quality management complements project management because both insist on the following:

Customer satisfaction, understanding, managing, and influencing needs so that customer expectations are fulfilled. This requires a combination of conformance to requirements (the project must produce what is claimed) and fitness for use (the product or service production must satisfy real needs) is. Prevention prior to inspection: The cost of preventing mistakes is always much less than the cost of correcting them. However there is one major difference that it is necessary to consider carefully the project management team And that is the temporary nature of the project means that investments in improved product quality Especially on error prevention and evaluation must often be tolerated by the Project (Hassan, 2005).

Because it may not lead project long enough to see the work efficiency According to assessments, the main reasons for the prolongation projects in Iran include:

weakness in early studies, the use of weak administrative organs in tenders on projects due to lower prices And under the influence of technical proposal of the financial offer, the weakness of the perfect site supervision consulting engineer on the project, Low effectiveness of project management in the process control industrial projects, weaknesses in process and bureaucracy cyclical payments for contractor and consultant positions, Lack of supervision and inspection of law enforcement agents and employers on traditional management by agents of the employer, problems related to purchases of domestic and foreign orders and clearance of customs formalities and so on. Reducing the quality or the quality of a project implies the existence of obstacles and difficulties in the implementation of projects is the root The reconstruction and development of urban space is seriously threatened, (Abbasi, 2007).

Quality loss can have the following consequences: A) increase the total cost (direct and indirect costs). B) waste costs such as energy, insurance, rent, etc. C) the discontent of the people and undermine the credibility of the project. D) reduce the reliability and safety of buildings built and the risk of casualties, E) the disappearance of architectural value and beauty) and prolong the operation if the decision to restructure without quality. G) decreasing the useful life of the project, I) lack of structural strength under constant gravity loads, H) meeting and cracks in the walls of buildings, G) lack of proper maintenance of the building.

Therefore to identify the causes of reduced quality and roots of the projects is essential so as to minimize negative impacts. Thus, according to the contents expressed in this article to identify and evaluate the factors reducing the quality of construction projects with a phased approach and solution to improve beyond.

## BACKGROUND RESEARCH

Khanzadi, (2010) studied and evaluated factors (cost, time, quality) where on mass housing projects were identified. Finally it has been concluded that three factors have the greatest impact on time, cost, and quality mass housing projects :Financial resources in comparison with similar organizations. The quality design of the project in terms of taking details. Quality of the financing of projects in terms of dealing with the lack of funding during the project. Khanzadi, (2010) also investigated the pathology of a city's quality management in construction. In this study, based on quality management processes, factors and were classified documents in the urban construction and mining studies and the opinion of experts, were identified as factors reducing the quality of urban buildings and were classified as follows:

1. Violation of managing and controlling processes
2. Lack of proper implementation of laws
3. Distribution of responsibilities and lack of a proper work flow between them (decentralization of duty)
4. The lack of correlation between the reference regulation and building control authority
5. Inadequate supervision. 6. The use of substandard materials
7. Lack of quality insurance and ensuring the operation.
- 8- Lack of education and culture.

Finally came to the conclusion that today's urban construction quality management requires review and reform processes in the planning, assurance and control. The revision and correction, need to ask for the public, determination and participation of all experts and officials involved in this industry. Chen and Lowe (2014) in a study to examine the use of BIM (Building Information Modeling) paid for the transfer of process design and is used to improve the design and design and construction quality by eliminating conflicts and reduce rework the be. This application contains, inspection and testing, analysis and feedback during the construction phase of the inspection results are. In this article the following as factors reducing the quality is classified: 1. Inappropriate construction methods. 2. Inappropriate design. 3. Failure to use appropriate materials. 4. The uncertainty and complexity of managing construction

Finally came to the conclusion that the key benefits of this model are as follows: quality of projects is visible to participants in the project. 5. The improved design quality and increase productivity and reduce errors caused by lack of coordination between team members carefully. Glory, (2007) in a research study created a key role in the quality of the iron triangle of cost, time, quality and importance of the organization's quality performance among key stakeholders to deliver a project's success criteria. The study consisted of three phases: (interviews, questionnaires approved by the Partial Least Squares PLS, case study). The study of the project's three dimensions of quality: quality design, quality and quality process to identify the organization and finally summary best practices for quality management provides that the results are as follows: 1. Quality management systems should be created to implement the project. 2. The quality management system must be created for suppliers and contractors. 3. methods for quality management project should RINCE, PMBOK, ISO, PMI is used. 4. The quality management system should be organized so that all accounting principles and is in full control.

Chua, (1999) examined the role and progress in improving quality performance results have been negotiated. According to this study, occurs when the difference of the project, the best strategy is to reduce the loss

of time the project contractor, project quality assurance, and gain knowledge of the owner, try to resolve the conflict and achieve project success they can help to target. That total this paper emphasizes that the quality assurance contractor, the more points he will negotiate. 120 questionnaires were distributed for data collection questionnaire was composed of two parts. The first part of the background information of respondents difference and the second data collection for the study variables. In this study, regression adjusted MMR was used to quantify the effect of an independent variable. To analyze the data to analyze the main M.lfh (PCA) was used to obtain the weight of each factor or factors found to be more effective. Also to check the suitability of test data Kaiser- meyer-olkin (kmo) was used.

At the end it was concluded that: In the absence of a dispute over construction delays occur, could facilitate a better quality of work, reduce stress and gain more efficiency. - The effects of better quality, more power in bargaining relationships that will lead to more cooperative attitude. - Better quality could improve the relationship with the owner (Chua, 1999).

## RESEARCH METHODOLOGY

The aim of the present study, descriptive and to methods of navigation (survey) is. The aim of this study was to investigate the factors influencing the decline in competitiveness survey research projects are thus placed in the category. And since the results of this research can be used in the manufacturing of applied research as well. In this study population, the city of Marivan engineering community (including employers, contractors, consultants, students, etc.) is. In this study, sampling is random sampling. Random sampling methods to estimate the number of sampling error is expected that a certain sample possible. From a variety of random sampling, in this study, a simple random sampling method is used. In this type of sampling, sample evenly all participants have a choice. The sample size was determined using Morgan table is equal to 250. Because the sample size should be 250 exploratory factor analysis was used. The best way to assess construct validity factor analysis exploratory factor analysis and confirmatory factor analysis that the two species are carried out. With this analysis, we can determine whether the questions in the form of indicators to measure or not. Factor analysis of the questions are designed to assess an index or a trait, a common factor this time are significant factors (Chan, 2000).

There are two ways to select a sample using factor analysis: 1. For 5 to 10 are available. This method is useful when the number of variables. In our study the low number of variables or questions. Once a sample of 73 to 365 people (5 times) or 730 people (10 against) the

problem seems possible sampling possibilities not allowed. So do not use this method for sampling.

2. According to previous studies has been proven: To do any research using factor analysis, a sample of 250 people to do is to answers and to find the precise answer will suffice. So our second sampling method we use to do your research and the target population, a sample of 250 people were taken as a prototype. According to the study questionnaire and the statistical sample is two to determine the sample size. For this purpose 12 expert using snowball sampling were identified in 5 companies that have paired comparison questionnaire. Snowball sampling is a sampling possible when the units were not readily detected. Especially when these units are rare or make up a small part of a much larger community. In this method the alarm after identifying or selecting sampling the first unit, the second unit to identify and select sampling is used. Select one of the sample using this method, the Group of 8 to 12 people are of First Instance. We own research maximum sample, a group of 12 samples were selected first as the second sample. In order to obtain information about the population studied, various methods can be used. Interviews, questionnaires and observations of people and the three major methods that are used in field studies.

In this study, given that aims to identify and prioritize the factors influencing the decline in the quality of construction projects. The researcher used two questionnaires. The questionnaire was designed based on the past and theoretical research. This questionnaire with Likert scale (five options) has been designed and consists of 73 questions. After performing exploratory factor analysis of the second questionnaire was reduced to 27 variables in five factors were categorized based on confirmatory factor analysis. The method of analyzing data depends on the purpose and nature of the subject and its executive facilities. The data analyzed in this study was descriptive and inferential analysis, to describe the variables in the form of tables and graphs, descriptive statistics sex, education, work experience, as well as a general description of the situation.

Respondents responses to questions by SPSS 22 software are given. In the inferential statistics, exploratory factor analysis and confirmatory factor analysis for classification factors reducing the quality of the project in 5 of the 27 indicators that were identified using exploratory factor analysis was obtained. Then using fuzzy hierarchical triangle with Chang method (method development analysis) to rank the following factors and the factors discussed them. This study analyzes the structural equations using smart PLS software and SPSS statistical analysis was performed. The second consists of experts in the community that were identified through snowball sampling. These people have related

education in the field of industrial and supply chain management, knowledge and experience in the supply chain. Through this sampling, 12 patients were identified who questionnaire (II) were paired comparison. The questionnaire through triangular fuzzy hierarchical data analysis using Microsoft Excel Chang were analyzed (Arditi, 2005).

## DESCRIPTIVE STATISTICS

In this part of the statistical analysis to measure the distribution of the sample in terms of variables such as gender, education level, field of study, work experience, work experience and age are discussed.1. Sex As can be seen in 30 patients (22%) of the respondents were female and 220 (88%) were male. Tables 1-5 in terms of gender composition of respondents in this research have been identified.

Gender	The frequency	Percent
Woman	30	22
Man	220	88

As can be seen 50 patients (20%) with associate's degrees, 186 patients (13%) have a bachelor's degree, 14 (4%) had a master's degree. Table 2 combination in terms of qualification respondents in this research have been identified.

degree of education	frequency	Percent
Associate Degree	50	20
Bachelor	186	74.4
MS	14	5.6

## WORK EXPERIENCE

As can be seen in 90 (80 percent) less than 5 years and 123 (20%) from 6 to 10 years and 37 (percent) have more than 10 years. Table 3 combination in terms of qualification respondents in this research have been identified.

Years of service	frequency	Percent
Less than 5 years	90	36
6-10 years	123	49.2
More than 10 years	37	14.8

## INFERENCE STATISTICS

### Exploratory factor analysis

The researchers tried to explore empirical data to detect and identify indicators and the relationships between them. There is no specific model here before. In other words, exploratory analysis suggested the addition to the surveillance or may structuring, modeling or hypothesis is building. When the heuristic analyzer is used to pre-experimental research and previous evidence for the formation of hypotheses about the number of factors underlying data is not actually willing to covariate variables specifying the number or nature of the factors that justify the pains data. The analysis further exploration as a way to develop and produce a theory, not a theory test method is considered. In an exploratory analysis, the questions fall into different categories and within these categories depend on together. However we can say that the questions in a category, it's something that we're going to measure it, weigh. Exploratory factor analysis to assess the validity of the tests used kmo and bartlett. Table 4 in the two test results for validity, exploratory factor analysis, we see (Chan, 2006).

Table 4. Exploratory factor analysis		
KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		808/0
Bartlett's Test of Sphericity	Approx. Chi-Square	719/15407
	df	2701
	Sig.	001/0

### Bartlett's test

Two situations may arise in the correlation matrix. The first mode is when the matrix of correlations between variables, and the same is a matrix in which case no significant associations And thus allowed the identification of new platforms based on variables exist together. The second mode is when the correlation matrix is an identity matrix and, The off-diagonal elements of the correlation matrix of at least 0.3, in which case there will be no significant relationship between variables. So is it possible to identify and define new platforms. Bartlett test the null hypothesis states that the correlation matrix is an identity matrix unit. If that is the case for the structure (the agent) is inappropriate. If sig is smaller than 5% Bartlett test (reject the null hypothesis) factor analysis to identify the structure (the factor) is known as the assumed correlation matrix is rejected. According to Table 4, which approximate the chi-square test result Bartlett is shown. Bartlett's test sig value less than 0.05

indicates that the factor analysis to identify the structure factor model fit.

### KMO index

The index is used to determine the adequacy of sampling so that the partial correlation between variables K.chk review And determines whether the variance of hidden variables influenced by some basic common variance or not. The index is between zero and one. If the index is close to a (minimum 0.6 ), Data suitable for factor analysis are desired. Otherwise (usually less than 0.6), Factor analysis for the data to be useful. According to Table 4 KMO index with a value of 0.808to mean that the number of samples is sufficient for exploratory factor analysis. At the end of the exploratory factor analysis of 27 variables or questionnaire or indicators grouped in five factors. According to the results of exploratory factor analysis on 73 variables, 27 variables questionnaire remaining questionnaire, 6 factors were identified as the main factors. The variables most correlated with each factor considered in operating, so we study 27 variables were categorized and sixth factor because of a question was removed.

### Confirmatory factor analysis

In confirmatory factor analysis confirmatory factor analysis or researcher looking for a model that assumes relatively little empirical data based on several parameters, describing explain or justify.is. Verification procedures (hypothesis) determined that data with a certain factor structure (that come in hypothesis) are coordinated or not. Standardized coefficients and significant coefficients in the confirmatory factor analysis (Student's t-test), questionnaire on each factor was obtained. To assess measurement models and confirmatory factor analysis three criteria: reliability, validity, convergent and divergent validity is (Li Juan, 2014).

### Standardized coefficients confirmatory factor analysis model

Saskatchewan was the Code: (factors related to the employer = A1), (factors related to consulting = A2), factors relating to the contractor = A3), (factors related to staffing = A4) and (factors related to machinery and materials = A5). The main sub-components of each factor based on the letter r sub-components Tdahr code and code stuff we've done stuff. The extent of the correlation coefficient for a more subcomponents more with their main factors and therefore more effective in reducing quality. In Figure 5-4 Standardized coefficients obtained for each factor is shown.

### significant factor confirmatory factor analysis model

In this part, as did the standardized coefficients. The values obtained by the time the agent or standardized

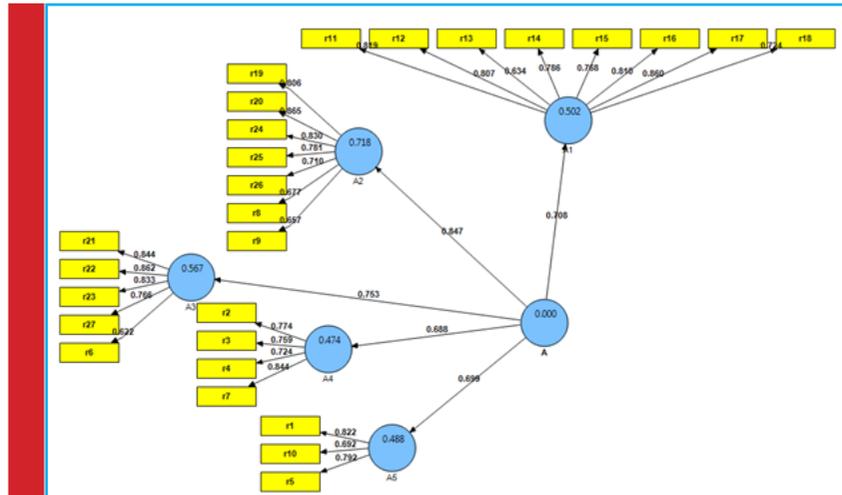


FIGURE 4. Standardized coefficients confirmatory factor analysis model

coefficients are the same. The time factor is the most significant factor is even greater and therefore will be more effective in reducing quality. In Figure 5 achieved significant factor has been determined for each factor.

**A significant criterion for determining the level of factor loadings**

For the interpretation of the factors to be determined which of the handling agent should be considered as significant amounts. There are several criteria for the decision. Based on these criteria, the factor loadings are greater than 0.3 ± are considered significant. Factor loadings are greater than 0.4 ± a significantly higher level and greater than 0.5 ± loads that are considered to be very significant. Therefore, the load factor is higher, they also interpret significant factor matrix increases. This criterion is used more in comparison with other criteria. In this research for better results and research

power, that the agent was 0.6 times greater than chose their agent. In Table 5 we see the results of confirmatory factor analysis models.

**Stability**

Table 6 Cronbach's alpha and composite reliability of the variables specified amount for each five variables Cronbach's alpha values above 0.7 indicate good reliability model.

**CONVERGENT VALIDITY**

When a new test available to test, to measure the same construct is made, the correlation is high, a new test to measure the lawful structures. These narratives tell convergent validity. Convergent validity, the correlation of each variable with questions (indicators) deals. Standard AVE (Average Variance Extracted) represents the

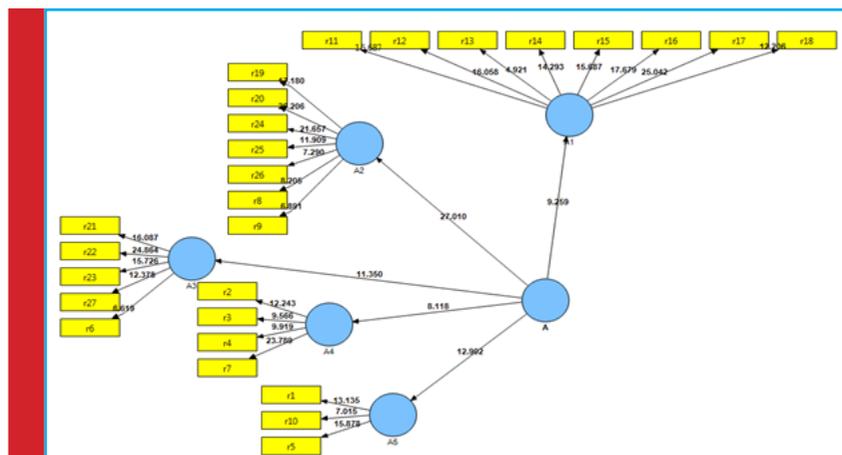


FIGURE 5. A significant factor confirmatory factor analysis model

Factor	Components	Load factor	sig
Factors related to employer A1	Technical weaknesses of examined studies conducted by consulting employer in control of the employer deselect the appropriate personnel	0.819	16.687
	Customer relationships are the rule rather than holding tenders	0.807	16.058
	The uncertainty of negligence in the design and review design documents and maps	0.634	4.921
	Rush in opening some projects political and social reasons	0.786	14.293
	Priority technical issues of the project's finances	0.768	15.687
	Change in scope of works contracts and change orders	0.810	17.679
	Failure to meet the rebels on the appropriate human resources and delay in resolving them	0.860	25.042
	Hard undue interference of the employer	0.724	12.206
Factors related to consultant A2	Lack of adequate review in the preliminary stages of the project early studies.	0.677	17.180
	There are ambiguities in the map administrative errors	0.657	26.206
	Timely low accuracy in estimating volumes and lack of control Change values	0.806	21.657
	The major dispute with the employer and contractors	0.865	11.909
	Lack of decision-making power and incompetence of monitoring workshops	0.830	7.290
	Poor communication between advisers and other parties involved in the project	0.781	8.205
	Delays and lack of proper control tests in the investigation conducted by the employer	0.710	6.891
Factors relating to the contractor A3	Insufficient experience of contractors	0.622	16.087
	Timely workshop workshop equipment failure or inadequate equipment and lack of access to various parts of the project	0.844	24.864
	Ignoring machinery and methods for implementation	0.862	15.726
	Lack of effective management and control of subcontractors	0.833	12.378
	Choose a sub-contractor inappropriate	0.766	6.619
Factors related to staffing A4	Low productivity workers.	0.774	12.243
	Lack of facilities, leading to the lack of qualified personnel in the project is good	0.759	9.566
	Improper payments to staff and workers	0.724	9.919
	Shortages of skilled workers in the country	0.844	23.789
Factors related to machines and materials A5	Technical defects and poor management	0.822	13.135
	Lack of machinery and equipment	0.792	7.015
	Increased volatility and unpredictable price of materials and being forced to use poor-quality materials cheaper and more	0.692	15.878

	Composite reliability	Cronbach's alpha
A1	0.924	0.906
A2	0.907	0.879
A3	0.891	0.846
A4	0.858	0.783
A5	0.813	0.764

average variance is shared between each variable with your questions. To put it simply AVE variable correlation with your question shows that the correlation is high, is more fitting. Fornell method and Larkr have introduced appropriate value for the AVE high 0.5. In Table 7 we see the average variance extracted of the study.

Given that the appropriate value for Cronbach's alpha of 0.7, 0.7 for the composite reliability and AVE, 0.4 and all the criteria to measure the right amount of factor

Table 7. The average variance extracted

	AVE
A1	0.607
A2	0.584
A3	0.624
A4	0.603
A5	0.593

Table 8. Fornell matrix and Larkr

	A1	A2	A3	A4	A5
A1	0.779				
A2	0.482	0.765			
A3	0.302	0.512	0.790		
A4	0.188	0.593	0.498	0.776	
A5	0.358	0.474	0.593	0.604	0.770

loadings, the suitability of the reliability, and convergent validity study confirmed.

**VALIDITY**

The test should other tests that measure different constructs, and divergent validity. This is called solidarity. square of the correlation coefficient between the structure) in a structure model. in this way, the correlation with its index against its correlation structures compared with other structures. In the diagonal of the matrix, root is entered AVE variables and divergent validity to confirm is necessary, this amount is more than the correlation between the variable and other variables. Average method, observed variance: This method is an alternative method based on factor analysis and Vlacr by Fornell (1981) were presented. In this way, when there are differences between the two structures that the average variance explained For a larger construct of shared variance between them.For this purpose it is used matrices The squared covariance between any scale with other scales have been formed. To check the reliability of the main diagonal elements of the matrix with the index AVE, to be replaced when the validity of each of the elements on the main diagonal is larger than any other component of the row or column.

Fornell and Larkr to check the validity of the matrix is depicted in Table 8.

According to this table, we can conclude

The validity of the model is as good as the square root of the AVE variables homes are located in the main diagonal matrix And each main diagonal elements outside the main diagonal is larger than the other compo-

nents. Table 5-8 Fornell and Larkr we see the results of the matrix. The numbers in the table using statistical analysis software smart PLS 1 (smart pls1) is obtained.

**Ranking of Factors related to consulting using fuzzy hierarchical analysis**

Given that the number of experts in this method is 12, so 12 different matrix for each operating there. In the hierarchical fuzzy at first we turn this matrix to an identity matrix. Paired comparison tables to combine all respondents, one of the best methods is using a geometric mean. The reason for this is that the paired comparisons, data for the establishment and also the inverse matrix of paired comparisons justifies the use of this method mainly because of the negative effect on the geometric mean of paired comparisons matrix preserves.

If we assume a  $\tilde{a}_{ij}^k$  k-th component of the K-responsive to standard  $j_i$  is a benchmark for comparison, the geometric mean of the corresponding components is calculated by the following equation (Ron, 204).

$$\tilde{a}_{ij} = (\prod_{k=1}^n \tilde{a}_{ij}^k)^{\frac{1}{n}} \tag{1}$$

$$\tilde{a}_{ij} = (\tilde{a}_{ij}^1 \otimes \tilde{a}_{ij}^2 \otimes \dots \otimes \tilde{a}_{ij}^{12})^{\frac{1}{12}} \tag{2}$$

According to the results of exploratory factor analysis of the questionnaire of 27 variables, five factors are identified as the main factors. Because the variables are highly correlated with each factor considered in operating, so we study 27 variables are classified as follows: Using the formula (2), matrices, matrix of pairwise comparisons between the following six factors are 12 expert and a pair-wise comparison matrix between the factors we turn.

Table 9 Factors Affecting the geometric mean of experts' judgments show that the quality of your project. With this table and based on Chang, the final weight were essential factors influencing the quality of projects.

According to the experts about the importance of reducing factors affecting project quality, non-normal weight and normal weight (final) each factor was obtained. The normal and non-normal weight, the behavior of some factors as factors influencing the reduction in the quality of construction projects have been identified. When a component is normal or normal to have the least impact on reducing quality. Thus, we conclude that any of the factors that have a more normal weight, Normal and non-normal weights this study were obtained through hierarchical triangular Chang. Table 10 ultimate weight loss factors affecting the quality of the projects we see.

By weight, the priority is as effective factors on the quality of projects

Table 9. fuzzy matrix of pairwise comparisons factors affecting project quality loss

Factors	(1)			(2)			(3)			(4)			(5)		
Factors related to employer	1.000	1.000	1.000	1.687	1.780	1.857	2.485	2.675	2.787	2.687	2.875	2.932	2.595	2.711	2.864
Factors related to consultant	0.539	0.562	0.593	1.000	1.000	1.000	1.589	1.654	1.723	2.323	2.430	2.501	1.432	1.434	1.504
Factors relating to the contractor	0.359	0.374	0.402	0.580	0.605	0.629	1.000	1.000	1.000	0.612	0.875	0.912	1.386	1.453	1.499
Factors related to staffing	0.341	0.348	0.372	0.400	0.412	0.430	1.096	1.143	1.634	1.000	1.000	1.000	0.612	0.854	0.907
Factors related to machines and materials	0.349	0.369	0.385	0.665	0.697	0.698	0.667	0.688	0.722	1.103	1.171	1.634	1.000	1.000	1.000

Table 10. ultimate weight loss factors affecting the quality of the project

Factors Affecting the Quality Project	Non-normal weight	normal weight
Factors related to employer	1	0.24001
Factors related to consultant	0.86843723	0.208434
Factors relating to the contractor	0.77632571	0.186326
Factors related to staffing	0.75805131	0.18194
Factors related to machines and materials	0.76367103	0.183289
Total	4.16648529	1

### CONCLUSION

The results of exploratory factor analysis of seven factors, including those related to the employer, the validity and reliability verification) fuzzy hierarchical analysis also revealed that the main sub-components of the following factors are affecting the quality loss: As noted in this study, projects that addressed factors related to the employer and consultant, has been the main cause of decreased quality and more partially, the following factors, such as lack of equipment, lack of skilled workers in the country, select the appropriate sub-contractor, increased price volatility, materials and the use of poor-quality materials and have been identified as factors reducing the quality, factors such as lack of proper management of the employer, the lack of proper supervi-

sion of the consultant and subcontractor selection inappropriate introduced as factors reducing the quality of matches if the expression was of course depending on the priority factors organization and the location was different.

### REFERENCES

Abbasi, Amir Attar, 2007 To evaluate and monitor the quality of residential buildings in Tehran, Disaster Management Conference, Tehran.

Arditi, D. and Gunaydin, H.M. (2005), Factors That Affect Process Quality in the Life Cycle of Building Projects, Journal of Construction Engineering and Management.

Chan, A.P.C. and Tam, C.M. (2000), Factors affecting the quality of building projects in Hong Kong, International Journal of Quality & Reliability Management.

Chan, A.P.C.Wong, F.K.W. and Lam, P.T.I. (2006), Assessing quality relationships in public housing: An empirical study, International Journal of Quality & Reliability Management.

Chua, D.K.H.Kog, Y.C. and Loh, P.K. (1999), Critical Success Factors for Different Project Objectives, Journal of Construction Engineering and Management.

Glory Abdi, M., Zahedan, M; Makouei, A., 2007, factors affecting the poor quality of structures in Tehran, Iran Retrofitting National Conference, Yazd.

Heydari, Abraham, 2006, engineering management, publishing Khajeh Rashid, Third Edition, Hamadan.

Khanjani, P. 2014, Pathology of quality management in the construction The second international congress.

Khanzadi, Mustafa Pour (2010) Opinion, conductor, born Younis something, H., R. Younes, Wahid, 2010, assess the factors

affecting the timing, cost and quality mass housing projects, the International Conference on Project Management.

LiJuan Chen, Hanbin Luo (2014), A BIM-based construction quality management model and its applications, School of Civil Engineering & Mechanics, Huazhong University of Science & Technology, Wuhan 430074, China.

Ron Basu ( 2014), Managing quality in projects: An empirical study, Henley Business School, United Kingdom ,SKEMA Business School, France- international journal of project management.

Reed, H Nasser., Bayati, A. Hussein, Afkhami, Ali ( 2005) The principle gentleness, goodness PM Book, Project Management Institute PMI, printing, Tehran.

Wenxue Lu, Jian Liu, (2014), Research into the moderating effects of progress and quality performance in project dispute negotiation, College of Management and Economics, Tianjin University, Tianjin 300072, China - international journal of project management.

## Evaluating the vibration system of steel building using viscose separator and damper

Behzad Dezhkam

*Department of Civil Engineering Faculty, Velayat University, Iranshahr, Sistan and Baloochestan, Iran*

### ABSTRACT

The main objective of the vibration separator is observing and reducing input energy, which lead to decreasing demand of energy loss in the main members of the structure. The vibration separator use the two following methods to reduce demand: increasing the the frequency time of structure and removing the force transfer way. Although, earthquake acceleration or displacement is used in designing of structure. However, the best variable to the effect of separator is speed. Based on the energy principle, there is a proportion between kinetic energy of an article and the square of the speed. In this study, two buildings without separator and damper and with frictional pendulum separator and non-linear viscose damper with tree records o Tabbas, Cape Mendesiona and North Rage are evaluated. The models are dynamically analyzed under simultaneous motivation of two horizontal earthquake elements. The northern-southern element of the used earthquakes in line to vector y and eastern-western elements of he earthquakes in line to vector x are applied on the models. The base shear, different floors and maximum acceleration structure of the building are criticized. The results show the amount of reducing maximum different floors is reduced as the friction coefficient increases.

**KEY WORDS:** FRICTIONAL PENDULUM SEPARATOR, NON-LINEAR VISCOSE DAMPER, BASE SHEAR, DIFFERENT FLOORS AND STRUCTURE ACCELERATION

### INTRODUCTION

After North Rage Earthquake in 1994, some concerns occurred relating to the Performance of separated structures against the earthquakes of the near field due to their more power regarding researches have been conducted on regular and irregular buildings, which indicate

irregular buildings do not show proper vibration performance confronting earthquake, meanwhile they show more sever damageability company to regular buildings. Therefore, available irregularities of structure, which make severe effects of earthquake as it occurs must be more considered (Code, 1997). Frictional damper system was used by Pall in 1980, however, many efforts were

#### ARTICLE INFORMATION:

\*Corresponding Author: [behzaddezhkam@yahoo.com](mailto:behzaddezhkam@yahoo.com)

Received 2<sup>nd</sup> April, 2017

Accepted after revision 12<sup>th</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal  
NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

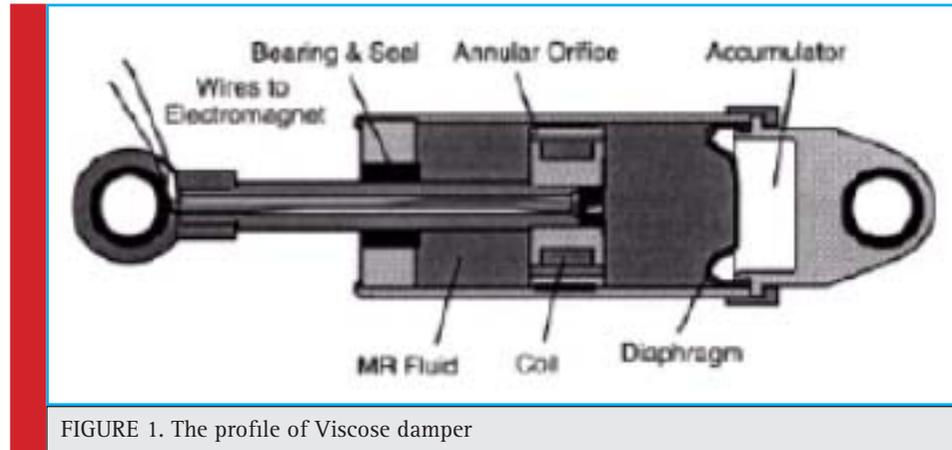


FIGURE 1. The profile of Viscose damper

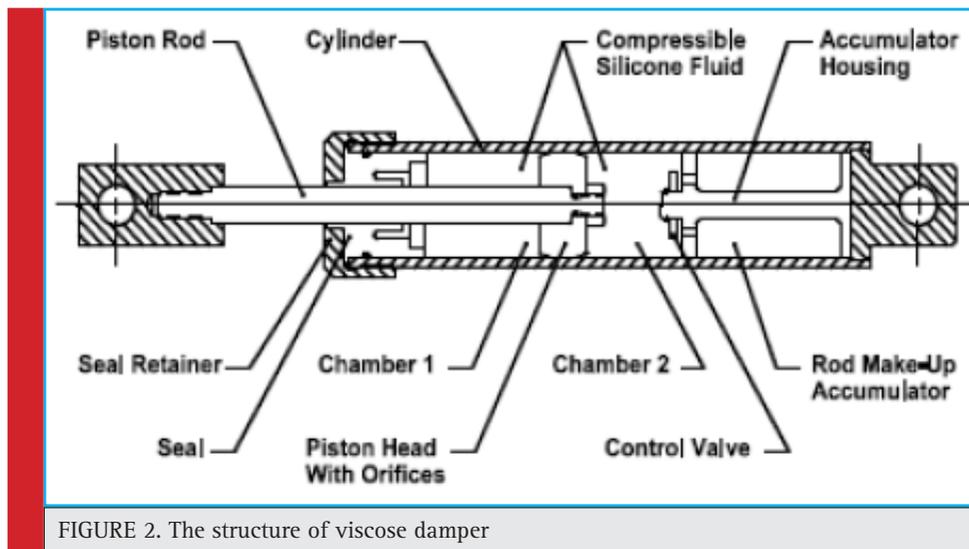


FIGURE 2. The structure of viscose damper

carried out to develop the use of this damper in civil engineering (Kalkan and Kunnath, 2004).

Viscos damper includes a plunger inside of cylinder filling a liquid with high viscosity like silicon gel or oil is used. In this type of damper, a central plunger moves in a container filling with fluid liquid and as the plunger moves the fluid liquid is high in this field. So whole of upper pressure energy of flow changes to kinetic energy. As fluid returns to its real volume in the other side of plunger later, its speed decreases as well it loses its kinetic energy and changes to turbulent state (Khatib et al., 1988).

Vibration Separation is separating whole or part of structure from the ground or the other parts of structure to reduce vibration reaction of that part as earthquake occurs. The most important feature of vibratory separation is creating flexibility which leads to increasing the normal frequency duration of structure. The main principal of using vibrate separation is reforming structure reaction in such way that the ground under the structure

is slipping. While no slipping transfer to the structure takes place (Uriz, 2008), the frequency time of an absolute rigid structure is zero (F. E. M. Agency, 2000).

#### The features of frictional pendulum separator

The frictional pendulum separator is a frictional separator system which provides slipping action and restoring force using its special geometry. This separator has a slipping part, which slips on a spiral surface of stainless steel. The surface of this part of joint, where touches spherical surface is covered by low friction material such as Teflon super heavy polyethylene (UHMW-PE). This surface places in a spiral slot, which is covered by friction composites. As the slipping part moves on spiral surface, the available mass remove from it, which leads to create of restoration force in the system (Aristizabal-Ochoa, 1986). The resistant force  $F$ ,

$$F = \frac{W}{R}D + \mu W \operatorname{sgn}(\dot{D})$$

which is created due to applying load on a frictional pendulum separator is: In this relation,  $W$  is the load on separator,  $R$  is the curve radius of separator for surface. Is the friction coefficient and  $D$  is slipping speed in the separator. The first phrase in this relation is the restoration force which is induced of removing mass, that leads to horizontal rigidity. This horizontal rigidity enhances the frequency period of the separated structure as the following,

$$K_H = \frac{W}{R}$$

$$T = 2\pi \sqrt{\frac{R}{g}}$$

$$\omega = \frac{2\pi}{T}$$

which is independent of the mass placing on it. The second phrase, is the friction force between Vibration part and bolded surface (C. W. Roeder and E. P. Popov, 1978). Horizontal Rigidity ( $K_H$ ), Frequency Period ( $T$ ) and Frequency of separated structure ( $W$ ) are obtained of the following relations. The friction coefficient  $U$  is obtained based on the following relation. In this relation,  $f_{\max}$  and  $f_{\min}$  are the maximum and minimum friction coefficients of the separator in the maximum and minimum slipping speeds respectively,

$$\mu = f_{\max} - (f_{\max} - f_{\min}) \exp(-a |d|)$$

while  $U$  is changes controlling parameter. The effective rigidity of separated system is obtained based on the relation 6. In this relation,

$$K_{\text{eff}} = \frac{W}{R} + \mu \frac{W}{D}$$

$W$  is the load on the separator.

#### The characteristics of the Viscose damper

In this type of damper, a central plunger mores in a container filling with a fluid liquid. The plunger inducts the fluid into it's around and inner holes. The speed of the fluid is very high in this field. Therefore, all upper pressure energy of flow changes to kinetic energy. As the fluid returns to its complete volume in the other side of the plunger later, its speed decreases, meanwhile its kinetic energy is lost and change to turbulent state. Viscose dampers provide a resistant force regarding input force speed to the structure (Naeemi and Bozorg, 2009). This damping force is calculated for a non linear liquid viscous damper and has the following features:

$$F_D = c \operatorname{sgn}(u) |u|^\alpha$$

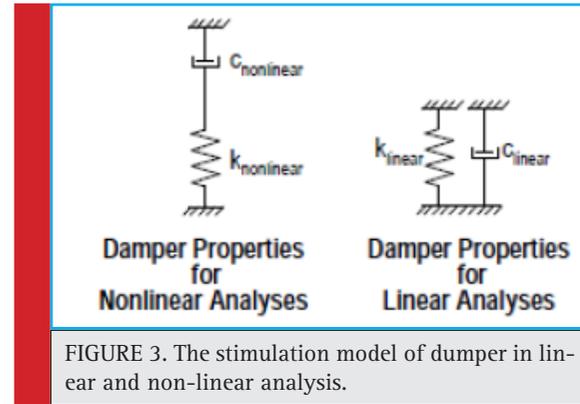


FIGURE 3. The stimulation model of damper in linear and non-linear analysis.

In this relation,  $C$  is the damping coefficient of damper.  $\operatorname{sgn}(u)$  is the signal indicator and Movement direction, is damping power and  $u$  is damper speed. The speed power is often between 0.01 to 82 in the non-linear damping. The value of this number depends on its usage. A valve, of this number depends on its usage. A value, which is under 1 is more proper for Vibration usage. The main advantage of using low power of speed in damping function is that they result to limiting damping forces messenger in low values and consequently. The values of structure base excision decrease. While, using damper with linear function almost leads to reducing damping effect as well increasing forces comparing to non-linear one (Balendra et al., 1990). The speed power is usually between percent 4 to %7 in the damping function, which show better Vibration performance comparing to linear statue. In this study, the damping power of non-linear viscose damper is considered %5 to indicate non-linear function in its damping power.

The complementary damping coefficient ( $c$ ) is a function of damping proportion ( $\xi$ ), which is determined in each vector of  $x$  and  $y$  regarding the sum of separators  $M$  rigidity ( $k$ ) and the whole structure mass ( $m$ ).

$$\left(\frac{kg.s}{m}\right) c = 2\xi\omega m = 2\xi\sqrt{\frac{K}{m}}m = 2\xi\sqrt{Km}$$

#### The characteristics of earthquake records

Asselerograms are used to determine earthmoving must show the real movement of the earth to the extent possible, where the building is constructed as the earth quake occurs. In this study. Those records, which are registered with distance of less than 15  $K_M$  are used as the records of the near field. Regarding the state of buildings placement on the ground type 2. Therefore, the selected accelero grams are from stations, which their ground are type 2. Three Records of Tabbas, cape Mendosino and North Rage are used (7 floors building) analyze undergraduate records. The models are dynamically analyzed under

Table 1. The characteristics of the earthquake Records.			
Number	the name of earthquake	the year of occurrence	PGA Two horizontal elements
1	Tabas	1978	406/0 - 328/0
2	Cape Mendocino	1992	549/0 - 385/0
3	Northridge	1994	308/0 - 344/0

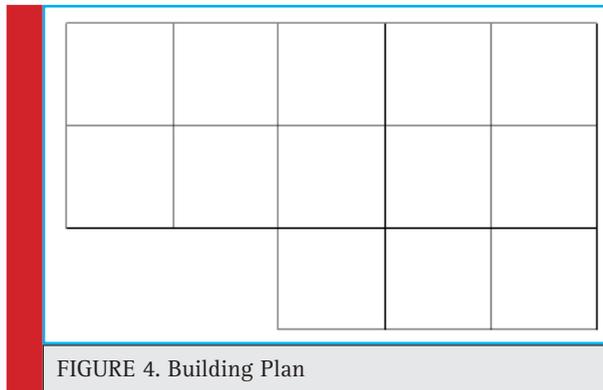


FIGURE 4. Building Plan

simultaneous motivation of two horizontal elements of earthquakes (Kim and Seo, 2003). The Northern- southern elements of used earthquake align the vector y and Eastern-western element of earthquakes align vector x are applied on the models. The characteristics of the earthquake records, which are extracted of site peer are mentioned in the following tale.

**Characteristics of the model**

In this study the three dimensions model with floors of steel structure with residential usage and mean leaning frame side loader system is studied. The floors high is 3.2 meter and the outfalls align both vectors x and y are 5 meter. Based on the Iran standard code (2800),when the

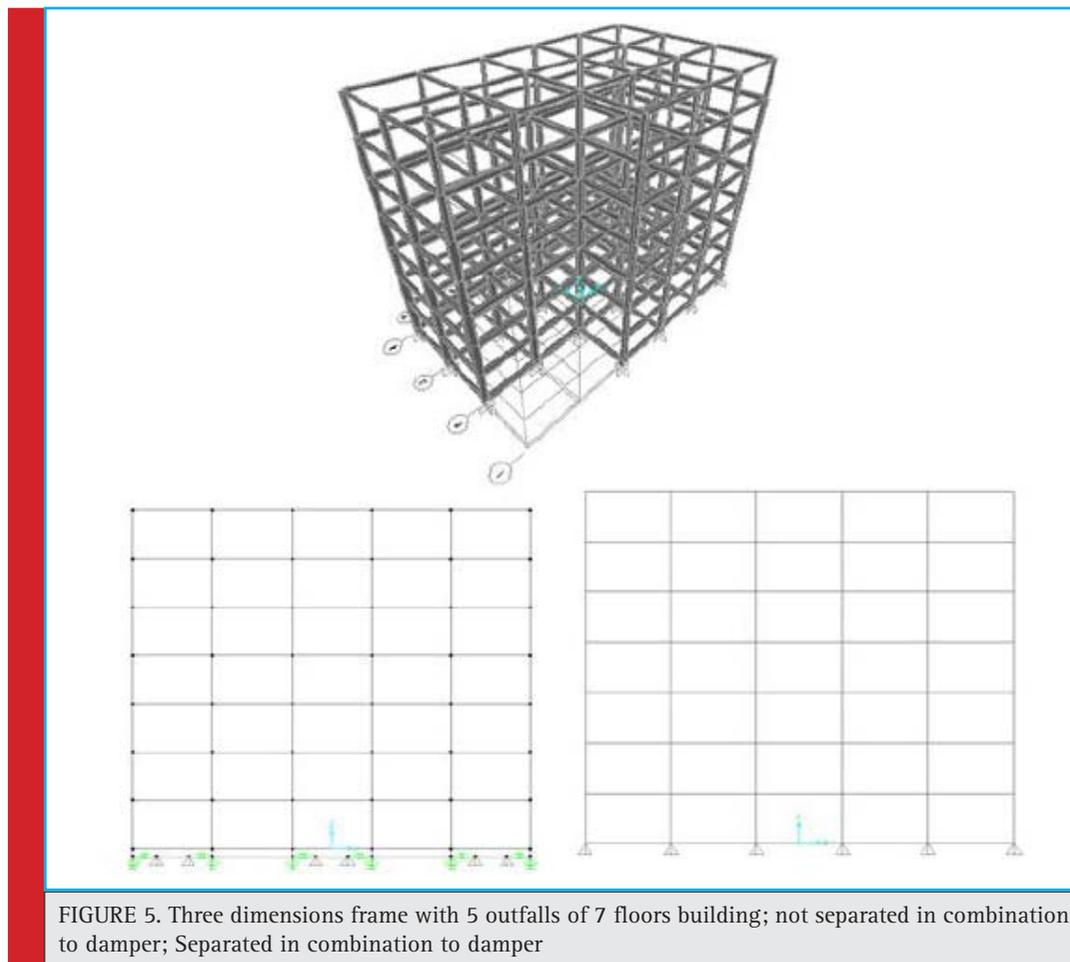
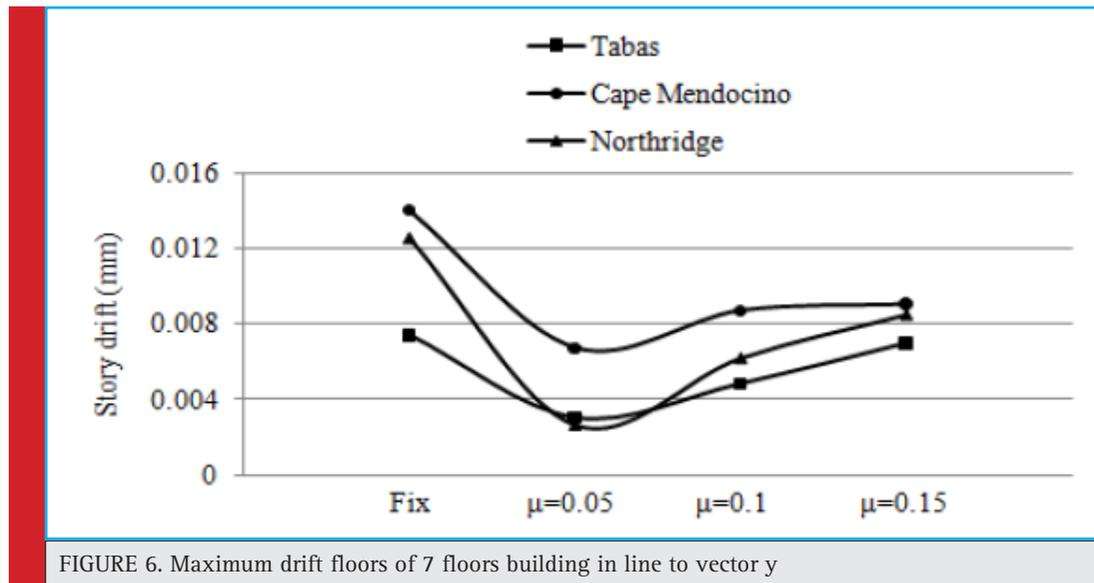


FIGURE 5. Three dimensions frame with 5 outfalls of 7 floors building; not separated in combination to damper; Separated in combination to damper

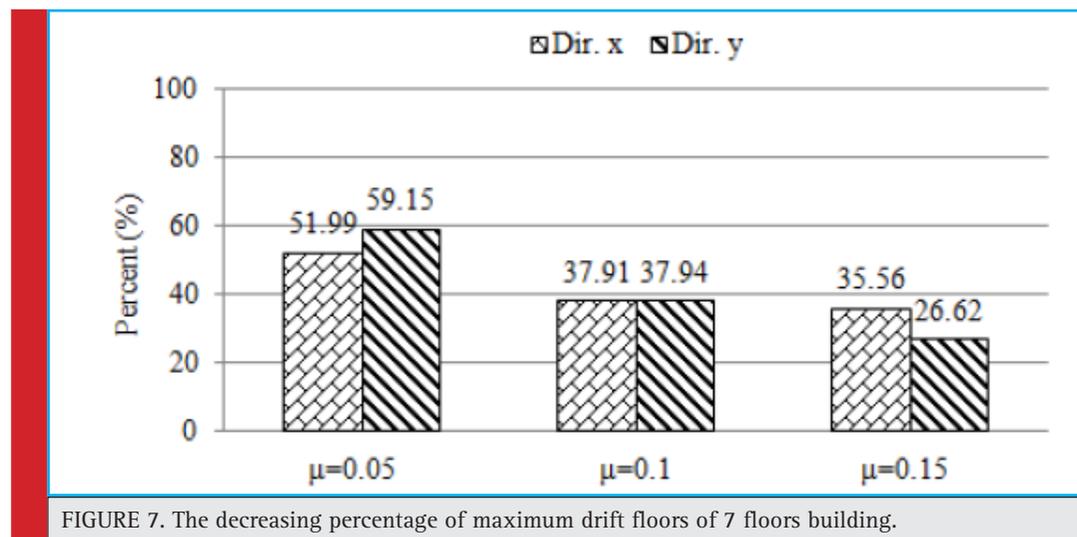


building plan is not homolographic or relative homolographic comparing to the main axis of building, meanwhile the resistant elements against earthquake place align then, besides if there is concavity or cantilever in the plan, and the its size.

In the loading of building considered  $555 \text{ kg/m}^2$  the dead load and lire load are considered  $555 \text{ kg/m}^2$  and  $200 \text{ kg/m}^2$  as dead and live loads for floats respectively, while  $615 \text{ kg/m}^2$  and  $150 \text{ kg/m}^2$  are considered as dead and live led for roofs respectively. The Vibration mass of the building is considered as 100 prevent dead load and 20 percent live load. Based on the calculations, underweights of 5 floors building and 7 floors building are obtained 983/125 and 1369,875 Tones. The structdre is designed based on ubc97 code using SAP 2000Software. The building is analyzed using the above mentioned

software and as non-linear time history dynamic analysis applying direct integral.

Regarding figures 6 and 7, the maximum different floors in line to vector X under the earthquakes of Tabbas, cope Mendocino and North Rage in a 7 floors unseparated building are 0.0074, 0.014 and 0.013 respectively. Maximum different floors in a building, which is furnished by Separator and complementary time damper are 0.0031, 0.0068 and 0.0026 respectively, while the friction coefficient of the separator was 0.05 The maximum different floors are 0.0048, 0.0078 and 0.0062, for friction coefficient 0.1 as well 0.0070, 0.0091 and 0.0085 for friction coefficient 0.15 respectively. Maximum deferent floors for unseparated building in line to vector y under the earthquakes of Tabbas cape Mendocino and North Rage are 0.0011, 0.018 and 0.021 respectively. Maximum drift floors



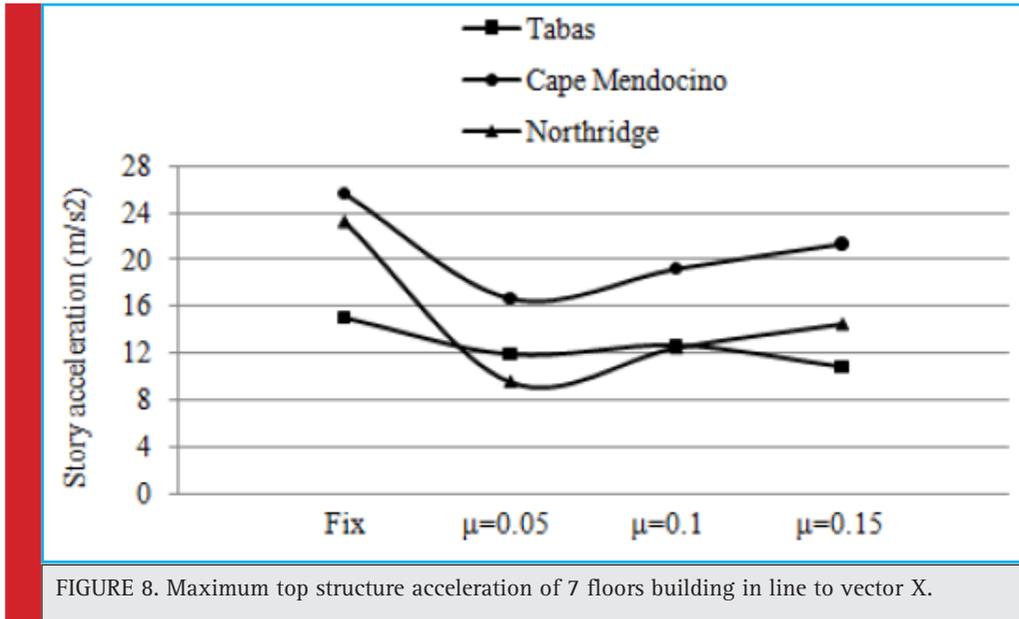


FIGURE 8. Maximum top structure acceleration of 7 floors building in line to vector X.

for a building, which is furnished by separator and complementary time damper are 0.0038, 0.0068 and 0.0086 and 0.0086 respectively, while the friction coefficient of the separator was 0.05. The maximum drift for the friction coefficient 0.1 is 0.00065, 0.0012 and 0.013, while for the friction coefficient 0.15 is 0.0086, 0.014 and 0.015 respectively. Figure 6. Maximum drift floors of 7 floors building in line to vector X

In the figure 7 The maximum drift of a the S 7 floors building in line to vectors X and y decreased 51.99 and 59.15 percent respectively, while the friction coefficient was 0.05. Its maximum drift decreased 34.91 and 37.94 percent in line to vectors X and y, while the friction

coefficient was 0.1, besides it decreased 35.59 and 26.62 percent in line to vectors X and y, while the friction coefficient was 0.15.

Maximum top structure acceleration in line to vector X under the Earthquakes of Tabbas, cope Mendocino and North Rage is 15.08, 25.62 and 23.25 Meter on square second in unseparated 7 floors building. The maximum top structure acceleration in a building, which is furnished by separator and complementary dumper is 11.90, 16.73 and 9.54 respectively, while the friction coefficient was 0.05. the maximum top structure acceleration for the friction coefficient 0.1 is 12.70, 19.23 and 12.49, as well for the friction coefficient 0.15 is 10.82, 21.35 and

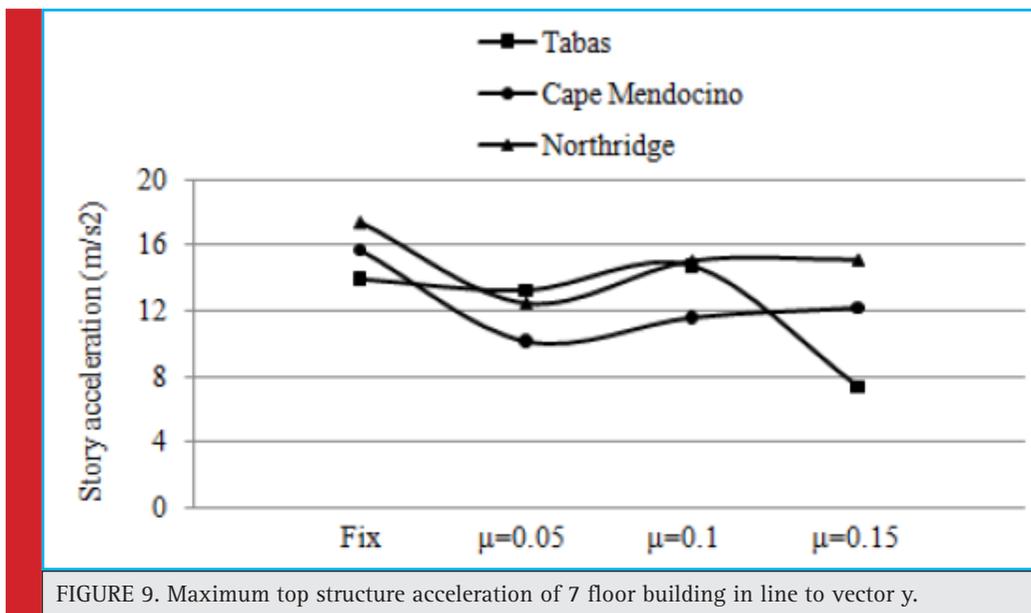


FIGURE 9. Maximum top structure acceleration of 7 floor building in line to vector y.

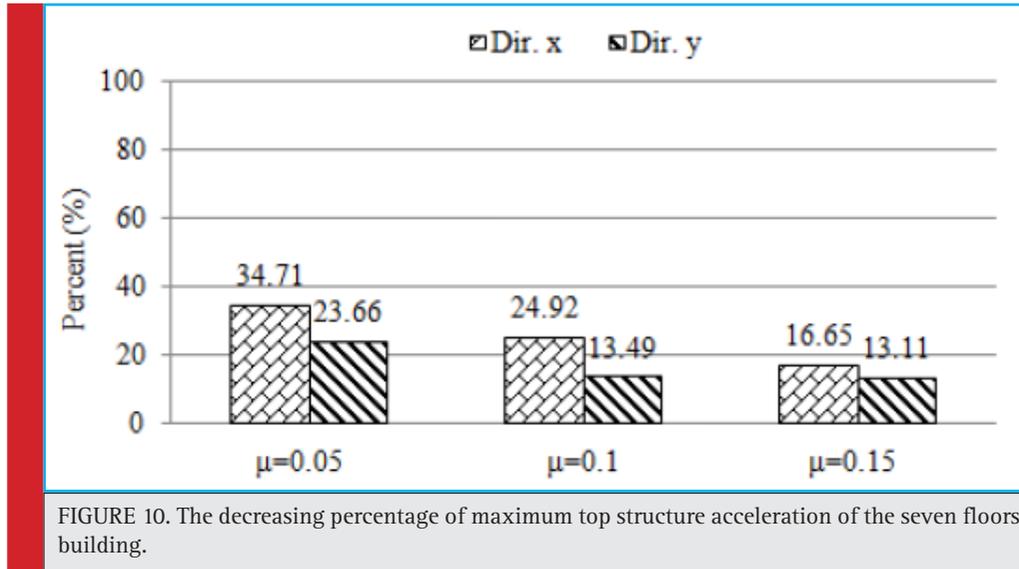


FIGURE 10. The decreasing percentage of maximum top structure acceleration of the seven floors building.

14.48 respectively. The maximum top structure acceleration for the unseparated building in line to vector y under the earth tabas guacks of Tabbas, capo Mendisieno and Noth Rage is 13.94,15.72 and 17.36 meter on square second respectively. The maximum top structure acceleration in a building, which is furnished by separator and complementary time damper is 13.27 10.14 and 12.45 respectively, while the coefficient friction of separator was 0.05. the maximum top structure for the friction coefficient 0.1, becomes 14.73, 11.60, and 15.03 as well for the friction.

0.15 became 7.36, 12.18, and 15.10 respectively.

Regarding figure 10, the maximum top structure acceleration in line to vectors X and y in the 7 floors building decreased 34.71 and 23.66 percent. While the friction coef-

ficient was 0.05. the maximum top structure acceleration line to vectors X and y decreased 16.65 and 13.11 percent respectively, while the friction coefficient was 0.15.

maximum base excision in building which is furnished by separator and complementary time damper became 211 2.01, 218 0.76 and 2374.52, while the friction coefficient of the separator was 0.05. the maximum base excision. The maximum acceleration superstructure for the friction coefficient 011 became 2829.09, 3447.07 and 3230.11, respectively well for the friction coefficient, 0.15 became 3581.40, 4216, and 4314.46, respectively. The maximum base shear for the unseparated building in line to vector y under the earthquake of Tabbas, cape mendensino and North Rage became 6763.91, 9775.01, and 10600.83, KN.

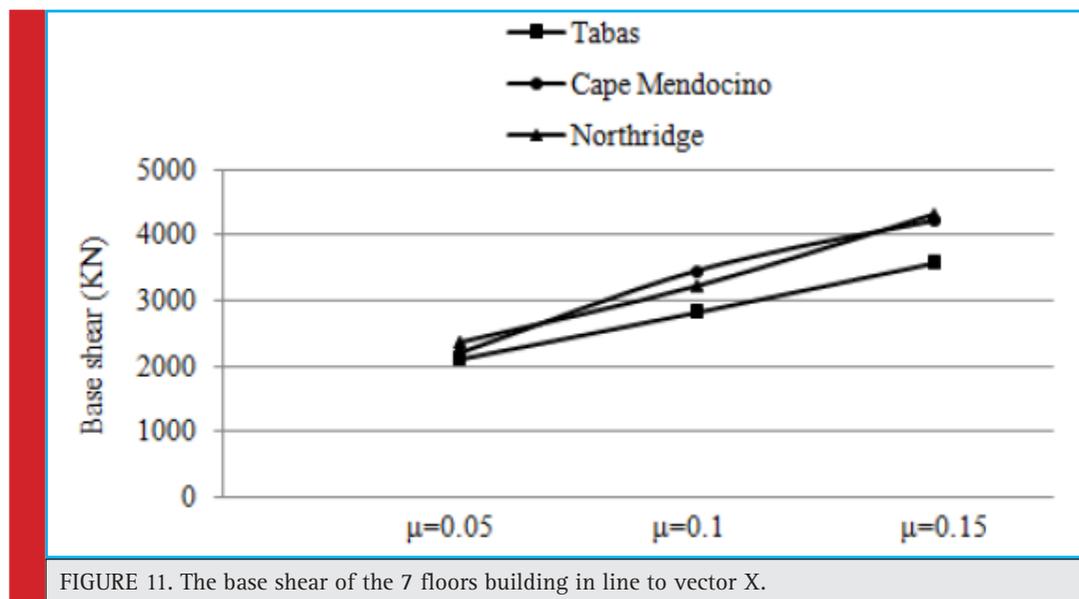


FIGURE 11. The base shear of the 7 floors building in line to vector X.

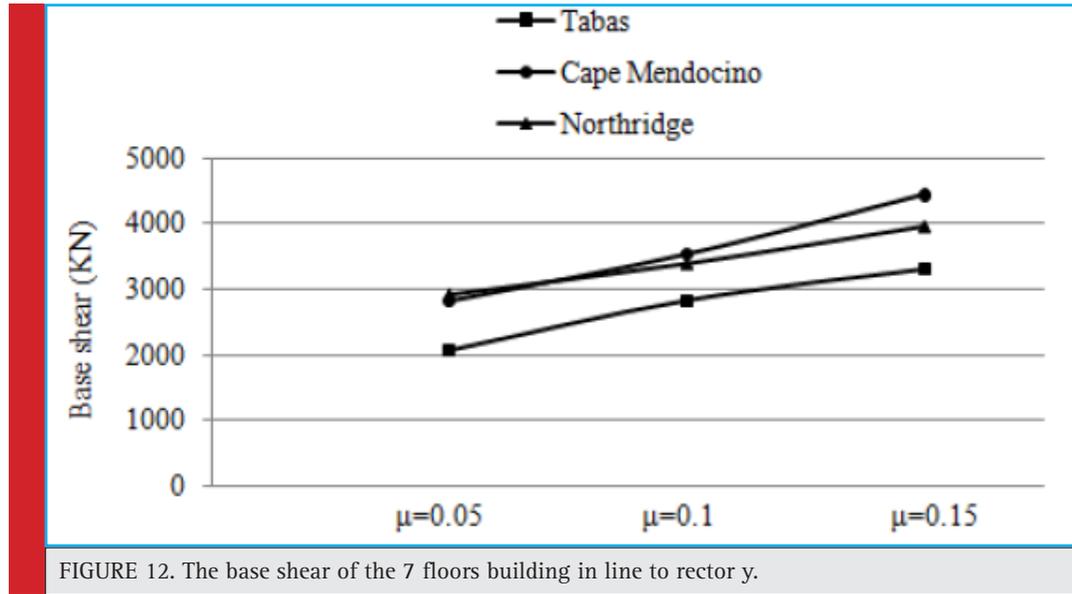


FIGURE 12. The base shear of the 7 floors building in line to rector y.

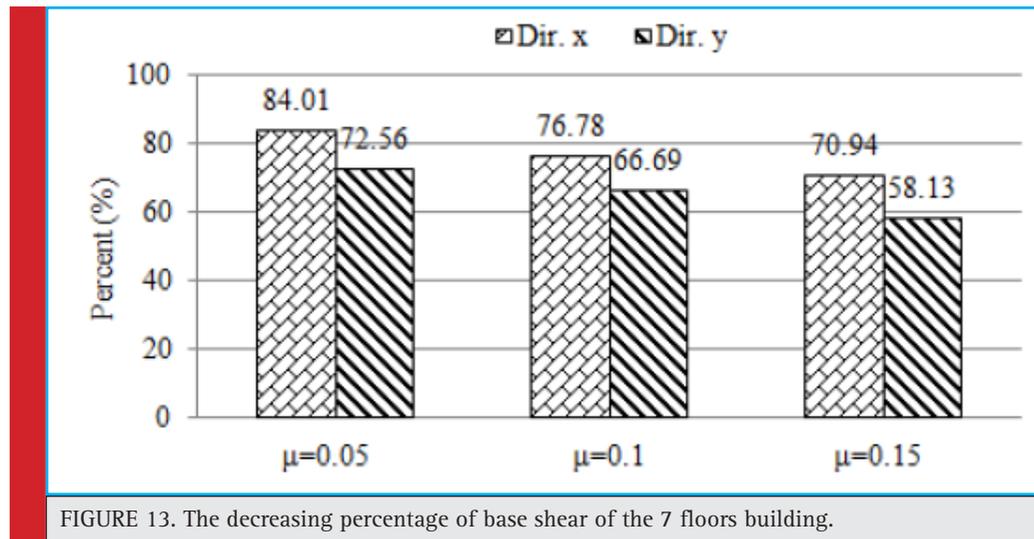


FIGURE 13. The decreasing percentage of base shear of the 7 floors building.

The maximum base shear in the building, which is furnished by separator and complementary time damper became 2058,65, 2817,74, and 2608.84. respectively, while the friction coefficient of the separator was 0.05. the maximum base shear for the friction coefficient 0.1 became 2821.75, 3531.53 and 3386.65 respectively, as well for the friction coefficient 0.15 became 3300.35, 4439.09, and 3960.33 respectively. the maximum base shear in the 7 floors building in line to vector X and y decreased 84.01, and 72.56 percent, respectively, while the friction coefficient was 0.05, as it was in line to vector X and y decreased 76.78, and 66.69, percent as the friction coefficient friction was 0.15, while it decreased 70.94, and 58.13, percent respectively as the friction coefficient was 10.15 of course in line to vectors X and y. based on what above mentioned in the beginning

of the chapter, as the friction coefficient increases, the amount of the input energy to the structure increases to, and consequently the base shear must be increased.

This subject is true for the under-evaluating 7 floors building. Decreasing of the friction coefficient will not often leads to decreasing all vibration reactions. Comparing to the state, while the friction coefficient was more. Therefore, Regarding to the target structure, further studies must be conducted on subject of what friction coefficient for the used separator leads to the most decreasing of the vibration reaction.

## REFERENCES

Agency FEM (2000) Pre standard and Commentary for the Seismic Rehabilitation of Buildings: FEMA-356, ed: Federal Emergency Management Agency Washington.

- Aristizabal-Ochoa JD (1986), Disposable knee bracing: improvement in seismic design of steel frames, *Journal of Structural Engineering*, vol. 112, pp. 1544-1552.
- Balendra, T M. T. Sam, and C. Y. Liaw (1990), Diagonal brace with ductile knee anchor for aseismic steel frame, *Earthquake engineering & structural dynamics*, vol. 19, pp. 847-858.
- Code UB (1997), UBC 97, Code for Seismic Design of Buildings (1997 Edition) *Structural Engineering Design Provisions*, vol. 2.
- Kalkan E and S. K. Kunnath (2004), Method of modal combinations for pushover analysis of buildings, in *Proc. Of the 13 th World Conference of Earthquake Engineering*.
- Khatib, IF S. A. Mahin, and K. S. Pister (1988), Seismic behavior of concentrically braced steel frames vol. 88: *Earthquake Engineering Research Center*, University of California.
- Kim J and Y. Seo (2003), Seismic design of steel structures with buckling-restrained knee braces, *Journal of Constructional Steel Research*, vol. 59, pp. 1477-1497.
- Naeemi M and M. Bozorg (2009), Seismic Performance of Knee Braced Frame, *Proceedings of World Academy of Science: Engineering & Technology*, vol. 50, pp 976-980.
- Roeder CW and E. P. Popov (1978), Eccentrically braced steel frames for earthquakes, *Journal of the Structural Division*, vol. 104, pp. 391-412.
- Uriz P (2008), *Toward earthquake-resistant design of concentrically braced steel-frame structures: Pacific Earthquake Engineering Research Center*.

## Risk Factors Related to Leukemia in Adults Referred to Teaching Hospitals in Ahwaz, Iran

Zeinab Ahmadi<sup>1\*</sup>, Mahnaz Rahmani<sup>2</sup>, Leila Amirmohseni<sup>3</sup>, Marzieh Azarkish<sup>4</sup>, Fatemeh Hordani<sup>5</sup> and Marjan Naseri<sup>6</sup>

<sup>1,3,5</sup>*MSc in Internal Nursing-Surgery*

<sup>2,6</sup>*MSc in Pediatric Nursing,*

<sup>4</sup>*MSc in Animal Biology - Developmental Cell*

### ABSTRACT

Leukemia is diagnosed as one of the most common cancers all around the world. Plenty of studies have examined risk factors related to Leukemia incidence and have obtained different results. This study was conducted to examine some risk factors related to Leukemia incidence among adults in Ahwaz, Iran. This retrospective case-control study was undertaken on 80 patients with Leukemia referring to Shafa and Glestan hospitals as well as 80 healthy persons who were similar in terms of age and gender in Ahwaz, Iran. To collect data, researcher-made 5-part questionnaire was used. Data analysis was done using SPSS19 Software and descriptive statistics of Chi-square and Logistic Regression. Results showed that some factors are related to leukemia incidence; these factors are as follows: O blood group, high BMI, and family history of leukemia or any other kind of cancer, exposure to radiation, exposure to chemicals and insecticides, contact with animals or pets, and consumption of certain foods such as the solid animal oil once a month, consumption of liquid oil more than 4 times per week, consumption of high-fat dairy once a week, consumption of sauce more than once a week and daily tea intake. Considering the identified risk factors related to leukemia incidence in this research, individuals who are exposed to risk can be identified; it is also possible to change those risk factors of leukemia incidence that are preventive identifying and following up those unchangeable risk factors in order to provide a suitable treatment based on timely diagnosis.

**KEY WORDS:** CASE STUDY, LEUKEMIA, RISK FACTORS, AHWAZ

### ARTICLE INFORMATION:

\*Corresponding Author: [farporh@sums.ac.ir](mailto:farporh@sums.ac.ir)

Received 4<sup>th</sup> April, 2017

Accepted after revision 29<sup>th</sup> June, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

Leukemia has been diagnosed as one of 9 common cancers among men and 10 common cancers among women all around the world (Ferlay *et al.* (2010). Prevalence rate of global leukemia among men and women is equal to 5.8 and 4.3 members per 100000 people, respectively. This rate is equal to 7.7 and 4 members per 100000 people for men and women, respectively (Rhomberg *et al.*, (2011). Out of each 100000 registered new cancer case in Iran, 3.8% of them are leukemia (Disease Management Center. 2008). According to Talaiezhadeh *et al.*, 10% of all of cancers in Khuzestan is leukemia (Talaiezhadeh *et al.* 2013).

Rajabi *et al.* reported epidemiology rate of leukemia in Glestan, Iran equal to 10.4 and 4.8 members per 100000 people for men and women, respectively (Rajabli *et al.* 2013). Leukemia forms about 8% of human cancers as the fifth common cancer in world (U.S. Cancer Statistics Working Group. 2009; Jemal *et al.* 2008; Mossoomy Z, Mesgari M. 2008). In addition, treatment costs, hospitalization duration, and mental problems caused by this disease impose heavy economic-social costs on families of these patients (Kazak *et al.*1997). In case of leukemia, bone marrow produces a large amount of blood cells abnormally; these cells are different with normal blood cells and do not act properly; therefore, prevent from natural generation of white blood cells and disturb ability of person to fight diseases. Leukemia cells also influence on the generation of other types of blood cells forming by bone marrow such as red blood cells that carry oxygen to the tissues of the body and blood platelets that prevent from blood clots (Leukemia lymphoma.org.2008).

Genetic disorders play a vital role in leukemia incidence in body. Some congenital diseases such as Down syndrome may lead to leukemia. 2) Exposure to ionizing radiation and some chemical substances. Individuals who are exposure to severe radiations, survivors after atomic attacks or nuclear reactor events, may suffer from leukemia more likely. 3) Defective immune system of body. 4) Leukemia incidence is directly related to increasing age. People older than 55 should be more aware of warning symptoms of this disease. However, leukemia may occur in children at any age, but it typically occurs at age of 3-4 (Leukemia lymphoma.org. 2008; Mahmoodabadi A. Leukemia (blood cancer) In plain language. 2009).

Some causes for leukemia in adults can be named as exposure to radiation, specific chemical substances such as benzene, viral infections, congenital diseases, race, gender, family history, and obesity (Ogunbadewa 2012; Geographical information systems and health: current state and future directions. Healthc Inform Res. 2012; Wakefield and Lyons, 2010; Alavi S, Rashidi A, *et al.*2009;

Nishimoto F1, Okuno K, Kuragaki C, *et al.*2008; Hadi N, Moezzi M, Aminlari 2008; Acute Lymphocytic Leukemia Causes and Risk Factors [homepage on the Internet]. updated 2016).

The certain cause for leukemia has not been diagnosed, but it is expressed that various environmental and genetic factors such as contact with ionization ray, specific chemical substances, alcohol consumption and smoking, some chemotherapy medicines, family history, and some genetic diseases may lead to leukemia (Strom *et al.*, 2012; Kingsley Holmes 2007; Lübbert 2006; Muselman *et al.*, 2013).

There have been many studies in case of relationship between obesity and risk of leukemia expressing the direct relationship between obesity and leukemia risk. Larsson (2008) found a direct relationship between high BMI and weight with risk of leukemia (Larsson 2008). Renehan (2008) states increase in BMI is directly related to increase in risk of different cancers (Renehan *et al.*, 2008). Strom (2012) considers obesity in women as the main risk factor for acute myeloid leukemia (Strom *et al.*, 2012).

Hadi *et al.* (2007) studied the relationship between living place and risk of leukemia expressing that living place within past decade can be introduced as the risk factor of leukemia. Also, they stated the risk of leukemia is higher among persons who live in Fars, Khuzestan, Hormozgan, and Bushehr, Iran (Acute Lymphocytic Leukemia Causes and Risk Factors [homepage on the Internet]. updated 2010) because of climate conditions, presence of industrial factories, pollutions related to chemical substances, and involvement of these provinces in Iran-Iraq war (Acute Lymphocytic Leukemia Causes and Risk Factors[homepage on the Internet]. updated 2010).

Various studies examined the relationship between blood groups and risk of leukemia and different results obtained. Zandi (2011) reported that types of cancers may occur more in two blood groups of A and O (Zandi, 2011). According to Novaretti (2008), O is the most common blood group among patient with leukemia (Novaretti, 2008). Vadivelu (2008) showed that O is the most common blood group among women with leukemia; however, Ravarian (2011) reported no significant difference among healthy people and patients with leukemia in terms of blood group (Ravarian, 2011). It was also determined in study of Tavasolian that there is a relationship between AB blood group and high risk of Acute Lymphoblastic Leukemia (ALL) (Tavasolian *et al.* 2014).

There have been various studies conducted about the relationship between job and risk of leukemia incidence. Majority of studies found a relationship between farming and animal husbandry jobs with risk of leukemia incidence. Hadi *et al.*, expressed that relevant jobs to

farming and livestock can be introduced as risk factor for leukemia (Hadi *et al.*, 2008). Rebecca carried out a study in which, animal husbandry and forestry, working in industries and factories increased risk of AML. It was found in study of Storm that contact with chemical substances in farming increases risk of AML (Strom *et al.*, 2012). Some studies have indicated a direct relation between family history of cancer and risk of leukemia. Belson *et al.*, (2007) and Deschler and Lübbert.2006) introduced family history as the risk factor of leukemia incidence. Rauscher expresses that family background in cancer, in particular breast cancer, among close relatives increases risk of leukemia incidence among adults (Rauscher G, Sandler D, Poole C, *et al.*2002). According to study of Hadi *et al.* (2007), family history in cancer considered as factor risk of leukemia. In addition, many of studies have reported the relationship between congenital diseases and risk factor of leukemia. According to Belson (2007), family history in congenital diseases may be risk factor of leukemia in children. Some have proved that congenital diseases such as Fanconi's anemia, Bloom syndrome, Ocular thromboembolism and neurofibromatosis are related to leukemia (Charalambous and Vasileiou 2012).

Different studies have examined the relation between contact with chemical substances and risk of leukemia. Majority of these studies found a relationship between contact with chemical substances and risk of leukemia. Hadi *et al.* (2007) named contact with chemical substances as risk factor for leukemia. Storm (2012) considered job exposure to chemical substances as the key risk factor for Rebecca (2014) expressed that working in factories and being exposure to chemical substances increases risk of Rajabi (2013) reported that prevalence of leukemia is higher in rural areas due to contact with chemical substances and agricultural pesticides.

There are various studies conducted to examine relationship between history of contact with animals and risk of leukemia and majority of these studies indicated a relationship between these two factors. Hadi *et al.* (2007) named history of contact with animals as the risk factor of leukemia. Deschler (2006) introduced history of contact with animals as risk factor of leukemia. Fritschi (2012) carried out a study in which, persons who had contact with animals such as cow and sheep were at higher risk of leukemia (Fritschi, 2012). Various studies examined the relationship between distance of living place from high-voltage power line and risk of leukemia and different results obtained by these studies. Elliott (2013) expressed that there is not any relationship between distance of living place from high-voltage power lines, magnetic fields and risk of leukemia in adults (Elliott, 2013).

Pour Feizi (2007) considered distance of living place from high-voltage power lines (lower than 500m) and

magnetic fields (higher than 0.45 $\mu$ T) as risk factor of leukemia in children. Pedersen (2014) concluded that distance of living place from high-voltage power lines (between 200-599 meters) can a little increases risk of leukemia in children. Some studies were conducted to examine the relationship between diet and leukemia while obtained different results (Saberiet *al.* 2014; Zhong,*et al.* 2014; Yamamura *et al.* 2013 ). Geoffrey (2013) indicated no relationship between diet and risk of CLM. According to study of Xiaomei (2010), those people who do not drink coffee are more exposure to risk of AML compared to those who drink coffee; meat consumption also introduced as one of risk factors of AML while consumption of fruits and vegetables had no relationship with risk of AML. Yamamura (2013) found that intake of green and orange vegetables, beans, and nuts can reduce the risk of AML.Chronic leukemia can be diagnosed before incidence of symptoms using a simple blood test; diagnostic process may be as follows: physical test to diagnose physical symptoms of leukemia such as pale skin because of anemia, swollen lymph nodes, liver or spleen; blood test to count number of white blood cells or blood platelets; Cytogenetic test to examine changes created in chromosomes such as having Philadelphia chromosome; and bone marrow sample test.

Over recent years, patients with leukemia can live for more years because of using more effective anti-cancer medicines so that such medicines can reduce symptoms preventing form getting worsen during treatment and some patient are treated to some extent. Leukemia treatment depends on the type of leukemia, disease condition at the beginning point of treatment, age, general health, and reaction of patient to type of treatment that may lead to complete health of patients. The most critical factor in recovery is the morale of patient to cope with this disease. Treatment method of this disease consists of chemotherapy, radiotherapy, bone marrow transplantation and stem cell transplantation; in last method, bone marrow of patient is replaced with bone marrow of healthy person so that patient can receive high doses of chemotherapy or radiotherapy medicines.

Nursing job provides health services that are matched with other medical professions to prolong life, guarantee health, control and treat disease and recover patients (Rakhshani 2010). Nurses are not only responsible for cost-effective and qualified cares in society but also are responsible to improve health of patients (Bernz 2009). Nurses play a vital role in preventing and controlling diseases prioritizing services and obtaining epidemiological data to prevent from diseases (Abady.2011).

Considering the importance of leukemia among diseases and its role in quality of life, prevention from its prevalence identifying risk factors should be priority

of health managers. One of strategies in this process is identifying such patients in population. To protect health of society members and to identify factors related to diseases, general awareness should be increased in order to prevent from relevant factors; in this case, persons at risk should be screened. Despite the conducted studies in Iran, causes for this disease have not been diagnosed.

Talaiezhadeh *et al.* studied prevalence of different types of cancer in Khuzestan and leukemia was introduced as the most common malignant blood cells among men and women (Talaiezhadeh *et al.* 2013). Khuzestan Province has a different climate and environment compared to other provinces in which, leukemia is common. There has been increasing rate of leukemia in Khuzestan over the recent years (Talaiezhadeh *et al.* 2013) and there has not been any study in Ahwaz City, Iran to examine risk factors of leukemia in adults. Majority of studies have been conducted in areas that are different with Khuzestan considering whether, life style, environmental considerations, race, and socio-economic situation. Further studies should be done in accordance with few holistic studies in this field. Limitations in study and effect of specific regional factors such as climate, life style, and socio-economic situation made to researcher to obtain epidemiologic data to prevent from diseases in accordance with the role of nurse in identifying health hazards and promotion of health level of society. This study was conducted to examine factors leading leukemia in Ahwaz, 2014.

## METHODOLOGY

The extant study is an analytical with case-control type in which, risk factors of leukemia were identified in Ahwaz, 2014. Statistical population of study consisted of all patients with leukemia in hematology ward of Shafa and Golestan Hospital. To determine control group, individuals introduced by patients were selected. In this regard, patients were asked to introduce one of their childhood friends, neighbors, and acquaintances except for relative who had not leukemia and were similar to patients in terms of age ( $\pm 2$ ). If members could not introduced persons for control group, other members of control group would be selected from healthy individuals by researcher.

Research environment of this study consisted of teaching hospitals in Ahwaz, Iran. Research sample consisted of 80 patients with leukemia that were selected from cases using random sampling method in Shafa and Golestan Hospitals, 2014; in this regard, 80 cases of patients with leukemia entered into the research using simple random sampling besides 80 healthy persons who were similar to patients in terms of age ( $\pm 2$ ). First, statis-

tical population consisting of cases of patients with leukemia was determined and case number of each patient was taken as its code. To select sample, we started randomly from a table point selecting the direction (up to down, left to right and right to left) in the direction of the row or column; selected number was indeed the code of case of patients related to members of sample group. This action continued until the considered sample size obtained. To select control group, a group was selected from members who were introduced by patients.

In this research, sample size obtained to 68 members and the number of members in each group increased to 80 members in order to expand accuracy of study considering the opinion of professor. In this case, control and case groups consisted of 80 members who were similar in terms of age ( $\pm 2$ ) and gender.

Storm conducted a study to identify risk factors related to AML in adults in Texas in which contact with chemical substances obtained to 34% and 14% in groups of patient with and without leukemia, respectively. Sample size obtained to 68 members using following formula.

Researcher-made questionnaire was used as data collection tool in this research. In this regard, questionnaire was designed based on scientific books and articles. This questionnaire was formed of 5 parts including 1- demographic information (age, gender, living place in past decade, marital status, blood group, body mass index); 2- economic situation (job, education level, economic situation, income level); 3- family history in disease (background of leukemia incidence or any kind of cancer in family, congenital disease); 4- medical background (history of tonsillitis removal and viral diseases); 5- life style (smoking, alcohol consumption, having pets, exposure to ray, chemical substances and insecticides, distance of living place from high-voltage power lines, eating habit). To assess validity of questionnaire, content validity method was used; in this case, faculty members of Nursing and Midwifery University in Ahwaz were surveyed. Corrective opinions were collected and final questionnaire was designed based on these opinions.

Obtaining license from relevant officials, sampling began in hematology ward of Shafa and Golestan hospitals. Sampling was done through simple random method. Research members in case group were randomly selected considering inclusion criteria and existing cases based on random numbers table in accordance with the required sample members. According to exclusion of some number of research members, sampling was continued to obtain determined sample size. Presenting explanations about research goals, consent form was completed by members. In this research, 80 members were assigned to case group and 80 members were assigned to control groups. Group members were asked to introduce one of

Group Variable	Type	case Mean±SD	Control Mean±SD	P-value
age		38.69±13.56	39.10±13.13	0.854

gender	Group	Case (%) N	Control (%) N	P-value
male		32 (40%)	32 (40%)	1
female		48 (60%)	48 (60%)	
total		80 (100%)	80 (100%)	

their friends not relatives who are not suffering from leukemia at the age range of ( $\pm 2$ ) and similar gender to assign them in control group. Since some members could not mobile introduce members for control group, other members of control group were selected by researcher from health members who were similar to case members in terms of age ( $\pm 2$ ) and gender. Research data were collected using questionnaire and interview.

Data were analyzed using SPSS19 Software, descriptive statistics (frequency, percent, mean, standard deviation, frequency distribution table) and inferential statistics (Chi-square, and logistic regression) at significance level of 5% and confidence interval of 95%.

## RESULTS

Age averages were equal to 38.69 and 39.10 in case and control groups, respectively. According to results of t test, this difference is not significant indicating homogenous distribution of age among groups.

According to table 2, there is equal number of men and women in both groups.

According to 6, there is not a significant difference between two groups at risk of leukemia in terms of consumption of solid vegetable oil considering Chi-square statistical test ( $P > 0.05$ ); however, there is a significant difference between two groups at risk of leukemia in

Case (%) N	Variable	Group		P-value
		Control (%) N		
family background of leukemia	does have	12 (13.8%)	4 (5%)	0.04
	does not have	68 (86.2%)	76 (95%)	
family background of any kind of cancer	does have	28 (35%)	12 (15%)	0.003
	does not have	52 (65%)	68 (85%)	
exposure to ray	does have	59 (73.8%)	37 (46.2%)	0.0001
	does not have	21 (26.2%)	43 (53.8%)	
contact with animal	does have	54 (67.5%)	32 (40%)	0.0001
	does not have	26 (32.5%)	48 (60%)	
exposure to insecticides	never	13 (16.3%)	24 (30%)	0.01
	low	46 (57.5%)	48 (60%)	
	average to high	21 (26.2%)	8 (10%)	
contact with chemical	never	22 (27.5%)	39 (48.7%)	0.02
	low	36 (45%)	31 (38.8%)	
	average to high	22 (27.5%)	10 (12.5%)	
blood group	A	22 (27.4%)	34 (42.5%)	0.02
	B	15 (18.8%)	19 (23.8%)	
	AB	8 (10%)	10 (12.5%)	
	O	35 (43.8%)	17 (21.2%)	
BMI (Mean±SD)		23.93±3.62	22.47±1.90	0.001

Table 4. Insignificant variables related to leukemia incidence

Case (%) N	Variable	Group		P-value
		Control (%) N		
nationality	Fars	50 (62.5%)	55 (68.7%)	0.40
	Arab	30 (37.5%)	25 (31.3%)	
fixed living place at past decade	yes	75 (93.8%)	72 (90%)	0.25
	no	5 (6.2%)	8 (10%)	
job (female)	employed	5 (10.4%)	8 (16.7%)	0.27
	housewife	43 (89.6%)	40 (83.3%)	
job (male)	employed	23 (71.9%)	24 (75%)	0.5
	unemployed	9 (28.1%)	8 (25%)	
family history of congenital diseases	does have	2 (2.5%)	1 (1.2%)	0.56
	does not have	78 (97.5%)	79 (98.8%)	
family history of viral diseases	does have	30 (37.5%)	22 (27.5%)	0.17
	does not have	50 (62.5%)	58 (72.5%)	
history of tonsillar removal	does have	16 (20%)	8 (10%)	0.77
	does not have	64 (80%)	72 (90%)	
smoking background	does have	23 (28.7%)	16 (20%)	0.19
	does not have	57 (71.3%)	64 (80%)	
alcohol consumption	yes	9 (11.2%)	7 (8.8%)	0.59
	no	71 (88.8%)	73 (91.2%)	
distance of living place form high-voltage power lines and telecommunication	yes	34 (42.5%)	27 (33.8%)	0.25
	no	46 (57.5%)	53 (66.2%)	
income level	lower than 600	24 (30%)	14 (17.5%)	0.27
	600-800	17 (21.3%)	17 (21.3%)	
	800-1000000	34 (42.5%)	44 (55%)	
	more than 1000000	5 (6.2%)	5 (6.2%)	
economic situation	good	6 (7.5%)	5 (6.3%)	0.49
	average level	50 (62.5%)	57 (71.2%)	
	weak	24 (30%)	18 (22.5%)	
marital status	single	20 (25%)	18 (22.5%)	0.61
	married	53 (66.3%)	56 (70%)	
	divorced.widow	7 (8.7%)	6 (7.5%)	
education	uneducated	18 (22.5%)	14 (17.5%)	0.66
	under diploma	30 (37.5%)	27 (33.7%)	
	diploma	23 (28.7%)	30 (37.5%)	
	above diploma	9 (11.3%)	9 (11.3%)	

Table 5. Logistic regression model using forward method for significant variables

Variable (sub-group)	P-value	OR (95% CI)
family background of any kind of cancer (does have)	p=0.003	3.70 (1.54-8.86)
contact with chemical substances (never)	p=0.048	0.20 (0.048-0.85)
contact with animals (does have)	p=0.002	3.22 (1.55-6.68)
exposure to ray (does have)	p=0.001	3.37 (1.60-7.10)

Table 6. Distribution of absolute and relative frequency of food consumption based on studied groups			
Variable	Case group N(%)	Control group N(%)	P-value
Solid Vegetable Oil			
daily	9 (11.3%)	6 (7.5%)	p=0.663
5 times a week	7 (8.8%)	5 (6.3%)	
2-3 times a week	12 (15.0%)	10 (12.5%)	
once a week	6 (7.5%)	8 (10.0%)	
twice a week	8 (10.0%)	6 (7.5%)	
once a month	18 (22.5%)	28 (35.0%)	
rare or never	20 (25.0%)	17 (21.3%)	
Solid animal oil			
more than three times a week	18 (%5.22)	9 (%3.11)	p=0.017
once a week	6 (%5.7)	11 (%8.13)	
twice a week	7 (%8.8)	6(%5.7)	
once a month	16 (%0.20)	32(%0.40)	
rare or never	33 (%3.41)	22(%5.27)	
total	80 (100.0%)	8 (100.0%)	

terms of consumption of solid animal oil considering Chi-square statistical test ( $P < 0.05$ ).

According to table 7, Chi-square test showed a significant difference between two groups in terms of consumption of liquid oil, frying liquid oil, olive oil, and risk of leukemia in ( $p < 0.05$ ).

According to table 8, Chi-square test showed a significant difference between two groups in terms of con-

sumption of low-fat, high-fat dairy products and risk of leukemia ( $p < 0.05$ ).

According to table 9, Chi-square test did not indicate any significant difference between two groups in terms of consumption of red meat and poultry and risk of leukemia incidence ( $P > 0.05$ ); while this test showed a significant difference between two groups in terms of consumption of fish and risk of leukemia incidence ( $P < 0.05$ ).

Table 7. Distribution of absolute and relative frequency of food consumption based on studied groups			
Variable	Case group N(%)	Control group N(%)	P-value
liquid Oil			
more than four times a week	(%8/58)47	(%0/20)16	p<0.00001
2-3 times a week	(%8/18)15	(%3/41)33	
once a week	(%3/6)5	(%3/16)13	
fewer than 3 times a month	(%3/16)13	(%5/22)18	
Frying liquid oil			
more than four times a week	(%8/68)55	(%8/38)31	p<0.001
2-3 times a week	(%8/13)11	(%0/35)28	
fewer than 3 times a month	(%5/17)14	(%3/26)21	
olive oil			
more than four times a week	(%5/7) 6	(%3/6)5	P=0.02
2-3 times a week	(%8/18)15	(%3/16)13	
once a week	(%8/13)11	(%8/13)11	
twice a week	(%5/22)18	(%5/17)14	
once a month	(%5/12)10	(%0/35)28	
rare and never	(%0/25)20	(%3/11)9	
total	80 (100.0%)	80 (100.0%)	

Table 8. Distribution of absolute and relative frequency of food consumption based on studied groups

Variable	Case group N(%)	Control group N(%)	P-value
Low-fat dairy products (Milk, cheese, yogurt, ...)			
more than four times a week	(%5/42)34	(%8/23)19	p<0.001
2-3 times a week	(%0/45)36	(%5/37)30	
fewer than 5 times a month	(%5/12)10	(%8/38)31	
High-fat dairy (Ice cream, cream, butter, ...)			
more than 4 times a week	(%8/23)19	(%0/15)12	p<0.0001
2-3 times a week	(%2/51)41	(%0/30)24	
once a week	(%0/10)8	(%3/41)33	
fewer than 3 times a month	(%0/15)12	(%8/13)11	
total	80 (100.0%)	8 (100.0%)	

According to table 10, Chi-square test did not indicate any significant difference between two groups in terms of consumption of sausages, sheep and calf's brain and risk of leukemia incidence (P>0.05); while this test showed a significant difference between two groups in terms of consumption of sheep byproducts and risk of leukemia incidence (P<0.05).

According to table 11, Chi-square test did not indicate any significant difference between two groups in terms of consumption of beans, palm, and nuts and risk of leukemia incidence (P>0.05).

According to table 12, Chi-square test did not indicate any significant difference between two groups in terms of consumption of fruits and vegetables and risk of leukemia incidence (P>0.05).

According to table 13, Chi-square test did not indicate any significant difference between two groups in terms of consumption of coffee and sweets and risk of leukemia incidence (P>0.05); while this test showed a significant difference between two groups in terms of consumption of tea and risk of leukemia incidence (P<0.05).

According to table 14, Chi-square test did not indicate any significant difference between two groups in terms of consumption of snacks and cans and risk of leukemia incidence (P>0.05); while this test showed a significant difference between two groups in terms of consumption of sauce and risk of leukemia incidence (P<0.05).

Following results were obtained based on logistic regression model:

Table 9. Distribution of absolute and relative frequency of food consumption based on studied groups

Variable	Case group N(%)	Control group N(%)	P-value
Red meat			
5 times a week	(%0/10) 8	(%3/6)5	p=0.051
2-3 times a week	(%5/42)34	(%5/22)18	
once a week	(%3/31)25	(%3/46)37	
once every two weeks	(%8/8)7	(%8/13)11	
fewer than 2 times a months	(%5/7)6	(%3/11)9	
Poultry			
2-5 times a week	(%5/47)38	(%3/41)33	p=0.206
once a week	(%5/42)34	(%8/38)31	
fewer than 3 times a week	(%0/10)8	(%0/20)16	
Fish			
more than once a week	(%5/22)18	(%0/25)20	P=0.003
once a week	(%0/45)36	(%8/18)15	
once every two weeks	(%8/18)15	(%3/36)29	
fewer than 2 times a month	(%8/13)11	(%0/20)16	
total	80 (100.0%)	8 (100.0%)	

Table 10. Distribution of absolute and relative frequency of food consumption based on studied groups			
Variable	Case group N(%)	Control group N(%)	P-value
Sausages			
once or more a week	(%0/20) 16	(%0/15)12	p=0.101
once every two weeks	(%8/18)15	(%5/22)18	
once a month	(%5/27)22	(%5/42)34	
seldom or never	(%8/33)27	(%0/20)16	
Heart, liver and kidney of animals			
more than once a week	(%0/40)32	(%3/31)25	p=0.003
once a month	(%2/51)41	(%8/38)31	
seldom or never	(%8/8)7	(%0/30)24	
Sheep byproducts			
1-3 times a week	(%5/7)6	(%5/7)6	P=0.0955
once every two weeks	(%3/21)17	(%3/21)17	
once a month	(%8/43)35	(%0/40)32	
seldom or never	(%5/27)22	(%3/31)25	
Sheep and calf's brain			
1-5 times a week	(%5/7)6	(%3/6)5	P=0.818
once every two weeks	(%0/20)16	(%0/15)12	
once a month	(%5/37)30	(%5/42)34	
seldom or never	(%0/35)28	(%3/36)29	
total	80 (100.0%)	8 (100.0%)	

Table 11. Distribution of absolute and relative frequency of food consumption based on studied groups			
Variable	Case group N(%)	Control group N(%)	P-value
Nuts			
more than 6 times a week	(%0/20) 16	(%3/6)5	p=0.063
2-3 times a week	(%5/22)18	(%3/21)17	
once a week	(%8/23)19	(%0/25)20	
once every two weeks	(%5/17)14	(%3/31)25	
fewer than 2 times a month	(%3/16)13	(%3/16)13	
Palm			
more than 6 times a week	(%0/50)40	(%8/33)27	p=0.207
2-3 times a week	(%5/22)18	(%0/30)24	
once a week	(%3/16)13	(%8/23)19	
fewer than 2 times a month	(%3/11)9	(%5/12)10	
Beans			
more than 6 times a week	(%0/20)16	(%3/11)9	P=0.237
2-3 times a week	(%8/38)31	(%5/37)30	
once a week	(%0/25)20	(%5/22)18	
once every two week	(%5/7)6	(%5/17)14	
fewer than 3 times a month	(%8/8)7	(%3/11)9	
total	80 (100.0%)	8 (100.0%)	

Table 12. Distribution of absolute and relative frequency of food consumption based on studied groups			
Variable	Case group N(%)	Control group N(%)	P-value
Fruits			
daily	(%0/40) 32	(%0/40)32	p=0.624
5 times a week	(%0/35)28	(%5/42)34	
2-3 times a week	(%5/17)14	(%3/11)9	
fewer than 5 times a month	(%5/7)6	(%3/6)5	
Vegetables			
daily	(%8/38)31	(%8/23)19	p=0.213
5 times a week	(%0/35)28	(%5/47)38	
2-3 times a week	(%5/17)14	(%8/18)15	
fewer than 5 times a month	(%8/8)7	(%0/10)8	
total	80 (100.0%)	8 (100.0%)	

Odds ratio of cancer incidence is equal to 11.85 among persons who have consumed liquid oil more than 4 times a week compared to those who have consumed fewer than 3 times a month.

Odds ratio of cancer incidence is equal to 4.27 among persons who have consumed tea daily compared to those who have consumed fewer than 5 times a month.

Research findings about the family history of congenital diseases with risk of leukemia incidence showed a significant difference between two groups without

family history of congenital disease and leukemia incidence; therefore, there is not a relationship between family history of congenital diseases and leukemia incidence. Considering the fourth question of study about the relationship between medical background and leukemia incidence, following finding obtained: Research findings obtained for the relationship between tonsillectomy and leukemia incidence showed no significant difference between two groups in terms of Tonsillectomy; therefore, there is not a relationship between Tonsil-

Table 13. Distribution of absolute and relative frequency of food consumption based on studied groups			
Variable	Case group N(%)	Control group N(%)	P-value
Coffee			
more than 1 times a week	(%0/15) 12	(%0/10)8	p=0.629
once a week	(%3/11)9	(%0/10)8	
once every two weeks	(%3/11)9	(%5/17)14	
once a month	(%5/27)22	(%5/32)26	
seldom or never	(%3/35)28	(%0/30)24	
Tea			
daily	(%8/68)55	(%8/38)31	p<0.001
5 times a week	(%8/8)7	(%3/36)29	
2-3 times a week	(%3/11)9	(%3/11)9	
fewer than 2 times a month	(%3/11)9	(%8/13)11	
Sweets			
daily	(%8/13)11	(%8/8)7	P=0.669
5 times a week s	(%3/6)5	(%5/7)6	
2-3 times a week	(%0/10)8	(%8/13)11	
once a week	(%8/33)27	(%3/26)21	
once every two weeks	(%8/18)15	(%3/26)21	
fewer than 2 times per month	(%5/17)14	(%5/17)14	
total	80 (100.0%)	8 (100.0%)	

Table 14. Distribution of absolute and relative frequency of food consumption based on studied groups

Variable	Case group N(%)	Control group N(%)	P-value
Sauce			
more than 1 times a week	(%3/31) 25	(%8/18)15	p=0.011
once a week	(%3/11)9	(%5/22)18	
once every two weeks	(%8/8)7	(%0/15)12	
once a month	(%5/22)18	(%5/32)26	
seldom or never	(%3/26)21	(%3/11)9	
Snack			
2-5 times a week	(%5/12)10	(%3/11)9	p<0.523
once a week	(%0/10)8	(%8/8)7	
once every two weeks	(%8/13)11	(%3/21)17	
once a month	(%5/32)26	(%5/37)30	
seldom or never	(%3/31)25	(%3/21)17	
Cans			
more than once a week	(%3/11)9	(%8/18)15	P=0.195
once a week	(%8/23)19	(%5/22)18	
once every two weeks	(%7/28)23	(%3/16)13	
fewer than once a month	(%3/36)29	(%5/42)34	
total	80 (100.0%)	8 (100.0%)	

lectomy background and leukemia incidence. Research findings obtained for the relationship between history of viral diseases and risk of leukemia incidence showed no significant difference between two groups; therefore, there is not a relationship between history of viral diseases and risk of leukemia incidence. Considering the fifth question of study about the relationship between life style and leukemia incidence, following finding obtained: Research findings obtained for the relationship between smoking and risk of leukemia incidence showed no significant difference between two groups; therefore, there is not a relationship between smoking and risk of leukemia incidence. Research findings obtained for the relationship between alcohol consumption and risk of leukemia incidence showed no significant difference between two groups; therefore, there is not a relationship between alcohol consumption and risk of leukemia incidence. Research findings obtained for the

relationship between exposure to ray and risk of leukemia incidence showed a significant difference between two groups; therefore, there is a relationship between exposure to ray and risk of leukemia incidence. In other words, persons who are exposure to ray are more at risk of leukemia compared to other persons. Research findings obtained for the relationship between contact with insecticides and risk of leukemia incidence showed a significant difference between two groups; therefore, there is a relationship between contact with insecticides and risk of leukemia incidence. In other words, persons who have contact with insecticides are more at risk of leukemia compared to other persons.

Research findings obtained for the relationship between contact with chemical substances and risk of leukemia incidence showed a significant difference between two groups; therefore, there is a relationship between contact with chemical substances and risk of

Table 15. Logistic regression model using forward method for significant variables in dietary pattern

Variable (sub-group)	P-value	OR (95% CI)
consumption of solid animal oil once a month	p=0.031	0.27 (0.08-0.88)
consumption of liquid oil more than 4 times a week	p<0.001	11.85 (3.03-46.30)
consumption of high-fat diary	p=0.003	0.08 (0.01-0.412)
consumption of sauce more than once a week	p=0.028	0.18 (0.03-0.83)
daily consumption of tea	p=0.037	4.27 (1.10-20.24)

leukemia incidence. In other words, persons who have contact with chemical substances are more at risk of leukemia compared to other persons.

Research findings obtained for the relationship between contact with animals or pets and risk of leukemia incidence showed a significant difference between two groups; therefore, there is a relationship between contact with animals or pets and risk of leukemia incidence. In other words, persons who have contact with animals or pets are more at risk of leukemia compared to other persons. Research findings obtained for the relationship between distance of living place from power lines or telecommunication and risk of leukemia incidence showed no significant difference between two groups; therefore, there is not a relationship between distance of living place from power lines or telecommunication and risk of leukemia incidence. Research findings obtained for the relationship between dietary pattern and risk of leukemia incidence showed a significant relationship between two groups in terms of consumption of solid animal oil once a month, consumption of liquid oil more than 4 times a week, consumption of high-fat dairy once a week, consumption of sauce once a week, daily consumption of tea, and risk of leukemia incidence.

Finally, it was concluded that some factors such as O blood group, high BMI, family background of leukemia and any kind of cancer, exposure to ray, contact with chemical substances and insecticides, contact with animals or pets, and consumption of some food stuffs such as solid animal oils once a month, liquid oil more than 4 times a week, consumption of high-fat dairy once a week, consumption of sauce once a week, daily consumption of tea can lead to leukemia incidence.

According to identified risk factors of leukemia incidence in this research, it is possible to diagnose persons at risk, to change those risk factors of leukemia incidence that can be prevented, to identify those unchangeable risk factors follow up and treat them timely. Therefore, timely treatment increases survival chance and side effects of disease. Moreover, identification of these factors increases public awareness to avoid factors related to this disease and to careen persons at risk; in this regard, a better prognosis of this disease can be created in society.

## REFERENCES

- Alavi S, Ashraf H, Rashidi A, et al. Distribution of ABO blood groups in childhood acute leukemia. *Pediatr Hematol Oncol*. 2009;23(8):611-7.
- Acute Lymphocytic Leukemia Causes and Risk Factors [homepage on the Internet]. updated 2016 Jun 10; cited 2016 Apr 2. Available from: <http://www.cancer.org.cancer.leukemia-acute-lymphocyticalinadults.detailedguide.leukemia-acute-lymphocytic-risk-factors>.
- Belson M, Kingsley B, Holmes A. Risk factors for acute leukemia in children: a review. *Environ Health Perspect*. 2007 Jan;115(1):138-45.
- Bernz S, gro N. Nursing research: implementation, review and application. First Edition. Translate by Dehghan N, Silani kh. Tehran: Andishe rafie Publications, 2009.
- Charalambous A, Vasileiou P. Risk factors for childhood leukemia: a comprehensive literature review. *Health Science Journal*. 2012; 6(3):432-68.
- Deschler B, Lübbert M. Acute Myeloid Leukemia: Epidemiology and Etiology. *cancer*. 2006;107(9):2099-2107.
- Disease Management center. [State report: cancer registration 2008]. P.17-18.(Persian)
- Elliott P, Shaddick G, Douglass M, et al. Adult cancers near high-voltage overhead power lines. *Epidemiology*. 2013 Mar;24(2):184-90.
- Ferlay J, Shin HR, Bray F, et al (2010). Estimates of worldwide burden of cancer in 2008: GLOBOCAN 2008. *Int J Cancer*, 127, 2893-917.
- Fritschi L, Johnson KC, Kliewer EV, et al. Animal-related occupations and the risk of leukemia, myeloma, and non-Hodgkin's lymphoma in Canada. *Cancer Causes Control*. 2002 Aug;13(6):563-71.
- Generated by High Voltage Overhead Power Lines - A Risk Factor in Iran. *Asia Pacific J Cancer Prev*, 8, 69-72.
- Geoffrey C, Jennifer W, Steven C, et al. Lifestyle and Dietary Factors in Relation to Risk of Chronic Myeloid Leukemia in the NIH-AARP Diet and Health Study. *Cancer Epidemiol Biomarkers Prev*. 2013; 22(5):1-13.
- Hadi N, Moezzi M, Aminlari A. A case control study of acute leukemia risk factors in adults, Shiraz, Iran. *Shiraz E-Medical Journal* 2008; 9: 210. [Persian]
- Idra abady E. Textbook of Community Health Nursing 1,2,3. First Edition. Tehran: Jamenegar Publications, 2011.
- Jemal A, Thun MJ, Ries LA, Howe HL, Weir HK, Center MM, et al. Annual report to the nation on the status of cancer, 1975-2005, featuring trends in lung cancer, tobacco use and tobacco control. *J Natl Canc Inst*. 2008;100(23):1672-94.
- Kazak AE, Barkat LP, meeskek. Post-traumatic stress, family functioning, and Social Support in Survivors of Childhood Leukemia and their mother and father. *J Consult Clin psychol* 1997; 65(1): 120-9.
- Larsson C. Overweight and obesity and incidence of leukemia. *Int. J. Cancer*. 2008; 122(4):1418-21.
- Leukemia lymphoma.org. Leukemia facts and statistics [homepage on the Internet]. Dallas: PedsCCM; c1995-2008 [updated 2009 Jun 10; cited 2008 Apr 2]. Available from: <http://www.leukemia-lymphoma.org>
- Mahmodabadi A. Leukemia (blood cancer) In plain language. Khane Ketab Pub: Tehran; 2009.

- Mossoomy Z, Mesgari M. Detection of leukemia epidemiology in Iran using GIS and statistical analyses. *Pediatr Hematol Oncol.* 2008;32(16):441-8.
- Musselman J, Blair C, Cerhan J. Risk of adult acute and chronic myeloid leukemia with cigarette smoking and cessation. *Cancer Epidemiology.* 2013; 37(4):410-16.
- Naghavi M. [Health manifestation modification in Iran]. *J of Iranian Epidemiology* 2008; 1(3): 13-25.(Persian).
- Nishimoto F1, Okuno K, Kuragaki C, etall. Hemoperitoneum as the first manifestation of acute leukemia. *Gynecol Obstet Invest.* 2008;66(1):12-3.
- Novaretti MC, Domingues AE, Manhani R, Pinto EM, Dorlhiac- Llacer PE, Chamone DA. ABO genotyping in leukemia patients reveals new ABO variant alleles. *Genet Mol Res.* 2008 Feb1;7(1):87-94.
- Ogunbadewa E. Developing natural resources database with Nigeriasat-1 satellite data and geographical information systems. *The Egyptian Journal of Remote Sensing and Space Science.* 2012; 15(2): 207-14.
- Pour Feizi A, Arabi M. Acute Childhood Leukemias and Exposure to Magnetic Fields
- Pedersen C, Raaschou-Nielsen O, Rod NH, etall. Distance from residence to power line and risk of childhood leukemia. *Cancer Causes Control.* 2014 Feb;25(2):171-7.
- Rajabli N, Naeimi-Tabeie M, Jahangirrad A, etall. Epidemiology of Leukemia and Multiple Myeloma in Golestan, Iran. *Asian Pacific J Cancer Prev.* 2013; 14 (4) : 2333-2336.
- Ravarian M, Sadeghian MH, Ebrahimzadeh S. Frequency of ABO and Rh blood groups in patients with acute leukemia. *J Gorgan Uni Med Sci.* Spring 2011;13(1):121-6.
- Rakhshani Nejad M. Introduction to Nursing Care. Tehran:Jameneqar Publications:Zabol: Zabol University of Medical Sciences and Health Services,2010.
- Rauscher G, Sandler D, Poole C, et all. Family History of Cancer and Incidence of Acute Leukemia in Adults. *American Journal of Epidemiology.* 2002;156(6):517-526.
- Rhomberg LR, Bailey LA, Goodman JE, Hamade AK, Mayfield D (2011). Is exposure to formaldehyde in air causally associated with leukemia?-A hypothesis-based weight-of-evidence analysis. *Crit Rev Toxicol*, 41, 555-621.
- Renahan G, Tyson M, Egger R,etall. Body-mass index and incidence of cancer. *Int. J. Cancer.* 2008; 371(6):569-577.
- Rebecca J, Sara E, Schumacher P,etall. Acute Myeloid Leukemia Risk by Industry and Occupation. *Leuk Lymphoma.* 2014; 18:143-50.
- Saberi Hosnijeh F, Peeters P, Romieu L,etall. Dietary Intakes and Risk of Lymphoid and Myeloid Leukemia in the European Prospective Investigation into Cancer and Nutrition (EPIC). *Nutrition and Cancer.* 2014; 66(1):14-28.
- Shaw NT Geographical information systems and health: current state and future directions. *Healthc Inform Res.* 2012;18(2):88-96.
- Strom S, Oum R, Kplola Y. De Novo Acute Myeloid Leukemia Risk Factors. *cancer.* 2012; 15:4589-96.
- .Talaiezhadeh A, Tabesh H, Sattari A, etall. Cancer Incidence in Southwest of Iran: First Report from Khuzestan Population-Based Cancer Registry. *Asian Pacific Journal of Cancer Prevention.* 2013;14(12):7517-22.
- Tavasolian F, Abdollahi E, Vakili M, etall. Relationship between ABO blood group and Acute Lymphoblastic Leukemia. *Iranian Journal of Pediatric Hematology Oncology.* 2014;14 (1):1-4.
- U.S. Cancer Statistics Working Group. Incidence and mortality web-based report. Atlanta: Department of Health and Human Services; 2009. Available from: <http://apps.nccdc.cdc.gov.uscs>.
- Vadivelu MK, Damodaran S, Solomon J, Rajaseharan A. Distribution of ABO blood groups in acute leukaemias and lymphomas. *Ann Hematol.* 2008;83(9):584-7.
- Wakefield, J. and Lyons, H. Spatial aggregation and the ecological fallacy. In *Handbook of Spatial Statistics* editors A. Gelfand, P. Diggle, P. Guttorp, M. Fuentes, CRC Press; 2010.
- Xiaomei M, Yikyung P, Susan T, etall. Diet,Lifestyle, and Acute Myeloid Leukemia. *Am J Epidemiol.* 2010;171:312-322.
- Yamamura Y, Oum R, Kplola Y,etall. Dietary Intake of Vegetables, Fruits, and Meats.Beans as Potential Risk Factors of Acute Myeloid Leukemia: A Texas Case-Control Study. *Nutrition and Cancer.* 2013; 65(8):1132-40.
- Zand M, Imani S, Saadati M, etall. Effects of age, sex and blood group on the incidence of leukemia. *Kowsar Medical Journal.* 2010;15 (2):111-114.
- Zhong SH, Chen Z, Yu X,etall. Tea consumption and leukemia risk: a meta-analysis. *Tumour Biol.* 2014; 17:30-7.

## Assessing genetic measurement of local *Citrullus colocynthis* species using SSR molecular markers of 8 regions of Sistan-Balouchestan state, Iran

Sattar Enayat Avval

*Department of Biology, Genetics, Faculty of Sciences, University of Zabol, Zabol, Iran*

### ABSTRACT

*Colocynthis* is cultivated in tropical and semitropical regions. This watermelon contains therapeutic and medicinal traits, which is studied due to its importance in genetic variety of local masses of this species. In the present research, simple repetitions indicator (ab. SSR) was used. Studied sample was colocynthis of local masses in 8 regions located in Sistan-Balouchestan state which was randomly collected. Extracting DNA of each sample was performed in Cetyltrimethyl Ammonium Bromide (CTAB) method. Ten primers were designed and used in this research. Polymerase chain reaction was done by means of extracted DNA and ten primers. To analyze genetic data, we used NTSYS pc ver 2/2, Genalex 6.5 and XLSATAT software. The results confirm wide genetic variety in respective samples of colocynthis. It seems that this genetic variety is specified to Sistan-Balouchestan states and, in general, to the whole country (Iran) and Iranian plateau.

**KEY WORDS:** COLOCYNTH, GENETIC VARIETY, MOLECULAR MARKER, SSR

### INTRODUCTION

The increasing importance, position and role of therapeutic plants in stable management, particularly in wide dimensions of economic, environmental and hygienic development (medicinal self-sufficiency), employment, foods safety and genetic resources in national and universal areas is to such extent that suffice it to say that

today trend of deepening, resurrecting and also its role particularly in drug supplement is regarded as one of the developmental indexes in the country. Therefore, succeeding in this choice depends on the variety existing in the herbal population. Regarding the importance of plants in supplying 90 percent of human food demands and, on the other hand, supplying necessary proteins from farm animals, it is required to utilize advanced

#### ARTICLE INFORMATION:

\*Corresponding Author: [atoosamoradi12@gmail.com](mailto:atoosamoradi12@gmail.com)

Received 29<sup>th</sup> April, 2017

Accepted after revision 10<sup>th</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

technologies and heredity facilities in order for genetic-qualities reforming plans. Today, one of indexes of countries' development is using genetic resources in producing drugs (Arzani, 2001).

In recent years, admirable performed advances in terms of molecular biology and biotechnology provided researchers with a powerful means for genetic studies. DNA-based markers technology makes it possible to overcome plenty of problems existing in herbal plasm germ maintenance and categorization (Qare Yazdi, 1996, Majidi, 2001). Molecular markers possess a wide variety in terms of biological, biotechnological and herbal molecular functions (Kumar et al., 1999; 2009).

Other studies related to variety in universal scale based on modern cultivars and herbal innovations in United States (PIs) have been accomplished by obtained selected achievements from African countries. RAPD markers are used for estimating genetic variety in watermelon cultivars in order to collect the plan of primary genetic correlation of watermelon (Mujaju et al. 2010). Another study was done in Sudan on Citrus breed using PARD and SSR markers for molecular properties. The obtained cluster from achievements' molecular properties are divided into 4 different groups sharing a 71%-similarity coefficient (Geoda, et al. 2007).

In 2014, Qanavati assessed the morphological-molecular variety of various accumulations of Iranian colocynth (*Citrullus colocynthis* L.) by analyzing the cluster using Jacard similarity coefficient adopting UPGMA method, 15 genotypes divided into four main categories. It was observed that the highest similarity and least genetic distance between Dezful and Bandangenogypes (0/68) was in group1, and the least similarity and biggest genetic distance was between Kashan and Hendijan genotypes (0/24). The results revealed that RAPD marker is an appropriate tool for assessing genetic variety of these genotypes. A relation was observed between categorizations based on RAPD marker and genotypes' geographical dispersion.

Recently, Wang et al. (2015) assessed the genetic diversity of Thumb Masturm watermelon in China. They used two molecular markers to study polymorphism (SRAP) and simple sequence (SSR). Results contained a strong correlation between SRAP and SSR to the extent of 0/86. They showed a genetic closeness of internal/external numbers.

This research aims at assessing this matter if it is possible to determine the existence or lack of genetic variety (polymorphism) of local congestions of colocynth in the region using a particular Locus-SSR specified marker. Since *Citrullus colocynthis* is grown wide in pastures across Sistan-Balouchestan state, the objective of this research is to determine genetic diversity of this plant.

## MATERIALS AND METHODS

### MATERIALS

#### Assessing Colocynth Botany

Colocynth is a bitter-flavored fruit from cucurbitales kingdom, cucurbitaceae family and citrullus genus which is scientifically called *Citrullus colocynthis*. Its genus belongs to cucurbit family containing 118 genera and 825 species. *Citrullus* is a member of Cucurbita subcategory family, of *Benincasa* genus, subtribe *Benincasae* (Dane et al., 2007). This genus has 4 diploid types ( $2n=22$ ) cultivated in Africa, Asia and Mediterranean area (Levi et al., 2001). This plant is included in therapeutic plants and is well developed in desert areas (Imami and Ahi, 2008). A wide range of studies have been accomplished on its therapeutic and medicinal effect such as Al-Yahya et al., 1995; Faraj, 1995; Asfi, 1994; Goldfain et al., 1989; Diwan et al., 2000; Bakhiet et al., 1995; Elawad et al., 1984; Lawad et al., 1984 and Alghaithi, 2004).

### METHODOLOGY

#### Sample Collecting

Samples were collected from 8 regions in Sistan-Balouchestan province, 4 samples from each. In general, 32 samples were randomly collected. These 8 regions included Khash, Irandgan, Zahedan, Iranshahr, Kheirabad, Dust Mohammad, Bampour and Daman. Samples were gathered in terms of morphological and place-specific features which were maintained and transported in an ice tank under negative temperature after being put in plastic bags. After transporting samples to the laboratory, they were kept in  $-80^{\circ}\text{C}$  in freezer in order for extracting DNA and molecular assessments.

There are SSR molecular markers in genomes of plants like colocynth, and they are various in terms of length and size. On the other hand, they have Locus-specific and dominance advantages which can be assessed using PCR molecular technique and hypervariable polymorphism. Accordingly, in this research we used such molecular markers in order to study polymorphism in local colocynth masses.

#### Genomic DNA Extraction

To extract genomic DNA from colocynth's leaf, genomic extraction kit Fermentas(#K0512) was used. Extracting DNA from all samples was done by use of Cetyltrimethyl AmmoniumBromide (CTAB). To determine extracted DNA density and purity of the samples, we used Nanodrop device. A part of final solution was taken out to perform electrophoresis. Electrophoresis performed in next stage.

## Primer

In order to do molecular evaluations of genetic sequences diversity using SSR technique, we used primers to proliferate known microsatellite sequences of colocynth based on the sources. 10 primers were designed and bought from the company of Yekta Tajhiz Azma and the names of each of the primers were obtained from the paper of J. M. GUERRA-SANZ (doi:10.1046/j.1471-8286.2002.00200.x). Therefore, ten pairs of primers used in this research are represented in Table 1.

## Polymerase Chain Reaction (PCR)

We used polymerase chain reaction to assess molecular genetic variety in microsatellite sequences using SSR markers. Afterwards, the samples were set up and appropriate thermal cycles were determined based on primers (Table 2 and 3). Then, electrophoresis was performed with Polyacrylamide gel within the samples were run after PCR on 8% polyacrylamide gel for 2 hours and 15 minutes with the voltage of 80 to 100 (amps vary but are about 30 to 60) and were colored with ethidium bromide and were observed by Gel Doc and their images were taken (Table 2).

## Data Analysis

We scanned electrophoresed gels by means of UVDOC device and their pictures were utilized to extract data. Bands were scored in positions for each sample accord-

ing to being binary or non-binary for all markers. This way, we extracted the gel such that if there was a band marker, mark 1, and if there was nothing in that position, mark 0 was given. In next stage, data were assessed using NTSYS pc 2.2 software whose results were drawn in form of clusters or dendrogram in compliance with similarity coefficient and appropriate data algorithm.

## The genetic correlation among genotypes

In order to determine the genetic relationship between collected samples, created bands in Agarozjel was scored based on Ladder such that the place of each created band gained mark 1 and the same place in samples in which no band existed, gained mark 0. Among evaluating and marking bands, two MITOD and WSUS primers did not show polymorphism meaning that all bands in the specified area was created in all samples and the band pattern in samples was unified. Accordingly, since we could not assess and analyze the reproduced samples and, hence, genetic distance and then cluster analyses, by these primers due to lack of any sign of band (satellite-genetic) variety, bore no data and, consequently, were removed (Figures 1 and 2).

## Genetic Distance and Its Measurement

Genetic distance is used for determining similarity of lack of similarity extent of a genetic position among populations of a single or various species based on which affinity between respective items will be specified.

Table 1. Ten pairs of used primers in SSR technique

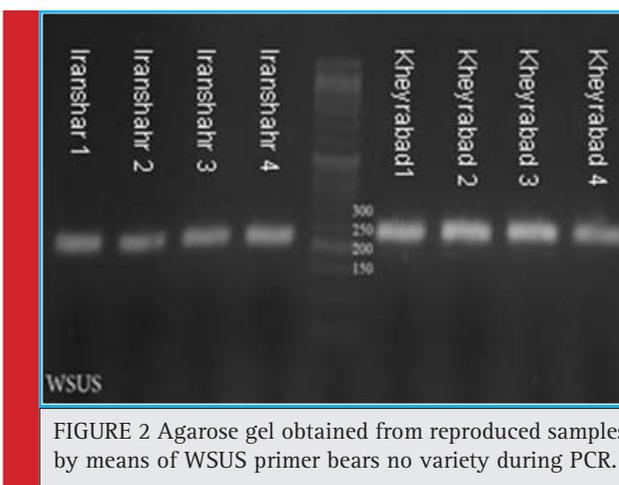
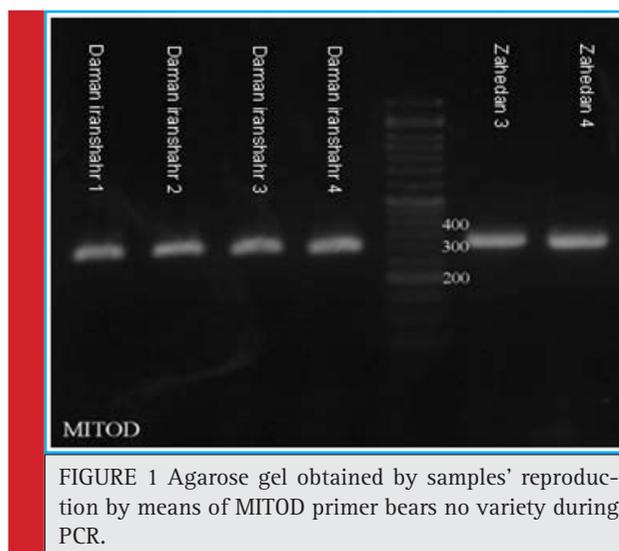
Position and sequence of the primer	Primer's name	Pair
ADPGPS-F: ACCACAACACAACACAACAC ADPGPS-R: AAGCTTTGCATTTACTTCCA	AF032471.1	1
SAT2-F: AGATTGACAACACATGCAGA SAT2-R: TTTTGCTCATCTACGAGAT	D85624.1	2
SAT3-F: TGAGAGGAAAGGAACCATAA SAT3-R: GTCTTTGCAAAGCTCAAACCT	AB006530.1	3
URF1-F: AGCAGCACCTTGTCTTGAT URF1-R: CACAGATCCCACTCAATCTT	X04130.1	4
MITODIXI-F: ATCTGTCAAGATCACGAAGG MITODIXI-R: TGGGAAATAGGAAACGTAGA	AF288042.1	5
WGA3H-F: CGATAATCGACTTCTCGAC WGA3H-R: GCTTCTTAGCATCATCAACC 2	AF074710.1	6
EST00675-F: CTCCTTTCTCTTCATTCCC EST00675-R: TGAGGAAAACGAGTTTAGA	EST00675	7
EST00667-F: ATTGACTCTGATTCTCCCG EST00667-R: GGAGGAAGATCAAAGAACC	EST00667	8
EST00507-F: CTTGTTTTCTTTTCGATGG EST00507-R: ATTAGATGGATGGTGTGACG	EST00507	9
WSUS-F: ATGAGTGAGAAAGCTTGAA WSUS-R: AATACTCCAATTGATGACGG	AB018561	10

Primer's name	Tm	Ta
WSUS	F=48.6 R=48.7	43.5
MITOD	F=48.8 R=48.5	43.5
SAT3	F= 48.5 R= 50.9	The temperature of 43 to 50 and also 55 were examined and no results were obtained.
EST507	F= 49.1 R= 48.9	44
ADPGPS	F= 47.9 R=49.3	46.2
URF1	F=48.3 R=48.6	48
EST00675	F=49.3 R=48.9	44.5
WGA3H	F=48.7 R=48.7	46.8
EST00667	F=48.9 R=49.1	43.5
SAT2	F=48.7 R=48	45

Substance	Unit
Primer	one Landa of each (unit)
purified DNA sample	one Landa(unit)
Master mix (PCR buffer)	10 Landa
Sterile twice distilled water	7 Landa

Then it is possible to genetically categorize them. As to genetic distance measurement methods for molecular markers, which perhaps produce different results, we used simple similarity, Jaccard (1908) and Dice (1945) methods which are considered to be the most common manners. Meanwhile, in Dice method, the bands produced from a common ancestor are taken into consideration. According to cophenetic coefficient, a correlation coefficient, genetic distance measurements' results were assessed and a manner matrix was used in order for cluster assessing and analyzing containing the highest cophenetic coefficient degree. Correspondingly, the best way of determining genetic distance and its respective matrix was selected. Correlation coefficients of similarity matrices obtained from each starter are represented in table 5.

Gel%	30%Acrylamide (29:1)	H2O (ml)	5 x TBE (ml )	10% APS (µl)	TEMED (µl)
8%	3.2ml	6.4	2.4	200	10



### Cluster Analysis

Cluster analysis is a multivariate statistical technique through which multiple measurements are simultaneously done based on similarity amount, samples are categorized and then similar samples are put into a single cluster. This way, in cluster analysis, items share the highest similarity and are most close to each other in terms of genetics. In present research, cluster analysis has been accomplished by NTSYSP (ver2.2) software according to UPGMA algorithm during which SM similarity coefficients, Dice and Jaccard were regarded as the comparative criteria. Each of the above-mentioned similarity coefficients was determined by means of

Table 5. correlation coefficient among starters' similarity matrixes		
the measurement method appropriate for the highest degree (r)	Cophenetic coefficient	Primer's kind
SM	0/51	EST00675
SM	0/89	EST00507
SM	0/46	EST00667
J	0/27	ADPGPS
J	0/51	WGA3H
J	0/51	URF1
SM	0/51	SAT2

Cophenetic correlation coefficient and the dendrogram of each one showing higher correlation coefficients was analyzed.

#### Total Dendrogram obtained from applying all markers

The dendrogram was obtained from respective research markers in this research after assessing collected samples of *Citrullus colocynthis* in Sistan-Balouchestan province based on similarity matrix (SM) (figure3). The dendrogram based on all markers show a genetic relation in terms of genetic positions among samples obtained from Khash, Dustmohammad, Daman, Irandegan, Kheirabad, Zahedan, Iranshahr and Bampur.

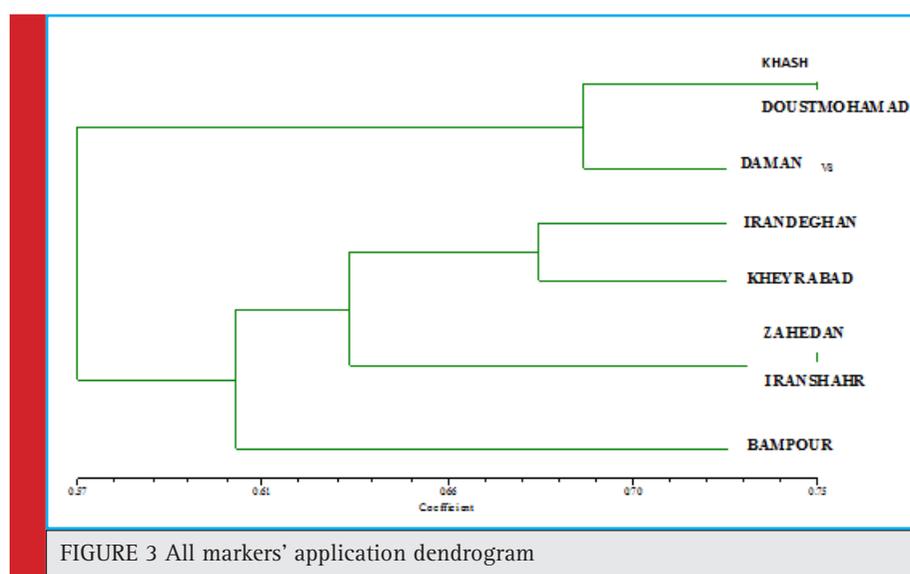
Regarding the results of respective primers' dendrogram for the samples, the probability of genetic relationship between samples in Khash and Dustmohammad is high since the similarity sequences of positions are numerous.

## DISCUSSION

Among the methods of assessing genetic variety, SSR method is most efficient. The method is a scattering marker on the genome surface based on set-light repetitive sequences which is functional in terms of assessing genetic diversity and categorizing germ-plasm congestions (Guerra Sanz, 2002). EST-SSR primers' variety in genomes of *Citrullus* species has been found in considerable amounts (Mujaju et al. 2013).

Considering the present study, local masses in Sistan-Balouchestan and, totally, in the whole country and Iranian plateau, demands more considerations in order to find and improve primers for assessing genetic diversity and introducing informative areas containing colocynth; since this way, regional considerations will be taken into account in terms of biological variety in different areas (Mujaju et al. 2010; Goda et al. 2007).

The results of this research obtained from assessing SSR marker in 32 samples collected from 8 regions in Sistan-Balouchestan province (Iran) selected randomly emphasize of the plenty of genetic diversity among local collected congestions. Since 7 out of 10 primers used in this research showed multiple shapes among respective samples, it was not possible to categorize them. Therefore, the mentioned primers were substituted for the colocynth local accumulations; their categorization is subject to more considerations applying numerous primers and improving them in order for arranging local accumulations in genetic multiple-shapes manner. This way, the findings of present research confirm the wide genetic variety of *Citrullus colocynthis* in the considered samples. It seems that this diversity is probably specified to Sistan-Balouchestan province, Iranian plateau



or totally in the whole country (Iran). In this respect, we represent some recommendations based on obtained results in the following. Low genetic diversity of watermelons was shown in some articles. For example, a very low genetic diversity was observed among 46 *Citrullus lanatus* variety *Lanatus* and 12 *Citrullus* species using RAPD marker (Levi et al., 2001b).

Researchers examined the RAPD variety in 303 species of *Citrullus* and *Praecitrullus* *Fistulosus* in different geographical regions. In that research, it was showed that a very low variety exists among *Citrullus lanatus* variety *Lanatus* in Turkey (Solmaz et al., 2010).

Want et al. (2010) evaluate the enhancement of determining specific traits of polymorphic microsatellite markers. In that study, polymorphic microsatellite markers were used for *Momordica charantia* L. in order to assess genetic diversity and population structure inside and among *Momordica charantia* and 4 other respective species (*Cucurbita pepo* L., *Luffa cylindrica* L., *Lagenaria siceraria* L. and *Curcumis sativus* L). They concluded that these markers are useful for studying population ecology and segregation among *Momordica charantia* and its respective species. Regarding this fact that this researcher used appropriate markers, he could reach good results related to genetic segregation. Evaluating genetic diversity of *Citrus* species in Sudan showed that sample collection position has no influence on species diversity. They found no morphological and molecular diversity existence among species (Geoda et al., 2002). On the contrary, in the present study, we achieved genetic diversity of colocynth in different places in Sistan-Balouchestan province.

## RECOMMENDATIONS

Considering the observed variety of each marker, and despite this fact that appropriate primers were used regarding resources, and since colocynth local accumulations have an exceptional diversity, it seems that more primers are needed to evaluate genetic diversity of the collected samples in order for categorizing and, eventually, achieving an improved primer group for genetic classification. Therefore, regarding the present diversity of *Citrullus colocynthis*, our recommendations are as follow:

- Studying in wider range based on improving present research primers,
- Accomplishing this research in the whole country (Iran),
- The necessity of proving gen bank containing germ-plasm of colocynth,
- Classifying colocynth's local accumulations based on SSR polymorphism using well-selected markers in this research and assessing other

markers in literature and their role on Iranian congestions,

- Assessing the difference influence of temperature and relative moisture on kinds of classifications based on obtained polymorphism.

## REFERENCES

- Arzani, A. 2001. Farming plants improvement(translation). Isfahan industrial university publications. 591-606.
- Qareyazi, B. 1996. Applying DNA markers in improving plants, the fourth Iranian agricultural sciences and plants improvement congress. Isfahan industrial university. 328-382.
- Majidi, M. 2001. Evaluating genetic diversity of farming and qualitative traits of various accumulations and the influence of Ethyl Methyl Sulfonate jump on sprout. MA thesis. Isfahan industrial university.
- Qanavati, Farangis, 2014. Evaluating morphologic, molecular and chemotypic diversity of various Iranian colocynth accumulations in terms of anti-cancer metabolite production amount of Elatrisin. MA thesis. Yasuj agriculture faculty.
- AlGhaithi F., ElRidi MR., Adeghate E. and Amiri MH. 2004. Biochemical effects of *Citrullus colocynthis* in normal and diabetic rats. Molecular and Cellular Biochemistry. 261(1):143-149.
- Al-Yahya M.A., AL-Farhan A.H. and Adam S.E. 2000. Preliminary toxicity study on the individual and combined effects of *Citrullus colocynthis* and *Nerium leander* in rats. Fitoterapia. 71: 385 - 391.
- Asfi I.A. 1994. Some pharmacological studies on *Citrullus colocynthis*. Journal of herbs, spices and medical plants. 2: 65-79.
- Bakhiet A.O. and Adam S.E.I. 1995. An estimation of *Citrullus colocynthis* toxicity for chicks. Vet. Hum. Toxicol. 37: 356-359.
- Dane F., Lang P, and Bakhtiyarova R. 2004. Comparative analysis of chloroplast DNA variability in wild and cultivated *Citrullus* species. Theoretical and Applied Genetics, 108(5), 958-966.
- Dane F. and Liu J. 2007. Diversity and origin of cultivated and citron type watermelon (*Citrullus lanatus*). Genetic Resources and Crop Evolution, 54(6), 1255-1265.
- Dey, S.S., Singh A. K., Chandel D. and Behera T.K. 2006. Genetic diversity of bitter gourd (*Momordica charantia* L.) genotypes revealed by RAPD markers and agronomic traits. Scientia Horticulturae. 109: 21-28.
- Diwan F.H., Abdel Hassan I.A. and Mohammed S.T. 2000. Effect of saponin on mortality and histopathological changes in mice. Eastern Mediterranean Health Journal; 6: 345 - 351.
- Elawad A.A., Abdel Bari E.M., Mahmoud O.M. and Adam S.E. 1984. The effect of *Citrullus colocynthis* on sheep. Veterinary and human toxicology, 26(6), 481-485.
- Faraj S. 1995. Haemorrhagic colitis induced by *Citrullus colocynthis*. Annals of tropical medicine and parasitology. 89(6): 695-6.

- Gichimu B.M., Owuor B.O., Mwai G.N. and Dida M.M. 2009. Morphological characterization of some wild and cultivated watermelon (*Citrullus* sp.) accession in Kenya. *ArpnJAgriBiol Sci*4: 1990-6145.
- Goda.Mashaer(Thesis), Superviseres:JensWeibull. El Tahir Ibrahim. 2007. Diversity of local genetic resources of watermelon *Citrullus lanatus* (Thunb.) Matsum and Nakai, in Sudan. 47p.
- Goldfain D., Lavergne A., Galian A., Chauveinc L. and Prudhomme F. 1989. Peculiar acute toxic colitis after ingestion of *Colocynthis*: a clinicopathological study of three cases. *Gut*. 30: 1412-1418.
- Gou D.L., Zhang J.P., Xue Y.M. and Hou X.G.2012. Isolation and characterization of 10 SSR markers of *Momordica charantia* (Cucurbitaceae). *American Journal of Botany*: e182-e183.
- Guerra-SanzJ.M.2002. *Citrullus* simple sequence repeats markers from sequence databases. *Molecular Ecology Resources*. 2 (3), 223-225.
- Kole C., Olukolu B.A., Kole R., Roa V.K., Bajpai A., Backiyarani S., Singh J., Elanchezhian R. and Abbott A.G. 2012. *Journal of Plant Science & Molecular Breeding*. HOJA. Doi: 10.7243/2050-2389-1-1.
- Levi A., Claude E.T., Keinath A.P. and Wehner T. C. 2001. Genetic diversity among watermelon (*Citrullus lanatus* and *Citrullus colocynthis*) accessions. *Genetic Resources and Crop Evolution*, 48(6), 559-566.
- Levi A., Claude E.T., Wehner T.C. and Zhang X. 2001. Low genetic diversity indicates the need to broaden the genetic base of cultivated watermelon. *HortScience*, 36(6), 1096-1101.
- Mujaju C., Sehic J. and Nybom H. 2013. Assessment of EST-SSR markers for evaluating genetic diversity in watermelon accessions from Zimbabwe. *American Journal of Plant Sciences*Vol.4.No.7; Article ID:34735,9 pages
- Mujaju C., Sehic J., Werlemark G., Garkava-Gustavsson L., Fatih M. and Nybom H. 2010. Genetic diversity in watermelon (*Citrullus lanatus*) landraces from Zimbabwe revealed by RAPD and SSR markers. *Hereditas* 147: 142-153.
- Wang S.Z., Pan L., Hu K., Chen C.Y. and Ding Y. 2010. Development and characterization of polymorphic microsatellite markers in *Momordica charantia* (Cucurbitaceae). *American Journal of Botany*: e75- e78.
- Wasfi I.A. 1994. Some pharmacological studies on *Citrullus colocynthis*. *Journal of herbs, spices and medical plants*. 2: 65-79.
- Wang, P., Li, O., Hu, J., Su, Y.2015. Comparative analysis of genetic diversity among Chinese watermelon germplasms using SSR and SRAP markers, and implications for future genetic improvement. *Turkish Journal of Agriculture and Forestry, Turk J Agric For*(2015) 39: 322-331.

## Meta-analysis of the impact of medical tourism and health tourism in the United States of America and Canada in the treatment of cancer

Farhad Hemmati<sup>1</sup>, Fatemeh Dabbaghi<sup>2</sup> and Ghahraman Mahmoudi<sup>3</sup>

<sup>1</sup>Student of Ph.D. by Research, Hospital Administration Research Center, Sari Branch, Islamic Azad University, Sari, Iran

<sup>2,3</sup>Associate Professor of Hospital Administration Research Center, Sari Branch, Islamic Azad University, Sari, Iran

### ABSTRACT

Canadians may be seeking treatment outside their borders, but an even greater number of foreigners are taking advantage of medical tourism in Canada for surgery, medical procedures, and treatments. The largest influx of health tourists is from the nearby US, but patients from Europe and Latin America are also traveling to the Great White North for world-class care, lower costs, and the opportunity to recuperate in the glorious natural landscape or modern urban centers of Canada. Americans have the advantage in traveling to Canada in that if their treatment takes less than 180 days, they won't even need a visa. Care in Canada is equal to or superior to that in the US. For example: There are 20% more nurses and 10% more hospital beds per 1000 population in Canada. Canada's in-hospital mortality rate is 33% lower. Canada has lower mortality rates for senior patients (age 65+). Overall surgical satisfaction rates are comparable between the two countries. Canadian patients have higher survival rates for things like liver or kidney transplants, colorectal cancer, and childhood leukemia. When it comes to medical costs, Canada is far ahead of the US with patients saving 30-60% of the costs. An average hospital stay in the US is \$20,673 compared to \$10,373 in Canada. Specialized treatments like coronary bypass can be as much as 80% higher in the US. Additionally, prescriptions and other medicines are significantly cheaper in Canada.

**KEY WORDS:** MEDICAL TOURISM, HEALTH TOURISM, CANADA, UNITED STATES, CANCER TREATMENT

### ARTICLE INFORMATION:

\*Corresponding Author: [F\\_dabbaghi@yahoo.com](mailto:F_dabbaghi@yahoo.com)

Received 27<sup>th</sup> April, 2017

Accepted after revision 20<sup>th</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

Cancer is a group of diseases involving abnormal cell growth with the potential to invade or spread to other parts of the body. ("Cancer Fact sheet N°297". 2014) ("Defining Cancer".2014) Not all tumors are cancerous; benign tumors do not spread to other parts of the body. Possible signs and symptoms include a lump, abnormal bleeding, prolonged cough, unexplained weight loss and a change in bowel movements. While these symptoms may indicate cancer, they may have other causes. ("Cancer - Signs and symptoms". 2014. ) Over 100 types of cancers affect humans. ("Defining Cancer".2014)

Tobacco use is the cause of about 22% of cancer deaths. (Cancer Fact sheet N°297. 2014). Another 10% is due to obesity, poor diet, lack of physical activity, and excessive drinking of alcohol. (Obesity and Cancer Risk".2015, Jayasekara et al., (2016)). Other factors include certain infections, exposure to ionizing radiation and environmental pollutants. (Anand et al. 2014). In the developing world nearly 20% of cancers are due to infections such as hepatitis B, hepatitis C and human papillomavirus infection. These factors act, at least partly, by changing the genes of a cell. Typically many genetic changes are required before cancer develops (World Cancer Report 2014).Approximately 5–10% of cancers are due to inherited genetic defects from a person's parents ("Hereditry and Cancer".2013). Cancer can be detected by certain signs and symptoms or screening tests. It is then typically further investigated by medical imaging and confirmed by biopsy ("How is cancer diagnosed?".2014)

Many cancers can be prevented by not smoking, maintaining a healthy weight, not drinking too much alcohol, eating plenty of vegetables, fruits and whole grains, vaccination against certain infectious diseases, not eating too much processed and red meat, and avoiding too much sunlight exposure (Kushi et al., 2012). (Parkin et al., 2011). Early detection through screening is useful for cervical and colorectal cancer. The benefits of screening in breast cancer are controversial (World Cancer Report 2014). Gøtzsche and Jørgensen (2013). Cancer is often treated with some combination of radiation therapy, surgery, chemotherapy, and targeted therapy. (Targeted Cancer Therapies". 2014). Pain and symptom management are an important part of care. Palliative care is particularly important in people with advanced disease. The chance of survival depends on the type of cancer and extent of disease at the start of treatment (World Cancer Report 2014). In children under 15 at diagnosis the five-year survival rate in the developed world is on average 80%. For cancer in the United States the average five-year survival rate is 66%. ("SEER Stat Fact Sheets: All Cancer Sites". 2014)

In 2015 about 90.5 million people had cancer. (GBD 2015) Disease and Injury Incidence and Prevalence, Collaborators. (8 October 2016). About 14.1 million new cases occur a year (not including skin cancer other than melanoma). (World Cancer Report 2014). It caused about 8.8 million deaths (15.7%) of human deaths. (GBD 2015 Mortality and Causes of Death, Collaborators, 2016). The most common types of cancer in males are lung cancer, prostate cancer, colorectal cancer and stomach cancer. In females, the most common types are breast cancer, colorectal cancer, lung cancer and cervical cancer. If skin cancer other than melanoma were included in total new cancers each year it would account for around 40% of cases. Dubas and Ingraffea (2013). Cakir et al., (2012).

In children, acute lymphoblastic leukemia and brain tumors are most common except in Africa where non-Hodgkin lymphoma occurs more often. (World Cancer Report 2014). In 2012, about 165,000 children under 15 years of age were diagnosed with cancer. The risk of cancer increases significantly with age and many cancers occur more commonly in developed countries. Rates are increasing as more people live to an old age and as lifestyle changes occur in the developing world. (Jemal et al., 2011). The financial costs of cancer were estimated at \$1.16 trillion USD per year as of 2010 (World Cancer Report 2014).

## MEDICAL TOURISM

Medical tourism refers to people traveling to a country other than their own to obtain medical treatment. In the past this usually referred to those who traveled from less-developed countries to major medical centers in highly developed countries for treatment unavailable at home. However, in recent years it may equally refer to those from developed countries who travel to developing countries for lower priced medical treatments. The motivation may be also for medical services unavailable or illegal in the home country (Horowitz, et al., 2007). "Medical tourism--health care in the global economy". 2012). Medical tourism most often is for surgeries (cosmetic or otherwise) or similar treatments, though people also travel for dental tourism or fertility tourism. People with rare conditions may travel to countries where the treatment is better understood. However, almost all types of health care are available, including psychiatry, alternative medicine, convalescent care, and even burial services (Paul McFedries, 2006). Medical tourists are subject to a number of risks, such as deep vein thrombosis from air travel or poor post-operative care. Health tourism is a wider term for travel that focus on medical treatments and the use of healthcare services. It covers a wide field of health-oriented, tourism ranging from

preventive and health-conductive treatment to rehabilitational and curative forms of travel. Wellness tourism is a related field ("History of Medical Tourism".2015)

## MATERIALS AND METHODS

Cancer remains a crisis in the U.S. in terms of both prevalence and cost. It is the second leading cause of death in the United States accounting for one out of every four deaths. The amount spent treating cancer is staggering. According to a study published in the journal *Cancer*, the cost of treatment with a newer cancer medication may reach over \$100,000 per year for each patient. (Bruce Einhorn, "Outsourcing the Patients", 2008).

Costs of cancer medication are much higher in the U.S. versus other western nations with a similar GDP. The median monthly price of branded cancer drugs, which are still patent-protected, was \$8,700 in the U.S., per a recent study, compared to \$2,600 in the U.K. and \$2,700 in Australia. Pharmaceutical companies seem to exploit the U.S. free market system, where drugs are priced based on supply and demand, to compensate for the lower prices negotiated by other countries. Thus, while the U.S. accounts for just 5 percent of the world's population, we are stuck with 50 to 70 percent of the globe's drug profitability (Greg Lindsay, "Medical Leave" Fast Company, 2008).

As health insurance plans move towards a model where patients pay a larger share of expenses – through deductibles or co-insurance – patients are increasingly responsible for covering enormous medication bills. Many in the medical community are concerned this "financial toxicity" could impede treatment progress for patients. In fact, a study found 32 percent of recently diagnosed cancer patients reported a change in prescription drug use due to financial concerns. While some lower-cost alternatives may be effective, some may be far less efficacious or have a much less attractive side effect profile ("IMTJ MEDICAL TRAVEL AWARDS 2014").

Solutions to stem the rising costs of cancer medication involve taking a hard look at current treatment protocols to see both where it makes sense to economize and how we can drive efficacy to improve outcomes and length of treatment. For example, \$3 billion per year is spent on discarded cancer medications because they are distributed in vials containing holding too much for most patients. Because of safety concerns, healthcare practices dispose of any leftover medication from these vials. While the same medications may be available in smaller quantities in other countries, there has not been a significant enough backlash in the U.S. to convince drug makers to offer different sized vials here. Some in the medical field are advocating for pricing based on

the value of a medication. If a new cancer drug is effective, for instance, drug companies would be allowed to charge more.

Precision-based medicine can deliver better outcomes within a shorter timeframe – resulting in lower costs – while improving the patient experience. By targeting the specific genetic abnormalities causing cancer, precision medicine is able to diagnose and treat with much greater accuracy. As cancer patients receive targeted medication within days of diagnosis, they are more likely to be able to forego the more toxic treatments (e.g. chemotherapy and radiation) resulting in hospitalization, intravenous lines, complications of those, steroids and other medication to lessen side effects, and nursing, saving money and significantly improving experiences. For example, a report by Price Waterhouse Cooper indicates a genetic test on breast cancer patients could save an estimated \$1,900 per patient because it can reduce chemotherapy use between 20 and 35 percent. Increased diagnostic accuracy for cancer screenings will also reduce the costs and morbidity associated with false positive tests. Precision technology will expedite the identification of several types of cancer, assessing the lowest minimum treatment required to provide a high-quality of life for those affected and save the healthcare system billions of dollars. The goal is to provide the best possible outcomes with less financial stress on the patient (Medical tourism in SA".2009).

### Cancer Screening and Medical Tourism

Colorectal cancer screening is important for prevention and early detection, and contributes to better prognosis and longer survival. While screening rates have generally increased in the United States, they have remained disproportionately low in some minority and immigrant populations. Recent evidence suggests that in some cases, these rates may be low because of medical tourism, where individuals return to their home country to receive preventive care. To assess the impact of medical tourism on colorectal cancer screening, Dr. Linda Ko and colleagues in the Public Health Sciences Division, Dr. John Inadomi at the University of Washington, and their community partners including Dr. Eun-Jeong Lee from the National Asian Pacific Center on Aging, surveyed Korean Americans for their screening history. As recently reported in *BMC Cancer*, the authors found that participants who engaged in medical tourism were significantly more likely to be up-to-date for their colorectal cancer screening (Gutmann, 2011).

Korean Americans comprise the fourth largest Asian group in Washington state, the majority of whom live in the Seattle metropolitan area. Colorectal cancer is the most commonly diagnosed cancer among Korean Americans, which may be partly due to low screening rates.

Said lead author Dr. Ko, “the anecdotal evidence from people around us suggested medical tourism might be a factor, and we said, let’s measure it to see the extent of people’s engagement in medical tourism.” (“Transplant Tourists Unwitting Beneficiaries of Prisoner Organ Harvest”, 2013).

To evaluate the prevalence of medical tourism in this group, the authors conducted a cross-sectional, observational survey of 193 Korean Americans in 2013. Participants answered questions regarding whether they were up-to-date on their colorectal cancer screening, which meant either a stool test within the last year or a colonoscopy within ten years. Participants also reported on their history of medical tourism, socio-demographic characteristics, health factors, acculturation, knowledge of colorectal cancer screening tests, and worries about the costs of health care (Doctors Against Forced Organ Harvesting, 2014).

All of the study participants reported being born outside of the U.S., but had lived in the U.S. for an average of 23 years. The average age of immigration was 39 years old, and most reported that they did not speak English well (72%). One third of the participants reported traveling outside of the U.S. for medical care, mostly to South Korea, an average of 2.5 times over the previous 5 years. Only 57% of the participants were up-to-date on their colorectal cancer screening, with nearly all reporting colonoscopy as their screening test. Said Ko, “what surprised us was the high percentage of Korean Americans who engaged in medical tourism; about half of those who have gotten screened for colorectal cancer have done so outside of the U.S.” In fact, medical tourism was the only significant predictor of colorectal cancer screening, with participants who engaged in medical tourism having nearly 9-fold greater odds of being up-to-date compared to those who did not travel for healthcare (“Why China will struggle to end organ harvesting from executed prisoners”, 2014).

One potential explanation for the high level of medical tourism is the relative costs of healthcare services in the U.S. versus other countries. For example, the cost of a colonoscopy in South Korea is only 2.3% of the cost in the U.S. – or approximately \$130-200. Half of the participants reported being worried about medical costs for general care (51%) or serious illness (62%), and patients without insurance were more likely to engage in medical tourism (41%) than those who had insurance (29%). Said Ko, “we were able to document that the rising healthcare cost in the U.S. is driving people to get healthcare outside of the U.S., and this can ultimately impact how people receive coordinated cancer care.” Also contributing has been a rise in South Korean hospitals partnering with Korean travel agencies in the U.S. to promote medical tourism as part of vacation packages

(“Forum on China’s State-Sanctioned Forced Organ Harvesting Held in UK Parliament”, 2014; Khampang, 2013; “Medical Tourism in Thailand: When Treatment Costs and Starbucks Clash”, 2015).

Understanding medical tourism will become increasingly important as the global medical landscape continues to change, and the authors plan to evaluate this trend further. Said Ko, “we are curious to see whether medical tourism is also practiced among other immigrant populations. Again, we have anecdotal evidence that immigrant population other than Korean Americans engage in medical tourism, but would be interesting to measure that as well. In addition, we are curious to see how engaging in medical tourism affects continuity of cancer care in the U.S., especially when the screening results are positive and how having received cancer screening outside of the U.S. affects communication with the U.S. oncologist. Lastly, it would be important to work with healthcare providers in the US to raise awareness that many Korean American patients may be engaging in medical tourism and following cancer screening guidelines that may be different from the US. Communication with these patients will be critical to avoid mistrust with the US medical system.”(Mellor and William, 2014; Ko et al., 2016).

#### Medical tourism in the US and Canada

Delays for medical interventions such as hip and knee replacements, spinal surgery, and ophthalmologic procedures are a serious problem in the US. Federal and provincial governments are struggling to shorten waiting lists and provide timely care. Patients often wait months to obtain appointments with specialists, undergo diagnostic tests, and receive treatment. Lack of access to family physicians can make obtaining care particularly difficult. Recognizing that many Americans are unable to obtain prompt treatment, medical tourism companies promote travel to medical facilities in other countries (Eggertson 2006) Customers of these companies can purchase anything from cosmetic procedures and diagnostic examinations to kidney transplants, in vitro fertilization, cancer therapies, and orthopedic procedures. The cost of medical tourism packages varies greatly. Prices depend on the procedures clients select, where they travel, how long they intend to stay, and whether they choose post-operative accommodations in budget hotels or luxury resorts.

At least 15 medical tourism companies operate in Canada. One such company is located in Alberta, 1 is located in Manitoba, 7 are located in British Columbia, 3 in Ontario, and 3 in Quebec. This list does not include more traditional travel agencies advertising medical tourism packages: a Vancouver-based travel agency arranges trips to Bumrungrad International Hospital

in Bangkok, Thailand; a Quebec travel agency markets travel to hospitals and clinics in India. Canadian medical tourism companies send their clients to such countries as Argentina, Brazil, China, Costa Rica, Cuba, France, Germany, India, Malaysia, Mexico, Pakistan, Poland, Russia, Singapore, South Africa, Sri Lanka, Thailand, Tunisia, Turkey, the United Arab Emirates, and the United States. Some companies send their clients to a single medical facility in a particular country, while others advertise a choice of destinations.

The health care travel packages typically include air and ground transportation, travel visas, hotel accommodations, assistance from a local company representative in the destination country, transfer of medical records to treating physicians, and negotiated rates for whatever medical procedures clients decide to purchase. Wealthy Canadians have always had the option of traveling outside Canada for treatment. (Johnston C. 1996; Katz SJ, Cardiff K, Pascali M, Barer ML, Evans RG. 2002; Korcok M. 1997). Medical tourism companies “democratize” the international health care option. Recent news media coverage tracked the journeys of a chaplain who sought cancer treatment in the state of New York, a high school biology teacher who traveled to India for treatment, and a cab driver who visited Belgrade for surgery (Alcoba N, Patrick K. 2007; Priest L. 2007; Priest L. 2007).

With some treatments unavailable in Canada and other medical interventions available only after long delays, medical tourism companies use problems with Canada’s provincial health care systems to promote out-of-country health care. Though few Canadians can afford the high price of care at US medical centres, the international facilities offer less expensive access to private health care. The number of medical tourism companies in Canada is growing. At present, however, these businesses are relatively small, have few employees, and appear to have a limited client base. As these companies become better known, standardize their operations, and benefit from considerable media coverage, it is possible that more Canadians will travel to other countries for treatment. Interest in the medical tourism option will likely decline if Canadians gain improved local access to elective surgical procedures, such as hip and knee replacements. If waiting lists persist or lengthen, however, medical tourism companies might succeed in “outsourcing” treatment for more Canadians seeking immediate care.

#### Advocates of medical tourism

Supporters of international health-related travel argue that medical tourism promotes patient choice, gives consumers access to treatment alternatives not found in their local communities, permits expedited access to care, fosters global competition, and puts pressure on more expensive health care facilities to lower their prices. As

well, say advocates, the practice promotes economic and social development by building health care economies in developing societies. Within the United States, advocates of medical tourism characterize travel to such places as India and Thailand as a safety net for uninsured and underinsured Americans who cannot afford to purchase expensive medical procedures at local hospitals (Roth M. 1992). Many American companies have out-of-country travel options in their health insurance plans (Canales M, Kasiske B, Rosenberg M. 2006). West Virginia is considering legislation that will provide financial incentives to state employees willing to travel outside the United States for health care (Yi D. 2006; Anderson J. 2007) In Canada, supporters of medical tourism argue that the practice promotes improved access to care for patients able to pay for treatment and helps citizens who cannot afford to travel abroad by shortening waiting lists at home. Proponents of medical tourism note that internationally accredited health care facilities are located around the world. Supporters emphasize the high quality of care at private hospitals and clinics in Asia, the Caribbean, Eastern Europe, and South America.

#### Critical perspectives

Critics of medical tourism have several powerful arguments on their side. Medical tourism raises concerns about health equity. Wealthy citizens can afford to buy immediate access to care, while poorer citizens wait in queues. Quality of care is a serious concern. Though medical tourism companies typically broker arrangements through internationally accredited hospitals, quality of health care around the world is variable. Some Canadian patients who travel abroad for care will likely receive excellent treatment. Other patients will be at increased risk of receiving substandard care. The modest body of scholarship on patients traveling to China, India, and Pakistan for organ transplants suggests that commercial out-of-country transplantation substantially increases morbidity and mortality rates (Kennedy S, Shen Y, Charlesworth J, Mackie J, Mahony J, Kelly J, et al. 2005; Prasad GV, Shukla A, Huang M, D’A Honey RJ, Zaltzman JS. 2006; “New DVT Guidelines: No Evidence to Support “Economy Class Syndrome”; 2012) Quality of care and patient safety could be serious concerns with other medical procedures.

Continuity of care is another problem associated with medical tourism. Within Canada, family physicians ideally interact with specialists and remain involved in patient care throughout the course of treatment. Continuity of care is likely to be disrupted when patients travel to other countries for treatment. Some medical tourism companies link family physicians to specialists in the countries where care is to be provided. In other cases, patients travel for hip and knee replacements,

kidney transplants, cataract surgery, and other procedures, and return to their family physicians with no documentation concerning the care they received outside Canada. The task of the family physician is made far more difficult when continuity of care is disrupted and patients offer little information about the treatments they received outside Canada (“Caring for Your Incision After Surgery”, 2013)

Legislation, professional codes, and institutional policies place strict legal and ethical duties upon Canadian physicians to disclose risks, benefits, treatment alternatives, and the consequences of not receiving medical care. Physicians in other countries are, of course, not bound by Canadian law. It is possible that Canadian patients will not be fully informed of risks and benefits when they arrange medical care outside Canada. Family physicians might sometimes find themselves providing postoperative care to patients who overestimated benefits and underestimated risks associated with treatment outside Canada (“Compliments, Comments, 2015)

Finally, Canadian physicians are governed by laws containing standards for determination of negligence and medical malpractice. Canadian courts provide a forum where patients can seek legal redress if they are harmed while receiving care. Patients who leave Canada and receive negligent medical care might find they cannot obtain legal remedies in the countries where they obtained treatment. Furthermore, the medical tourism companies that arrange out-of-country care insist that patients sign waivers of liability. These documents state that medical tourism agencies have no legal obligations if patients are harmed while receiving care at destination sites. Companies will presumably try to use these documents to shield themselves from litigation if their clients are harmed while receiving care outside Canada (“World Alliance for Patient Safety”. 2011; Ginger Rough, 2009).

## CONFLICTS OF INTERESTS

There is no conflict of interest between the authors of this review meta-analysis research.

## CONCLUSION

Travel for treatment outside might remain a minor, idiosyncratic option for Canadian patients. Many patients will not want to leave their family members and other loved ones to receive a hip replacement in India, for example. Furthermore, some patients will prefer the frustration of waiting for treatment over whatever risk they associate with traveling abroad for care. It is also possible, however, that avoiding treatment delays by leaving Canada for care will become increasingly common. If medical tourism companies expand their clientele, fam-

ily physicians will find themselves treating increasing numbers of patients willing to leave Canada for medical care. Family physicians will have to decide whether they should mention this option when patients face lengthy waits for treatment. They will have to consider to what extent they should help their patients explore risks and benefits associated with traveling elsewhere for care. If international health-related travel remains a marginal phenomenon, few family physicians will have to face such questions. Some Canadian patients, however, are becoming decidedly impatient. Tired of waiting for treatment, afraid of the suffering they will have to endure if they do not receive the therapies they require, or concerned about the harm they might experience by failing to receive health care in a timely fashion, they are willing to pay for prompt access to care. Therefore, it is possible that family physicians might soon find themselves encountering increasing numbers of patients contemplating traveling abroad for care.

## REFERENCES

- Alcoba N, Patrick K. Ontario agrees to pay \$52,000 Cancer bill. *National Post*. 2007. Jan 31, Sect. A:13.
- Anand P, Kunnumakkara AB, Kunnumakara AB, Sundaram C, Harikumar KB, Tharakan ST, Lai OS, Sung B, Aggarwal BB (September 2008). “Cancer is a preventable disease that requires major lifestyle changes”. *Pharmaceutical Research*. 25 (9): 2097–116. PMC 2515569. PMID 18626751. doi:10.1007/s11095-008-9661-9.
- Anderson J. Hospitals oppose ‘medical tourism’ bill. *Charleston Daily Mail*. 2007 Feb 16
- Appleby J, Schmit J. Sending patients packing. *USA Today*. 2006. Aug 9. Accessed 2007 Aug 27 Available from: [www.usatoday.com/money/industries/health/2006-07-26-travel-surgery-usat\\_x.htm](http://www.usatoday.com/money/industries/health/2006-07-26-travel-surgery-usat_x.htm).
- Bruce Einhorn, “Outsourcing the Patients”, *BusinessWeek*, March 13, 2008
- Cakir BÖ, Adamson P, Cingi C (November 2012). “Epidemiology and economic burden of nonmelanoma skin cancer”. *Facial Plastic Surgery Clinics of North America*. 20 (4): 419–22. PMID 23084294. doi:10.1016/j.fsc.2012.07.004.
- Canales M, Kasiske B, Rosenberg M. Transplant tourism: outcomes of United States residents who undergo kidney transplantation overseas. *Transplantation*. 2006;82:1658–61. [PubMed]
- Cancer Fact sheet N°297. World Health Organization. February 2014. Retrieved 10 June 2014.
- Caring for Your Incision After Surgery”, *FamilyDoctor.org*, American Academy of Family Physicians, December, 2010. Retrieved July 23, 2013.
- Compliments, Comments, Concerns or Complaints” (PDF). *The Pennine Acute Hospitals*. Retrieved 2015-01-01.” *Cancer - Signs and symptoms*. NHS Choices. Retrieved 10 June 2014.

- Defining Cancer". National Cancer Institute. Retrieved 10 June 2014.
- Doctors Against Forced Organ Harvesting (5 Dec. 2014) "World should be skeptical of China's announcement to end organ harvesting from executed prisoners by January 1, 2015", PR Newswire,
- Dubas LE, Ingraffea A (February 2013). "Nonmelanoma skin cancer". *Facial Plastic Surgery Clinics of North America*. 21 (1): 43–53. PMID 23369588. doi:10.1016/j.fsc.2012.10.003.
- Eggertson L. Wait-list weary Canadians seek treatment abroad. *CMAJ*. 2006;174:1247. [PMC free article] [PubMed]
- Ethan Gutmann (10 March 2011) "How many harvested?" revisited eastofethan.com
- Fars News Agency :: Ahmadijad Stresses Iran's Growing Medical Tourism Industry". *English.farsnews.com*. 2012-01-17. Retrieved 2012-02-05.
- Forum on China's State-Sanctioned Forced Organ Harvesting Held in UK Parliament", *clearwisdom.net*, 2 December 2014
- GBD 2015 Disease and Injury Incidence and Prevalence, Collaborators. (8 October 2016). "Global, regional, and national incidence, prevalence, and years lived with disability for 310 diseases and injuries, 1990–2015: a systematic analysis for the Global Burden of Disease Study 2015.". *Lancet*. 388 (10053): 1545–1602. PMC 5055577. PMID 27733282. doi:10.1016/S0140-6736(16)31678-6.
- GBD 2015 Mortality and Causes of Death, Collaborators. (8 October 2016). "Global, regional, and national life expectancy, all-cause mortality, and cause-specific mortality for 249 causes of death, 1980–2015: a systematic analysis for the Global Burden of Disease Study 2015.". *Lancet*. 388 (10053): 1459–1544. PMID 27733281. doi:10.1016/s0140-6736(16)31012-1.
- Ginger Rough (June 7, 2009). "Globe-trotting to cut down on medical costs". *The Arizona Republic*
- Gøtzsche PC, Jørgensen KJ (June 2013). "Screening for breast cancer with mammography". *The Cochrane Database of Systematic Reviews*. 6 (6): CD001877. PMID 23737396. doi:10.1002/14651858.CD001877.pub5.
- Greg Lindsay,"Medical Leave" *Fast Company*, May 2008. Retrieved October 15, 2008.
- health tourists coming to Iran for medical treatment". *Irna.ir*. Retrieved 2017-01-08.
- Heredity and Cancer". *American Cancer Society*. Retrieved July 22, 2013.
- History of Medical Tourism". *Discovermedicaltourism.com*. *Discovermedicaltourism.com*. Retrieved 2015-11-03.
- Horowitz, Michael D.; Rosensweig, Jeffrey A.; Jones, Christopher A. (2007). "Medical Tourism: Globalization of the Healthcare Marketplace". *MedGenMed*. 9: 33. PMC 2234298 PMID 18311383.
- How is cancer diagnosed?". *American Cancer Society*. 2013-01-29. Retrieved 10 June 2014.
- IMTJ MEDICAL TRAVEL AWARDS 2014". Retrieved 2014-04-25.
- Jayasekara H, MacInnis RJ, Room R, English DR (2016). "Long-Term Alcohol Consumption and Breast, Upper Aero-Digestive Tract and Colorectal Cancer Risk: A Systematic Review and Meta-Analysis". *Alcohol Alcohol*. 51 (3): 315–30. PMID 26400678. doi:10.1093/alcalc/agv110. CS1 maint: Uses authors parameter (link)
- Jemal A, Bray F, Center MM, Ferlay J, Ward E, Forman D (February 2011). "Global cancer statistics". *Ca*. 61 (2): 69–90. PMID 21296855. doi:10.3322/caac.20107.
- Johnston C. US ad uses lure of prompt treatment to entice Canadians needing joint replacement. *CMAJ*. 1996;154:1071–2. [PMC free article] [PubMed]
- Katz SJ, Cardiff K, Pascali M, Barer ML, Evans RG. Phantoms in the snow: Canadians' use of health care services in the United States. *Health Aff (Millwood)* 2002;21:19–31. [PubMed]
- Kennedy S, Shen Y, Charlesworth J, Mackie J, Mahony J, Kelly J, et al. Outcome of overseas commercial kidney transplantation: an Australian perspective. *Med J Aust*. 2005;182:224–7. [PubMed]
- Ko LK, Taylor VM, Yoon J, Copeland WK, Hwang JH, Lee EJ, Inadomi J. 2016. The impact of medical tourism on colorectal screening among Korean Americans: A community-based cross-sectional study. *BMC Cancer*. 16(1):931.
- Korcok M. Excess demand meets excess supply as referral companies link Canadian patients, US hospitals. *CMAJ*. 1997;157:767–70. [PMC free article] [PubMed]
- Kushi LH, Doyle C, McCullough M, Rock CL, Demark-Wahnefried W, Bandera EV, Gapstur S, Patel AV, Andrews K, Gansler T (2012). "American Cancer Society Guidelines on nutrition and physical activity for cancer prevention: reducing the risk of cancer with healthy food choices and physical activity". *Ca*. 62 (1): 30–67. PMID 22237782. doi:10.3322/caac.20140.
- Medical tourism in SA". *Mediaclubsouthafrica.com*. 2009-08-06. Retrieved 2011-10-29.
- Medical Tourism in Thailand: When Treatment Costs and Starbucks Clash". *Medical Tourism Magazine*. 2015-10-13. Retrieved 14 October 2015.
- Medical tourism--health care in the global economy" (PDF). *Physician Exec*. Retrieved 16 September 2012.
- Mellor, William (19 November 2014). "Medical Tourists Flock to Thailand Spurring Post-Coup Economy". *Bloomberg*. Retrieved 19 February 2015.
- New DVT Guidelines: No Evidence to Support "Economy Class Syndrome"; Oral Contraceptives, Sitting in a Window Seat, Advanced Age, and Pregnancy Increase DVT Risk in Long-distance Travelers". *American College of Chest Physicians*. 7 February 2012. Retrieved 10 February 2012.
- Obesity and Cancer Risk". *National Cancer Institute*. January 3, 2012. Retrieved 4 July 2015.
- Parkin DM, Boyd L, Walker LC (December 2011). "16. The fraction of cancer attributable to lifestyle and environmental factors in the UK in 2010". *British Journal of Cancer*. 105 Suppl 2: S77–81. PMC 3252065. PMID 22158327. doi:10.1038/bjc.2011.489.

- Paul McFedries (2006-05-17). "fertility tourism". Word Spy. Retrieved 2011-10-29.
- Prasad GV, Shukla A, Huang M, D'A Honey RJ, Zaltzman JS. Outcomes of commercial renal transplantation: a Canadian experience. *Transplantation*. 2006;82:1130-5. [PubMed]
- Priest L. Long wait forces cancer patient to buy operation in land he fled. *The Globe and Mail*. 2007. Jan 31, Sect. A:1.
- Priest L. Panel orders Ontario to pay for hip surgery. *The Globe and Mail*. 2007. Feb 3, Sect. A:6.
- R Khampang (2013). "Health Biotechnologies in Thailand: Redefining Policy Directions". *Journal of Translational Medicine*. 11 (1): 1. PMC 3564822. PMID 23281771. doi:10.1186/1479-5876-11-1.
- Roth M. Surgery abroad an option for those with minimal health coverage. *Pittsburgh Post-Gazette*. 2006. Sept 10. [Accessed 2007 Aug 28]. Available from: [www.post-gazette.com/pg/06253/719928-37.stm](http://www.post-gazette.com/pg/06253/719928-37.stm).
- SEER Stat Fact Sheets: All Cancer Sites". National Cancer Institute. Retrieved 18 June 2014.
- Targeted Cancer Therapies". NCI. 2014-04-25. Retrieved 11 June 2014.
- Transplant Tourists Unwitting Beneficiaries of Prisoner Organ Harvest", *Voices In Bioethics*, 15 October 2013
- Why China will struggle to end organ harvesting from executed prisoners", *CNN*, 5 Dec. 2014
- World Alliance for Patient Safety". *Who.int*. 2010-05-05. Retrieved 2011-10-29.
- World Cancer Report 2014. World Health Organization. 2014. pp. Chapter 1.1. ISBN 9283204298.
- World Cancer Report 2014. World Health Organization. 2014. pp. Chapter 4.7. ISBN 9283204298.
- World Cancer Report 2014. World Health Organization. 2014. pp. Chapter 1.3. ISBN 9283204298.
- World Cancer Report 2014. World Health Organization. 2014. pp. Chapter 6.7. ISBN 9283204298.
- Yi D. Overseas surgery a clamp on costs. *Los Angeles Times*. 2006. Jul 30, Sect. A:1.

## Water quality index of Karaj dam with regard to providing solutions for surface water management

Maryam Mazhari<sup>1</sup>, Nooshin Sajjadi<sup>2\*</sup> and Saeed Malmasi<sup>3</sup>

<sup>1</sup>M. Sc. Environment Management, Technical & Engineering Faculty, Islamic Azad University, North Tehran Branch, Tehran, Iran

<sup>2,3</sup>Department of Environment, Technical & Engineering Faculty, Islamic Azad University, North Tehran Branch, Tehran, Iran

### ABSTRACT

Amir Kabir Dam (Karaj Dam), has been investigated for the water quality of the output based on the National Health Foundation (NSFWQI) and (WQI). Beginning of the locations of River Karaj Dam Vabgyr Bylqan were studied. During the field visit to the study area in terms of the type of user, location of health privacy (in terms of determining the coordinates and the coordinates of space and privacy protection) sampling locations were determined. The analysis of 4 stations were completed with regard to coverage of Karaj River and its water quality conditions were determined. Karaj Dams water entering the first station, the second station output setting of the Karaj Dam, the third stop of water entering the pond Bylqan and the fourth station Bylqan pond water outlet of the water pathway of Karaj in Tehran were selected for studies before and after treatments. Sampling was done to determine the qualitative parameters of curves and tables by the National Institutes of Health quality indicators America (NSF-WQI). Based on the results of water quality index of 93 has been found to be the lowest of all the stations studied. In this study we present the indicators and parameters and effective system of monitoring which includes many types of stations and their locations, frequency of sampling and sampled instruments, along with suggestions of management strategies to improve quality of water resources and their use for particular purposes.

**KEY WORDS:** WATER QUALITY INDEX, KARAJ DAM, MONITORING OF WATER RESOURCES, WATER QUALITY PARAMETERS, EMP TECHNIQUE

### ARTICLE INFORMATION:

\*Corresponding Author:

Received 2<sup>nd</sup> April, 2017

Accepted after revision 12<sup>th</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

Adequate and good quality water is essential for human survival. Health promotion and protection of the environment depends on providing clean water. Human civilization has always been critical of the rivers, the lakes or natural springs, which have been disturbed by human settlements. To prevent from many water borne diseases such as diarrhea, cholera, typhoid and para-typhoid, infectious hepatitis and amoebic and bacillary dysentery, clean water and sanitation is very important. As long as the biological sciences, chemistry and medicine were undeveloped and procedures for determining water quality and its effects on human health invention were not effective, earlier workers only through the physical senses such as sight, taste and smell water quality carried out the assessment. Supply of clean water

and health of biological, physical and chemical, today is one of the most important humanitarian challenges, particularly in densely populated communities, (Khani and Yaghmaeian 2010).

Since the issue of water as one of the infrastructure of the pillars of development in all areas, always among one of the first indicators of development are evaluated, noteworthy in this regard, according to available water resources and management in the area. The rapid growth of urbanization in Iran prevented the necessary measures for the protection of the urban environment in general and specifically the country's water resources. This has been particularly weak in the area of contamination of surface and ground water resources is obvious and scale of the risks of each day becomes more widespread. Monitoring and evaluation of water resources can be considered one of the most important steps to increase

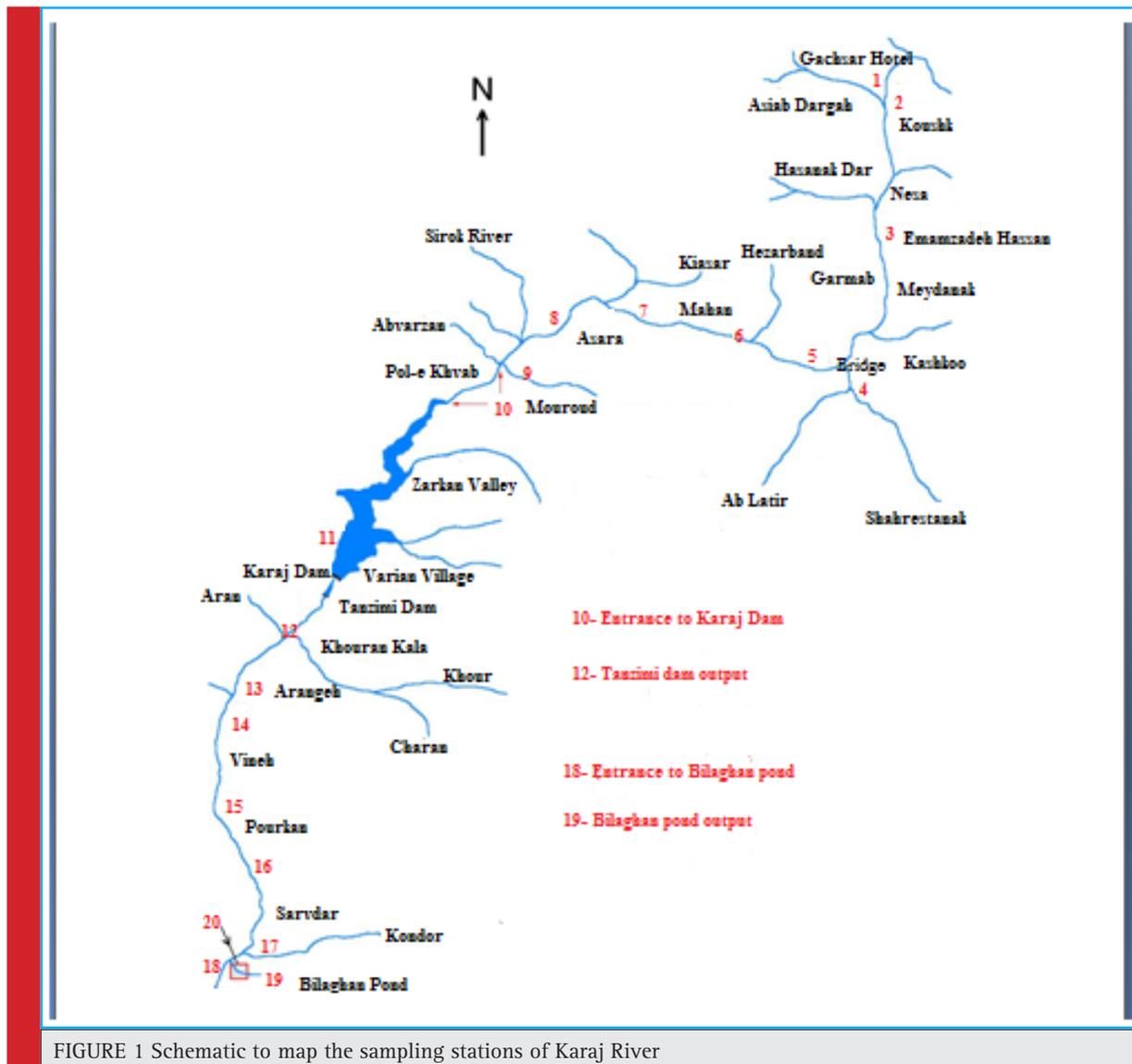


FIGURE 1 Schematic to map the sampling stations of Karaj River

Row	Parameter Evaluated	Method or By measure
1	TDS	Gravimetric method
2	Temperature	Digital thermometer
3	Turbidity	Turbidity meter
4	pH	PHP m
5	Dissolved oxygen	Winkler method and Membrane electrode
6	Nitrate	Spectrophotometry
7	Biochemical oxygen demand	Winkler method
8	The total phosphate	Spectrophotometer
9	Fecal coliform	Way Direct Test

awareness and knowledge about the conditions of water resources should be carried out and the results of such studies can be used in planning and proper management of water resources (Jafari et al, 2005).

The drinking water stations 1 and 2 were more suitable than other stations and with conventional treatment can be made much safe for drinking, (Samarkand et al, 2012, Radmanesh 2012 and Hosseini et al, 2013). Water quality index values have been determined and the results showed that the water quality index values of 58 to a maximum of 68 varied considerably and quality of water has always been mediocre as reported by several workers, (Nykjvy et al. 2009 Ghahnavieh and Town 2011).

Studies on providing strategies and management strategies to improve the quality monitoring of surface water resources have been done by Zare et al., (2013). In this study we present the indicators and parameters and effective system of monitoring includes types of stations and their location, frequency of sampling and sampled instruments, management strategies to improve monitoring quality of water resources and use of water resource to be expressed particular purpose.

Amir Kabir Dam Iran's first multi-purpose dam 63 kilometers, is 23 kilometers northwest of Tehran, Karaj road Chalus close to village Varian. The double-arch concrete dam with a maximum height of 180 meters is followed with a thickness of 30 m and 9 m at the bottom of the crown. Withdrawal of Karaj Dam with a capacity of 205 million cubic meters, started and 56 million cubic meters of water is needed for Tehran's Amir Kabir Dam as data obtained show. In this research, indices and important parameters in designing an effective monitoring system includes the type of station and location,

sampling intervals and sampled instruments have been studied. Qualitative assessment of water resources management strategy was done to improve the operation and use of the water source to be expressed for particular purpose.

The population of the study area Karaj River 4 main station entrance Sdkrj output Bylqan pond inputs and outputs, sampling and sample standard in 1053 and the last edition of the standard methods for testing water Sewage 90 to 94 years in Each 1 month and biological samples 1 physical prototype And chemical Each station was done. A total of 240 samples and 240 samples of microbial and chemical physics during the period.

The value of each parameter is obtained through experiment and the Test result Table (2) Put each of these parameters has a Q-value are obtained through a special graph.

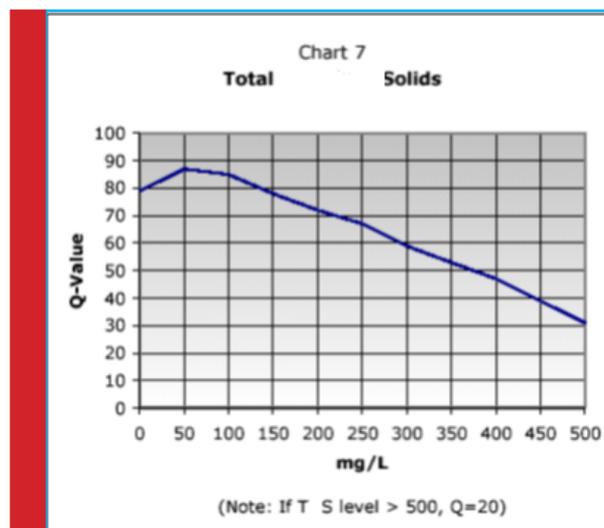
X-axis of the graph, the test results for their units.

Y-axis and Q-value of each parameter that is a dimensionless number.

Numbers obtained from the Q-value is placed in a column graph.

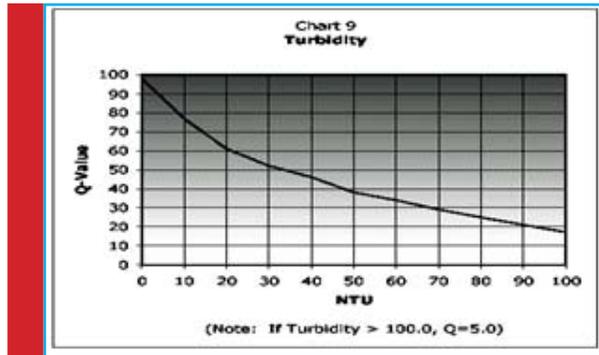
### 1. TDS (Total Dissolved Solids)

Increasing TS From zero to 50 ppm index value increases After 50 mg, Increasing TS , Its value decreases From 500 ppm up, Equality Index is assumed to be 20.



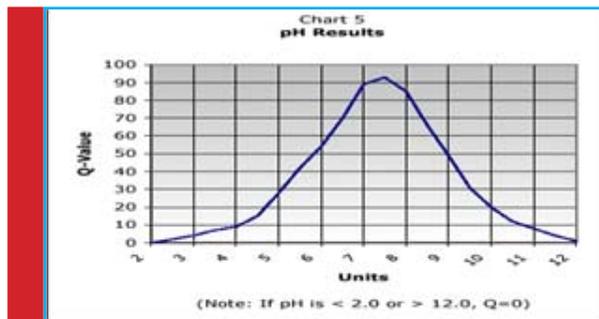
### 2 - Turbidity

With increasing turbidity, Index decreased Turbidity NTU 100 up, It is assumed parity 5.



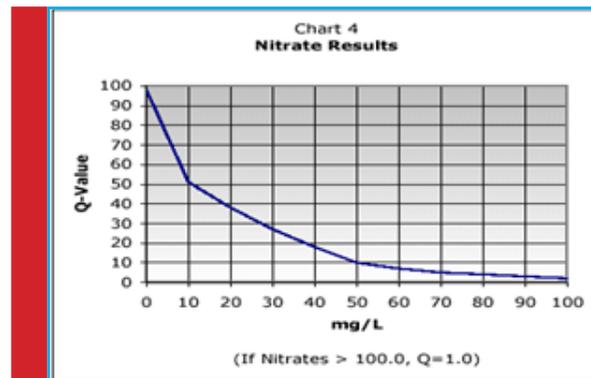
### 3 - PH

For pH values greater than 12 and Less than 2, The index value is equal to zero. At pH 3/7 times the index value is zero.



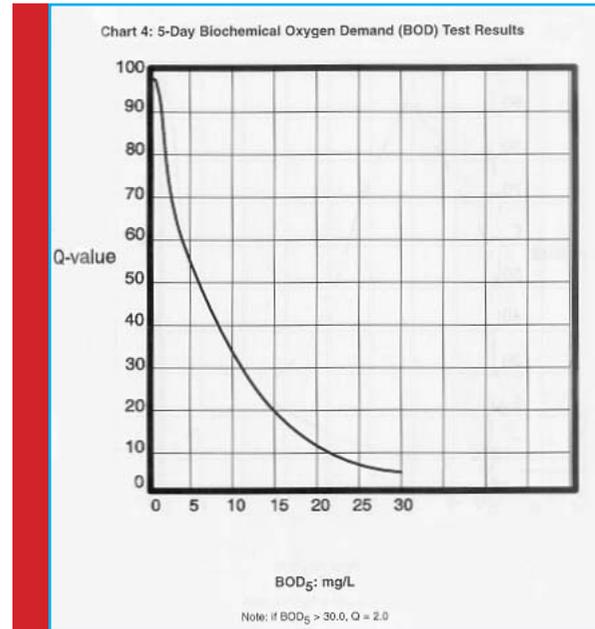
### 4. Nitrate

With increasing amounts of nitrate, Indices also decreased 100 mg of nitrate per liter on, the index value is considered equal to zero.



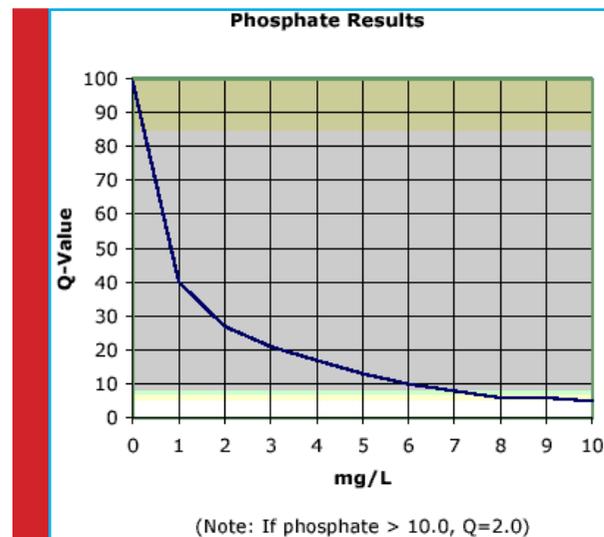
### 5. biochemical oxygen demand (BOD5)

Increasing BOD5, Indices also decreased From BOD5 More than 30 ppm, Index value of 2 is considered.



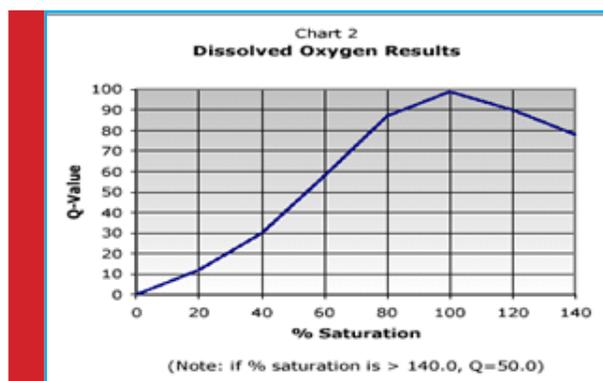
### 6 The total phosphate (Total Phosphate)

By increasing the amount of total phosphate indices also decreased Means greater than 10 mg per liter, Index value of 2 is considered.



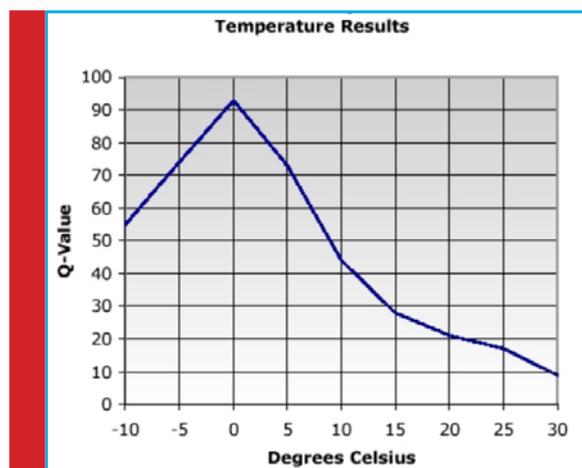
### 7. Dissolved Oxygen

Increasing the percentage of oxygen saturation from zero to 96% and increases indices Then index percentage decreases Dissolved oxygen saturation greater than 50 is considered 140% value for the indicator that this index decreased water quality due to build up of corrosion caused by dissolved oxygen is too much.



### 8. Temperature

By increasing the temperature from -10° C to zero degrees, the numerical value of the index increases reaches its maximum at zero degrees water at zero degrees to cause the least ability to act and micr bial interactions and the lowest temperature for freezing is the best index.



### 9. Fecal coliform

By increasing the number of indices decreased fecal coliform and one hundred thousand colonies per 100 ml of the above, Index value of 2 is considered adequate.

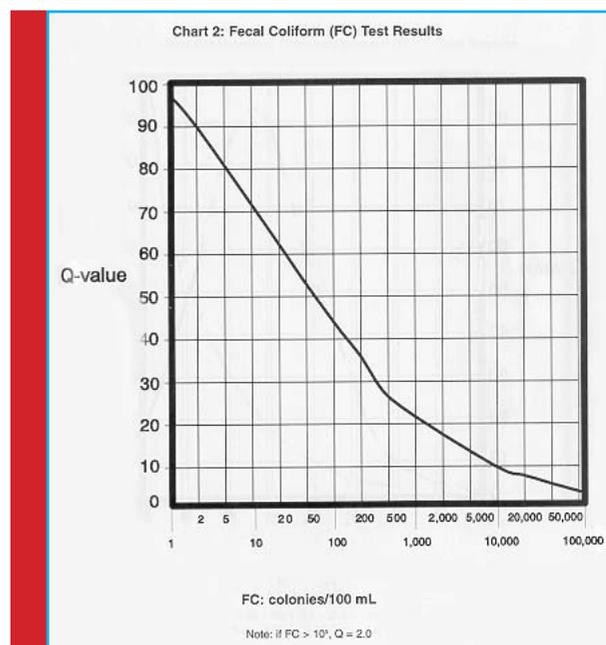
Since each parameter has a net weight factor is obtained by multiplying the numbers of coefficients in the values of this column specifies the index WQI.

$$\text{Relationship}_{(1)}: \text{NSFWQI} = \sum W_i I_i$$

I<sub>i</sub>: under each parameter index

W<sub>i</sub>: weighting factor for each parameter

After obtaining the indices for parameters 9 to determine the quality indicators studied stations of the Water Quality Index was used. For this purpose, the average seasonally each calculated parameter, then



use these values and curves criteria for each parameter is defined, grading parameter mined each parameter has a weight factor is determined (Table 2) with the highest weight the dissolved oxygen (17/0) and the lowest amount of total dissolved solids was (07/0). By multiplying the grade of the weight parameter and then using equation (1), indicators of water quality from stations in different seasons were calculated. Total Quality Index in different seasons was determined for the annual quality indices. Using the classification system based on the quality of water per year in rivers (table 3), group and qualitative terms any stations using indicators of water quality at various stations and color table (Table 4) were determined.

Table 2. Weighting Q-value, Watrqualindex Converte, 2012

Test Parameter	Test Results	Q-Value	Weighing Factor	Total
BOD	(mg/L)		0.11	
Dissolved Oxygen	(% saturation)		0.17	
Fecal Coliform	(colonies/100 mL)		0.16	
Nitrates	(mg/L)		0.10	
PH	(Units)		0.11	
Temperature			0.10	
Total Solids	(mg/L)		0.07	
Total Phosphate	(mg/L)		0.10	

group	The annual index	General situation of water
I	1200-1050	1. Water Clean and Healthy 2. The non-contact or contact with domestic pollution 3. ideals for normal use such as fish and wild life 4. It can be seen in some rivers is limited.
II	1049-850	1. start serious changes in weather features affected by environmental degradation 2. Contact Home infections and Agriculture 3. Can be used with minor measures for households and Industrial 4. suitable for wildlife 5. Reproduction of fish Immigrant be affected.
III	849-650	1. create drastic changes in water characteristics 2. changes in color The smell of water 3. Usable with serious measures for domestic use and industrial 4. Reduce the efficiency of reproduction in fish And other groups Animal 5. L Phat possibility of aquatic vertebrates at some times of the year
IV	649-450	1. cause dangerous changes in water system 2. The replacement Group Resistant to pollution 3. vertebrates and mass casualties Other consumers aquatic 4. The risk of disease outbreaks and Toxic to humans 5. Can be used to group Compatible with infected animal 6. The almost complete destruction of the indigenous community living Be.
V	450	1 infection in highly dangerous level 2. Pollution Chemical so much 3. Limited traditional uses mainly able to be seen. 4. Some rivers may be seen as limited.

Color	The index number	Definition
Red	25-0	Bad
Orange	50-26	Weak
Yellow	70-51	Average
Green	90-71	Good
Blue	100-91	Excellent

## RESULTS AND DISCUSSION

The results of the water quality index in the tables are provided. These results show that the water entering the station Sdkrj has highest quality index show an increase.

According to tests and analyzes conducted, the average seasonal changes NSFQI index based on the classification and color of water resources in the four years studied Station 94-90 (Spring, summer, autumn and winter) of water in the pond outlet Bylqan Karaj Dam to the state average yellow and water entering the station only has 94 Karaj Dam in poor condition and orange colors.

## CONCLUSION

The average seasonal changes NSFQI index based on the classification and color of water resources in

the four study stations (from input to output Karaj Dam basin water Bylqan) has average conditions Yellow and water entering the station only has 94 Karaj Dam in poor condition and Orange color. The results values of seven parameters BOD5, phosphate, PH, DO, Nitrates, total dissolved solids and the temperature in all seasons, the authorized two parameters fecal matter coliform and turbidity in some seasons have exceeded.

### Environmental Management (EMP) in the study area

Generally, after the identification threats Environmental, and priority it requires a response plan to deal with the risks of managing risks and solutions are provided. In fact, the approach towards environmental management plan Environmental stewardship is a must ecology, policy, planning and social development of our merge. Environmental management program of a development plan covers all mitigation measures, monitoring requirements and organizational capacity during the project, to remove the adverse effects or reduce those to acceptable levels is needed. The control strategies provided in the risk assessment to fully and in detail the responsibilities of the personnel for each of these control measures to express it.

### Recommendations

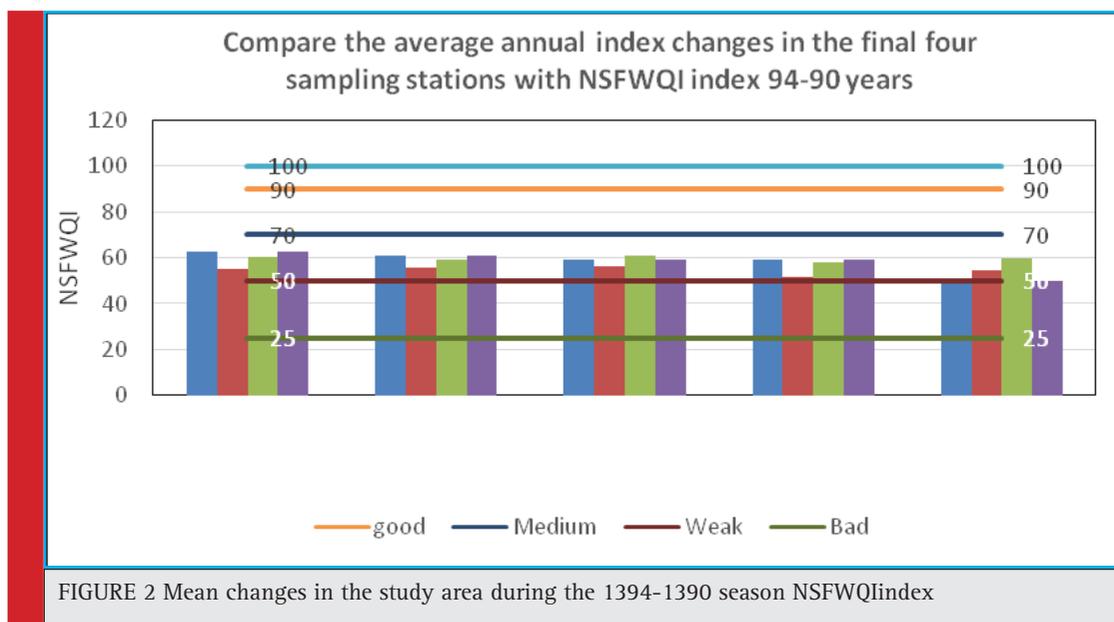
In order to achieve environmental goals dams and secure sustainable development indicators, developed, modified

Water Quality Index Station review	90 years	91 years	92 years	93 years	94 years
Water entering the Karaj Dam	719.775	648.33	656.91	627.765	804.84
Regulatory Dam output	660.24	670.8	675.48	621.6	874.4
Inlet Bylqan	725.28	709.68	730.56	692.58	952.16
Intake output Bylqan	754.68	728.28	712.56	707.76	798.8

The average seasonal index Station review	90 years	91 years	92 years	93 years	year 94
Water entering the Karaj Dam	59.98	54.02	54.74	52.31	48.2
Regulatory Dam output	55.02	55.9	56.29	51.8	50.17
Inlet Bylqan	60.44	59.14	60.88	57.71	60.09
Intake output Bylqan	62.89	60.69	59.38	58.98	58.8

and revised rules and criteria to evaluate and proper oversight of the studies, the operational plan for monitoring and inspection, compiling program of monitoring and environmental management environmental dams, determining the level of the river self-purification, water quality management, reduce the adverse effects of environmental pollution, following steps in the study area are recommended :

- Precise control and monitoring of the quality of drinking water sources (per month at least one sample to be tested).
- Public awareness and environmental education
- Privacy surface water sources and the distance from septic systems and sewage disposal facilities and rural homes be monitored.
- Prevent the discharge and disposal of waste in order to reduce contamination of soil and water.
- Prevent the discharge of oil and petroleum products into the river, collect and transfer to a recycling center.
- Control and monitor the area for the presence of disease vectors and methods of biological control of the carriers working with health centers.
- Full management of waste in the manufacturing sector and domestic, industrial, water treatment plants for cities, villages and hospitals in the province
- Public participation in organizing and establishing non- authorized service and reception classes, especially in the tourist axis of Karaj River



- Reviewing, organizing and upgrading processes regarding management of environmental resources
- Monitoring the quality and quantity of contamination of water resources in the event of unexpected

## REFERENCES

Ghahnavieh S., Safai, AR and Town F. (2011) Management and evaluation of Effects of Pollution On Environment In: Environment, Environmental Effects and Their Guidelines for Sustainable Management 2011.

Hosseini, P. et al. (2013) Study of Karun River water quality index NSFQI Zargan range to Kot Amir (5 years) Journal Man And environment Biology, 2013.

Jafari, A and Torabian, A. (2005) Evaluation and Presentation Program Qualitative assessment Suitable for Basin Watershed

Dam Amir Kabir (Karaj River) Journal of Environmental Studies, 2005.

Khani, MR and Yaghmaeian, K. (2010) Water Institute of Tehran Dabigatran, 2010.

Nykjvy, F., Yousefi , Falakdeh M (2009) Measurement of Rood river water quality index 2009.

Radmanesh F. (2012) Democracy, corals Dez River water quality zoning and Karkheh using indicators (NSFWQI) and (WQI) 2012.

Samarkand M R., BG Vesey and F Saturn, (2012) Tradesman, Check the water quality of Lake Dam Complex in Hamedan city enjoying quality index NSFQI, 2012.

Zare, M. and Shamsaee, A. (2013) Providing strategies and management strategies to improve surface water quality monitoring the filth of Iran, Water Resources Management Conference, 2013.

## Studies on drug absorption based on form, dosage, drug functional groups and intestinal conditions

Majid Reza Kaviani\*

*Assistant Professor, Department of Education and Science, University of Farhangian, Iran Tehran*

### ABSTRACT

In recent years, there is always the problem that, how drugs pass from the small intestinal and gastrointestinal tract into the bloodstream is of vital interest to the pharmacologist and the medicinal chemist, but until recently little progress has been made in unravelling this seemingly complex problem. There are many reports about absorption drugs, but studies are usually concerned with an evaluation of the rapidity and extent of drugs absorption. It is clear that, all drugs pass across cell membranes. Mechanisms by which drugs cross membranes and the physicochemical properties of molecules and membranes that influence this transfer are critical to understanding the disposition of drugs in the human body. In this paper in addition to the conditions of drug passage, with regard to the mentioned properties we have taken two compounds as model for illustrating the main factors that have significant effect on absorption of drugs.

**KEY WORDS:** DRUGS ABSORPTION, SYNTHESIS, PHENYLBUTAZONE, THIOPENTAL

### INTRODUCTION

When medicines are passed in to the gastrointestinal tract, initial percentage gets liberated, but main part of drug based on physicochemical properties of molecules and membranes that influence the transfer to the human cells, will be absorbed. The properties of a drug that we can predict its movement behaviors and availability at sites of action are its molecular size and structural features, ionization characteristics, amount of solubility

in lipid for its ionized and non-ionized types, and its binding to serum and tissue proteins. Mostly, a medicine must pass from the plasma membranes of many cells to reach its site of action. Although limitations and barriers to drug crossing over cell membrane and also the intestinal wall may be a single layer of cells (intestinal epithelium) or several layers of cells and associated extracellular protein (skin), the plasma membrane is a common barrier for drug distribution coefficient (Benet et al. 2006).

#### ARTICLE INFORMATION:

*\*Corresponding Author: Majid Reza Kaviani*

*Received 2<sup>nd</sup> April, 2017*

*Accepted after revision 12<sup>th</sup> Aug, 2017*

*BBRC Print ISSN: 0974-6455*

*Online ISSN: 2321-4007*



*Thomson Reuters ISI ESC and Crossref Indexed Journal*

*NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006*

*© A Society of Science and Nature Publication, 2017. All rights reserved.*

*Online Contents Available at: <http://www.bbrc.in/>*

The cellular membrane and generally plasma membrane consists of a bilayer of mutual lipids with their hydrocarbon chains oriented inward to the center of the bilayer to form a continuous hydrophobic phase and their hydrophilic heads oriented outward. Individual lipid molecules in the bilayer vary according to the particular membrane and can move laterally and organize themselves with cholesterol, endowing the membrane with fluidity, flexibility, organization, high electrical resistance. Membrane proteins embedded in the bilayer serve as structural anchors, receptors, ion channels, or transporters to transduce electrical or chemical signaling pathways and provide selective targets for drug actions. In contrast to earlier proposals that cell membranes are fluid and thus proteins collide in an unordered fashion, we now understand that membranes are highly ordered and compartmented (Pinaud et al., 2009; Singer, 2004).

These proteins may be associated with caveolin and sequestered within caveolae; they may be excluded from caveolae; or they may be organized in signaling domains rich in cholesterol and sphingolipid not containing caveolin or other scaffolding proteins (i.e., lipid rafts). Cell membranes are relatively permeable to water either by diffusion or by flow resulting from hydrostatic or osmotic differences across the membrane, and bulk flow of water can carry with it drug molecules. However, proteins with drug molecules bound to them are too large and polar for this type of membrane passage to occur. Transmembrane movement of drug generally is limited to unbound drug; thus drug-protein complexes constitute an inactive reser-

voir of drug that can influence both therapeutic as well as unwanted drug effects. Paracellular passage through intercellular gaps is sufficiently large that transfer across capillary endothelium is generally limited by blood flow and not by other factors.

As mentioned above, such membrane passage is an important factor in filtration across the glomerulus in the kidney. Important exceptions exist in such capillary diffusion; "tight" intercellular coupling are present in specific tissues, and paracellular passage in them is insignificant. Bulk flow of water can carry with it small water-soluble substances, but bulk-flow transfer is faced with problem when the molecular mass of the solute become more than 100–200 Da. Accordingly, most large lipophilic drugs must pass through the cell membrane itself (Fig. 1).

The characteristics of a drug that predict its crossing and availability at sites of action are its structural features and, degree of ionization molecular size, relative lipid solubility of its ionized and non-ionized forms, and its binding to serum and tissue proteins (Benet et al., 1996). In passive transfer, the drug molecule usually penetrates by diffusion along a concentration gradient by virtue of its solubility in the lipid bilayer. Such transfer is directly proportional to the magnitude of the concentration gradient across the membrane, to the lipid-water partition coefficient of the drug, and to the membrane surface area exposed to the drug. Levine and her co-workers (Levine et al., 1955 and Maickel 1962), studied the absorption of a number of quaternary ammonium ions by measuring their rates of disappear-

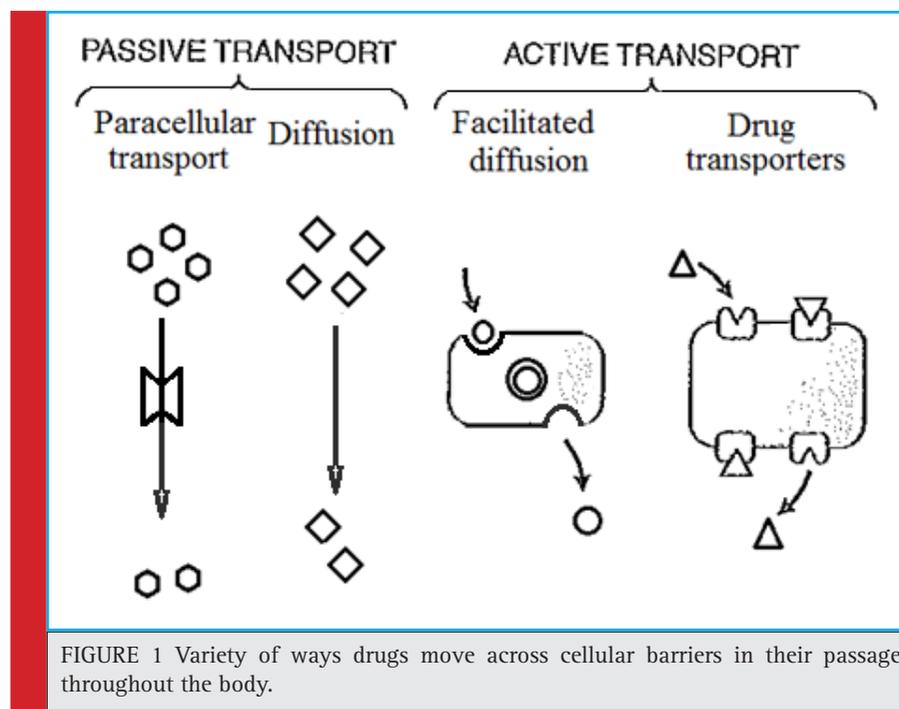


FIGURE 1 Variety of ways drugs move across cellular barriers in their passage throughout the body.

ance from loops of the rat small intestine. They observed that in general the rate of absorption declined markedly with time. For example, several quaternary ammonium compounds were absorbed to the extent of about 15 per cent in four hours, but most of the absorption took place during the first hour of the experiment.

From other literature reports, it can be concluded that, the concentration of the unbound drug is the same on both sides of the membrane if the drug is a non-electrolyte. For ionic compounds, the steady-state concentrations depend on the electrochemical gradient for the ion and on differences in pH across the cell membrane that will have effect on the state of ionization of the molecule disparately on either side of the membrane and can effectively trap drug on one side of the membrane. Many drugs are weak acids or bases that are present in solution as both the non-ionized and ionized species. The non-ionized drugs usually are soluble in lipid and can easily across the cellular membrane. But, the ionized molecules usually their crossing process is limited from lipid membrane because of their low lipid solubility, and passage will depend on the leakiness of the membrane related to the membrane's electrical resistance.

To present the pH effect on medicines distribution, it is assumed that the gastric mucosal membrane treats as a simple lipid barrier with a high electrical resistance that is sensitive only to the lipid-soluble, non-ionized form of the acid. The percentage of non-ionized to ionized medicines at each pH is readily calculated from the Henderson-Hasselbalch equation:

$$\log \frac{[\text{protoated from}]}{[\text{unprotoated from}]} = pK_a + pH \quad (1)$$

Common ionizable groups on drug molecules are carboxylic acids and primary amino groups, Estimated  $pK_a$  for these groups are  $\approx 9.5$  and  $\approx 4.5$ , respectively. Resonance structures and electron withdrawing groups can change the  $pK_a$ , and many compounds have multiple ionizable groups; thus,  $pK_a$  values vary over a broad range. Furthermore, some drugs contain quaternary amines with a permanent positive charge. One result of a drug being ionized at physiological pH is illustrated by the relative lack of sedative effects of second generation histamine  $H_1$  antagonists: second generation antihistamines are ionized molecules (less lipophilic) that cross the blood-brain barrier poorly compared to first generation agents (uncharged at  $pH \approx 7.4$ ).

The intestinal absorption of acidic drugs is decreased several fold and the absorption of basic drugs increased several fold when the pH of the intestinal contents is raised from 4 to 8. This supports the hypothesis that the intestinal mucosa preferentially allows the absorption of the unionized form of a drug.

Significant steady state concentration gradients of drugs are maintained between the gut lumen and plasma. Bases are concentrated within the gut lumen and acids are concentrated in plasma. These concentration ratios can be attributed to a slightly acidic environment at the intestinal blood barrier. There is a sufficient association between absorption of drugs and the lipid: water partition coefficients of their unionized moieties to justify the continued assumption that the gastrointestinal cell membranes are essentially lipoidal. Highly lipid-soluble drugs are in general rapidly absorbed while decidedly lipid-insoluble drugs are in general poorly absorbed. Recent progress in the understanding of the role of physicochemical properties in membrane permeability

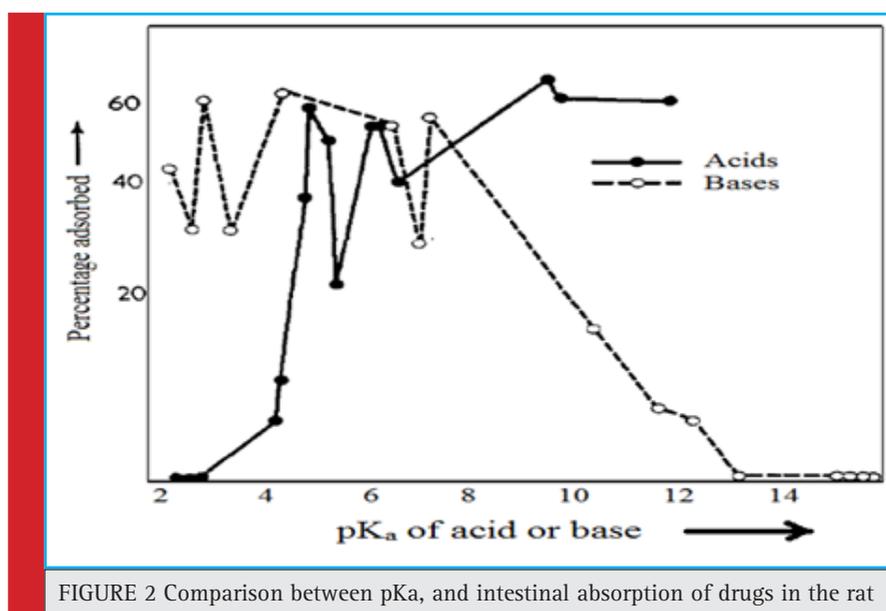


FIGURE 2 Comparison between  $pK_a$ , and intestinal absorption of drugs in the rat

relevant to important processes such as drug absorption and blood-brain barrier crossing, brings rational drug delivery more within reach.

One of such difficulties is the inability to confine the dosage form in the desired area of the gastrointestinal tract. Medicine absorption through the gastrointestinal tract is a complex process and according to many variables. It is widely identified that the extent of gastrointestinal tract drug absorption is related to contact time with the small intestinal mucosa (Hirtz, 1985). Thus, small intestinal transit time is an important parameter for drugs that are incompletely absorbed. Basic human physiology with the details of gastric emptying, motility patterns, and physiological and formulation variables affecting the gastric emptying are summarized, (Arora et al., 2015).

Prolonged gastric retention improves solubility for drugs that are less soluble in a high pH environment. It has applications also for local drug delivery to the stomach and proximal small intestines.

Size and shape of dosage unit also affect the gastric emptying. Garg and Sharma (2003) reported that tetrahedron- and ring-shaped devices have a better gastric residence time as compared with other shapes. The diameter of the dosage unit is also equally important as a formulation parameter. Dosage forms having a diameter of more than 7.5 mm show a better gastric residence time compared with one having 9.9 mm.

Schanker and co-workers (1971) indicate that the epithelium of the intestine is very much like that of the

stomach in that it allows the ready penetration of un-dissociated drug molecules but is highly resistant to the passage of ionized moiety. In the experiments, the entire small intestine of the anaesthetized rat was perfused with drug solution, and the degree of absorption estimated by measuring the difference in the concentration entering and leaving the intestine.

## RESULTS AND DISCUSSION

A relation between the degree of ionization and the rate of absorption for drugs was shown: the weak acids and bases were easily absorbed ; stronger, highly ionized organic electrolytes were slowly absorbed ; and the completely ionized quaternary ammonium compounds and sulphonic acids were hardly absorbed at all.

The authors pointed out that the failure to observe any measurable absorption for some of the very highly ionized compounds was not inconsistent with the slow but definite absorption of these substances known to occur in therapeutics. In their experiments, the drug solution passed through the intestine in only seven minutes, compared with the several hours that a drug remains in the intestine when used therapeutically ( Schanker, 1959 ).

The slow rates of absorption for many of the highly ionized compounds were magnified by continuously recirculating the drug solution through the intestine. extra percentage of absorption were obtained for all of the drugs except the fully ionized quaternary ammo-

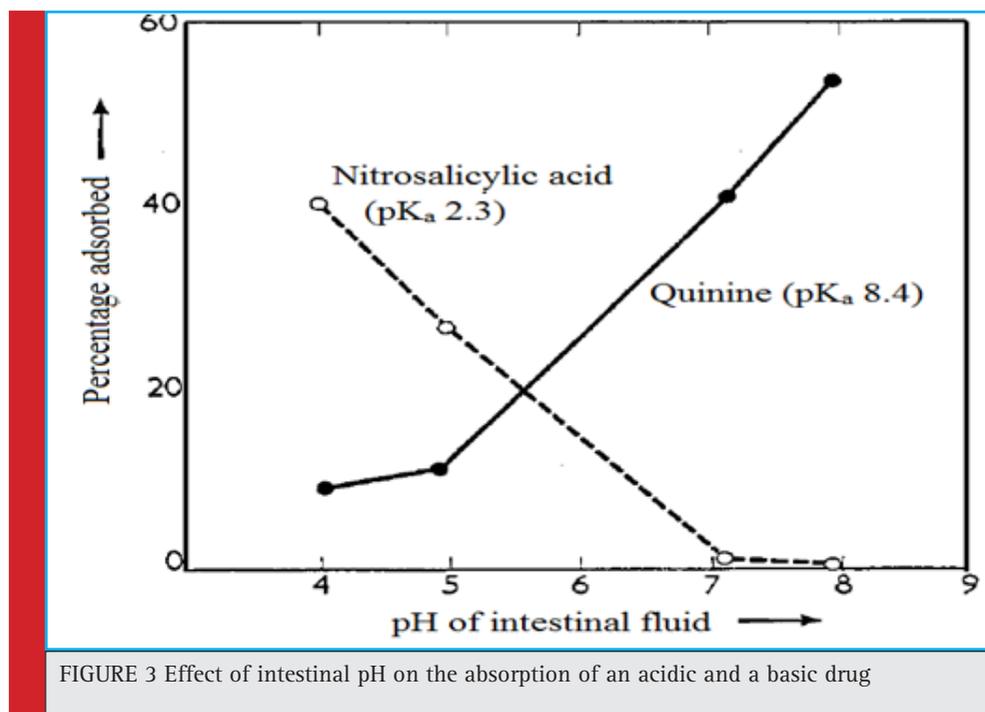
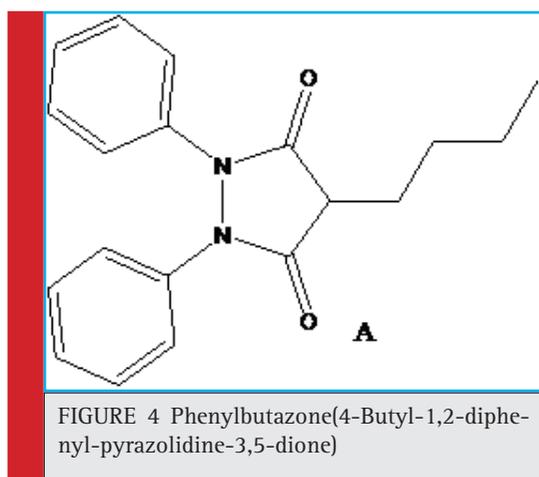


Table 1. Comparison between intestinal absorption of weak organic acids and bases in the rat and lipid/water partition coefficient (K) of the undissociated form of the compounds

Drugs	% Absorbed	$K_{\text{heptane}}$	$K_{\text{chloroform}}$
Rate of absorption			
Phenylbutazone	54	>100	>100
Thiopental	67	3.30	>100
p-Toluidine	56	3.26	97.5
Aniline	54	1.10	26.4
m-Nitroaniline	63	0.24	39.2

nium compounds and sulphonic acids. These results suggest that a drug may be almost totally ionized, but can still be absorbed by passive diffusion because of the small concentration of lipid-soluble, undissociated molecules. Because of drugs like salicylic acid and aniline were absorbed at a constant percentage over a wide range of concentrations, it may be presumed that these substances cross the intestinal epithelium by simple diffusion rather than a storable transport mechanism. Additional evidence of this is the failure of one drug to change the rate of absorption than another. For example, when solutions containing various combinations of drugs were passed through the intestine, each compound was absorbed as though it were present alone.

Due to the rates of absorption of drugs were related to the proportion of lipid-soluble, un dissociated drug molecules and not to the molecular weight of the compounds, the main pathway of absorption appears to be through the lipid areas of the intestinal boundary rather than through small pores. As evidence of this view, a number of lipid-soluble drugs of high molecular weight were absorbed more rapidly than small, lipid-insoluble molecules like  $D_2O$  and urea.



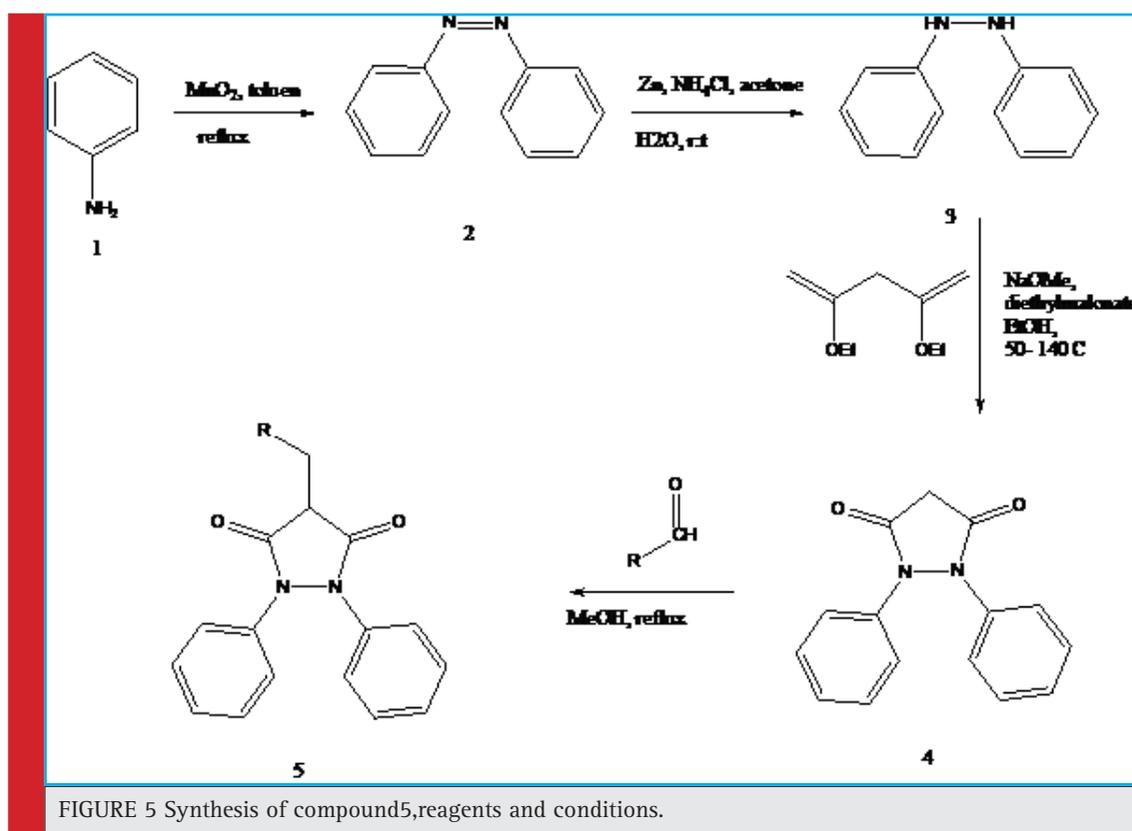
The pH of the intestinal contents identify the extent of ionization of a drug and should therefore be an important factor in dictating the rate of absorption. Hogben and co-workers ), studied the effect of intestinal pH on the absorption of a number of weak organic acids and bases in the rat sample. In varying the pH of the drug solution from 4 to 8, the authors found that the rates of absorption varied directly with the proportion of drug present as the undissociated molecule. For example, raising the intestinal pH increased the absorption of bases and decreased the absorption of acids (Fig. 3). Furthermore, compounds which remained essentially undissociated at the various pH values showed no change in absorption.

For a more detailed study of the relationship between intestinal pH, the  $pK_a$ , of a drug, and the rate of drug absorption, these investigators determined the steady-rate distribution of drugs between plasma and the intestinal lumen. In the experiments, the rat intestine was perfused with a solution of drug, and the animal also received the drug intravenously.

At the steady state, when there was no net passage of drug from intestine to plasma or from plasma to intestine, samples of the intestinal solution and plasma were removed and analyzed for the drug. The observed gut/plasma concentration ratios agreed only roughly with the ratios calculated from the equations described earlier. For example, when the measured pH values of the gut solution (6.6) and plasma (7.4) were substituted in the equations, the resulting ratios for acidic drugs were greater than the observed values, and those of basic compounds lower than the observed values. These results suggested that the pH of the intestinal contents might not be the same as the effective pH at the site of absorption.

Based on the observed ratios of initial concentration, the authors calculated a hypothetical or 'virtual' intestinal pH; a value of 5.3 was obtained. An effective pH of 5.3, possibly located at the surface of the intestinal epithelial boundary, would explain an earlier observation ( Abbott et al., 1989 ) (see Fig. 3) that the lowest  $pK_a$ , of an acidic drug consistent with very rapid. absorption was about 3, while the corresponding highest  $pK_a$ , for a basic drug was about 8. Assuming an effective pH of 5.3, the ratio of un-ionized to ionized drug necessary for very rapid absorption is 1: 300 for both an acid of  $pK_a$ , 2.8 and a base of  $pK_a$ , 7.8 . On the other hand, if the intestinal pH is accepted as 6.6, the necessary proportion of un-ionized to ionized drug is 1: 6000 for acids and 1: 16 for bases -an unlikely circumstance if the lipid boundary concept is valid.

Evidence that lipid-solubility is the physical property that governs the passage of uncharged molecules across the intestine blood boundary was provided by the observation that the rates of absorption of a large number



of weak acids and bases were roughly parallel to the organic solvent/water partition ratios of the undissociated drug molecules (Table 1).

For this aim we considered two different pharmaceutical compound to obtain data for best understanding.

Phenylbutazone has a plasma elimination half-life of 4-8 hours, however the inflammatory exudate half-life

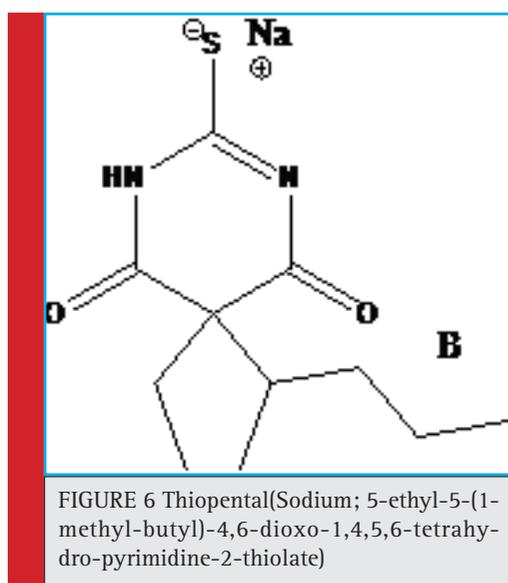
is 24 hours (Lees, et al., 1986). So single daily dosing can be sufficient, although it is often used twice per day, (Winters, et al. 1955). The drug is considered fairly non-toxic when given at appropriate doses (2.2, 4.4 mg/kg/day), even when used repeatedly (Collins and Tyler 1984).

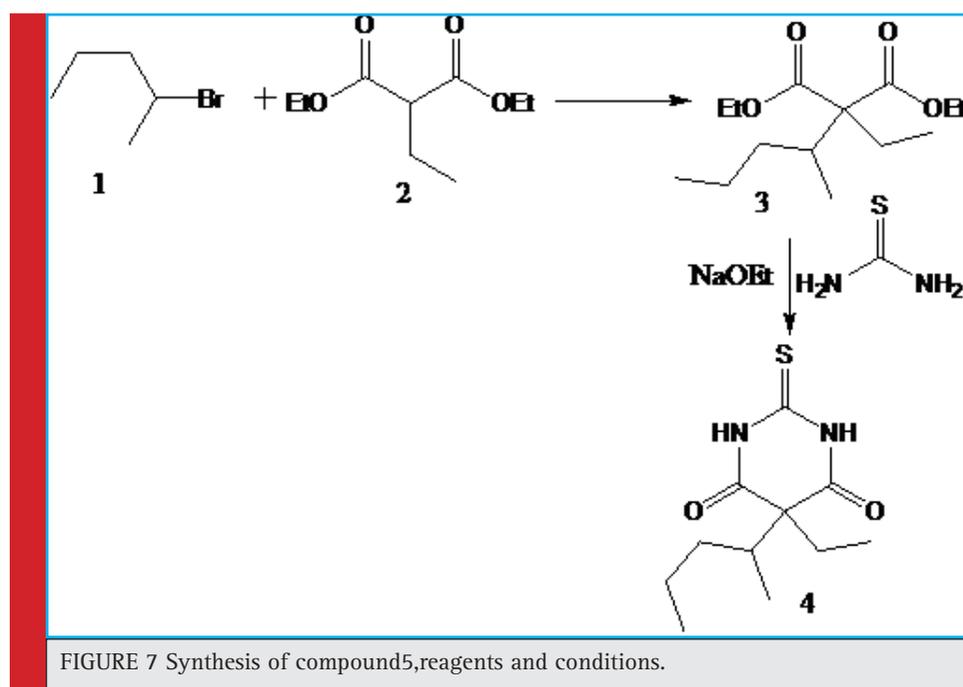
To develop potent and selective anticancer agents, a series of novel 4-substituted 1,2-bis(4-chlorophenyl)pyrazolidine-3,5-dione derivatives were designed and synthesized. At first we synthesized the compound as below:

For synthesis A, the mechanism of reaction were presented in Fig. 5. as can be seen,

According to structure-activity relationship (SAR) analysis, it was clear that aromatic ring on the side chain of pyrazolidine-3,5-dione was important for ant proliferative activity.

*Sodium thiopental* is a member of the barbiturate class of drugs, which are relatively non-selective compounds that bind to an entire superfamily of ligand-gated ion channels, of which the GABA<sub>A</sub> receptor channel is one of several representatives. Thiopental rapidly and easily crosses the blood brain barrier as it is a lipophilic molecule. As with all lipid-soluble anaesthetic drugs, the short time of action of sodium thiopental is due almost entirely to its redistribution away from central circulation towards muscle and fat tissue, due to its very high





fat: water partition coefficient (aprx 10). the free fraction in the blood is metabolized in the liver [15].

About sodium thiopental the factors that can be significant in absorption of this compound, classified such as, existence of amine functional groups, organic ion, lipid-soluble and also its basis substantiate. Sodium thiopental is rapidly absorbed for mentioned properties.

In comparing the two drug combinations, rate of absorption in small intestine, according to their structure can be predicted, and because of some factors sodium thiopental has higher absorbance than phenylbutazone. This is in good agreement with the experimental results. By a comprehensive research about the conditions of the small intestine and mechanisms of absorption of the medication in this part of the gastrointestinal tract, and also can be predicted drug absorbance level by detecting functional groups on drug structure. Understanding of the drug structure can have significant effect on the drug remaining time in body and drug dose.

It should be noted that, most of the factors that are effective on medication absorption are acidity or alkalinity of it. That this property related to carboxylic acid and amine groups present on the drug, respectively. The degree of ionization, lipid solubility of drug and dosage and form are important parameters that can be concluded from drug structure. This can be a quick and easy way to find out how the drug is presented in the intestines and gastrointestinal entire system. That it would be leading to reduce the scope of trial and error to select the most effective form of drug absorption such as pills, syrup or other forms to prescribe medication.

## REFERENCES

- Abbott, N., D. Blankschtein, and T. Hatton, On protein partitioning in two-phase aqueous polymer systems. *Bioseparation*, 1989. 1(3-4): p. 191-225.
- Arora, S., et al., Floating drug delivery systems: a review. *Aaps PharmSciTech*, 2015. 6(3): p. E372-E390.
- Benet, L.Z., et al., Pharmacokinetics: the dynamics of drug absorption, distribution, metabolism, and elimination. *Goodman and Gilman's The pharmacological basis of therapeutics*, 2006: p. 3-27.
- Collins, L. and D. Tyler, Phenylbutazone toxicosis in the horse: a clinical study. *Journal of the American Veterinary Medical Association*, 1984. 184(6): p. 699-703.
- Garg, S. and S. Sharma, Gastroretentive Drug Delivery Systems, *Business Briefing pharmatech*, 160-164, 2003.
- Hirtz, J., The gastrointestinal absorption of drugs in man: a review of current concepts and methods of investigation. *British journal of clinical pharmacology*, 1985. 19(S2): p. 77S-83S.
- Jollow, D. and B. Brodie, Mechanisms of drug absorption and of drug solution. *Pharmacology*, 1972. 8(1-3): p. 21-32.
- Levine, R.M., M.R. Blair, and B.B. Clark, Factors influencing the intestinal absorption of certain monoquaternary anticholinergic compounds with special reference to benzomethamine [n-diethylaminoethyl-n'-methyl-benzilamide methobromide (MC-3199)]. *Journal of Pharmacology and experimental Therapeutics*, 1955. 114(1): p. 78-86.
- Lees, P., et al., Phenylbutazone and oxyphenbutazone distribution into tissue fluids in the horse. *Journal of Veterinary Pharmacology and Therapeutics*, 1986. 9(2): p. 204-212.

Maickel, R. and H. Weissbach, Recent developments in chemical and biochemical assay techniques applicable in pharmacology. *Annual Review of Pharmacology*, 1962. 2(1): p. 399-412.

Pinaud, F., et al., Dynamic partitioning of a glycosyl-phosphatidylinositol-anchored protein in glycosphingolipid-rich microdomains imaged by single-quantum dot tracking. *Traffic*, 2009. 10(6): p. 691-712.

Singer, S.J., Some early history of membrane molecular biology. *Annu. Rev. Physiol.*, 2004. 66: p. 1-27.

Schaner, L., Absorption of drugs from the gastrointestinal tract, in *Concepts in Biochemical Pharmacology*. 1971, Springer. p. 9-24.

Schaner, L.S., On the mechanism of absorption of drugs from the gastrointestinal tract. *Journal of Medicinal Chemistry*, 1959. 2(4): p. 343-359.

Winters, W., et al., Metabolism of thiopental-S35 and thiopental-2-C14 by a rat liver mince and identification of pentobarbital as a major metabolite. *The Journal of pharmacology and experimental therapeutics*, 1955. 114(3): p. 343.

## Enhancement of copper recovery from chalcopyrite concentrate using chemically mutated mesophilic bacteria

Rafezi Farid<sup>1</sup>, Pourbabaee Ahmadali<sup>2\*</sup> and Shafaei Seid Ziaedin<sup>3</sup>

<sup>1</sup>Department of Mining Engineering, Science and Research Branch, Islamic Azad University, Tehran, Iran

<sup>2</sup>Biotechnology Laboratory, Department of Soil Science, University of Tehran, Tehran, Iran

<sup>3</sup>School of Mining, College of Engineering, University of Tehran, Tehran, Iran

### ABSTRACT

Three strains of mutated mesophilic bacteria were subjected to chemical mutation by diethyl sulfate and a mixed culture of those bacteria were used to evaluate the effect of mutation on the oxidation activity of the bacteria. The samples were employed to test copper recovery from flotation concentrate originating from Sarcheshmeh Copper Complex in Kerman, Iran. Different concentrations of diethyl sulfate were added to bacterial solutions. The results showed that solutions of *Acidithiobacillus ferrooxidans* and *Leptospirillum ferrooxidans* containing 1.0%(v/v) diethyl sulfate increased the oxidation rate of Fe<sup>2+</sup> by 15%, in both cases, compared to the wild-type samples. Also, solution of *Acidithiobacillus thiooxidans* containing 1.0%(v/v) diethyl sulfate increased the oxidation rate of elemental sulfur by 24% compared to original strain. The effect of mutation on viability of mesophilic bacteria at higher temperatures and on copper recovery from concentrate was investigated using a series of bioleaching tests at 32, 40, 45, 50 and 55°C. A mixed culture of mutated mesophilic bacteria was used and the results were compared to recoveries obtained using a mixed culture of wild-type mesophilic and one of moderately thermophilic bacteria. It was found that chemical mutation resulted in an increase in copper recovery by the mesophilic bacteria at 32°C from 34.2% by the mixed culture of wild-type mesophiles to 39.5% by the mutated mesophiles. The results also showed that the same level of recovery achieved by wild-type mesophiles in 30 days was achieved by mutated strains in less than 15 days. Bioleaching by the mixed culture of mutated mesophiles at a higher temperatures (45°C) resulted in higher copper recovery (48.5%). This value was slightly lower than the recovery obtained by the original mixed culture of moderate thermophiles (49.8%). The findings indicate that the recovery obtained by wild-type mixed culture of moderate thermophiles at 50°C can be achieved by mutated mesophiles at a lower temperature, i.e. 45°C.

**KEY WORDS:** FLOTATION CONCENTRATE, BIOLEACHING, MESOPHILIC BACTERIA, MODERATELY THERMOPHILIC BACTERIA, MUTATION, DIETHYL SULFATE.

### ARTICLE INFORMATION:

\*Corresponding Author: [pourbabaee@ut.ac.ir](mailto:pourbabaee@ut.ac.ir)

Received 12<sup>th</sup> April, 2017

Accepted after revision 12<sup>th</sup> July, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

For many years, copper has been extracted from sulfide minerals using a pyro metallurgical process which has serious environmental drawbacks, especially with regard to SO<sub>2</sub> emissions. Furthermore, conventional concentrate treatment by smelting is expensive and consumes large amounts of energy. Researchers have thus focused on development of alternative processes such as hydrometallurgy and bio hydrometallurgy. These processes, including chemical leaching and bioleaching by mesophilic cultures, have not proven to be efficient for copper extraction from chalcopyrite, a refractory copper containing sulfide. Techniques to overcome the low recovery of copper extraction from chalcopyrite include bioleaching at higher temperatures by moderately and extremely thermophilic bacteria, the addition of catalytic agents such as activated carbon and silver ions, redox control and physical and chemical mutation of bacteria [12–19]. Torma (1977), Rawling (1995), Rawling (2002), Farah et al., (2005), Walting (2006), Plumb et al., (2008), Mousavi et al., (2006), Ahmadi et al., (2011), Panda et al., (2012a) Panda et al., (2012) b and Moazemi et al. (2014).

Domestication, genetic engineering and mutagenesis of bacteria have been investigated for industrial applications, but drawbacks exist for production of excellent strains for bioleaching. For example, domestication of strains is time-consuming and inefficient and genetic engineering is complex and still in the early stages of development. The main problems with bioleaching of bacteria are low efficiency, oxidation ability and resistance to adverse environments

Akcil (2004), Schaaper et al., (1987), Gericke et al., (2001), Brierley (2008), Qiu et al., (2008) and Dong et al., (2011).

Recent studies have examined the effects of mutagenesis by chemical reagents, ultraviolet light, microwaves and ultrasound to improve strains. Although some strains of mesophilic bacteria mutated by physical mutagens including UV, microwave, ultrasound, etc. have been successfully applied to ore leaching, there have been no report on chalcopyrite leaching by chemically mutated mesophilic microorganisms. Diethyl sulfate was chosen in this work as chemical mutagen due to the lower cost and higher stability (Olumbabi (2009), Anjum et al., (2010), Meng et al., (2007), Frankham, (2010).

The concentration of diethyl sulfate was optimized and the characteristics of flotation concentrate bioleaching by chemically mutated mesophiles including *Acidithiobacillus ferrooxidans* (*Tf*), *Leptospirillum ferrooxidans* (*Lf*) and *Acidithiobacillus thiooxidans* (*Ti*) were investigated in this work, excepting to improve the copper recovery from chalcopyrite bearing flotation con-

centrate obtained from Sarcheshmeh Copper Complex, Kerman, Iran.

## EXPERIMENTAL SECTION

### Microorganisms

The mesophilic iron- and sulfur-oxidizing acidophiles *Acidithiobacillus ferrooxidans*, *Acidithiobacillus thiooxidans* and *Leptospirillum ferrooxidans* were isolated from Sarcheshmeh Copper Mine in Kerman, Iran, and used in the experiments. The cultures were grown separately in 9K medium consisting of 3 g/l (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, 0.5 g/l MgSO<sub>4</sub>·7H<sub>2</sub>O, 0.1 g/l KCl, 0.01 g/l Ca(NO<sub>3</sub>)<sub>3</sub> and 0.5 g/l K<sub>2</sub>HPO<sub>4</sub>. The strains were cultured in 500 ml flasks containing 20 ml of bacterial solution and 180 ml of 9K medium. The optimum growth conditions of cultures were 32°C and a stirring rate of 125 rpm [30]. The initial pH and energy sources for each culture were 1.8 and 45 g/l ferrous sulfate for *Acidithiobacillus ferrooxidans*, 2.0 and 10 g/l elemental sulfur for *Acidithiobacillus thiooxidans* and 1.6 and 75 g/l ferrous sulfate for *Leptospirillum ferrooxidans*, respectively. The redox potential and pH values were measured and recorded for each culture every day. Sulfuric acid was used to adjust the initial pH and acidity of the solutions during culturing as required. Microbial population were controlled during the culturing by direct counting. Subcultures of each bacterial solution were mixed at a ratio of 4:4:2 for *Acidithiobacillus ferrooxidans*: *Leptospirillum ferrooxidans*: *Acidithiobacillus thiooxidans* to produce a mesophilic mixed culture. A mixed culture of moderately thermophilic bacteria consisting of acidophilic iron- and sulfur-oxidizing bacteria originally obtained from Mintek (South Africa) was also used in order to compare the recovery of copper from concentrate by mutated mesophiles and wild-type moderately thermophiles. The growth conditions of those bacteria had been optimized previously by other researchers. The moderately thermophilic bacteria were cultured in 500 ml flasks containing 180 ml 9K medium and 20 ml bacterial solution at 50°C, an initial pH of 1.8 and a stirring rate of 120 rpm using 45 g/l ferrous sulfate and 10 g/l elemental sulfur as energy sources.

### Flotation Concentrate

A representative sample of copper sulfide flotation concentrate was obtained from Sarcheshmeh Copper Complex in Kerman, Iran. The results of XRF analysis indicated that the sample contained 24.1% Cu. XRD analysis showed that chalcopyrite was the major mineral phase. The chemical and mineralogical compositions of the concentrate are shown in Tables 1 and 2, respectively. Fig. 1 shows the XRD patterns of the concentrate sample. The particle size distribution of the concentrate was

Table 1. Chemical composition of the concentrate sample.

Elements	Cu	Fe	S	Zn	Al	Si	Ca	K
Wt.%	24.10	29.34	34.06	0.96	1.93	7.63	0.41	0.79

Table 2. Mineralogical composition of the concentrate sample.

Mineral	Chalcopyrite	Covellite	Chalcocite	Pyrite	Non metallic	Oxides
Wt.%	38.53	7.12	6.32	21.19	19.35	5.25

determined by sieving and cyclosizer and resulted in a  $d_{80}$  of 45  $\mu\text{m}$ .

### Mutation

Samples of 10 ml of mesophilic subcultures of *Acidithiobacillus ferrooxidans*, *Leptosprillum ferrooxidans* and *Acidithiobacillus thiooxidans* were cultured separately into 250 ml flasks including 180 ml of 9K medium as well as 0.4, 0.8, 1.0 and 1.2 percent (v/v) of diethyl sulfate. The diethyl sulfate-induced samples were then used in ferrous iron/sulfur oxidation rate tests to determine the effect of diethyl sulfate concentration on the oxidation rates of the mutated strains. The results of the oxidation rate tests were used to select the strains with the highest efficiency for oxidizing ferrous iron/sulfur to make the mutated mixed culture at a ratio of 4:4:2 for *Acidithiobacillus ferrooxidans*: *Leptosprillum ferrooxidans*: *Acidithiobacillus thiooxidans*. The mixed culture was then used in the bioleaching experiments.

### Oxidation rate tests

To evaluate the effect of mutation by diethyl sulfate addition on the oxidation rates of the strains, specified amounts of ferrous sulfate/elemental sulfur were added to the solutions of *Acidithiobacillus ferrooxidans* and *Leptosprillum ferrooxidans*/*Acidithiobacillus thiooxidans* containing different concentrations of diethyl sulfate. The initial concentrations of ferrous sulfate added to the *Acidithiobacillus ferrooxidans* and *Leptosprillum ferrooxidans* solutions were 30 g/l and 50 g/l ( $\approx 6$  g/l and  $\approx 10$  g/l ferrous ion), respectively. An initial concentration of 10 g/l of elemental sulfur was added to the *Acidithiobacillus thiooxidans* solution. The oxidation rate tests were carried out under the same conditions as the culturing of the strains: 32°C, stirring rate of 125 rpm and pH values of 1.8 for *Acidithiobacillus ferrooxidans*, 1.6 for *Leptosprillum ferrooxidans* and 2.0 for *Acidithiobacillus thiooxidans*. The ferrous iron/elemental sulfur concentrations were measured at specific time intervals

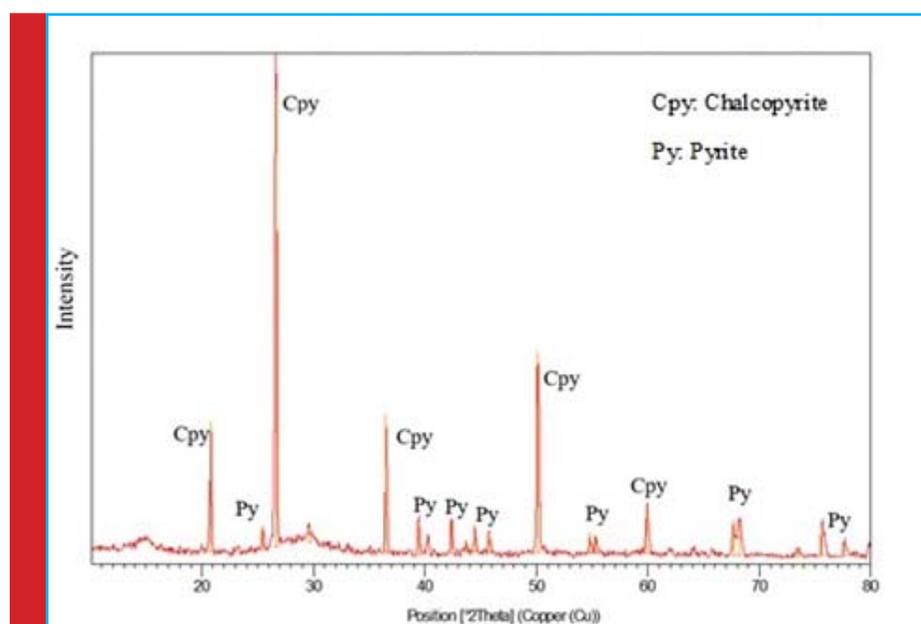


FIGURE 1 XRD pattern of the flotation concentrate sample.

and the oxidation rates were calculated based on loss of initial concentration during testing.

### Bioleaching

Bioleaching experiments were carried out in 500 ml flasks containing 20 ml of bacterial solution, 40 g of dry concentrate and the volume of 9K medium required to make a 200 ml pulp with a 20% solid concentration and 10% inoculation ratio. Control tests were carried out using mixed wild-type mesophilic cultures as well as moderately thermophilic strains. Bioleaching tests were carried out using wild-type mesophilic mixed culture at 32°C, a pH of 1.8 and a stirring rate of 125 rpm. The corresponding values for the mixed culture of moderate thermophiles were 50°C, a pH of 1.8 and a stirring rate of 120 rpm.

The diethyl sulfate-induced samples of each mesophilic strain that resulted in the highest oxidation rates were used to make the mutated mixed culture for bioleaching experiments at 32, 40, 45, 50 and 55 °C. The other operational conditions were same as the mixed culture of wild-type mesophiles. The aim of these tests was to determine the effect of diethyl sulfate addition to bacterial solutions on the viability of the bacteria at higher temperatures as well as the influence of higher temperature on copper recovery. The dissolved copper concentration, pH and redox potential were measured and recorded every day. Volume loss due to water evaporation was compensated by using distilled water.

### Analytical methods

The redox potential and pH were measured using a Metrohm pH/Eh meter and Mettler-Toledo pH meter. Free cells in solution were counted by direct counting using a Thoma chamber of 0.1 mm depth and 0.0025 mm<sup>2</sup> area with an optical microscope (×1500, model: Zeiss-Axiokop 40). The dissolved copper concentration was determined by atomic absorption spectrometry (AAS). The Fe<sup>2+</sup> concentration was analyzed by titration with potassium dichromate (K<sub>2</sub>CrO<sub>7</sub>). The oxidation rates of ferrous iron and elemental sulfur were calculated as:

$$Fe^{2+} \text{ Oxidation rate (\%)} = \left(1 - \frac{[Fe^{2+}]_t}{[Fe^{2+}]_0}\right) \times 100 \quad (1)$$

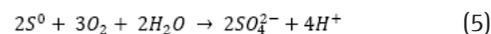
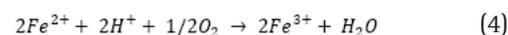
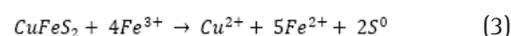
$$S^0 \text{ Oxidation rate (\%)} = \left(1 - \frac{[S^0]_t}{[S^0]_0}\right) \times 100 \quad (2)$$

where and are the ferrous iron and elemental sulfur concentrations, respectively, at time  $t$  and and are the initial concentrations of ferrous iron and elemental sulfur, respectively.

## RESULTS AND DISCUSSION

### Effect of mutation on oxidation capabilities of strains

Metal dissolution from sulfide minerals by microorganisms occurs through two main mechanisms. In the first one, the catalytic action of the microorganisms is responsible for the dissolution of the mineral [32]. This is the dominant mechanism in copper dissolution from secondary sulfide minerals such as chalcocite and covellite. In the second mechanism, the microbial action results in the oxidation of ferrous ions to ferric ions and the ferric ions then chemically oxidize the sulfide minerals and dissolve the copper ions. This is referred to as an indirect mechanism and is the dominant mechanism in copper dissolution from chalcopyrite as the primary and refractory copper sulfide [33]. Copper dissolution from chalcopyrite by the indirect mechanism occurs through the following reactions [34]:



The first stage of this research focused on enhancing the oxidation rate of the microorganisms (Eqs. (4) and (5)) and subsequently increasing the dissolution rate and recovery of copper from chalcopyrite concentrate (Eq. (3)). For this purpose, diethyl sulfate was used as an effective chemical mutagen. Different concentrations of diethyl sulfate were added to Samples of each microorganism. The samples then stirred for 15 minutes at a rate of 100 rpm. The diethyl sulfate induced bacterial samples were subsequently cultured under the optimal conditions described previously for the mesophilic strains.

To quantify the effect of diethyl sulfate addition on the bacteria used, a series of oxidation rate tests were conducted. The diethyl sulfate-induced bacterial solutions contained specific amounts of initial ferrous ion added in form of ferrous sulfate and elemental sulfur were incubated under optimal operating conditions. The oxidation rates during incubation were calculated as the ratio of oxidized ferrous iron to the initial value (Eq. (1)) for *Acidithiobacillus ferrooxidans* and *Leptosprillum ferrooxidans* and the ratio of oxidized elemental sulfur to the initial value (Eq. (2)) for *Acidithiobacillus thiooxidans*. The Fe<sup>2+</sup> oxidation rates for *Acidithiobacillus ferrooxidans* and *Leptosprillum ferrooxidans* and the S<sup>0</sup> oxidation rates for *Acidithiobacillus thiooxidans* are shown in Figs. 2 to 4, respectively.

Fig. 2 shows that the oxidation rate of ferrous ion by *Acidithiobacillus ferrooxidans* increased gradually from

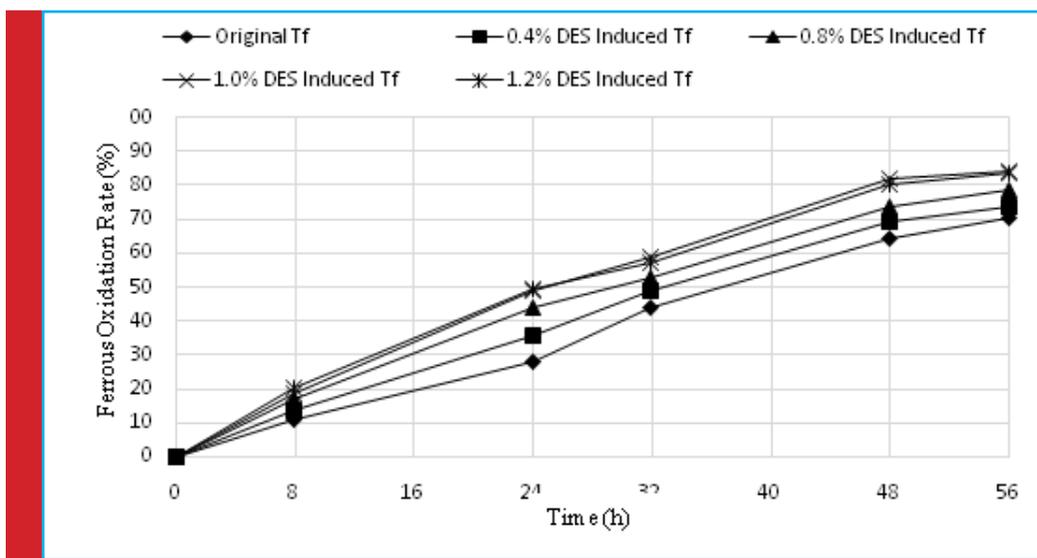


FIGURE 2  $Fe^{2+}$  oxidation rates by original and diethyl sulfate-induced Tf (Tf: *Acidithiobacillus ferrooxidans*) at 32°C, 125 rpm, initial pH of 1.8 and initial  $Fe^{2+}$  concentration of 6 g/l.

70% to 84% in 56 h as the concentration of diethyl sulfate increased from 0 to 1.0 % (v/v). A further increase in mutagen concentration to 1.2% (v/v) slightly decreased the oxidation rate to 83%.

Fig. 3 shows the results of  $Fe^{2+}$  oxidation rates for the wild-type and diethyl sulfate-induced *Leptospirillum ferrooxidans* bacteria. The oxidation rate increased from 75% to 90% as the diethyl sulfate concentration increased from 0 to 1.0% (v/v). Increasing the mutagen concentration to 1.2% (v/v) decreased the oxidation rate 87%.

Fig. 4 shows results of  $S^0$  oxidation rates by wild-type and diethyl sulfate-induced *Acidithiobacillus thiooxidans*. The highest elemental sulfur oxidation rate was obtained at 1.0% (v/v) diethyl sulfate concentration (62.5%). Extra concentration of mutagen decreased the oxidation rate to 62%.

Based on the results, 1.0% (v/v) concentration of diethyl sulfate was selected as optimum concentration of chemical mutagen for mutating all three strains and to make a mixed culture of mutated mesophiles at a ratio of 4:4:2, for *Acidithiobacillus ferrooxidans*, *Leptospirillum*

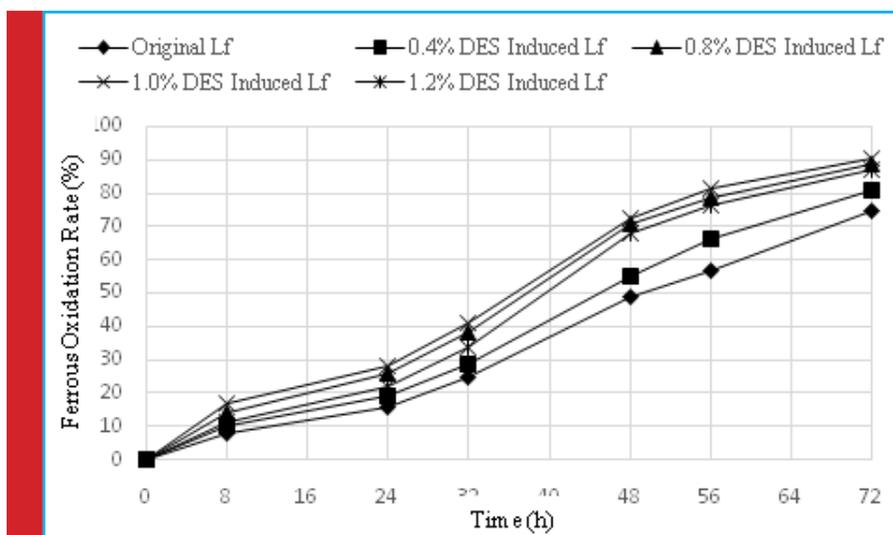


FIGURE 3  $Fe^{2+}$  oxidation rates by wild-type and diethyl sulfate-induced Lf (Lf: *Leptospirillum ferrooxidans*) at 32°C, 125 rpm, initial pH of 1.6 and initial  $Fe^{2+}$  concentration of 10 g/l.

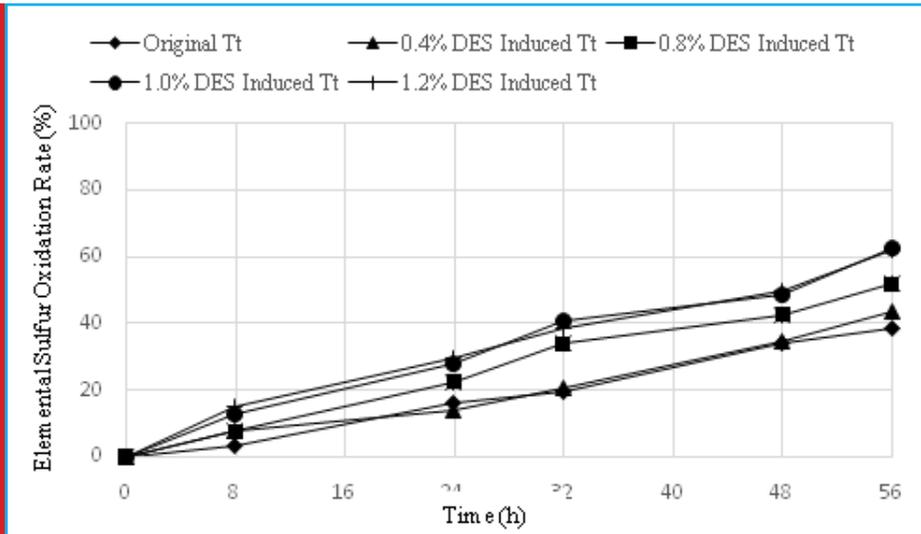


FIGURE 4 S<sup>0</sup> oxidation rates by wild-type and diethyl sulfate-induced Tt (Tt: *Acidithiobacillus thiooxidans*) at 32°C, 125 rpm, initial pH of 2.0 and initial sulfur concentration of 10 g/l.

*ferrooxidans* and *Acidithiobacillus thiooxidans*, respectively. The mixed culture was then used in the bioleaching experiments.

**Bioleaching experiments**

Bioleaching experiments were conducted to evaluate the effect of bacteria chemical mutation using diethyl sulfate on copper recovery from chalcopyrite concentrate. Three series of tests were carried out using: (1) a mixed

culture of wild-type mesophilic bacteria without mutation; (2) a mixed culture of chemical mutated mesophilic bacteria and; (3) a mixed culture of the original moderately thermophilic bacteria without mutation. In all tests, 40 g of dry concentrate was added to a sufficient amount of 9K medium containing 10% (v/v) bacterial solution without an additional energy source to make a 200-ml pulp at 20% (w/v) solid density. The experiments were carried out in 500 ml Erlenmeyer flasks.

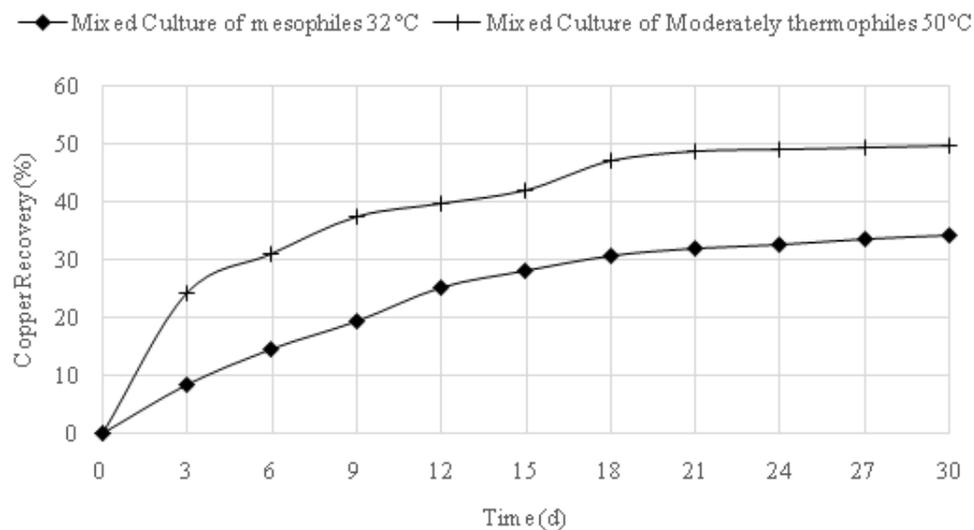


FIGURE 5 Copper recovery from concentrate in control tests using wild-type mesophilic and moderately thermophilic Mixed Cultures.

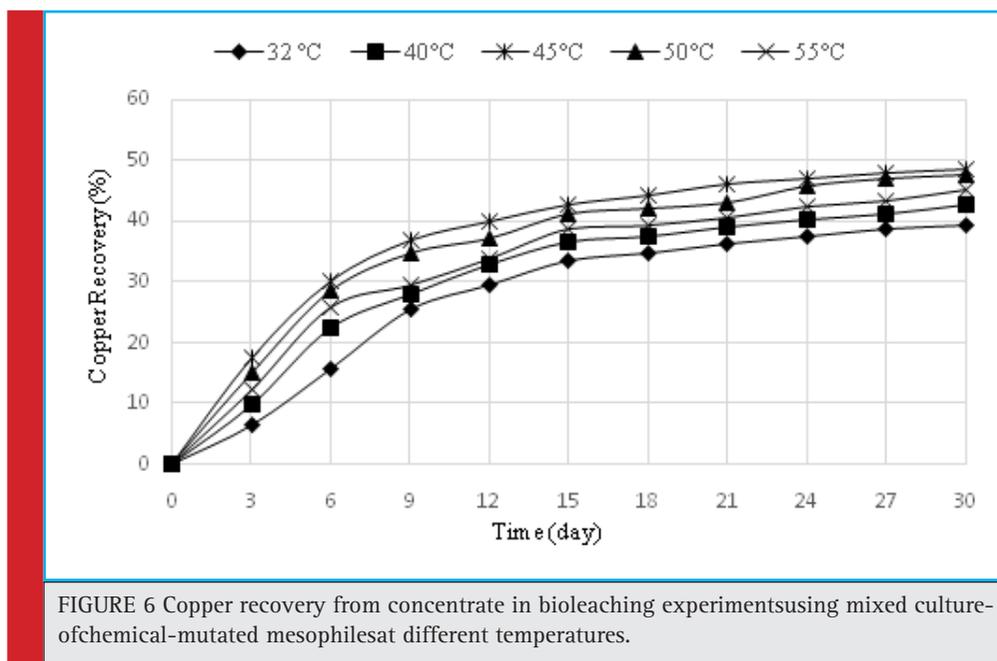


FIGURE 6 Copper recovery from concentrate in bioleaching experiments using mixed culture of chemical-mutated mesophiles at different temperatures.

**Control tests**

Bioleaching experiments with a mixed culture of wild-type mesophilic bacteria without mutation were carried out as control tests. The initial pH of the pulp was adjusted to 1.8 using sulfuric acid. The temperature and stirring speed were set to 32°C and 125 rpm, respectively.

The samples were allowed to bioleach for 30 days. At specific intervals, the leaching solutions were analyzed for pH, redox potential and dissolved copper concentration. The results of copper recovery shown in Fig. 5 indicate that only 34.2% Cu was extracted from the chalcopyrite after 30 days.

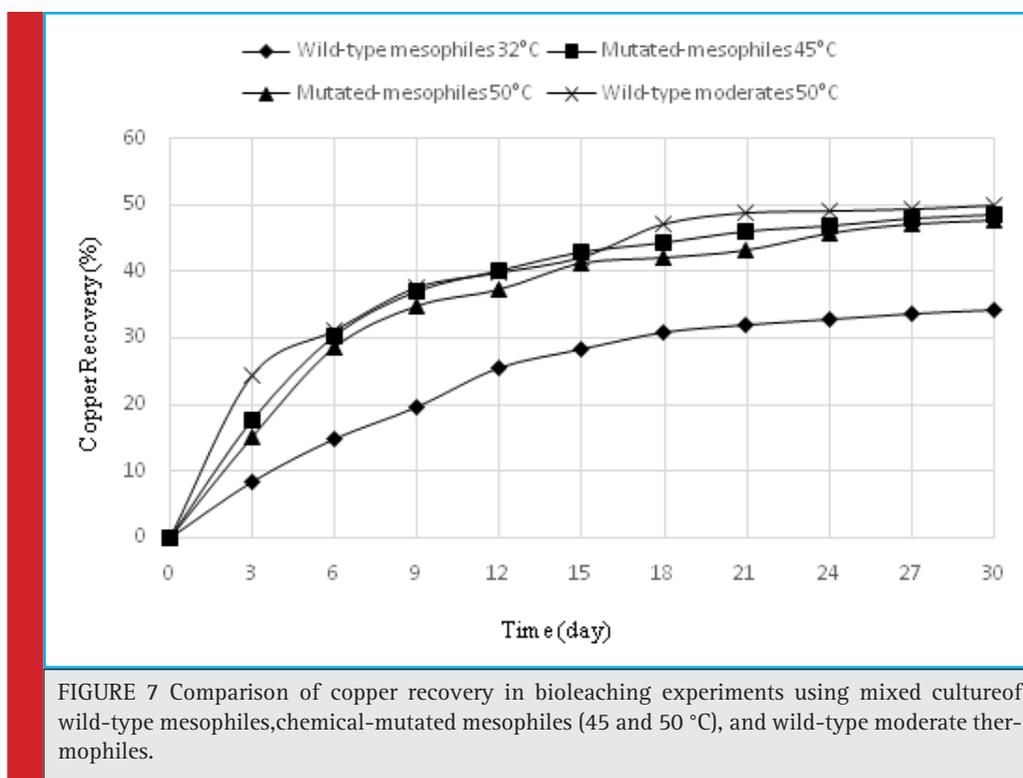


FIGURE 7 Comparison of copper recovery in bioleaching experiments using mixed culture of wild-type mesophiles, chemical-mutated mesophiles (45 and 50 °C), and wild-type moderate thermophiles.

Bioleaching tests were also carried out with a mixed culture of original moderately thermophilic bacteria at 50°C, a pH of 1.8 and a stirring rate of 120 rpm. The results of copper recovery are shown in Fig. 5. After 21 days, copper extraction was about 49%; after that, no significant increase was observed in Cu extraction. This could be attributed to the passivation of the mineral surface by sulfur and poly-sulfide precipitates formed during bioleaching [12, 17, 31].

#### Leaching experiments using mutant bacteria

A mixed culture of chemical mutated mesophilic bacteria was used in chalcopyrite concentrate bioleaching experiments. These experiments were carried out at temperatures of 32, 40, 45, 50 and 55 °C to investigate the effect of chemical mutation by diethyl sulfate on the viability of mutant bacteria at higher temperatures as well as the influence of higher temperatures on copper recovery in bioleaching. The other conditions of experiments including pH, stirring rate, solid concentration and inoculation ratio were same as the control test. Fig. 6 shows that the recovery of copper increased as the temperature increased from 32 to 45 °C. The highest copper recovery after 30 days recovery obtained at 45 °C was 48.5%. Further increase in temperature to 50 and 55 °C decreased copper recovery to 47.6 and 45.2%, respectively. It can be concluded that chemical mutation increased the viability of mesophilic bacteria at higher temperatures up to a certain temperature. It is also evident that copper recovery increased as the temperature increased.

#### Comparison of Cu recovery by wild-type and mutated bacteria

Fig. 7 compares the Cu recovery from concentrate by a mixed culture of wild-type mesophiles, a mixed culture of chemical-mutated mesophiles at higher temperatures, and a mixed culture of moderate thermophiles. It can be observed that in the early stages of bioleaching, the slope of the recovery versus time graph for the mutated mesophilic bacteria is sharper than for the wild-type bacteria and that the graph for the moderately thermophilic bacteria is sharper than the other two. This means that the copper dissolution rate by the moderate thermophiles was higher than for both the mutated and original mesophiles in the preliminary phase of bioleaching.

The mutated mesophiles equaled the final copper recovery of the original bacteria (about 34%) after less than 15 days, which was half of the total bioleaching time for the original strains. After 30 days, 39.5% of copper had been dissolved by the mutated mesophilic bacteria. It can be concluded that the mutated mesophilic mixed culture was able to extract more copper from the chalcopyrite concentrate in a shorter bioleach-

ing time. This can be attributed to the higher oxidation activity of the mutated bacteria compared to the original mesophilic strains.

Copper recovery by moderate thermophiles in the preliminary stage of bioleaching was higher than by the mutated mesophiles. At 9 days of bioleaching, copper recovery by the mutated mesophiles reached a value similar to that obtained by the wild-type moderate thermophiles. This can be attributed to the higher oxidation activity due to mutation. After 9 days, similar behavior was observed for both the mutated mesophiles and original moderate thermophiles and the final copper recovery rate by the mixed culture of mutated mesophiles at 45°C (48.5%) was slightly lower than that for the mixed culture of moderate thermophiles at 50°C (49.8%). The copper extraction rates in the last phase of bioleaching by all types of strains were very low. It was concluded that the decrease in recovery rate was caused by mineral surface passivation in all cases; thus, oxidation activity of strains in the early stages of bioleaching is very important to the amount of copper extracted from the concentrate.

The current study investigated the effect of chemical mutation in bacteria by using diethyl sulfate on the oxidation activity of *Acidithiobacillus ferrooxidans*, *Acidithiobacillus thiooxidans* and *Leptosprillum ferrooxidans* and on copper recovery from chalcopyrite concentrate during bioleaching using a mixed culture of mesophilic bacteria. It was found that mutagen concentration affected oxidation rates of the strains. The bacterial solutions of *Acidithiobacillus ferrooxidans* and *Leptosprillum ferrooxidans* contained 1.0%(v/v) diethyl sulfate increased the Fe<sup>2+</sup> oxidation rates by 15% for both strains, compared to the wild-type bacteria. Elemental sulfur oxidation by solution of *Acidithiobacillus thiooxidans* contained 1.0%(v/v) diethyl sulfate increased by about 24% compared to the wild-type strain. Further concentration of mutagen was found to decrease the oxidation rates in all cases.

The increase in oxidation rates caused by mutation was investigated for bioleaching of chalcopyrite concentrate using a mixed culture of chemical mutated *Acidithiobacillus ferrooxidans*, *Leptosprillum ferrooxidans* and *Acidithiobacillus thiooxidans* at a ratio of 4:4:2, respectively. The results showed that copper recovery increased in the mutated mixed culture compared to the wild-type bacteria under similar operational conditions. Cu extraction reached about 34% in 15 days for the mutated mixed culture, which equals the final recovery obtained by the mixed culture of wild-type mesophiles in 30 days. The final copper extraction rate for the mutated mixed culture of mesophilic bacteria after 30 days was 39.5%, which was higher than the 34.2% for the original mixed culture in 30 days.

The effect of mutation on the viability of the mesophilic bacteria at higher temperatures and subsequently on copper recovery from chalcopyrite concentrate at 32, 40, 45, 50 and 55 °C was investigated and compared with that by the original mixed culture of moderately thermophilic bacteria at 50°C. The results showed that the mutated mixed culture of mesophilic bacteria at 45 and 50 °C increased copper recovery that equaled that obtained by the original mixed culture of moderately thermophilic bacteria. Further increasing the temperature to 55°C decreased Cu recovery, indicating that mutation had a positive effect on the viability of bacteria at higher temperatures up to a certain level. It could be concluded that copper recovery by the original mixed culture of moderately thermophilic bacteria at 50°C can be achieved by chemical-mutated mesophilic bacteria at 45°C.

## ACKNOWLEDGMENTS

The authors gratefully acknowledge the R&D Division of the National Iranian Copper Industries Company and Tehran Science and Research Branch at Islamic Azad University.

## REFERENCES

- Abdollahi H., Noaparast M., Shafaei S.Z., Manafi Z., Muñoz J.A., Tuovinen O.H., Silver-Catalyzed Bioleaching of Copper, Molybdenum and Rhenium from a Chalcopyrite-Molybdenite Concentrate, *International Biodeterioration & Biodegradation*, **104**: 194-200 (2015).
- Abdollahy M., Shojaosadati S.A., Zare Tavakoli S., Valivand A., Bioleaching of Low Grade Uranium Ore of Saghand Mine, *Iranian Journal of Chemistry and Chemical Engineering (IJCCE)*, **30**(4): 71-79 (2011).
- Ahmadi A., Schaffie M., Manafi Z., Ranjbar M., Electrochemical Bioleaching of High Grade Chalcopyrite Flotation Concentrates in Stirred Bioreactor, *Hydrometallurgy*, **104**(1): 99-105 (2010).
- Ahmadi A., Schaffie M., Manafi Z., Ranjbar M., Optimization of Copper Concentrate Bioleaching by Mixed Moderate Thermophile Bacteria, *Journal of Separation Science and Engineering*, **2**(1): 99-105 (2010).
- Ahmadi A., Schaffie M., Petersen J., Schippers A., Ranjbar M., Conventional and Electrochemical Bioleaching of Chalcopyrite Concentrates by Moderately Thermophilic Bacteria at High Pulp Density, *Hydrometallurgy*, **106**(1-2): 84-92 (2011).
- Akcil A., Potential Bioleaching Developments towards Commercial Reality: Turkish Metal Mining's Future, *Minerals Engineering*, **17** (3): 477-480 (2004).
- Anjum F., Bhatti H.N., Ghauri M.A., Enhanced Bioleaching of Metals from Black Shale Using Ultrasonics, *Hydrometallurgy*, **100** (3-4): 122-128 (2010).
- Behrad Vakylabad A., A Comparison of Bioleaching Ability of Mesophilic and Moderately Thermophilic Culture on Copper Bioleaching from Flotation Concentrate and Smelter Dust, *International Journal of Mineral Processing*, **101**(1-4): 94-99 (2011).
- Brierley J.A., A Perspective on Developments in Biohydrometallurgy, *Hydrometallurgy*, **94** (1-4): 2-7 (2008).
- Chang L., Xia J., Zhao X., Yang Y., Gong S., Nie A., Ma C., Zheng L., Zhao Y., Qiu G., Effect of Activated Carbon on Chalcopyrite Bioleaching with Extreme Thermophile *Acidianus manzaensis*, *Hydrometallurgy*, **105**(1-2): 179-185 (2010).
- Dong Y., Lin H., Wang H., Mo X., Fu K., Wen H., Effects of Ultraviolet Irradiation on Bacteria Mutation and Bioleaching of Low-Grade Copper Tailings, *Minerals Engineering*, **24**(8): 870-875 (2011).
- Farah C., Vera M., Morin D., Haras D., Jerez C.A., Guiliani N., Evidence for a Functional Quorum-Sensing Type AI-1 System in the Extremophilic Bacterium *Acidithiobacillus ferrooxidans*, *Applied and Environmental Microbiology*, **71** (11): 7033-7040 (2005).
- Gericke M., Pinches A., Rooyen J.V., Bioleaching of a Chalcopyrite Concentrate Using an Extremely Thermophilic Culture, *International Journal of Mineral Processing*, **62** (1-4): 243-255 (2001).
- Habashi F., "Chalcopyrite; Its Chemistry and Metallurgy", McGraw Hill, New York (1978).
- Lotfalian M., Ranjbar M., Fazelpoor M.H., Schaffie M., Manafi Z., The Effect of Redox Control on the Continuous Bioleaching of Chalcopyrite Concentrate, *Minerals Engineering*, **81**: 52-57 (2015).
- Meng C., Shi X., Lin H., Chen J., Guo Y., UV Induced Mutations in *Acidianus brierleyi* Growing in a Continuous Stirred Tank Reactor Generated a Strain with Improved Bioleaching Capabilities, *Enzyme and Microbial Technology*, **40**(5): 1136-1140 (2007).
- Moazemi Goodarzi M., Rezai B., Seifikhani A., Leaching and Kinetic Modelling of Molybdenite Concentrate Using Hydrogen Peroxide in Sulfuric Acid Solution, *Iranian Journal of Chemistry and Chemical Engineering (IJCCE)*, **33**(2): 73-85 (2014).
- Mousavi S.M., Vossoughi M., Yaghmaei S., Jafari A., Copper Recovery from Chalcopyrite Concentrate by an Indigenous *Acidithiobacillus ferrooxidans* in an Air-Lift Bioreactor, *Iranian Journal of Chemistry and Chemical Engineering (IJCCE)*, **25**(3): 21-26 (2006).
- Olumbabi P. A., Influence of Microwave Pretreatment on the Bioleaching Behaviour of Low-Grade Complex Sulphide Ores, *Hydrometallurgy*, **95** (1-2): 159-165 (2009).
- Panda S., Sanjay K., Sukla L.B., Pradhan N., Subbaiah T., Mishra B.K., Prasad M.S.R., Ray S.K., Insights into Heap Bioleaching of Low Grade Chalcopyrite Ores: A Pilot Scale Study, *Hydrometallurgy*, **125-126**: 157-165 (2012).
- Panda S., Sarangi C.K., Pradhan N., Subbaiah T., Sukla L.B., Mishra B.K., Bhatoa G.L., Prasad M.S.R., Ray S.K., Bio-

- Hydrometallurgical Processing of Low Grade Chalcopyrite for Recovery of Copper Metal, *Korean J. Chem. Eng.*, **26**: 781–785 (2012).
- Plumb J.J., McSweeney N.J., Franzmann P.D., Growth and Activity of Pure and Mixed Bioleaching Strains on Low Grade Chalcopyrite Ore, *Minerals Engineering*, **21** (1): 93–99 (2008).
- Qiu G.Z., Liu X.D., Zhou H.B., Microbial Community Structure and Function in Sulfide Ore Bioleaching Systems, *Transactions of Nonferrous Metals Society of China (English Edition)*, **18**: 1295–1301 (2008).
- R. Frankham, J. D. Ballou, D. A. Briscoe, 2010. Introduction to conservation Genetics, Chapter 7: Evolutionary impacts of mutation and migration, and their interactions with selection in large populations. Cambridge University Press, New York.
- Rawling D. E., Heavy Metal Mining Using Microbes, *Annual Review of Microbiology*, **56**: 65–91 (2002).
- Rawling D. E., Silver S., Mining with Microbes, *Biotechnology*, **13**: 73–778 (1995).
- Sand W., Gehrke T., Jozsa P.G., Schippers A., (Bio)Chemistry of Bacterial Leaching-Direct Vs. Indirect Bioleaching, *Hydrometallurgy*, **59**(2-3): 159–175 (2001).
- Schaaper R.M., Dunn R.L., Glicman B.W., Mechanisms of Ultraviolet-Induced Mutation: Mutational Spectra in the *Escherichia coli* lacI Gene for a Wild-Type and an Excision-Repair-Deficient Strain, *Journal of Molecular Biology*, **198** (2): 187–202 (1987).
- Schippers A., Sand W., Bacterial Leaching of Metal Sulfides Proceeds by Two Indirect Mechanisms Via Thiosulfate or Via Polysulfides and Sulfur, *Applied and Environmental Microbiology*, **65** (1): 319–321 (1999).
- Torma A.E., The role of *Thiobacillus ferrooxidans* in Hydrometallurgical Processes, *Advances in Biochemical Engineering*, **6**: 1–37 (1977).
- Waltling H.R., The Bioleaching of Sulphide Minerals with Emphasis on Copper Sulphides: A review, *Hydrometallurgy*, **84**(1-2): 81–108 (2006).
- Wang Y., Su L., Zeng W., Qiu G., Wan L., Chen X., Zhou H., Optimization of Copper Extraction for Bioleaching of Complex Cu-Polymetallic Concentrate by Moderate Thermophiles, *Transactions of Nonferrous Metals Society of China*, **24**(4): 1161–1170 (2014).
- Zeng W., Qiu G., Zhou H., Chen M., Electrochemical Behaviour of Massive Chalcopyrite Electrodes Bioleached by Moderately Thermophilic Microorganisms at 48 °C, *Hydrometallurgy*, **105**(3): 259–263 (2011).
- Zhang W., Gu S., Catalytic Effect of Activated Carbon on Bioleaching of Low-Grade Primary Copper Sulfide Ores, *Transactions of Nonferrous Metals Society of China*, **17**(5): 1123–1127 (2007).

## Gorgan Bay hydrodynamic model to calculate water flow velocity

Majid Dastdaran, Hossein Morovvati, Afshin Mohseni Arasteh,\* Masoud Torabi Azad and Kamran Lari

*Department of Physical Oceanography, Faculty of Marine Science and Technology, Islamic Azad University, North Tehran Branch; Tehran, Iran*

### ABSTRACT

This research aims at studying the field and the nature of the flow pattern within the Gorgan Bay. The sandstone slabs of Miankaleh and Gorgan Bay openings under the hydrodynamic factors are constantly changing. Various factors such as wind, sea level fluctuations and flow are affected by this deformation. In this paper, the two-dimensional hydrodynamic model of Gorgan Bay is presented using the Mike 21 hydrodynamic model software to calculate the flow velocity. Changes in water level at the only open boundary of the model (Ashuradeh - Turkmen port), Gulf primary water level, Meteorological parameters including precipitation, evaporation, wind speed and direction, time step, ambient heat exchange, and coefficient of roughness of the floor in the appropriate range to the model Applied. Using flow velocity data, the hydrodynamic model was accurately calibrated and verified. The results of the model state that the average direction of flow in a year in the Gorgan Bay is clockwise. The average water flow rate is 0.029 m/s, and the flow pattern calculated by the model is compared with the continuous measurements of flow through float tracking in two stages and the results are confirmed.

**KEY WORDS:** GORGAN BAY, HYDRODYNAMIC MODELING, WATER FLOW VELOCITY, MIKE 21

### INTRODUCTION

The status of water bodies in human life is undeniable. Gulfs are important water bodies and very sensitive and fragile ecosystems in arid and semi-arid world, including Iran. Gulfs have a valuable role in the development of

their marginalized communities and their vital effect is also visible to remote areas indirectly. Gorgan Bay and Miankaleh peninsula has been registered as one of the world's biosphere reserves of wildlife refuge due to have a great biological importance. Ecology of Gorgan Bay is affected by the Caspian Sea, adjacent rivers and the pen-

#### ARTICLE INFORMATION:

\*Corresponding Author: [Info@am-arasteh.com](mailto:Info@am-arasteh.com)

Received 12<sup>th</sup> April, 2017

Accepted after revision 1<sup>st</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

insula of Miankaleh which is important in the growth and reproduction of aquatic animals, fish and fish bones, cartilage and attraction of winter migratory birds. Research conducted in Gorgan Bay indicated that this water body is a good place for different aquaculture (Javani, 2012).

In the current situation, facing with water shortage caused by drought and reduction of rainfall in the country, the preservation and management of water bodies such as gulfs and lagoons is essential. In order to carry out qualitative studies, locating and ... it is required that state of motion and flow in the body of water is known. So, one of the important requirements in water bodies' studies are performing of hydrodynamic study. Mathematical modeling of hydrodynamics simultaneously is possible and can provide the chance to measure and determine the pattern of changes in water flow velocity in the considered range. So far, many studies on hydrodynamic modeling is performed in water bodies, also, in several studies, Mike 21 software was used to design the hydrodynamic modeling. So, in any case in order to study accurately first of all the comprehensive investigation and accurate insights from studies of similar projects which was related to the topic is essential. Therefore, we will review some similar studies. David, Huntley and Davidson, 2003 performed the hydrodynamic model MIKE 21 in the river channel in an area of 2 km and 14 km from the Gulf of Teignmouth in England. The result of sensitivity analysis after calibration program indicated the very low error in the model simulation and data analysis (David, Huntley And Davidson, 2003).

Babu *et al.* 2005 studied modelling of tide-driven currents and residual eddies in the Gulf of Kachchh located in southwest India using Mike21 numerical hydrodynamic model. In this modeling, wind friction coefficient was equal to 0.002, Manning number was 38 and

rotational viscosity was 0.5 and was calibrated. This study revealed that wind power has an important role in determining the hydrodynamics and sediment transport in the region so as to increase the southwest winds during January and July the tidal flow speed is about 20 percents and the rate of flow decrease equally (Babu *et al.* 2005).

French and Kerper 2004 using Mike software control the salinity of seawater in the Gulf of Ted and using the available data, the control of salinity was considered as a factor in improving the plant environment of Ted Gulf (French and Kerper, 2004). Petersen and Rasch, 2005 with Modeling of seismic waves resulting tsunami off the coast of northern Sumatra in Indonesia examined how to create waves of ground motion and three-dimensional simulation software and how the waves took using Mike 21 software and its approach to these shores (Petersen and Rasch, 2005)

## MATERIALS AND METHODS

**Area of study:** Gorgan Bay is located in the southeast of the Caspian Sea with an area of approximately 521 square kilometers and is considered as the largest Bay in the shore of Caspian Sea. The only open border of this Bay is Ashuradeh border in the northeast part which connects the Bay to the Caspian Sea (Figure 1). The average length is about 40 km and the average width is about 10 km. its geographical coordinates are of 30° 53' to 03° 54' Eastern and 36° 46' to 36° 54' northern respectively. Part of the Bay is located in Golestan province and other parts of Mazandaran province. Gorgan Bay has a level-polling station digital which is located in Ashuradeh region and flush the water every 10 minutes once picked (Figure 2).

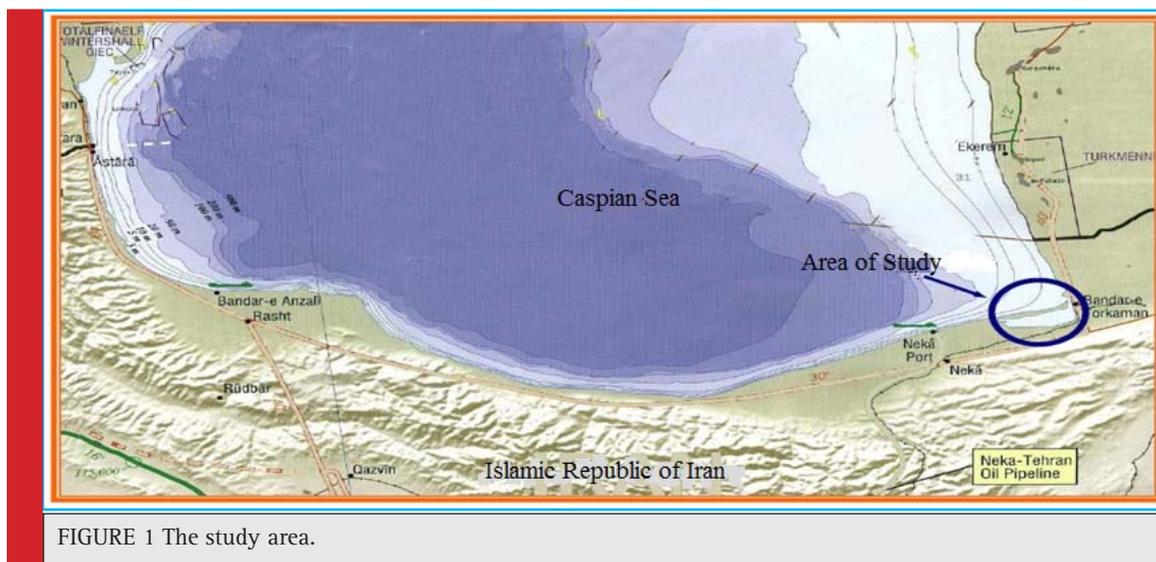


FIGURE 1 The study area.



FIGURE 2 Regional level gauge stations of Ashuradeh

### THE GOVERNING EQUATIONS IN THE SOFTWARE MIKE21

Mike 21 is a two-dimensional model (longitudinal and transverse) which has been developed by a Danish Hydraulic Institute (DHI) which is one of the most important and most prominent research institutions in the world in the field of hydrodynamics. This software supports hydrodynamic modeling for the kinematic wave, reflective and is quite dynamic. In this model, the assumption is made that there is no change in the vertical dimension this assumption seems reasonable because

in Gorgan Bay the water depth is very small compared to its level. Mike21 hydrodynamic model is worked based on discrete finite difference method for the equations of continuity and momentum. Therefore, in this study, according to the capabilities Mike 21 model, the model for hydrodynamic simulation is used to calculate the water flow velocity. The governing equations of hydrodynamic model (Table 1) are presented. The parameters used in the equations of hydrodynamics are presented (Table 2).

**Research Algorithm:** According to the measured and collected information modeling was considered for

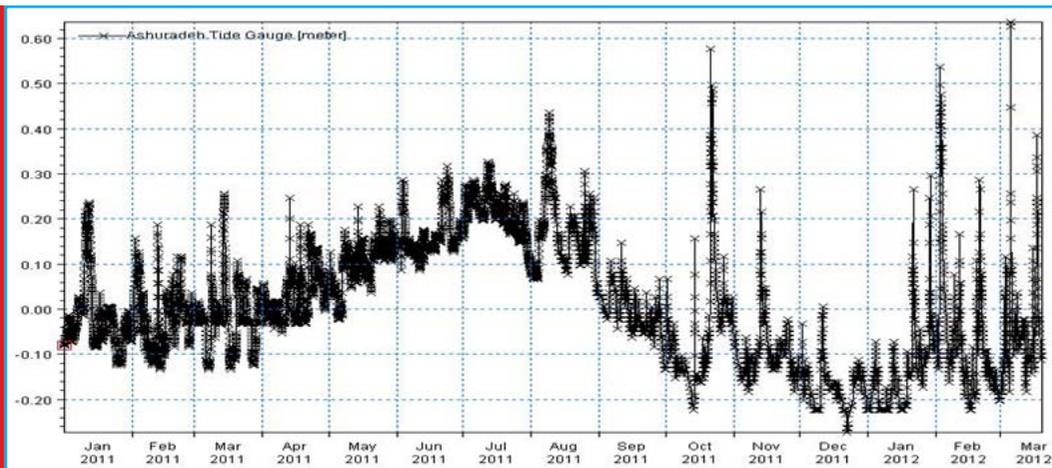


FIGURE 3 . Time changes in the water level of Ashuradeh station in the period when modeling

Table 1. Hydrodynamic equations of the model Mike 21.

Formula	Equation
$\frac{\partial \zeta}{\partial t} + \frac{\partial p}{\partial x} + \frac{\partial q}{\partial y} = \frac{\partial d}{\partial t}$	Conjunction
$\frac{\partial p}{\partial t} + \frac{\partial}{\partial x} \left( \frac{p^2}{h} \right) + \frac{\partial}{\partial y} \left( \frac{pq}{h} \right) + gh \frac{\partial \zeta}{\partial x} + gp \sqrt{\frac{p^2+q^2}{c^2 h^2}} - \left[ nu_x \frac{\partial^2 p}{\partial x^2} + nu_y \frac{\partial^2 p}{\partial y^2} \right] - \Omega q = 0$	Momentum in the direction of x
$\frac{\partial p}{\partial t} + \frac{\partial}{\partial y} \left( \frac{p^2}{h} \right) + \frac{\partial}{\partial x} \left( \frac{pq}{h} \right) + gh \frac{\partial \zeta}{\partial y} + gp \sqrt{\frac{p^2+q^2}{c^2 h^2}} - \left[ nu_x \frac{\partial^2 p}{\partial y^2} + nu_y \frac{\partial^2 q}{\partial x^2} \right] - \Omega q = 0$	Momentum in the direction of y

Table 2. Parameters used in the equations in the model Mike 21.

Parameters' definiton	Parameters' Mark	Parameters' definiton	Parameters' Mark
Water depth	h	Coefficient of viscosity	nu
Water level	(x,y,t)ζ	Chezy coefficient	C
water depth changes	d(x,y,t)	Coriolis parameter	Ω
Flux density in the direction of x and y	p,q(x,y,t)	Gravitational constant	g
Time		T	

a period of one year, 2011, this period was intended to do modeling. Research algorithm (Figure 5) is presented. Then, the steps shown in (Figure 5) are described briefly in figure 5. In order to access the information of water border, Mark Line and deep-water of Gorgan Bay hydrographic modeling and geodetic field operations in the area was performed. Water harvesting and Mark Line

were performed using Nivo Total Station and took a handheld GPS device, the base is used for all harvested areas land surveying and hydrographic operations, BM Precise Leveling wast the balance equal to -23.32 meters from the high seas (Yarinasab, 2012). The input data includes the following models: Time changes of Gorgan Bay in 2011 when the water level open border with

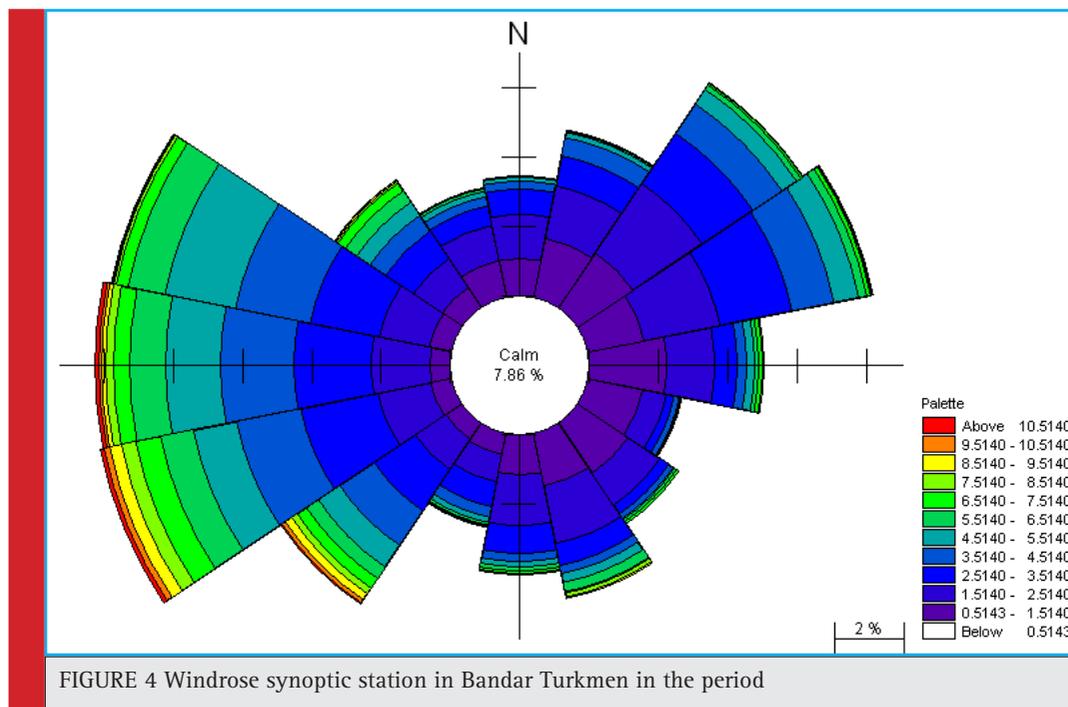
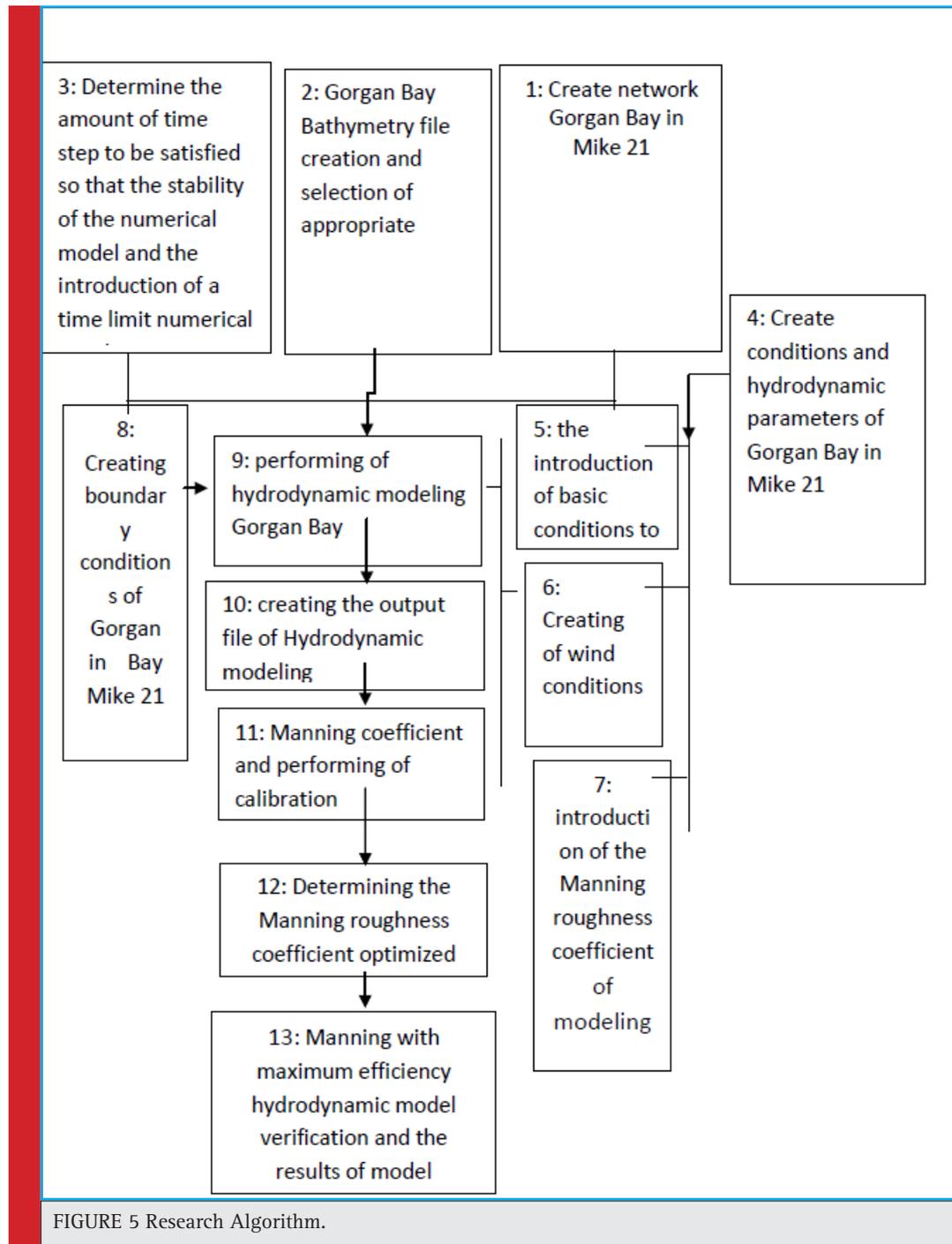


FIGURE 4 Windrose synoptic station in Bandar Turkmen in the period



Digital level gauge stations of Ashuradeh occurs each 10 minutes (Figure 3).

The wind changes for 10 minutes of synoptic station in Bandar Turkmen were picked due to its proximity to the Gulf was harvested. Regarding to (Figure 4) Windrose of synoptic station in Bandar Turkmen in the period plotted model.

Time changes in effective precipitation (precipitation minus evaporation) were collected to-be 10 minutes of evaporation station and were collected by rain nearby lake. Step running time of 600 seconds was considered the model that fits courant number was 0.7.

After creating input files and import them into a hydrodynamic model using Manning roughness

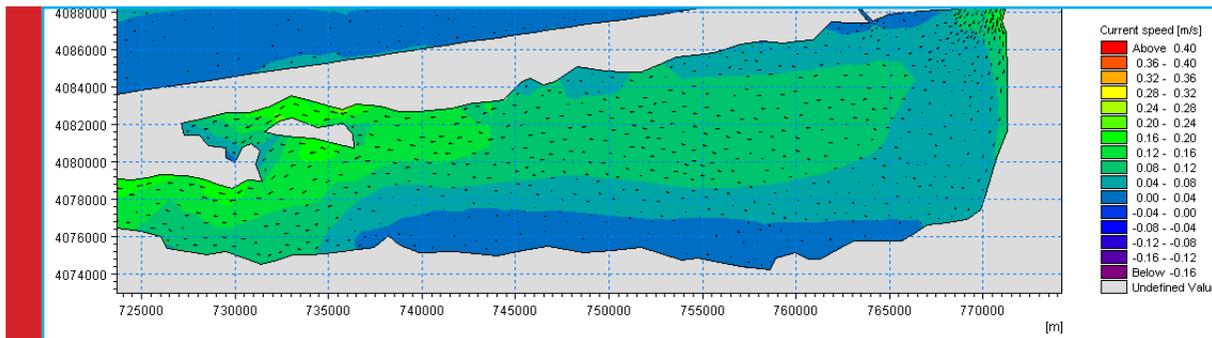


FIGURE 6 The input of flow in the Gulf due to the open border

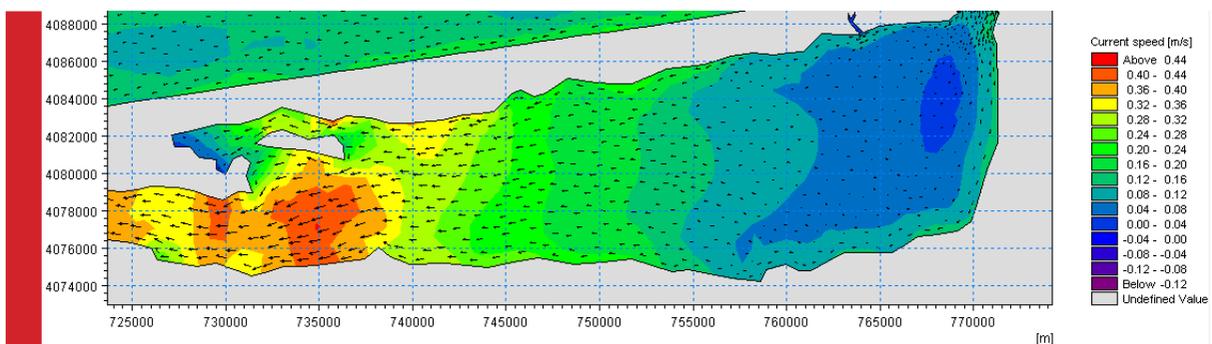


FIGURE 7 The flow pattern in the Gulf created by the rising of water level in the inlet of Gorgan Bay

coefficient, water flow velocity were extracted. For calibration and validation operations to a series of real values of the parameters of the water flow velocity the data parameter measured flow velocity has been achieved in the Gorgan Bay. This step must be performed the operation hydrodynamic model calibration and optimization of Gorgan Bay Manning roughness coefficient to be determined. During calibration operation, hydrodynamic modeling for different values of the coefficient of Manning in range (0.0-02.025) was

repeated, the results of modeling indicated the difference with Manning roughness coefficient values. For the calibration of flow velocity field information was used in the Gulf. At this stage, after hydrodynamic model calibration, validation of the models was performed. Model verification results indicated that the model is the development and calibrated thus, if a hydrodynamic model developed for the Gorgan Bay by a factor of 0.021 Manning is approved it can be used for any period of time and for the entire Gorgan Bay.

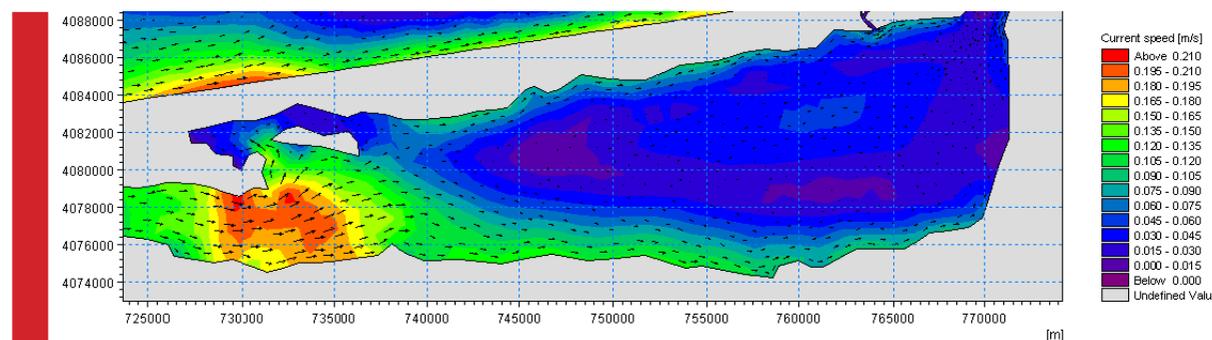


FIGURE 8 The flow pattern created by the wind blowing at a speed of 2.5 meters per second in the Gulf

## RESULTS AND DISCUSSION

### GORGAN BAY BEHAVIOR UNDER THE INFLUENCE OF VARIOUS FACTORS ON THE HYDRODYNAMIC

#### The effect of entrance Debi on open border of Gorgan Bay:

General circulation of water in Caspian Sea can enter flows through the northeast open border of the Gulf, even if in the absence of large fluctuations in the water level of the Caspian Sea in Gorgan Bay does not exist. Mean flow velocity at different levels was about 0.15(m/s). According to the strait and its average depth, the rate of debi was approximately 450-650 Cubic meters per second respectively. As shown in (Figure 6) the entrance of flow occurs due to the narrow lanes of the Strait and has created a remarkable velocity in flow, the velocity resulting in areas of central and western was not remarkable. The flow was in the direction towards the south and southwest.

#### Caspian Sea level changes at the entrance to Gorgan Bay

One of the factors that could cause significant flows in the Gulf of Caspian Sea is the rise of water level and its

impact on the Gulf through the Strait. Due to the rising water will cause a dip in the water level, the Gulf will create far greater speeds. Such a flow due to fluctuations in the Caspian Sea could be important. However, due to the fluctuations that occur during longer changes was more slowly and therefore create fluctuations in the flow pattern can be effective in the long run. Analyzes conducted by the model also confirms this issue. These analyzes indicated that by the rise of sea-level to 0.5 meters at a speed of about 0.11 meters per second at the beginning of Gulf Stream there is far more to have delivered the bay in the longitudinal direction of the effect that of entering debi. In this case, the direction of the prevailing flow was along with the length of the bay and was the only input at the beginning of the bay which dumped into a bit to the south near the border (Figure 7). Such a model shaped after about 3 hours of rising water in the Gulf and after about 13 hours reduce after removing the water from the bottom of the bay to the primary areas, the velocity began to declinestems.

### WIND EFFECTS

In general, the effect of the wind on the water flow velocity level is visible and is effective on the flow pattern of lower depths especially in cases where the effect of other hydrodynamic factors is strong. Of course,

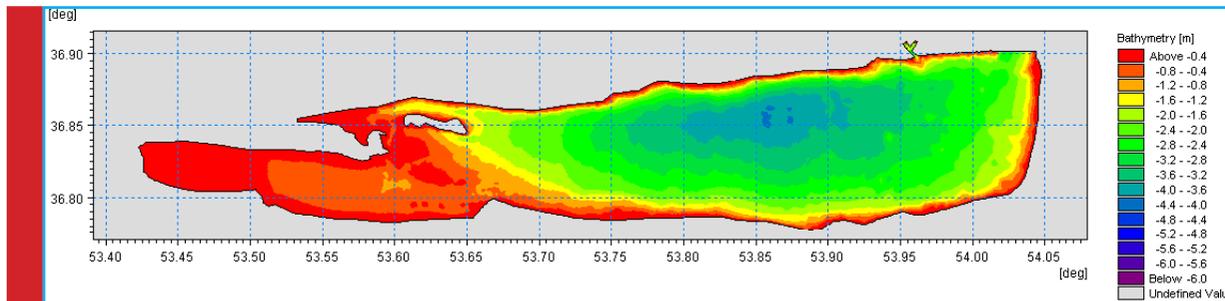


FIGURE 9 Align map of Gorgan Bay in MIKE21

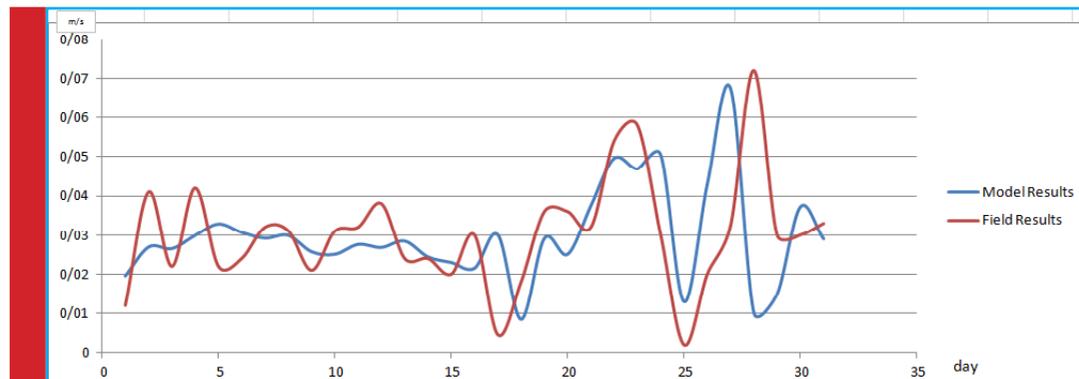


FIGURE 10 Water flow velocity obtained from the analysis model and values of the field in April 2011.

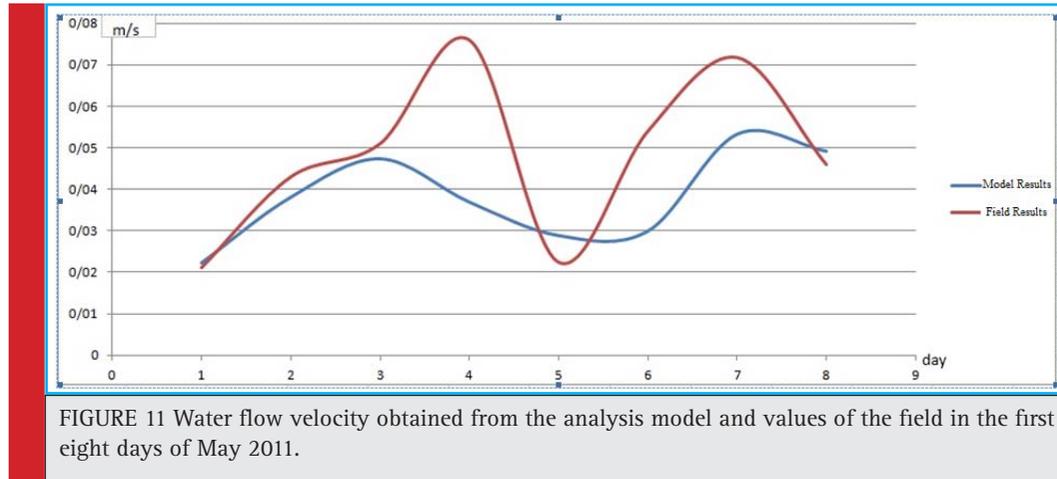


FIGURE 11 Water flow velocity obtained from the analysis model and values of the field in the first eight days of May 2011.

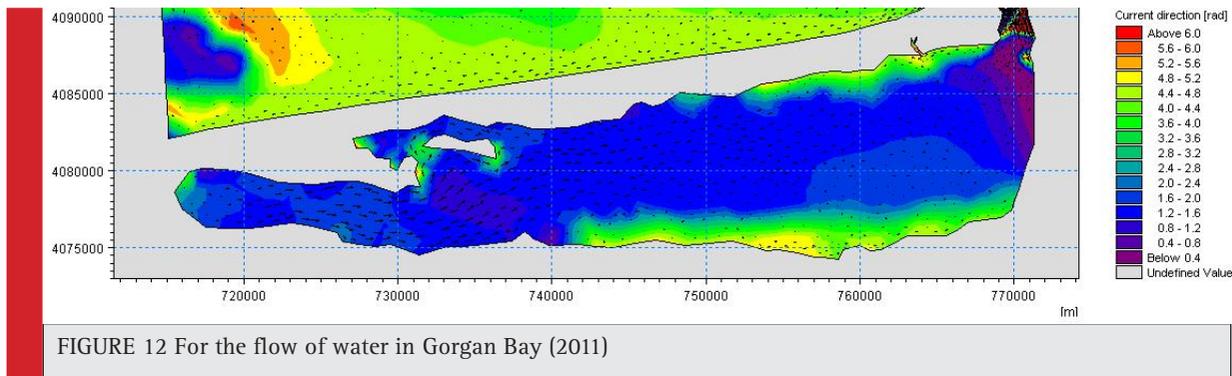


FIGURE 12 For the flow of water in Gorgan Bay (2011)

this issue is largely due to changes in wind direction, velocity limits and most importantly depend on the wind continue and this latter factor can play a major role in creating a stable and effective pattern of wind-driven flow. Windrose checking in area (Bandar Turkmen station) illustrated that winds over 5 meters per seconds are low in the area. Regarding to the annual winds blowing at a speed of 2.5 meters per second can be representative to examine the effect of the wind. The speed and direction of wind blowing across the bay from south to north creates after about 4 hours the same flow pattern (Fig-

ure 8). It is seen that the created velocity are negligible. Due to low width of bay in wind direction, the created flow after the collision to these borders returned and gradually created vortex flow patterns in the border of Gulf. In the case of a large entrance to the Gulf does not exist to openings, the resulting vortex flow of the wind scattered around the entire bay will prevail. The vortex intensity depending on the wind speed and roughness of the substrate somewhat moved by changing the values dumped into them, but the general pattern is the same in all cases.

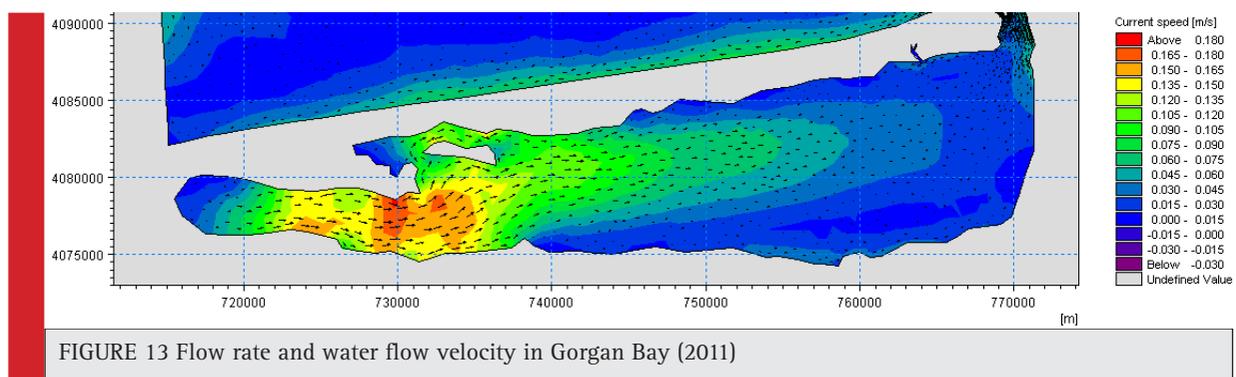


FIGURE 13 Flow rate and water flow velocity in Gorgan Bay (2011)

### The effect of rainfall and evaporation

The usual amounts of rainfall and evaporation in the implementation model represent a very small impact of these factors of the bay on stream. In fact, these two factors are important particularly evaporation in creating long-term cycles.

For depth measurements, after entering the border points and Gulf level data into the Mike software, the interpolation of the aligned data is performed and the Gorgan Gulf Water Mapping Map is constructed in the Mike 21 environment in (Fig. 9) is provided. Modeling was performed with different amounts of Manning roughness coefficient and finally, the amounts of Manning in the calibration factor was equal to 0.021 respectively.

In this section, the results of the calibration and validation of hydrodynamic model is presented. In (Figure 10) the flow velocity values obtained from the model with the actual flow velocity obtained in April 2011 in the Gorgan bay were compared for calibration.

After calibration of hydrodynamic model, it is needed for validation of the model. Manning optimal accuracy by a factor of 0.021 was carried out in (Figure 11) values water flow velocity of the model with actual results in the first eight days of May 2011 were compared together. Overall dozens results demonstrated appropriate modeling.

However, Gorgan Bay hydrodynamic model has been developed that would be state of the water flow velocity of the hydrodynamic model output, for utilization in different areas of Penn Culture including the creation and development of a variety of fish species extracted.

Therefore, the Average amount of water flow velocity was 0.029 meters per second.

The mean flow direction in the Gorgan Bay is from the west to the east and is clockwise (Figure 12) The flow velocity and vector velocity for water flow in the Gorgan Bay are shown (Figure 13).

### REFERENCES

- Babu M.T, Vethamony P, Ehrlich D. (2005). Modelling tide-driven currents and residual eddies in the Gulf of Kachchh and their seasonal variability A marine environmental planning perspective, *Ecol Model* 184: 299- 312.
- David A, Huntley F, Davidson A. (2003). Modeling Water Surface Topography at a Complex Inlet Ystem-Teignmouth. *Journal of Coastal Research*, 36: 675-685.
- French B and Kerper D. (2004). Salinity Control as a Mitigation Strategy for Habitat Improvement of Impacted Stuaries. 7th annual EPA Wetlands Workshop, NJ, USA.
- Javani A. (2012). Spatial modeling of different pollution in Gorgan gulf, MSc Thesis. Faculty of Civil and Environmental Engineering, Tarbiat Modares University. Tehran, Iran, 116p. In Persian.
- Petersen N.H and Rasch P. (2005). Modelling of the Asian Tsunami off the Coast of Northern Sumatra, Presented at the 3rd Asia-Pacific DHI Software Conference in Kuala Lumpur, Malaysia, 21-22 February.
- Yarinasab A, Taheri Shahraini H, Mohammadkhani H, Pour sufi T. (2012). Derivation of the Gorgan bay volumetric model from bathymetry data. 1st Wetland Management and Engineering Conference. Tehran, Iran. In Persian.
- Yarinasab A. (2012). Water quality modeling of Gorgan bay, Ms thesis. MSc Thesis. Faculty of Civil and Environmental Engineering, Tarbiat Modares University Tehran, Iran, 106p. In Persian.

## Determining the concentration of heavy elements and nitrate ion in heavy-used tea of Ardebil City

Nasim Ghane Anzabi and Hossein Saadati\*

*Department of Natural Resources, Ardabil Branch, Islamic Azad University, Ardabil, Iran*

### ABSTRACT

Tea is the most popular beverage for its flavor and properties in the world. Tea of Iran is one of the most healthy and purest tea of the world. The present research studies the heavy elements and nitrate ion in 20 heavy consumed tea of Ardebil (Golestan, Debsh, Galin, Doghazaal, Mahmud, Ahmad, Shahrzad, Kalkateh, Famila, and Lipton) in fall 2016. The concentration of metals in samples were checked using atomic absorption device, Perkin Elmer model, statistical analysis by Spss software, and also one-sample-t-test was used to compare them to the standard and global value. Results of research showed that the amount of heavy metal in all samples was zero. The analysis result of nitrate ion in samples showed that the mean nitrate in samples was 8.171 ppm that is 5.5 time less than standard value. The maximum mean nitrate was 13.18 ppm in Doghazaal, and the minimum one was 0.112 ppm in Mahmud tea that showed 50 ppm less than Iran standard (50 ppm).

**KEY WORDS:** BLACK TEA, HEAVY METALS, NITRATE, ARDEBIL

### INTRODUCTION

Tea is the most popular drinking for its flavor and properties in the world after water (Queen, 2007). Tea has scientific name of *Tea sinensis L.* or *Camellia sinensis* from *Teaceae* family. Tea is consumed in most countries of the world for its flavor and benefits and is considered as a diet. Studies on some foreign samples have shown that consumption of some tea types accumulate some elements in body and finally cause poisoning (Kaienzo et al., 1996). Tea, as good and heavy-used beverage of

the world, has many properties such as antibacterial properties that are effective in treatment of basil microbial infections such as cholerae vibrio (Cholera) (Londe et al., 2000). The world tea production has 1.81% growth in past decade, and global teal consumption has had 2.05% growth. In addition, annual tea consumption in Iran has been estimated 1.5 kg (Asgari, 2008). Tea is able to absorb relatively high amounts of cadmium, lead, tin, and aluminum from the soil, particularly acidic and contaminated soils, and store in its leaves (Tashkel Oghli et al., 1998).

#### ARTICLE INFORMATION:

\*Corresponding Author: [h.saadati@iauardabil.ac.ir](mailto:h.saadati@iauardabil.ac.ir)

Received 2<sup>nd</sup> July, 2017

Accepted after revision 25<sup>th</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

Tea leaves have fluoride, but the old and ripe leaves have fluoride 112 to 20 times more than young leaves (Lung et al., 2008). Consumption of the contaminated teams can make health dangers such as aluminum have role in creating Alzheimer, lead in damaging the nervous system, arsenic in skin and lung cancer, tin in blood, and cadmium in cardiovascular disease (Ebadi et al., 2005). Increasing tea age and leaves increases metal accumulations and consequently increases its danger. Therefore, high quality tea is made by young leaves (Ower et al., 1990).

Based on epidemiological and animal studies, tea is able of preventing many diseases such as skin cancer, Parkinson, heart attack, and other cardiovascular diseases (Queen, 2007). Some studies show anti-mutation and carcinogenicity properties of tea in a diet such as circular antiperspirant properties that are made in cooking meat and fish. The chemical compounds of tea are so sophisticated and include flavonoids, alkaloids, enzymes, salts, trace elements, etc. (Jaha, 1996). In addition, tea may be contaminated to heavy metals such as lead and copper in growth, process, and production that can increase amount of them in body. (Fungi, 2003) Extra receiving of the mentioned elements can lead to poisoning, and the mentioned poisoning by the mentioned elements can cause various symptoms such as disorder in gastrointestinal and kidney function, liver cirrhosis, and impaired RBC formation (Caseln, 2012). Based on standard 623 of Iran, a permitted level is determined 1 mg/kg, less than 1 mg/kg, 50 mg/kg, 0.1 mg/kg, and 0.05 mg/kg, relatively for heavy metals such as lead, arsenic, copper, cadmium, and mercury as metal contaminants (Inistuteh, 2007). Heavy metals such as cadmium and lead are important environmental pollutants that enter to the body of live animals and make poisoning and damage on tissues such as the liver, kidney, and sex glands. After facing with cadmium, mitochondrial function is impaired in renal cells and reactive oxygen species (ROS). Lack of equilibrium between ROS and intracellular antioxidant system makes oxidative stress and cellular damage (Zaheri, 2011).

Most studies in Iran were on the packed tea in market, and related studies to tea leaves were limited to the produced tea in Iran factories such as what are stated in Ansari et al. (2007) research. Lead and cadmium elements weren't identifiable, but the existed copper in the studied samples was 29.3 mg/kg in their study that was on the heavy metals in the black cultivated tea in north of Iran (). In a research that was conducted in China by aim of studying the effect of lead in tea, season changing significantly changes the amount of copper as the amount of copper in spring harvest was higher than fall harvest, and in fall harvest was higher than summer harvest. (Han, 2007)

Since most studies in Iran have been conducted on the packed teat of market, this research was conducted on 10 samples of the consumed tea of Ardebil city based on the present facilities with aim of measuring copper, cadmium, lead, chromium, iron, and also nitrate ion. Moreover, the determined amounts were compared by the standard level.

## MATERIALS AND METHODS

This study was conducted to determine the amounts of heavy metals of copper, cadmium, copper, iron, and also nitrate ion in the consumed tea types of Ardebil city, and all types of tea were bought from supermarkets and stores all over Ardebil city that totally 10 domestic and foreign samples (three types of bag, packed and weighted) as random samples (Doghazaal, Galin, Shahrzad, Ahmad, Mahmud, Debsh, Golestan, Lipton, Famila, Kalkateh) were selected in fall, then the prepared samples before experiments were put in a dry place (decictor) individually and fat from any probable contamination.

## PREPARATION THE TECHNIC OF SAMPLES

Each sample was fully milled and powdered, then 5 gr was weighted by digital scale and separated. Distilled water was used to brew tea. After 5 minutes of boiling, it was passed through Whatman filter 42, then was completely flattened and the volume was delivered, and the amounts of heavy elements were read by atomic absorption device, model Perkin Elmer. The concentration of nitrate ion was measured using LC aqueous system in room temperature. One-sample-t-test was used to analyze data to compare to the standard value, and ANOVA technic was used to compare the difference among all tea types.

## RESULTS

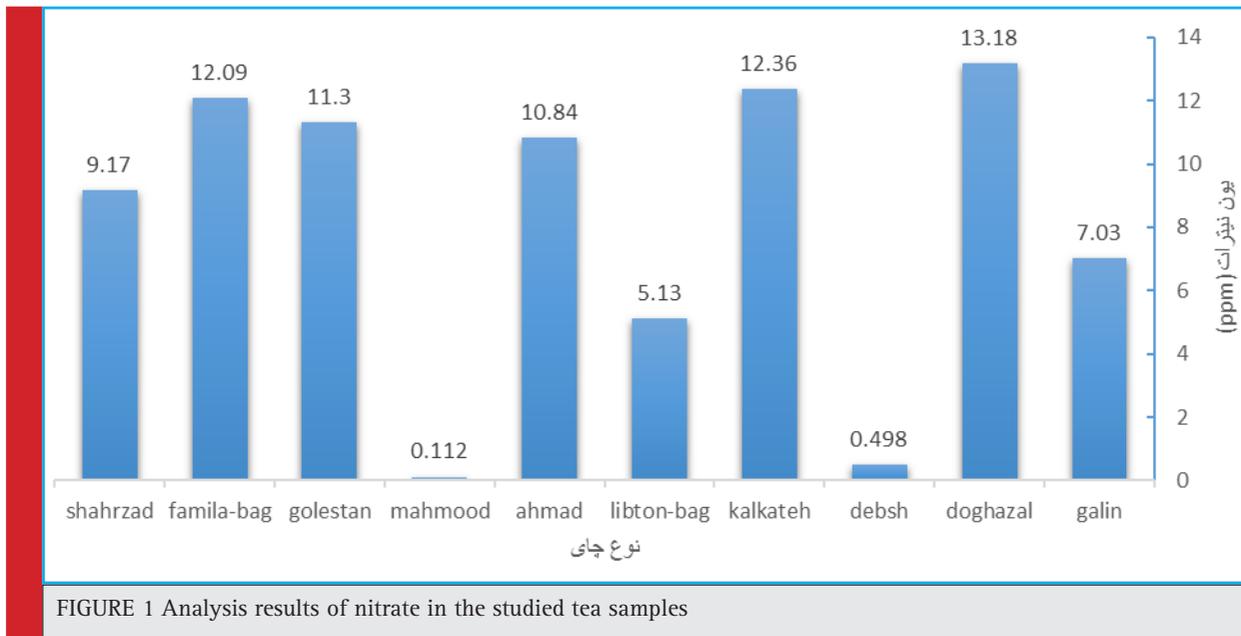
The analysis of the studied tea types to determine amount of heavy metals including lead, cadmium, copper, chromium, and iron showed that the mean concentration of these metals in the studied tea types was obtained zero based on table (1).

In addition, the estimated nitrate amount for each of the mentioned samples showed that the measured amount of nitrate ion in Doghazaal tea, is 18.13 ppm and had the maximum concentration than the other samples, and the minimum amount of nitrate ion was in Mahmood tea with 0.112 ppm (diagram (1)).

One-sample-t-test analysis, that means comparison of 10 team samples with Iran standard value and EPA global standard that equals to 50 ppm, showed that

Table 1. Analysis results of the studied heavy metals in various tea types of Ardebil city

Heavy Elements \ samples	Debsh	Galın	Ahmad	Mahmud	Golestan	Doghazaal	Shahrzad	Kalkateh	Famılia	Lipton
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cadmium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Copper	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chrome	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00



nitrate ion of samples had significant difference with the standard value, and the mean nitrate of samples was 8.171 ppm that is 5.5 times less than standard value (Table (2)).

As it is observed in table (3) and figure (1), samples are divided into 2 general clusters. Debsh and Mahmud

that have low nitrate are in one cluster and 8 other samples are in another cluster. In the 8-sample cluster, Galin and Lipton samples are in one sub-cluster with lower nitrate than others.

Table 2. Specifications of samples in one-sample-t-test

	No.	Mean	St. dev.	Mean error of st. dev
Nitrate (ppm)	10	8.17100	4.833684	1.528545

### DISCUSSION

According to the high annual tea consumption (1.5kg per year), drinking tea has a significant role in receiving trace nutritional elements in human as daily regular tea consumption that can provide daily need to some of

Table 3. the obtained results from cluster analysis of nitrate in the studied tea samples

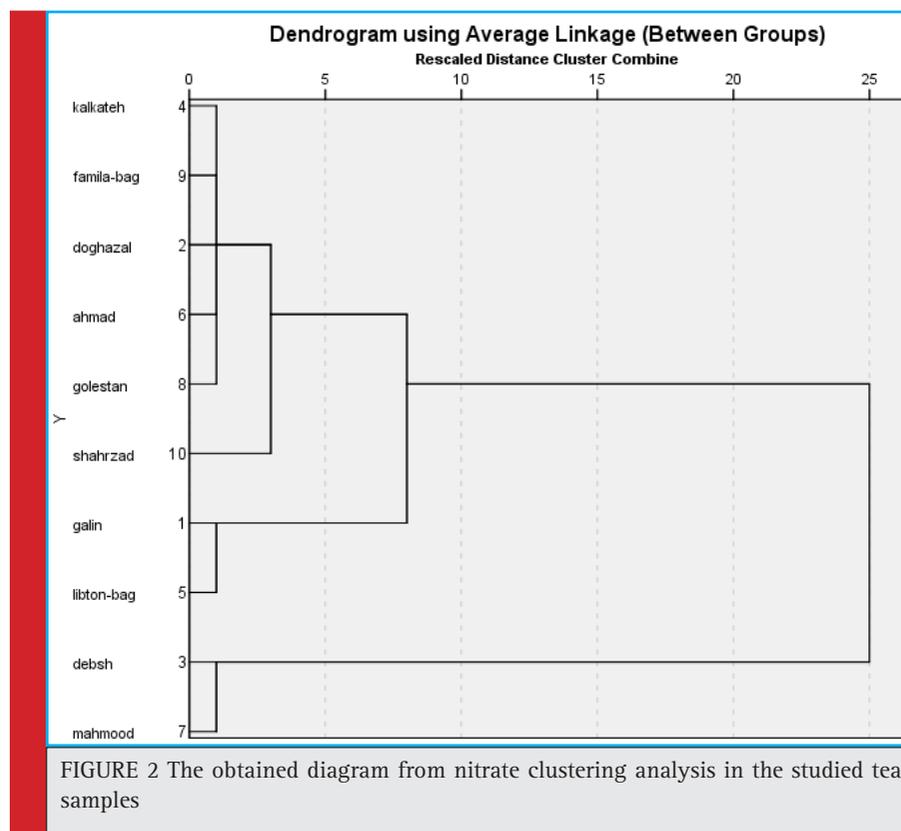
	Iran standard value & EPA = 50					
	t	DF	Sig. level	Difference from the average	Confidence interval 95% of difference	
					Low	High
Nitrate(ppm)	-27.365	9	.000	-41.829000	-45.28681	-38.37119

Table 4. Agglomeration Schedule

Step	Combined cluster		Coefficient	Stage Cluster First Appears		Next step
	Cluster 1	Cluster 2		cluster 1	Cluster 2	
1	4	9	.073	0	0	4
2	3	7	.149	0	0	9
3	6	8	.212	0	0	5
4	2	4	.930	0	1	5
5	2	6	2.438	4	3	7
6	1	5	3.610	0	0	8
7	2	10	8.422	5	0	8
8	1	2	31.806	6	7	9
9	1	3	103.655	8	2	0

these elements. Experimental studies have shown that the accumulation of significant amount of non-essential trace elements in tea leaves may increase the accumulation amount of them in body. Therefore, trace elements in tea can have either good or bad effects on human health. Determination of trace elements in tea can guide us to study the nutritional value of tea and also prevent probable dangers made by extra reception of elements (Moustey, 2013).

Checking the experimental results and measurement of the studied heavy metals in the samples of consumed tea in recent search showed that the amounts of the studied heavy metals was zero and no specific concern about people health was confirmed. In addition, the results of one-sample-t-test among 10 studied tea samples showed that mean amount of nitrate ion in them was 8.171 ppm that is less than global and Iran standard in which the permitted nitrate concentration in the drinking water is



EPA=50 ppm (tea is consumed directly in brewing with drinking water). Moreover, the mean obtained results for per studied sample showed that concentrations in all samples was less than the global and Iran standard; as though, the highest mean concentration is related to the Doghazzal tea bag with 13.18 ppm, and the minimum mean concentration is related to Mahmud tea bag with 0.112 ppm.

Researchers concluded in 1980s that the nitrate concentration more than 10mg/l based on nitrogen increases the probability of gastric cancer, and also 9-29 mg/l nitrate causes abortion in 8 women in India (Nul-len, 2001). Results of clustering classification about the tea samples showed that the samples were into 2 general clusters as Debsh and Mahmud tea with very low nitrate concentration were in one cluster, and 8 other samples were in another cluster. In the second cluster, Galin and Mahmud tea were in one sub-cluster for having less nitrate concentration.

In Malakutian et al. (2011) research on 11 consumed black tea types by atomic absorption spectrum device showed that the mean lead concentration in tea samples was  $6.97 \pm 4.78$  mg/kg that is higher than the obtained results in this research, and the maximum lead concentration was observed in Ahmad tea. Paul et al. (1998) had a research about the accessibility of metals in tea under the stomach simulated conditions and concluded although the mean daily reception of aluminum in 1 liter tea is 58.8%, the accessible is 2.82% of the mentioned value. They knew this matter related to the accessibility of this metal to pH of stomach. In another research by Alviodo (2003) that was conducted to determine lead concentration in green tea brands of Pakistan, it was concluded that the mean accumulated concentration of this element is more than the permitted value.

## CONCLUSION

Generally, it can be concluded that although tea leaves can be contaminated to heavy metals in various growing processes and then processing steps in factory, the content of these metals significantly reduces in brewed tea and less amount is absorbed in body. In general, results of this research showed that the studied tea samples can be used as a useful beverage without a concern of poisoning by heavy metals and nitrate in balance of utilization the essential elements for body. However, according to transmission of heavy metals in environment and as a results of the accumulation of these metals in plants, it is necessary to measure heavy metals in food industry continuously. Then, controlling actions must be considered to prevent transmission of heavy metals in environ-

ment after comparison to the threshold concentration of these metals in foodstuffs. These preventive actions include cultivation of plants far from industries, roads, and no-using chemical materials.

## REFERENCES

- Al-oud S. Heavy metal contents in tea and herb leaves. *Pak J Biol Sci* 2003; 6: 208-12.
- Ansari F, Norbaksh R, Daneshmandirani K. Determination of heavy metals in Iranian and imported black tea. *Iran J Environ Health Sci Eng* 2007; 4(4): 243-248 (Persian).
- Asgari1 A, Ahmadi Moghadam M, Mahvi AH, Yonesian M. Evaluation of Aluminum in Iranian Consumed Tea. *Knowledge and Health* 2008; 3(2): 45-49 (Persian).
- Cairns WRL, Hill SJ, Ebdon L. Directly coupled high performance liquid chromatography-inductively coupled plasma-mass spectrometry for the determination of organometallic species in tea. *Microchemical Journal* 1996; 54(2): 88-110.
- Ebadi, A.G, Zare, S., Mahdavi, M. and Babae, M. 2005. Study and measurement of Pb, Cd, Cr and Zn in green leaf of tea cultivated in Gillan province of Iran. *Pakistan J.Nutr.* 4(4), 270-272.
- Fungi KF, Zhang ZQ, Wong JWC, Wong MH. Aluminum and fluoride concentrations of three tea varieties growing at Lantau Island, Hong Kong. *Environ Geochem Hlth*2003; 25: 219-232.
- Jha A, Mann RS, Balachandran R. Tea: a refreshing beverage. *Int Food Indust* 1996; 15: 22-29.
- Han WY, Shi YZ, Ma LF, Ruan JY, Zhao FJ. Effect of liming and seasonal variation on lead concentration of tea plant (*Camellia sinensis* (L.) O. Kuntze). *Chemosphere* 2007; 66(1): 84-90.
- Institute of Standards and Industrial Research of Iran. Black tea -Specifications and test methods. ISIRI. NO. 623. 2rd ed. Karaj ISIRI, 2007.ICS:67.140.10.
- Kathleen Mahan L, Raymond JL, Escott- Stump S. Krause's food & the nutrition care process, 13rd ed. Philadelphia: W.B. Saunders Company; 2012.
- Lund BM, Baird-Parker TC, Gould GW. Microbiological Safety and Quality of Food. Springer. 2000: 960-4.
- Lung SC, Cheng HW, Fu CB. Potential exposure and risk of fluoride intakes from tea drinks produced in Taiwan. *J Expo Sci Environ Epidemiol.* 2008; 18 (2): 158-66.
- Qin F, Chen W. Lead and Copper Levels in Tea Samples Marketed in Beijing, China. *Bull Environ Contam Toxicol* 2007; 78: 128-131.
- Malakootian M, Mesreghani M, Danesh Pazhoo M. A Survey on Pb, Cr, Ni and Cu Concentrations in Tehran consumed black-tea: A short report. *JRUMS* 2011; 10(2): 138-143 (Persian).
- Moseti KO, Kinyanjui T, Wanyoko JK, Kurgat JK, Too JC, Omondi KG, Wachira FN. Fe, Zn, Cu, Pb and Cd in tea grown and marketed in Kenya, A quantitative assessment. *Int J Environ Protect* 2013; 3(6): 24-30.

Nolen Bernard T., "Relating Nitrogen Sources and Aquifer Susceptibility to Nitrate in Shallow GroundWater of the United States", 2001, Ground Water, Vol.39, No.2.

Powell JJ, Burden TJ, Thompson RP. In vitro mineral availability from digested tea: a rich dietary source of manganese. *Analyst* 1998; 123(8):1721-1724.

Tagçloşlu, S and Kok, E. 1998. Temperature dependence of copper, iron, nickel and chromium transfers into various black and green tea infusions. *J. Sci. Food. Agri.*, 76, 200-208.

Zaheri M, Ebrahimi Vosta kalai S, Cheraghi J. Protective effect of aerial parts extract of *scrophularia striata* on cadmium and mercury -Induced nephrotoxicity in Rat. *JBUMS* 2011; 13(4): 48-54 (Persian).

## A comparative study of everyday memory performance, suicidal tendencies and mental disorders between depressed and non-depressed high school students of Zahedan

Fateme Barakzaei Kemak<sup>1</sup> and Bahman Kord Tamini<sup>2</sup>

<sup>1</sup>MA in Clinical Psychology, Department of Psychology, Islamic Azad University, Zahedan Branch, Zahedan, Iran

<sup>2</sup>Assistant Professor of Department of Psychology, University of Sistan and Baluchestan, Zahedan, Iran

### ABSTRACT

The objective of this study was to compare everyday memory performance, suicidal tendencies, and mental disorders between depressed and non-depressed high school students in Zahedan. The method of the current study was descriptive followed by a casual-comparative design. The statistical population included all 16 to 18 years old female high school students studying in Fatemeh Zahra School in district 1 of Zahedan and Noavaran Conservatory School in district 2 of Zahedan. Overall, a sample of 60 individuals (30 students diagnosed with depression and 30 non-depressed students) was selected using the simple random sampling method. The measurement tools were the Beck Depression Inventory, the Sunderland Everyday Memory Scale, the Multi-Attitude Suicide Tendency Scale, and the Symptoms Check List. The obtained data was analyzed using the independent two-sample t-test and the multivariate analysis of variance. The results indicated that everyday memory performance of the depressed students was lower than that of the non-depressed students. Moreover, examining the difference between these two groups in suicidal tendencies demonstrated that the depressed students, compared to the non-depressed students, obtained higher scores on repulsion by life and gained lower scores on attraction to life and repulsion by death. In addition, investigating the difference between these two groups in mental disorders showed that the depressed students, in comparison with the non-depressed students, obtained higher scores on the global severity index and the positive symptom total and the subscales of depression, anxiety, somatic complaints, obsession, interpersonal sensitivity, paranoid ideation, and psychosis. In general, it can be concluded that depression among students can lay the ground for the incident of various memory problems, suicidal tendencies, and mental disorders; therefore, paying attention to the necessity of developing and promoting activities aimed at preventing the occurrence of depression among students, both in families and in educational centers, is of significant importance.

**KEY WORDS:** DEPRESSION, EVERYDAY MEMORY, SUICIDAL TENDENCIES, MENTAL DISORDERS, STUDENTS

### ARTICLE INFORMATION:

Received 2<sup>nd</sup> June, 2017

Accepted after revision 25<sup>th</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal  
NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

## INTRODUCTION

Changes that occur during adolescence may provide the ground for various issues. Among these issues, psychological and social problems and tensions such as dealing with parents, breaking up a relationship, facing with problems or failures at school, having legal issues, coping with social isolation, and dealing with physical diseases (including depression-related concerns) can be mentioned (Shain, 2007). When adolescents cannot overcome these developmental challenges and crises successfully, they experience psychological distress (Garber, Keily, & Martin, 2002, as cited in Abdollahi & Rasoulizadeh Tabatabaei, 2013). Certain levels of depression, anxiety, and stress are considered as important indicators of mental health in a society (Teh, Ngo, Zulkifli, Vellasamy, & Suresh, 2015). According to a previously conducted study, depression is one of the most prevalent diseases among adolescents. This study has shown that 7.5% of adolescents (10.4% of girls vs. 4.5% of boys) suffered from depression (Consoli et al., 2013).

American Psychiatric Association (2013) defined depression as a heterogeneous disease that is different in various people and is determined through either a persistent depressed mood and/or a loss of pleasure and interest in nearly all activities. Accordingly, depression is associated with a range of emotional, cognitive, physical, and behavioral symptoms (Steadman & Taskila, 2015) including sad emotions, negative thoughts, sleep disorders, thoughts disorders, loss of appetite, and low levels of energy (Potter & Steffens, 2007). Evidence indicated that untreated depression may lead to physical, cognitive, functional, and social disorders. Based on this evidence, depression has a high comorbidity with cognitive impairments (Sousa, Pereira, & Costa, 2015).

Impairments in concentration and other thinking abilities are the key criteria in the diagnosis of depression. Studies have demonstrated that depressed people, compared to non-depressed people, dealt with more neurocognitive issues. These issues are more prominent in the realm of executive function, memory, attention, and speed of information processing (Potter & Steffens, 2007; Dumas, Smolders, Brunfaut, Bouckaert, & Krampe, 2012). Memory includes mental processes such as encoding, storing, and retrieving information (Budson, 2009) and everyday memory refers to daily memory operations needed to meet the challenges of everyday life (Chen, Tsai, Hsu, Ma, & Lai, 2013). The concept of everyday memory was introduced in 1980. The critical importance of everyday memory is due to two main reasons. First, it provides a better understanding of memory and processes that are more complicated than that. Second, it promotes our clinical understanding of people who suffer from memory disorders and aids us to help

them deal with their problems (Montejo, Montenegro, & Sueiro, 2012).

Examining the available literature review indicated that the current study faced a lack of studies carried out to examine everyday memory problems among depressed people. This is while previously conducted studies have shown that depressed people, compared to non-depressed people, encountered with more problems related to the amount of attention, memory, and cognitive inhibition (Gotlib & Joormann, 2010), semantic memory and autobiographical memory (Söderlund et al., 2014), retrieval memory and recent memory (Akhouri, Javed, Ansari, Azmi, & Siddiqui, 2014), working memory performance, autobiographical memory, semantic memory, and short-term memory (Castaneda, Tuulio-Henriksson, Marttunen, Suvisaari, & Lönnqvist, 2008), performance of working memory and long-term memory (Christopher & MacDonald, 2005; Kensinger & Corkin, 2003; Ahmadibehagh et al., 2014), reminiscence memory (MacQueen, Galway, Hay, Young, & Joffe, 2002), false memory (Heidari, Moradi, Abdollahi, Parhoon, & Naderi, 2015), autobiographical memory performance in recalling specific and general memories (Mosayebi, 2013), and everyday memory and prospective memory (Sharifi Dolatabadi, 2013) and had lower performance in comparison with normal people.

Furthermore, another variable that is highly coexistence with depression is suicide. Studies have noted that depression is the leading cause of death among adolescents and young people (Capron, Lamis, & Schmidt, 2014). Depression is a risk factor for predicting suicidal thoughts and the incidence of suicide (Cindy & Chiu, 2011). Suicide is a complex process of thought starting from an initial idea and progressing through a planned behavior to attempting to commit suicide. More than one million people annually commit suicide all around the world. In the UK, the suicide rate is 10 people per hundred thousand people (Leadbetter, 2015). Additionally, in a study carried out by Consoli et al. (2013), the prevalence rate of suicidal ideation among adolescents was 16.2% and 8.2% were reported to have suicide attempts. In this study, school problems, abusing drugs such as the use of marijuana, and negative relations with parents were mentioned as the most important predictors of suicide (Consoli et al., 2013). Depression and suicide are the results of the interaction of biological, genetic, psychological, sociological, cultural, and environmental factors which create severe suffering in people's lives and subsequently affect families, friends, and the community (Silva, Tavares, Alexandre, Freitas, Brêda, Albuquerque, & Neto, 2015).

Studies have indicated that a significant level of depression among youth is associated with a high rate of thoughts and behaviors related to suicide (Watkins

et Melde, 2016). Other studies have shown that severe depression among youth is related to the risk of committing suicide (Alsaman et Alansari, 2016; Roesch, 2015). The results of a study carried out by Marinova et al. (2014) revealed that patients with depression, compared to non-depressed people, were significantly more likely to commit suicide. This study considered depression as a significant risk factor for suicide. A study conducted by Capron, Lamis, and Schmidt (2014) indicated that depression was correlated with suicide ideation and it increased the risk of committing suicide. Khan (2011) examined the relationship of suicide thoughts with depression and hopelessness among adolescents aged 15 to 17 years old and concluded that depression was related to suicide thoughts. Moreover, the relationship between depression and suicide thoughts, even regardless of hopelessness, was significant.

In a study aimed to investigate the role of depression in the incidence of suicidal behaviors, Ahokhosh (2015) reported that depression was a strong predictor of suicide thoughts among adolescents and it determined 0.54 of the variance in suicidal thoughts. The results of a study conducted by Bagheri Khatoonabadi, Manochehri, and Hekami (2015) revealed that depressed mood was associated with decreased interest in life and increased interest in death. Pourhossein et al. (2014) showed that depression was positively correlated with suicidal thoughts and played the most significant role in predicting suicidal thoughts.

Moreover, studies have shown that adolescence is associated with a range of mental disorders (Walker et Bollini, 2002). Mental disorders are brain diseases that are caused by neurotransmitters and are determined by a biological agent (Deacon, 2013). Mental disorders refer to a set of all diagnosable mental diseases which are determined by abnormal changes in thoughts, moods, and behaviors related to distress and functional impairments (Reeves et al., 2011). It seems that adolescence is a critical period for the emergence of symptoms of psychosis and mental disorders. As an instance, a previously carried out study indicated that adolescents obtained higher scores on the schizotypal personality disorder and concluded that they were more likely to develop schizophrenia spectrum disorders (Fonseca-Pedrero, Paino, Lemos-Giráldez, & Muñiz, 2011). MadHakar and Trivedi (2004) and Tabatabaei, Faiazi Bordbar, and Lotfi (2004) reported that depression during adolescence was correlated with many somatization disorders. In addition, depression during adolescents was linked with mental disorders related to eating, anxiety, and behavioral disorders (Thapar, Collishaw, Pine, & Thapar, 2012).

Depression is considered as a risk factor for violence and aggression among adolescents (Fazel et al., 2015; Ferguson, San Miguel, & Hartley, 2009). Väänänen

et al. (2011) examined the relationship between depression and social phobia among adolescent boys and girls and indicated that depression was significantly related to social phobia in mid-teens. In a study aimed to examine the effect of depression on social relations, Steger and Kashdan (2009) demonstrated that symptoms of depression were strongly correlated with social exclusion and interpersonal sensitivity. This study indicated that high levels of depression were associated with negative social interactions. However, examining the available literature review showed that very few studies were conducted to examine the comorbidity of depression and other mental disorders; therefore, given the conducted studies, the prevalence of suicidal ideation, successful suicides, and disorders related to memory, and the high prevalence of mental disorders among adolescents and considering the lack of studies carried out to investigate the role of depression in the incidence of mental disorders, the present study aimed to examine everyday memory performance, suicidal tendencies, and mental disorders among depressed students. Accordingly, the main objective of the current study was to compare everyday memory performance, suicidal tendencies, and mental disorders between the depressed and non-depressed high school students in Zahedan. Furthermore, due to the objective of this study, considering the theoretical foundations, and examining the previously conducted studies, the following questions were raised:

- Is there any significant difference in everyday memory performance between the depressed and non-depressed students?
- Is there any significant difference in suicidal tendencies between the depressed and non-depressed students?
- Is there any significant difference in mental disorders between the depressed and non-depressed students?

## METHODS

The method of the current study was descriptive followed by a casual-comparative correlational design. The statistical population of the present study included all 16 to 18 years old female high school students studying in Fatemeh Zahra School in district 1 of Zahedan and Noavaran Conservatory School in district 2 of Zahedan. In this study, using the simple random sampling method, 30 depressed students and 30 non-depressed students were selected and the questionnaires were distributed among them. To collect the required data, the following questionnaires were applied.

- A. The Beck Depression Inventory (BDI-21): This inventory was developed by Beck (1971) to

assess and measure depression. This inventory includes 21 items. Based on the severity, each of the items (symptoms) has 4 degrees which are scored from 0 to 3. 0 indicates the lowest level and 3 shows that highest level of experiencing a depressive symptom. The minimum and maximum scores are respectively 0 and 63. This inventory is used to evaluate the severity of depression in people older than 13 years old. Scores in the range of 0 to 9 indicate the minimum level of depression, 10 to 18 demonstrate mild depression, 20 to 29 show moderate depression, and scores in the range of 30 to 63 reveal severe depression (Beck, Steer, & Garbin, 1988). In a study conducted by Rahimi (2014), the results indicated that the Beck Depression Inventory has a high internal consistency ( $\alpha=0.78$ ) and has an acceptable reliability over time 0.73.

**B. The Sunderland Everyday Memory Scale:** This scale was developed by Sunderland et al. (1983) to evaluate memory in real life. Using the mean score in this scale can indicate a memory assessment in real life. This scale includes 28 items that are scored based on a Likert-type scale ranging from 1 to 9. Total scores ranging from 28 to 58 show that a respondent has a good memory. Scores ranging from 58 to 116 indicate an average memory and scores ranging from 116 to 243 demonstrate a memory lower than the average. In a study conducted by Zare, Abazarian Tehrani, and Alipour (2012), using the test-retest method, the reliability of this scale was 0.83. In the present study, the Cronbach's alpha coefficient was applied to examine the correlation among the items, the result of which was 0.95.

**C. The Multi-Attitude Suicide Tendency Scale:** This scale was designed by Orbach et al. (1991). It includes 30 items developed to assess the level of suicidal tendencies among adolescents. This scale can be used for adolescents aged 15 to 18 years old and it has four subscales, i.e. attraction to life, repulsion by life, attraction to death, and repulsion by death. The items are scored based on a Likert-type scale ranging from 1 to 5. To calculate the final score, the total scores of the items related to each subscale are added together and are divided by the number of items related to that subscale. Applying the total score is not recommended. The inner consistency of this scale in a study carried out by Orbach et al. (1991) ranged from 0.76 to 0.83. In the present study, the Cronbach's alpha coefficient

was used to examine the correlation among the items related to each subscale. The results indicated that the correlation coefficient of attraction to life, repulsion by life, attraction to death, and repulsion by death was respectively 0.81, 0.76, 0.74, and 0.86.

**D. The Symptom Check List (SCL-90):** This scale (SCL-90) was initially developed by Derogatis and Cleary (1986) and its current form was revised and introduced using the clinical experiences and previous psychometric analyses. This scale includes 90 5-point Likert-type items. This scale assesses nine psychiatric symptoms which are as follows: depression, anxiety, somatic complaints (hypochondriasis), obsession, interpersonal sensitivity, aggression, phobia, paranoid ideation, and psychosis. In addition to these nine subscales, this scale includes three global indices including the Global Severity Index (GSI), the Positive Symptom Total (PST), and the Positive Symptom Distress Index (PSDI). The scoring and interpretation of the scale is carried out based on these three global indices. To determine the prevalence of psychiatric symptoms in each dimension, the cut-off point of 2.5 is used. The mean scores of 2.5 and greater than 2.5 indicate psychiatric disorders. The results of Anisi, Eskandari, Bahmanabadi, Noohi, and Tolaei (2014) reported that the internal consistency and the Cronbach's alpha coefficients of the subscales of this scale were all high (ranging from 0.75 to 0.92). Moreover, they indicated that the alpha coefficient of the general symptom index was 0.98.

In the current study, to analyze the obtained data, the independent two-sample t-test and the multivariate analysis of variance were employed.

## RESULTS

Overall, a sample of 60 individuals (30 depressed students and 30 non-depressed students) participated in the current study. In this study, 46.7% of the subjects suffered from the minimum level of depression, 30% of them suffered from severe depression, 20% of them suffered from moderate depression, and 3.3% of them suffered from mild depression. To answer the first research question, i.e. is there any significant difference in everyday memory performance between the depressed and non-depressed students?, the independent t-test was applied, the results of which are presented in Table 1. According to the total score of everyday memory ( $t=4.228$ ,  $P<0.01$ ) and given the level of significance ( $P<0.01$ ), it

Variable	Individuals	N	Mean	SD	t	df	Sig
Everyday memory	Depressed	30	4.14	1.517	4.228	58	0.0001
	Non-depressed	30	2.44	1.598			

Variable	Depressed students		Non-depressed students	
	M	SD	M	SD
Interest in life	3.16	0.689	3.81	0.973
Repulsion by life	3.15	0.721	2.02	0.681
Interest in death	2.95	0.888	2.47	0.920
Repulsion by death	2.09	0.890	2.78	0.874

can be concluded that there was a significant difference between the depressed and non-depressed students considering their overall scores on everyday memory. In this regard, the mean score of the depressed students on everyday memory was higher than that of the non-depressed students. Since higher scores on the Everyday Memory Scale represent low memory performance; therefore, the depressed students had lower memory performance compared to the non-depressed students.

The descriptive results related to the second research question, i.e. is there any significant difference in suicidal tendencies between the depressed and non-depressed students?, are presented in Table 2.

In Table 3, the multivariate analysis of variance among the groups was used to examine the difference between the depressed and non-depressed students in the subscales of suicidal tendencies. All the four depend-

ent variables were examined. The depressed and non-depressed students were the independent variables. Using the adjusted Bonferroni value that was equal to 0.01, the results indicated statistically significant differences between the depressed and non-depressed students with regard to three subscales of suicidal tendencies, i.e. interest in life ( $F=8.785$ ,  $P<0.01$ , partial  $\eta^2=0.132$ ), repulsion by life ( $F=39.143$ ,  $P<0.01$ , partial  $\eta^2=0.403$ ), and repulsion by death ( $F=9.163$ ,  $P<0.01$ , partial  $\eta^2=0.136$ ). Given the adjusted Bonferroni value, no significant difference was found between these two groups with regard to repulsion by death ( $P>0.01$ ).

To indicate the difference between these two groups with regard to the subscales of suicidal tendencies, the LSD post hoc test was applied, the results of which are presented in Table 4. The results demonstrated that the mean scores of the non-depressed students on the sub-

Source	Sum of squares	Df	Mean of squares	F	sig	Eta squared
Interest in life	6.252	1	6.252	8.785	0.004	0.132
Repulsion by life	19.267	1	19.267	39.143	0.0001	0.403
Interest in death	3.494	1	3.494	4.269	0.04	0.069
Repulsion by death	7.133	1	7.133	9.163	0.004	0.136

Variable	Group (i)	Group (j)	Mean difference (i-j)	Standard error	Sig
Interest in life	Depressed	Non-depressed	-0.646	0.218	0.004
Repulsion by life	Depressed	Non-depressed	1.133	0.181	0.0001
Repulsion by death	Depressed	Non-depressed	-0.690	0.228	0.004

Table 5. The descriptive results related to the depressed and non-depressed students' scores on mental disorders

Variable	Depressed students		Non-depressed students	
	M	SD	M	SD
Depression	2.36	0.812	0.84	0.678
Anxiety	2	0.741	0.97	0.910
Somatic complaints	1.96	0.796	1.03	0.846
Obsession	1.98	0.801	1.15	0.901
Interpersonal sensitivity	2.03	0.751	0.90	0.786
Aggression	2.75	1.150	1.98	1.340
phobia	1.39	0.797	0.81	0.957
Paranoid ideation	1.75	0.850	0.69	0.633
Psychosis	1.38	0.752	0.65	0.739
Global Severity Index (GSI)	1.96	0.596	0.97	0.669
Positive Symptom Total (PST)	71.1	11.268	39.8	23.631
Positive Symptom Distress Index (PSDI)	0.02	0.006	0.02	0.010

scales of interest in life and repulsion by death were higher than those of the depressed students. However, considering the subscale of repulsion by life, the depressed students obtained higher scores in comparison with the non-depressed students ( $P < 0.05$ ).

The descriptive results related to the third research question, i.e. is there any significant difference in mental disorders between the depressed and non-depressed students?, are presented in Table 5.

In Table 6, the multivariate analysis of variance among the groups was used to examine the difference between the depressed and non-depressed students in the subscales of mental disorders. All the twelve dependent variables were examined. The depressed and non-

depressed students were the independent variables. Using the adjusted Bonferroni value that was equal to 0.04, the results indicated statistically significant differences between the depressed and non-depressed students in the subscales of depression ( $F = 61.510$ ,  $P < 0.04$ , partial  $\eta^2 = 0.515$ ), anxiety ( $F = 23.196$ ,  $P < 0.04$ , partial  $\eta^2 = 0.286$ ), somatic complaints ( $F = 19.176$ ,  $P < 0.04$ , partial  $\eta^2 = 0.248$ ), obsession ( $F = 14.434$ ,  $P < 0.004$ , partial  $\eta^2 = 0.199$ ), interpersonal sensitivity ( $F = 32.134$ ,  $P < 0.004$ , partial  $\eta^2 = 0.357$ ), paranoid ideation ( $F = 30.196$ ,  $P < 0.004$ , partial  $\eta^2 = 0.342$ ), psychosis ( $F = 14.319$ ,  $P < 0.004$ , partial  $\eta^2 = 0.198$ ), the global severity index ( $F = 37.072$ ,  $P < 0.004$ , partial  $\eta^2 = 0.390$ ), and the positive symptom total ( $F = 42.879$ ,  $P < 0.004$ , partial  $\eta^2 = 0.425$ ).

Table 6. The results of the multivariate analysis of variance conducted to compare the subscales of mental disorders between the depressed and non-depressed students

Source	Sum of squares	Df	Mean of squares	F	Sig	Eta squared
Depression	34.454	1	34.454	61.510	0.0001	0.515
Anxiety	15.987	1	15.987	23.196	0.0001	0.268
Somatic complaints	12.944	1	12.944	19.176	0.0001	0.248
Obsession	10.494	1	10.494	14.434	0.0001	0.199
Interpersonal sensitivity	19.026	1	19.026	32.134	0.0001	0.357
Aggression	8.817	1	8.817	5.650	0.02	0.089
Pharanoid ideation	16.973	1	16.973	30.196	0.0001	0.342
Phobia	4.906	1	4.906	6.315	0.01	0.098
Psychosis	7.973	1	7.973	14.319	0.0001	0.198
Global Severity Index (GSI)	14.896	1	14.896	37.072	0.0001	0.390
Positive Symptom Total (PST)	14695.350	1	14695.350	42.879	0.0001	0.425
Positive Symptom Distress Index (PSDI)	0.000	1	0.000	1.898	0.17	0.032

Table 7. The results of the LSD post hoc test conducted to indicate the difference between the depressed and non-depressed students with regard to their scores on mental disorders

Variable	Group (i)	Group (j)	Mean difference (i-j)	Standard error	Sig
Depression	Depressed	Non-depressed	1.516	0.193	0.0001
Anxiety	Depressed	Non-depressed	1.032	0.214	0.0001
Somatic complaints	Depressed	Non-depressed	0.929	0.212	0.0001
Obsession	Depressed	Non-depressed	0.836	0.220	0.0001
Interpersonal sensitivity	Depressed	Non-depressed	1.126	0.199	0.0001
Paranoid ideation	Depressed	Non-depressed	1.064	0.194	0.0001
Psychosis	Depressed	Non-depressed	0.729	0.193	0.0001
Global Severity Index (GSI)	Depressed	Non-depressed	0.997	0.164	0.0001
Positive Symptom Total (PST)	Depressed	Non-depressed	31.300	4.780	0.0001

Given the adjusted Bonferroni value, no significant difference was found between these two groups with regard to aggression, phobia, and the positive symptom distress index ( $P > 0.004$ ).

To indicate the difference between these two groups with regard to the subscales of mental disorders, the LSD post hoc test was applied, the results of which are presented in Table 7. The results demonstrated that the mean scores of the depressed students on depression, anxiety, somatic complaints, obsession, interpersonal sensitivity, paranoid ideation, psychosis, Global Severity Index (GSI), Positive Symptom Total (PST) were higher than those of the non-depressed students ( $P < 0.004$ ).

## DISCUSSION

The present study aimed to compare everyday memory performance, suicidal tendencies, and mental disorders between the depressed and non-depressed students in Zahedan. The obtained results indicated that the depressed students, compared to the non-depressed students, faced more problems related to their everyday memory performance. This finding is in line with the results obtained from studies conducted by Gotlib and Joormann (2010), Söderlund et al. (2014), Akhouri et al. (2014), Castaneda et al. (2008), Christopher and MacDonald (2005), Ahmadibehagh et al. (2014), Heidari et al. (2015), and Sharifi Dolatabadi (2013). Many factors were mentioned in order to explain why depressed people deal with failures and memory issues.

Other studies indicated that poor cognitive functions such as attention and various memory types were associated with defects in the functions of the prefrontal cortex, anterior cingulate, parietal cortex, and cortical areas (Levin, Heller, Mohanty, Herrington, & Miller, 2007). Depression increases the amount of cortisol in the blood vessels. This shrinks or retracts certain areas of the

brain. One of these areas that can be affected by cortisol is hippocampus. Hippocampus is related to memory; therefore, it is normal that depressed people have difficulty in remembering new and everyday information (Akhouri et al., 2014). Moreover, the decline in motivation and the slow psychomotor are mentioned as factors that restrict depressed people's cognitive functions (Ahmadibehagh et al., 2014).

In addition, when examining the differences between the depressed and non-depressed students in suicidal tendencies, the results revealed that the mean score of the depressed people on the subscale of repulsion by life was higher than that of the non-depressed students and their mean scores on interest in life and repulsion by death were lower than those obtained by the non-depressed students. These findings demonstrate that depressed people, compared to non-depressed people, are more repulsed by life and are less interested in life and repulsed by death. Generally, a significant level of depression among the students was related to the higher rates of suicidal thoughts and behaviors. These findings are consistent with the results of studies carried out by Watkins and Melde (2016), Alsaman and Alansari (2016), Roesch (2015), Marinova et al. (2014), Capron et al. (2014), Ahokhosh (2015), Bagheri Khatoonabadi et al. (2015), and Pourhossein et al. (2014).

To explain the results obtained from the current study, it can be stated that adolescence can be associated with a range of physical and psychological issues. Among these issues, physical and mental maturity, tendency to independence, psychological and social problems, tensions such as dealing with parents, having a discrete family, breaking up a relationship, dealing with academic problems (including dealing with academic failure, having a conflict with other classmates, being humiliated and scolded by a teacher and classmates, etc.), coping with social isolation, and dealing with physical diseases can be mentioned (Shain, 2007). In general, it can be noted

that these problems can lay the ground for the incidence of depression among students. Along with these problems, low levels of life satisfaction, the occurrence of unpleasant events, adolescents' inabilities in controlling such problems, and consequently the negative perceptions of these problems can increase adolescents' desires to commit suicide. Depression leads adolescents to excessively think about death and consider their lives worthless. Due to the unpleasant conditions and the inability in controlling the conditions, adolescents disregard the actual value of life and this leads to their self-destruction (Bagheri Khatoonabadi et al., 2015).

Additionally, when examining the differences between the depressed and non-depressed students in mental disorders, the results of the present study revealed that the depressed students, compared to the non-depressed students, gained higher scores on depression, anxiety, somatic complaints, obsession, interpersonal sensitivity, paranoid ideation, psychosis, the Global Severity Index (GSI), and the Positive Symptom Total (PST). These findings are consistent with the results of the following studies. The results of other studies showed that depression was linked with unexplained physical symptoms including mental disorders related to eating, anxiety, and behavioral disorders (Thapar et al., 2012), the social anxiety disorder (Väänänen et al., 2011), social exclusion, interpersonal sensitivity, and negative social interactions (Steger and Kashdan, 2009), and somatization disorders and hypochondriasis (Tabatabaei et al., 2004).

To explain these findings, it can be noted that adolescents, in different environments, respond to various stressors in many different ways. Among these various ways, isolation, feelings of inadequacy, frustration, and hopelessness, and somatization disorders can be mentioned. Adolescents who deal with a lot of pressure and stress at home, at school, and in the community and are not trained to use appropriate strategies to cope with these stressors may apply negative psychological strategies, such as somatization disorders, in the face of environmental stressors. Furthermore, studies have shown that the existence of OCD symptoms among depressed people was related to the defects in the prefrontal cortex of the brain (Cavedini, Ferri, Scarone, & Bellodi, 1998). Anxiety and interpersonal sensitivity among depressed adolescents can be attributed to biases in social information processing. It seems that depressed adolescents expect more negative reactions in their social interactions and are less likely to feel that they belong. Moreover, they reject to get help and assistance from other people and have very few intimate relationships with others. This leads to social exclusion and loss of positive social opportunities (Steger and Kashdan, 2009).

Despite these findings, the current study faced with several limitations. The first limitation was that almost

no studies were conducted to examine everyday memory issues among depressed people and their comorbidity with other mental disorders. The second limitation was that the present study was only carried out on female high school students studying in district 1 and 2 of Zadehan; therefore, caution should be exercised in generalizing the obtained results. Moreover, since depression can be caused by specific problems and occur temporarily among students, examining the severity of this disorder, its duration, and factors affecting its incidence requires conducting a longitudinal study. In this regard, conducting similar studies on other statistical populations, examining depression longitudinally, and increasing the number of studies aimed at investigating everyday memory issues among depressed people and their comorbidity with other mental disorders are highly recommended. The incidence of depression among students reflects the fact that the home-school parents have not paid enough attention this issue. The complications of this issue can impose irreparable damages to the future generation. In this regard, holding workshops and training programs for students, parents, and teachers can be really useful. The presence of psychology specialists at schools as consultants can be considered as an effective program which should be regarded by authorities of the education system.

## REFERENCES

- Akhouri, D., Javed, S., Ansari, S., Azmi, S.A., & Siddiqui, A.Q. (2014). Assessment of immediate, recent and remote memory of patients with depression and Anxiety Disorder. *Delhi Psychiatry Journal*, 17(2), 362-367.
- Alsaman, R., & Alansari, B. (2016). Relationship of suicide ideation with depression and hopelessness. *European Psychiatry*, 33, 597-610. Doi: <http://dx.doi.org/10.1016/j.eurpsy.2016.01.2228>.
- Beck, A.T., Steer, R.A., & Garbin, M.G.J. (1988). "Psychometric properties of the Beck Depression Inventory Twenty-five years of evaluation". *Clinical Psychology Review*, 8, 77-100. Doi: 10.1016/0272-7358(88)90050-5.
- Budson, A.E. (2009). Understanding memory dysfunction. *The Neurologist*, 15, 71-79. <http://dx.doi.org/10.1097/NRL.0b013e318188040d>
- Capron, D. W., Lamis, D. A., & Schmidt, N. B. (2014). Test of the depression distress amplification model in young adults with elevated risk of current suicidality. *Psychiatry Research*, 219(3), 531-535. Doi:10.1016/j.psychres.2014.07.005.
- Capron, D.W., Lamis, D.A., & Schmidt, N.B. (2014). Test of the depression distress amplification model in young adults with elevated risk of current suicidality. *Psychiatry Research*, 219(3), 531-535.
- Castaneda, A.E., Tuulio-Henriksson, A., Marttunen, M., Suvisaari, J., & Lönnqvist, J. (2008). A review on cognitive

- impairments in depressive and anxiety disorders with a focus on young adults. *Journal of Affective Disorders*, 106(1-2), 1-27.
- Cavedini, P., Ferri, S., Scarone, S., & Bellodi, L. (1998). Frontal lobe dysfunction in obsessive-compulsive disorder and major depression: a clinical-neuropsychological study. *Psychiatry Research*, 78(1-2), 21-8.
- Chen, C., Tsai, P.L., Hsu, Y.W., Ma, H.L. & Lai, H.A. (2013). Everyday memory in children with developmental coordination disorder. *Research in Developmental Disabilities*, 34, 687-694.
- Christopher, G., & MacDonald, J. (2005). The impact of depression on working memory. *Cognitive Neuropsychiatry*, 10 (5), 379-99.
- Cindy, W.C.T., & Chiu, H.F.K. (2011). Depression and Suicide in the Elderly. *Medical Bulletin*, 16(9), 13-16.
- Consoli, A., Peyre, H., Speranza, M., Hassler, C., Falissard, B., et al. (2013). Suicidal behaviors in depressed adolescents: role of perceived relationships in the family. *Child Adolescent Psychiatry Mental Health*, 7(1), 8. Doi: 10.1186/1753-2000-7-8.
- Deacon, B.J. (2013). The biomedical model of mental disorder: A critical analysis of its validity, utility, and effects on psychotherapy research. *Clinical Psychology Review*, 33, 846-861.
- Doumas, M., Smolders, C., Brunfaut, E., Bouckaert, F., & Krampe, R.T. (2012). Dual task performance of working memory and postural control in major depressive disorder. *Neuropsychology*, 26(1), 110-8.
- Fazel, S., Wolf, A., Chang, Z., Larsson, H., Goodwin, G.M., & Lichtenstein, P. (2015). Depression and violence: a Swedish population study. *Lancet Psychiatry*, 2(3), 224-232.
- Ferguson, C.J., San Miguel, C., & Hartley, R.D. (2009). A multivariate analysis of youth violence and aggression: the influence of family, peers, depression, and media violence. *The Journal of Pediatrics*, 155(6), 904-908.
- Fonseca-Pedrero, E., Paino, M., Lemos-Giráldez, S., & Muñoz, J. (2011). Schizotypal traits and depressive symptoms in non-clinical adolescents. *Comprehensive Psychiatry*, 52, 293-300.
- Gotlib, I.H., & Joormann, J. (2010). Cognition and Depression: Current Status and Future Directions. *Annual Review of Clinical Psychology*, 6, 285-312.
- Kensinger, E.A., & Corking, S. (2003). Effect of negative emotional content on working memory and long-term memory. *Emotion*, 3(4), 378-93.
- Khan, I. (2011). Relationship of Suicide Ideation, Depression and Hopelessness. *Indian Journal of Psychological Science*, 2(2), 126-133.
- Leadbetter, J. (2015). Depressive disorder and suicide in the older population: a literature review of suicide prevention in this age group. *Old Age Psychiatrist*, 62, 1-9.
- Levin, R.L., Heller, W., Mohanty, A., Herrington, J.D., & Miller, G.A. (2007). Cognitive deficits in depression and functional specificity of regional brain activity. *Cognitive Therapy and Research*, 31 (2), 211-233.
- MacQueen, G.M., Galway, T.M., Hay, J., Young, L.T., & Joffe, R.T. (2002). Recollection memory deficits in patients with major depressive disorder predicted by past depressions but not current mood state or treatment status. *Psychological Medicine*, 32(2), 251-8.
- MadHakar H., & Trivedi M.D. (2004). The link between depression and physical Symptoms. *Primary Care Companion to the Journal of Clinical Psychiatry*, 6, 12-16.
- Marinova, P., Koychev, L., Laleva L, Kancheva L, Tsvetkov M, Bilyukov R, Vandeva D, Felthouse A, & Koychev G. (2014). Nightmares and suicide: predicting risk in depression. *Psychiatria Danubina*, 26(2), 159-64.
- Montejo, C.P., Montenegro, P.M., & Sueiro, M.J. (2012). The Memory Failures of Everyday (MFE) Test: Normative Data in Adults. *The Spanish Journal of Psychology*, 15(3), 1424-1431.
- Orbach, I., Milstein, I., Har-Even, D., Apter, A., Tiano, S., & Elizur, A. (1991). A Multi-Attitude Suicide Tendency Scale for adolescents. *Psychological Assessment: A Journal of Consulting and Clinical Psychology*, 3(3), 398-404.
- Potter, G.G., & Steffens, D.C. (2007). Contribution of Depression to Cognitive Impairment and Dementia in Older Adults. *The Neurologist*, 13(3), 105-117.
- Reeves, W.C., Strine, T.W., Pratt, L.A., Thompson, W., Ahluwalia, I., Dhingra, S.S., McKnight-Eily, L.R. Harrison, L., et al. (2011). Mental Illness Surveillance among Adults in the United States. *MMWR (Morbidity and Mortality Weekly Report)*, 60, 1-32.
- Roesch, J.B. (2015). Depression and Suicidal Ideation in Undergraduate College Students: Risk Factors & Barriers to Treatment Present Within Universities. University Honors Theses. Paper 186. <http://pdxscholar.library.pdx.edu/honorstheses/186>
- Shain, B.N. (2007). Suicide and suicide attempts in adolescents. *Pediatrics (American Academy of Pediatrics Committee on Adolescence)*, 120(3), 669-76.
- Silva, D.S.D., Tavares, N.V.S., Alexandre, A.R.G., Freitas, D.A., Brêda, M.Z., Albuquerque, M.C.S., & Neto, V.L.M. (2015). Depression and suicide risk among nursing professionals: an integrative review. *Revista da Escola de Enfermagem da USP (REEUSP)*, 49(6), 1023-1031.
- Söderlund, H., Moscovitch, M., Kumar, N., Daskalakis, Z.J., Flint, A., Herrmann, N., & Levine, B. (2014). Autobiographical Episodic Memory in Major Depressive Disorder. *Journal of Abnormal Psychology*, 123(1), 51-60.
- Sousa, M., Pereira, A., & Costa, R. (2015). Subjective Memory Complaint and Depressive Symptoms among Older Adults in Portugal. *Current Gerontology and Geriatrics Research*, ID 296581, 1-6. <http://dx.doi.org/10.1155/2015/296581>.
- Steadman, K., & Taskila, T. (2015). Symptoms of depression and their effects on employment. The work foundation, [www.theworkfoundation.com](http://www.theworkfoundation.com).
- Steger, M.F., & Kashdan, T.B. (2009). Depression and Everyday Social Activity, Belonging, and Well-Being. *Journal of Counseling Psychology*, 56(2), 289-300.

- Thapar, P.A., Collishaw, S., Pine, D.S., & Thapar, A.K. (2012). Depression in adolescence. *Lancet*, 379(9820), 1056-1067.
- Teh, C.K., Ngo, C.W., Zulkifli, R.A.B., Vellasamy, R., & Suresh, K. (2015). Depression, Anxiety and Stress among Undergraduate Students: A Cross Sectional Study. *Open Journal of Epidemiology*, 5, 260-268.
- Väänänen, J.M., Fröjd, S., Ranta, K., Marttunen, M., Helminen, M., et al. (2011). Relationship between social phobia and depression differs between boys and girls in mid-adolescence. *Journal of Affective Disorders*, 133(1-2), 97-104.
- Walker, E., & Bollini, A. (2002). Pubertal neurodevelopmental and the emergence of psychotic symptoms. *Schizophr Res*, 54, 17-23.
- Watkins, A.M., & Melde, C. (2016). The Relationship between Gang Membership, Depression, Self-Esteem, and Suicidal Behavior. *Criminal Justice and Behavior*, 13. Doi: 10.1177/0093854816631797.
- Ahmadibehagh, A., Bakhshipour, B.A., Saeedinejad, H., & Ahmadibehagh, S. (2014). Comparing selective attention and working memory of people with OCD and depression with normal people (from the perspective of neuropsychology). *Advances in Cognitive Science*, 16(2), 38-47.
- Anisi, J., Eskandari, M., Bahmanabadi, S., Noohi, S., & Tolaei, A. (2014). The standardization of the Symptoms Check List (SCL-90 -R) among military personnel. *Quarterly of Military Psychology*, 5(17), 57-67.
- Ahokhosh, P. (2015). The role of depression, hopelessness, and anxiety in the incidence of suicidal behaviors among adolescents. The First Conference on Psychology, Educational Sciences, and Pathology of the Society. [http://www.civilica.com/Paper-ASIBCONF01-ASIBCONF01\\_103.html](http://www.civilica.com/Paper-ASIBCONF01-ASIBCONF01_103.html)
- Bagheri Khatoonabadi, F., Manochehri, M., & Hekami, M. (2015). The relationship of controlling emotions with suicidal tendencies among high school students in Karaj. The Second National Conference of Psychology and Educational Sciences, Islamic Azad University of Shadegan, 1-6.
- Pourhossein, R., Farhoodi, F., Amiri, M., Janbozorgi, M., Rezaei Binakhoidi, A., & Nourollahi, F. (2014). Examining the relationship between suicidal thoughts, depression, anxiety, resilience, daily stressors and mental health among students of Tehran University. *Journal of Clinical Psychology*, 4(14), 21-39.
- Heidari, A., Moradi, A., Abdollahi, M.H., Parhoon, H., & Naderi, Y. (2015). The performance of patients with the major depressive disorder in doing assignments related to false memory. *Journal of Psychology*, 19(2), 122-136.
- Rahimi, Ch. (2014). Applying the Beck Depression Inventory-2 on Iranian students. *Daneshvar Raftar*, 21(10), 173-188.
- Zare, H., Abazarian Tehrani, M., & Alipour, A. (2012). The effect of the menstrual cycle on the meta-memory, everyday memory, and prospective memory in women aged 18 to 45 years old. *The Iranian Journal of Obstetrics, Gynecology, and Infertility*, 15(41), 1-8.
- Sharifi Dolatabadi, M. (2013). Assessing the state of memory and examining the effect mood and emotion regulation on memory function among patients with multiple sclerosis. MA Thesis of Clinical Psychology, Faculty of Psychology and Educational Sciences, Isfahan University.
- Tabatabaei, S.M., Faiazi Bordbar, M.R., & Lotfi, M. (2004). The prevalence of physical symptoms among patients with the major depressive disorder. *Journal of Mental Health Principles*, 6(21-22), 29-35.
- Abdollahi, R., & Rasoulizadeh Tabatabaei, K. (2013). The impact of computer games on personality characteristics and adjustment among adolescents. *Female Police Studies*, 7(18), 84-106.
- Mosayebi, E. (2013). Assessing the state of memory and examining the effect mood and emotion regulation on memory function among patients with type II diabetes. MA Thesis of Clinical Psychology, Faculty of Psychology and Educational Sciences, Isfahan University.

## Effect of group consultation based on maternal communication skills on the perspectives of 13-15-year-old girls about sex dialogues

Tayebe Ziaei<sup>1</sup>, Maryam Ghanbari Gorji\*<sup>2</sup>, Naser Behnampour<sup>3</sup> and Masumeh Rezaei Aval<sup>4</sup>

<sup>1</sup>Ph.D in Reproductive Health, Assistant Professor, Counseling and Reproductive Health Research Center, Golestan University of Medical Sciences, Gorgan, Iran

<sup>2</sup>Master's Degree Student of Midwifery Counseling, Counseling and Reproductive Health Research Center, Golestan University of Medical Sciences, Gorgan, Iran

<sup>3</sup>Ph.D. in Biostatistics - Assistant Professor- Department of Biostatistics- Faculty of Health, Golestan University of Medical Sciences- Gorgan, Iran

<sup>4</sup>Master of Clinical Psychology Counseling and Reproductive Health Research Center, Golestan University of Medical Sciences, Gorgan, Iran

### ABSTRACT

Adolescence is the most critical period of each individual's life during which sexual and emotive maturity is reached. Such changes make adolescents curious about finding some sex-related information. Since the proper communications and discussions between the adolescents and their parents, especially their mothers, is one the most important information sources about this issue, the mothers need to have proper communication skills to transfer the required knowledge. The present study was conducted to determine the effect of group consultation based on maternal communication skills on girls perspective about sex dialogue in Gorgan, Iran. This pretest-posttest intervention study with a control population was conducted on 168 13-15 years old girls under the supervision of health centers of Gorgan (Iran) and their mothers (336 people) with study inclusion criteria on 2016. The subjects were selected based on point-to-point consistency and using effective variables and were allotted into two intervention and control groups using a simple randomized method. The data-collecting instrument used in this work is the demographic specification questionnaire and the 16-item girl-perspective Persian-translated sex-based girl-mother discussion questionnaire. After completing the questionnaires by the girls, the mothers in the intervention group were divided into 5-12 groups and subjected to 6-7 60-minute sessions of communication-based group consultation. Then, one week and one month after the sessions, the girls in intervention and control group were asked to complete the questionnaires. One week and one month after these consultation sessions, the girls in intervention and control groups were asked again to complete the questionnaires. The statistical analyses were performed using Mann-Whitney, independent t-test, repeated measure analysis of variance (ANOVA)

### ARTICLE INFORMATION:

\*Corresponding Author: [maryamghanbari136@yahoo.com](mailto:maryamghanbari136@yahoo.com)

Received 2<sup>nd</sup> June, 2017

Accepted after revision 26<sup>th</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

and corrected post hoc Bonferroni tests at a confidence level of 95% and test power of 80% using SPSS v.16. The results show that the average score of mother-girl sex dialogue-based discussion in girls' perspective in two intervention (40.95 ± 9.43) and control (38.80 ± 9.44) before the intervention has no statistically significant difference. However, after the intervention, the first and second follow-ups (one week and one month after the intervention, respectively) show a decrease in average sex dialogue-based discussion score (36.20±9.98 and 31.41±8.86) in the intervention group, while these scores increased in the control group for these two follow-ups. Furthermore, one week after the intervention, a significant statistical difference is noticed between the scores of intervention (36.20 ± 9.89) and control (41.35±9.35) scores (P = 0.001). Finally, the one-month follow-up intervention also revealed a statistically significant difference between the intervention (31.41 ± 8.86) and control (42.65 ± 9.17) scores (P < 0.001). The results of this work show that the communication skills based on group consultation can be considered as an effective tool for improving the sex-based mother-girls communications. Such a consultation can be offered through the health caregiver, the midwifery counselors and midwives in health centers, and the parent-teacher meetings.

**KEY WORDS:** COMMUNICATION SKILLS BASED ON GROUP CONSULTATION; PERSPECTIVE; SEX-BASED MOTHER-GIRL DISCUSSIONS

## INTRODUCTION

Adolescence is the most critical and important period of each individual's life [C B,2013] since the physical, mental, and social changes and development initiate and person reaches sexual and emotional maturity (Nourolahi et al., 2013). The onset of puberty and changes in the body, along with sexual orientation and curiosity about finding some sex-related information leads to an increase in the adolescents need for sex-based education [Rice P,2008]. The most important need of adolescent girls includes increasing needs of sex-related information such as signs of puberty, description of physiology and anatomy of reproductive system and the beginning of puberty, sexual and spiritual development and health issues in this period (Abdollahi et al., 2003, Farahani 2005; Mahmodi et al.2007), basic information about human reproduction and fertility process, pregnancy and childbirth, contraception and birth control (Miller et al., 1998), prevention of venereal disease (VD) especially AIDS and HIV and other sexually transmitted diseases (Abdollahi et al., 2003; Miller et al., 1998 ; Miller et al., 2009), and protection from sexual abuse (Zhang et al., 2014).

Although adolescents achieved fertility by changes in this period (Rice 2008), their knowledge about sexual issues and changes in this period is limited, which may have serious consequences (Jejeebhoy 2006;

Probably, most of the high-risk problems may include forced sex, sexual abuse, unwanted pregnancy, unsafe abortion, and sexually transmitted infections (Javadnoori et al., 2012; Heggenhougen & Quah 2008). Given that the sexual issue is one of the most private matters in individual's life, therefore talking about sexual issues can be the most challenging issues for parents and adolescents (Jerman & Constantine 2010). Since talking about these issues is taboo for girls and boys based in our (Iranian) culture , damages and concerns result from ignoring this issue is obvious (Javadnoori et al., 2012 ,Heggenhougen & Quah 2008). The relationship between

parents and adolescent plays an important role in the prevention of the damages (Jesus and Fantahun 2010).

If parents have a logical and descent relationship with their children, it will help adolescents to pass this period easily (Kaltiala et al., 2003). When parents easily and proficiently talk to their adolescents about sexual issues, such discussion can accelerate the growth of sexual health and reduce the sexual risk (Jesus and Fantahun 2010; Ahlberg et al., 2001 Yadeta et al., 2014). In this period, giving necessary knowledge to parents as well as mental and psychological help play a significant role in adolescent development. In this regard, group programs such as group consultation are considered among effective solutions for strengthening the communication between parents and adolescents (Griffith 2010).

Regarding the importance of sex-based mother-girl discussions and its effect on prevention of psychological problems, infectious diseases, unsuccessful marriages, early and high-risk pregnancies, injuries, deaths, and the physical and mental problems (Rice 2008) and based on the important aspects of study and investigation on mothers and adolescents relationship, understanding the capabilities, requirements, incompatibilities between mothers and girls, and help mothers maintain and strengthen their dialogue with the girls about sexual issues, the present study was performed to determine the effect of group consultation based on maternal communication skills on the perspective of girls about sex dialogue in Gorgan.

## MATERIAL AND METHODS

This pretest-posttest intervention study with a control population was conducted on 168 13-15 years old girls under the supervision of health centers of Gorgan (Iran) and their mothers (336 people) with study inclusion criteria on 2016. Inclusion criteria for mother included: Having only one girl aged 15-13 years and being her biological mother. Besides, the inclusion criteria for

adolescent girls included having an age range of 13-15 years old and not having a single parent. Finally, common inclusion criteria for mother and adolescent girl included being fluent in Persian, having at least literacy on Persian reading and writing, having no psychological disease with and without treatment, and lack of participation in any workshops on communication skills.

Exclusion criteria: Failure to complete at least 5% of questionnaire and unwillingness to cooperate in research. In order to determine sample size, study of Schuster et al. (2008) (Schuster et al. 2008) was used. According to 4% and 18.3% increase in communication skill respectively in control group and intervention group, with respect to 80% and confidence level of 95%, sample size was determined for each group (with 72 persons) using equation below. Finally, based on the possibility of 15% sample loss, 84 qualified subjects were assigned in each group (168 persons in total).

$$n = \frac{(Z_{1-\alpha/2} + Z_{1-\beta})^2 [P_1(1-P_1) + P_2(1-P_2)]}{(P_1 - P_2)^2}$$

$$n = \frac{[1.96 + 0.84]^2 [0.04(0.96) + (0.183)(0.817)]}{(0.183 - 0.04)^2} = 168$$

In the present study, the samples were recruited from Gorgan health centers (Centers 3 and 4) based on demographic diversity such as cultural, economic, and social levels. Since the documents of eligible households were not specified in health care centers, all documents were reviewed and selected based on girl's age. Based on effective variables (such as mother's age, education, job, the number of children, Birth rank) the best samples for present research were selected among selected documents and all primary data was entered to SPSS. In the second step, point-to-point consistencies were carried out based on effective factors and were allotted into control and intervention groups via the simple randomized method. Mothers and their daughter were invited to the health center and the aim of the research was described. After obtaining written consent from participants, the other steps of data collection were continued.

Girls in both control and intervention groups completed the sex-based mother-girl discussions questionnaire and demographic specification form in three stage; prior to the intervention and one week (Schuster et al. 2008) and one-month (Honarparvaran et al., 2012) after the intervention. In the first stage, prior to intervention, each of 168 girls filled the demographic specifications form and the questionnaire. In the second stage, after a week of intervention, 75 persons of the intervention group and 72 persons of control group filled the questionnaire. Eventually, in the third stage, one month after the intervention, 73 persons from the intervention group, and 72 persons from the control group were

asked to fill the questionnaire. In this study, 6-7 60-minute sessions of communication-based group consultation (Honarparvaran et al., 2012) were conducted only for the mothers in the intervention group.

Finally, the obtained data were analyzed in confidence level of 95% and power of a test of 80% by SPSS v.16. According to data normality responses, the Mann-Whitney test, independent t-test, ANOVA with repeated measures and corrected Bonferroni post hoc test were used for analyses. The minimum and the maximum number of members in each group were 5 and 12 (Shafiqabadi 2005) respectively. The process of group consultation was designed based on Yahaya (2004) and Vassilopoulos (2012) studies (Vassilopoulos and Brouzos 2012).

Group consultation sessions based on communication skills are presented in Table 1.

At the beginning of each group consultation sessions, the summary of activities performed in the previous session was presented and previous session home works were discussed in a large group. In each session, different scenarios were designed based on the aim of the session, the scenario was performed in small groups, and the ideas were exchanged in a large group. At the end of each session, the content was summarized by the consultant and the home works were given to participants.

## DATA COLLECTION TOOL

In the present study, data were collected using demographic specification form and Persian questionnaire about a sex-based mother-daughter discussion from the perspective of girls.

### Sex-based mother-daughter discussion questionnaire from the perspective of girls:

The questionnaire contains 16 question to evaluate sex-based mother-daughter discussion. This scale was initially developed by Jaccard et al. (2000) to measure the sex-based communication between teens and parents, which was translated by Toriki (2014), and its content Validity and reliability of the questionnaire were evaluated by Torky and its stability was 82%. These questions using the five-choice Likert scale (strongly agree (5 points) – agree (4 points), no idea (3 points), disagree (2 points), and strongly disagree (1 point)). In the questionnaire, scoring interpretation is done reversely. In this regard, 0-49.9 scores present good dialogue, 50- 74.9 scores indicate average dialogue and score higher than 75 shows weak dialogue (Toriki 2014).

## RESULTS

The information of final 145 couples (mothers and daughter) showed that the average age of participant girls in

Table 1. The contents of group consultation sessions based on communication skills

The contents of group consultation sessions based on self-awareness skill	
session 1	<ul style="list-style-type: none"> <li>- Introduce the members to each other</li> <li>- Describe the rules and principles of group consultation</li> <li>- Present the aim of group consultation</li> <li>- Determine the questions related to mothers by presenting two questions include:               <ul style="list-style-type: none"> <li>• Write the sex-based questions that have been asked by your daughter</li> <li>• Write the sex-based questions that you are concerned that in the future your daughter asks you</li> </ul> </li> </ul>
session 2	<ul style="list-style-type: none"> <li>- Determine the reasons for differences in reactions</li> <li>- Identify the importance of communication skill, Types of communication (one-way and two-way communication), characteristic of effective communication, Verbal and nonverbal communication</li> <li>- Make trust, privacy principles, mutual respect and empathy</li> </ul>
session 3	active listening skill ( how to listen and how to speak) and communication barriers
session 4	The basis of teaching sexual issues to girls
session 5	how to answer the girls' questions about a girl and boy anatomy, menstruation, menstrual hygiene, and nutrition, hymen, and circumcision
session 6	how to answer the girls' questions about pregnancy, childbirth, maternity, contraception and sexually transmitted diseases, AIDS, hepatitis and masturbating
session 7	<ul style="list-style-type: none"> <li>- Summarize and answer the questions by counselor</li> <li>- Evaluate and terminate consultation</li> </ul>

intervention and control group were  $14.13 \pm 0.77$  and  $14.14 \pm 0.74$ , respectively. Besides, the average age of mothers was  $39.16 \pm 4.41$  in the intervention group and  $38.87 \pm 3.99$  in control group. Moreover, the average age of fathers in intervention and control group was respectively  $44.68 \pm 4.46$  and  $43.02 \pm 3.8$ . It is worth mentioning that both intervention and control group were similar in terms of demographic variables (Table 1).

The results of independent t-test show that based on the average score of mother-girl sex dialogue-based discussion in the perspective of girls prior to the intervention has no statistically significant difference between intervention ( $40.95 \pm 9.43$ ) and control group ( $38.80 \pm 9.44$ ).

The Mann-Whitney test results present that the average score of mother-girl sex dialogue in the perspective of girls a week after the intervention has a significant difference ( $p=0.001$ ) between intervention ( $36.20 \pm 9.89$ ) and control group ( $41.35 \pm 9.35$ ). Moreover, the results of Mann-Whitney test show that the average score of mother-girl sex dialogue in the perspective of girls a month after the intervention there is a statistically significant difference ( $p<0.001$ ) between intervention ( $31.41 \pm 8.86$ ) and control group ( $42.65 \pm 9.17$ ) (Table 2).

The results of ANOVA with repeated measures show that the average score of mother-girl sex dialogue in three stages (prior to intervention, a week after intervention, and a month after intervention) has a significant difference ( $p<0.001$ ) between intervention and control group. According to the significant difference between averages in ANOVA with repeated measures tests, two by two comparison was conducted using corrected Bon-

ferroni post hoc test. The results showed that the average score of mother-girl sex dialogue-based discussion in the perspective of girls prior to intervention and one week after the intervention was estimated  $40.95 \pm 9.43$  and  $36.20 \pm 9.98$ , respectively. The averages were associated with significant difference and showed a decrease in average sex-based discussion score during the time of sexual dialogue based conversation ( $p= 0.002$ ). In addition, the average sex-based discussion score in the perspective of girls was estimated prior to intervention and one month after intervention as  $40.95 \pm 9.43$  and  $31.41 \pm 8.86$ , respectively. The averages were associated with significant difference and showed a decrease in average sex dialogue score during discussion time ( $p< 0.001$ ). In this group, the average sex-based discussion scores respectively were estimated in one week and one month after intervention ( $36.20 \pm 9.98$  and  $31.41 \pm 8.86$ ). The averages were associated with significant difference and showed a decrease in average sex dialogue score during discussion time ( $p< 0.001$ ).

The comparisons in control groups showed that the average sex dialogue scores in pre-intervention and one week after the intervention were estimated  $38.80 \pm 9.44$  and  $41.35 \pm 9.35$ , respectively. The averages were associated with significant difference and showed an increasing trend during the mean time of sex dialogue ( $p< 0.001$ ). Besides, the mean score of sex dialogue prior to intervention and a month after intervention were estimated  $38.80 \pm 9.44$  and  $42.65 \pm 9.17$ , respectively. The averages were associated with significant difference and showed an increasing trend during the mean time of sex dialogue ( $p< 0.001$ ). Moreover, the average sex dialogue score in one week after intervention, and a

Table 2. comparison between intervention and control group in terms of frequency distribution in qualitative demographic specification of girls

Variables	Group	intervention group	control group	Significance level of chi-square test
		the number (frequency)	the number (frequency)	
education grade of girls	seventh grade	19 (26)	15. (20.8)	0.69
	eight grade	29 (39.7)	33 (45.8)	
	ninth grade	25 (34.2)	24 (33.3)	
Mother's education level	primary school	3 (4.1)	3 (4.1)	0.87
	intermediate school	2 (2.7)	2 (2.7)	
	High school	28 (38.4)	28 (38.4)	
	university degree	40 (54.8)	40 (54.8)	
Father's education level	primary school	1 (1.4)	0 (0)	0.05
	intermediate school	9 (12.3)	6 (8.3)	
	High school	13 (17.8)	12 (16.7)	
	university degree	50 (68.5)	54 (75)	
Mother's job	Housewife	47 (64.4)	47 (65.3)	0.053
	worker	0 (0)	1 (1.4)	
	Employee	17 (23.3)	19 (26.4)	
	Other	9 (12.3)	5 (6.9)	
Father's job	worker	3 (4.1)	5 (6.9)	0.137
	Factory or office worker	1 (1.4)	6 (8.3)	
	Employee	43 (58.9)	44 (61.1)	
	self-employed	24 (32.9)	14 (19.4)	
	Other	2 (2.7)	3 (4.2)	
the number of sisters	no sister	37 (50.7)	35 (48.6)	0.79
	one	32 (43.8)	31 (43.1)(43.1)	
	two	4 (5.5)	6 (8.3)	
the number of brothers	no brother	35 (47.9)	37 (51.4)	0.57
	one	36 (49.3)	31 (43.1)	
	two	2 (2.7)	4 (5.6)	
Birth rank	first	52 (71.2)	53 (73.6)	1
	second	16 (21.9)	15 (20.8)	
	third	5 (6.8)	4 (5.6)	
Religion	Shia	70 (95.9)	69 (95.8)	1
	Sunni	3 (4.1)	3 (4.2)	
Ethnicity	Persian	70 (95.9)	69 (95.8)	1
	Turkoman	3 (4.1)	3 (4.2)	

month after intervention were estimated  $41.35 \pm 9.35$  and  $42.65 \pm 9.17$ , respectively. The averages were associated with significant difference and showed an increasing trend during the mean time of sex dialogue ( $p < 0.001$ ) (Table 3).

## DISCUSSION

The present study was conducted to determine the effect of group consultation based on maternal communication skills on the perspective of girls about sex dialogue

Table 3. Comparison between intervention and control group in terms of mean score of girls sex dialogue prior, one week after and one month after intervention

sex dialogue scores from the girls perspective	intervention	control	test type	test statistic	significance level
	Mean ± SD	Mean ± SD			
prior to intervention	40.95 ± 9.43	38.80 ± 9.44	t-test	t = 1.47	0.143
a week after intervention	36.2 ± 9.89	41.35 ± 9.35	Mann-Whitney	Z = -3.46	0.001
a month after intervention	31.41 ± 8.86	42.65 ± 9.17	Mann-Whitney	Z = -6.41	<0.001

via intervention method. The results showed that there is no statistically significant difference between the average sex dialogue score in the perspective of girls in intervention and control groups pre-intervention. On the contrary, in the intervention group, the average sex dialogue score decreased in two follow-ups after intervention (a week and a month after intervention). Therefore, group consultation based on communication skills, as a method to improve the mother-daughter relationship, increases the sex-based mother-daughter discussion in the perspective of girls. This finding was supported by other studies, For example, the study of Aronowitz *et al.* (2015) on sexual communication intervention for African American mothers and daughters showed that group consultation from the perspective of girls resulted in an increase in mother and daughter sex dialogue (Aronowitz *et al.*, 2015).

Forehand *et al.* (2007) studied parents of preadolescents (9-12 years old) and reported the positive effect of group consultation on mother and daughter sex dialogue, such that after intervention in the group with more consultation session compared to the group with fewer sessions, more increase in the sex dialogue was observed. Its result is an affirmation for present study

(Forehand *et al.*2007). The results of present study showed that in the control group, sex-based mother-daughter communications decreased. In control group, a decrease in sex-based communication occurred due to the need of communicating with the mother when the girls faced with a questionnaire, but because the mothers in control group were not trained in this field, they had insufficient knowledge and skill to communicate with their children about sexual issues. The lack of skill resulted in an increase in average sex dialogue score in girls' perspective in first follow-up compared to pre-intervention due to the inappropriate communication between mother and daughter from a girls point of views.

In the first and second follow-ups, there is the statistically significant difference between intervention and control groups. The results of the present study are in agreement with the study of Schuster *et al.* (2008) on the evaluation of the effect of parents conversation about adolescent health based on worksite program to promote parent-adolescent communication about sexual health. According to the results of Schuster, the group training had statistically significant effect on parent-adolescent sexual communication in perspective of an

Table 4. comparison of average variables of sex dialogue between intervention and control groups in three stage: prior to intervention, a week after intervention, and a month after intervention

Variable		group (1)	The average prior to intervention, a week after intervention, and a month after intervention. *(1,2, and 3)			The results of ANOVA with repeated measures	corrected Bonferroni post hoc test ** (3 and 2, 3 and 1, 2 and 1)		
			(2)	(3)	(1,2, 3)		(1and 2)	(3 and 1)	(3 and 2)
the sex dialogue between mother and daughter	girl perspective	intervention	40.95	36.20	31.41	<0.001	0.002	<0.001	<0.001
	control	38.80	41.35	42.65	<0.001		<0.001	<0.001	<0.001
*(1) prior to intervention, (2) a week after intervention, (3) a month after intervention			**( 1 and 2) prior to intervention and a week after intervention, (1 and 3) prior to intervention and a month after intervention, (2 and 3) a week and a month after intervention						

adolescent. In the intervention group, the sex dialogue increased after three and nine months in the perspective of adolescents. On the contrary, in control group, same as the present study, the reduction in the sex dialogue was observed.

The findings of some research are in different with the present study. For instance, Bartlett *et al.* (2010) evaluated the Feasibility and initial efficacy testing of an HIV prevention intervention for black adolescent girls and reported an increase in sex dialogue immediately after intervention but it decreased three months after intervention. Therefore the results are in contrast with the present study. Perhaps the difference between the intervention and the number of a training session for mother cause this conflict. In Bartlett and colleagues study, due to the less training session for mothers compared to the present study and holding group meetings for girls resulted in an increase in their expectation from parents, but because of less training session for parents, they could not achieve enough skill in intervention.

Current findings are in contrast with those of Lederman *et al.* (2008) who evaluated the effect of parent-adolescents communication training on reducing pregnancy risk and adolescents STD a reported a decrease in parent-adolescents sex dialogue rate during 2 years follow-up. In Lederman study, adolescents showed a reduction in parent-adolescents sex dialogue while an increase in sexual communication with a friend. The difference between tools and inclusion criteria compared to present study results in this difference. In the present study, selected adolescent lived with both parents but in those of Lederman 27% and 21% of adolescent lived respectively with a single parent and other persons except parents (grandmother etc.).

## CONCLUSION

The present study has the positive effect on improving mother-daughter sexual communication in the intervention group. The results showed that in the control group, sex-based mother-daughter communication was decreased due to the need for communicating with the mother when the girls faced with a questionnaire. Due to the lack of basic information in mothers in control group about physical and sexual changes and insufficient knowledge and skill to communicate with their children about sexual issues in this period, the average sex-based discussion score in perspective of girls was decreased.

Considering the increase in sex-based discussion due to consultation based on maternal communication skills, to improve sex-based mother-daughter communication and to reduce its irrecoverable effects, it is suggested applying communication skill based group consultation

in health centers, clinics and parent-teacher meetings, midwifery consultants, and midwives.

## LIMITATIONS

Some of the limitations in this study were due to the lack of cooperation in licensing a sampling from school by the department of education since they believed the items in the questionnaire conflict their educational approaches. Therefore, the sampling was conducted through the health centers, which was difficult and time-consuming. Besides, the researcher should rely on the information that was presented by participants due to being self-report questionnaires. Moreover, this study had gender limitation. Thus, the statistical population of the study included only mothers and their daughters. Therefore, it cannot generalize to whole people. It is recommended that a similar study performs on the both sexes with a large statistical population.

## ACKNOWLEDGMENTS

This study is the part of an intervention project with the number of 941218330 that was approved in 2016.05.03. We would like to show our gratitude to the Deputy of Golestan University of Medical Sciences and School of Nursing and Midwifery, Dean of the Health Center of Gorgan, all staff of urban health centers in Gogan and, and all adolescents and their families who cooperated in this study.

## REFERENCES

- Abdollahi F, Shabankhani B, Khani S. Study of puberty health educational needs of adolescents in Mazandaran province in 2003. *J Mazandaran Univ Med Sci* 2003; 4(43):61-5 (Persian).
- Ahlberg BM, Jylkäs E, Krantz I. Gendered construction of sexual risks: implications for safer sex among young people in Kenya and Sweden. *Reproductive Health Matters*. 2001;9(17):26-36.
- Aronowitz T, Ogunlade IJ, Nwosu C, Gona PN. Sexual communication intervention for African American mothers & daughters. *Applied Nursing Research*. 2015;28(3):229-34.
- Bartlett R, Shelton T. Feasibility and initial efficacy testing of an HIV prevention intervention for black adolescent girls. *Issues in mental health nursing*. 2010;31(11):731-8.
- Anthony C B. The State of The World's Children 2011:Adolescence; an age of opportunity. UNICEF 2011 [cited 2013 May 31]. Anthony Forehand R, Armistead L, Long N, Wyckoff SC, Kotchick BA, Whitaker D, et al. Efficacy of a parent-based sexual-risk prevention program for African American preadolescents: a randomized controlled trial. *Archives of pediatrics & adolescent medicine*. 2007;161(12):1123-9.
- Farmahini Farahani M. Appropriate Content for Sex Education in Secondary Schools. training & learning researches. 2005;1(9):1-14.

- Griffith AK. The Use of a Behavioral Parent Training Program for Parents of Adolescents. *Journal of At-Risk Issues*. 2010;15(2):1-8.
- Honarparvaran N, Ghaderi Z, Amirianzadeh L. Effectiveness of combined group cognitive and reality therapy on the relationship between mothers and their daughters. *Applied Psychology*. 2012(20).
- Heggenhougen, k & Quah, S.R International Encyclopedia of Public Health. Oxford: Academic Pr. 2008
- Jejeebhoy SJ, editor Sexual and reproductive health of young people: expanding the research and programme agenda. David and Lucile Packard Foundation's Population Program Review Task Force Meeting California; 2006.
- Jerman P, & Constantine, N. A. . Demographic and Psychological predictors of parent-adolescent communication about sex: A representative statewide analysis. *Journal of Youth and Adolescence*, 2010; 39:1164-74.
- Javadnoori M, Roudsari RL, Hasanpour M, Hazavehei SMM, Taghipour A. Female adolescents' experiences and perceptions regarding sexual health education in Iranian schools: A qualitative content analysis. *Iranian journal of nursing and midwifery research*. 2012;17(7):539.
- Kaltiala-Heino R, Marttunen M, Rantanen P, Rimpelä M. Early puberty is associated with mental health problems in middle adolescence. *Social science & medicine*. 2003;57(6): 1055-64.
- Lederman RP, Chan W, Roberts-Gray C. Parent-Adolescent relationship education (PARE): Program delivery to reduce risks for adolescent pregnancy and STDs. *Behavioral Medicine*. 2008;33(4):137-44.
- Mahmodi G, Hassanzadeh R, Heidari G. The effect of sex education on family health on Mazandran medical university students. *The Horizon of Medical Sciences*. 2007;13(2): 64-70.
- Miller K, Fasula A, Dittus P, Wiegand R, Wyckoff S, McNair L. Barriers and Facilitators to Maternal Communication with Pre-adolescents about Age-Relevant Sexual Topics. *AIDS Behav*. 2009;13(2):365-74.
- Miller KS, Kotchick BA, Dorsey S, Forehand R, Ham AY. Family communication about sex: What are parents saying and are their adolescents listening? Family planning perspectives. 1998:218-35.
- Nourolahi T GZ, Moazzami Goodarzi H The Technical Report of 2011 National Census of Population and Housing Statistical Center of Iran: Technical Design and Statistical Methods Research Group; (cited 2013 June 5)
- Rice P. human Development. Translated to Persian by: Froughan M, translated human Development, Philip Rice. F. Arjmand, 2008 (persian).
- Roudi-Fahimi F, Ashford L, Khalil K. Advancing research to inform reproductive health policies.
- Schuster MA, Corona R, Elliott MN, Kanouse DE, Eastman KL, Zhou AJ, et al. Evaluation of Talking Parents, Healthy Teens, a new worksite based parenting programme to promote parent-adolescent communication about sexual health: randomised controlled trial. *bmj*. 2008;337.
- Shafiabadi A. Group dynamics and group counseling: roshd; 2005.
- Torki M. The relationship between Parenting style with public and sex of talking Mother and teen daughter, [MSc Thesis]: Ahvaz Jundishapur University. 2014. (persian).
- Vassilopoulos SP, Brouzos A. A pilot person-centred group counselling for university students: Effects on social anxiety and self-esteem. *The Hellenic Journal of Psychology*. 2012;9: 222-39.
- Yesus DG, Fantahun M. Assessing communication on sexual and reproductive health issues among high school students with their parents, Bullen Woreda, Benishangul Gumuz Region, North West Ethiopia. *Ethiopian Journal of Health Development*. 2010;24(2).
- Yadeta TA, Bedane HK, Tura AK. Factors Affecting Parent-Adolescent Discussion on Reproductive Health Issues in Harar, Eastern Ethiopia: A Cross-Sectional Study. *Journal of environmental and public health*. 2014;2014.
- Yahaya LA. Effects of group counselling and SQ3R on the study habits of secondary school students in Ilorin. *Journal of education research and development*, (1). 2004:125-36.
- Zhang W, Chen J, Feng Y, Li J, Liu C, Zhao X. Evaluation of a sexual abuse prevention education for Chinese preschoolers. *Research on Social Work Practice*. 2014;24(4):428-36.

## Association of phosphoinositide-3-kinases and genetic polymorphisms on the risk of multiple sclerosis in South East of Iran

Atefeh Mir<sup>1</sup>, Pouria Mohammadi<sup>2</sup> and Dor Mohammad Kordi-Tamandani<sup>1\*</sup>

<sup>1</sup>Department of Biology, Faculty of Science, University of Sistan and Baluchestan, Zahedan, Iran

<sup>2</sup>Department of Genetics & Molecular Medicine, Hamadan University of Medical Sciences, Hamadan, Iran

### ABSTRACT

Multiple sclerosis (MS) is the most common inflammatory demyelinating disease involving Central nervous system (CNS). Genetics and environment are important factors in development of MS. Phosphoinositide-3-kinases (PI3K) are a group of enzymes that are involved in many cellular functions such as; cell growth, proliferation, differentiation, motility, intracellular trafficking and anti apoptotic mechanisms. In fact it has a crucial role in the PI3K/AKT signaling pathway. Hence PIK3CA gene encodes alpha catalytic subunit of PI3K enzyme. In the present study, we analyzed the role of two SNPs of PIK3CA gene (rs7640662(C/G) and rs7621329(C/T)) in development of MS. This study is a case-control study. We extracted DNA from blood of 100 patients who suffered from MS and 100 healthy controls. We designed a tetraplex ARMS PCR for genotyping of samples. Our findings represent significant differences between both analyzed (rs7640662(C/G) and rs7621329(C/T)) SNPs in risk of MS manifestation. To the best of our knowledge, there is an association between PIK3CA gene polymorphisms in two mentioned positions - (rs7640662(C/G) and rs7621329(C/T)) and risk of MS. further studies in different genetic population with large sample size are recommended.

**KEY WORDS:** MULTIPLE SCLEROSIS, PIK3CA, GENE POLYMORPHISM, SNP, ARMS

### INTRODUCTION

Multiple sclerosis (MS) is the most common disease of inflammatory and neurodegenerative disorders of central nervous system (CNS), in which demyelination of

CNS involved in disease pathogenesis [Kostic, M., et al., 2015]. Also it is the most common neurological disease affecting young adults and 70% of patients manifest symptoms between ages 20 and 40, (Izadi et al.,2014). It is known as “disseminated sclerosis” or “encephalomy-

#### ARTICLE INFORMATION:

\*Corresponding Author: [or\\_kordi@science.usb.ac.ir](mailto:or_kordi@science.usb.ac.ir)

Received 28<sup>th</sup> May, 2017

Accepted after revision 27<sup>th</sup> Aug, 2017

BBRC Print ISSN: 0974-6455

Online ISSN: 2321-4007



Thomson Reuters ISI ESC and Crossref Indexed Journal

NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

© A Society of Science and Nature Publication, 2017. All rights reserved.

Online Contents Available at: <http://www.bbrc.in/>

elitis disseminata” too. This lesion interferes in communicating ability of nervous system in involved segments and finally it can be manifested in a broad spectrum of signs and symptoms, including physical, mental, and maybe psychiatric problems (Izadi *et al.*, 2014; Murray *et al.*, Buttner 2012).

MS is more developed in young adults and it has a complex genetic causes, probably needs to some environmental factors, such as viral infection, to trigger MS disease (Sospedra and Martin 2005). Actually it is a multifactorial disease, genetic factors and environmental elements are key players in its development. Genome screening studies provide some important evidences for deprivation of a major locus in MS. however, there are many genes that are associated with MS (Dyment *et al.*, 2004).

Phosphatidylinositol 3-Kinase (PI3K) group consists of enzymes which are involved in cellular growth [Engelman, J.A., J. Luo, and L.C. Cantley, 2006], proliferation, differentiation (Ptasznik, *et al.*, 1997), motility, intracellular trafficking and survival [Khwaja, A., *et al.*, 1997]. In addition, this family contain some intracellular signal transduction enzymes that are able to phosphorylate the 3'- hydroxyl group of the inositol ring of phosphatidylinositol (PtdIns) (Knight *et al.*, 2006), recognized as phosphatidylinositol 3-kinases or phosphoinositid 3-kinases (Kalaany and Sabatini 2009). Phosphoinositid 3-kinase families are divided into three classes: Class I, Class II and Class III. This classification is based on the primary structure, substrate specificity and regulation of lipid *in vitro* (Leever *et al.*, 1999).

The PI3Ks are associated with some cellular functions. Most of these functions are linked to class I PI3K ability to activate protein kinase B (AKT or PKB). It is involved in the PI3K/AKT/mTOR pathway (Franke *et al.*, 1997) which is important for cell proliferation and survival. This pathway is stimulated through protecting astrocytes from ceramide induced apoptosis (Pulgar *et al.*, 2002). Since, the tumor-suppressor phosphatase with tensin homology (PTEN) is the most important negative regulator of cell-survival signaling pathway it is initiated by phosphatidylinositol 3-kinase (PI3K) (Cully, M., *et al.*, 2006). Based on mentioned importance of PI3K and its correlations with cellular functions we decided to study the polymorphisms of this gene and their associations with MS.

## MATERIALS AND METHODS

This case-controlled study examined 100 individuals with MS (33 men; 67 women). The individuals were selected through the MS Society in the city of Zahedan, Iran and had been diagnosed by neurologists based on the McDonald criteria [20] and MRI test was performed

for all. An additional 100 healthy individuals were selected that did not have any personal or family history of autoimmune disease. Patients and controls are all from South East of Iran, matched for age and gender as the patient group. The informed consent was obtained from all of participants and this study was approved by the Ethics Committee of the University of Sistan and Baluchestan, Zahedan, Iran. This case-control study examined 100 individuals with MS (33 men; 67 women). The individuals were selected through the MS Society in the city of Zahedan, Iran and had been diagnosed by neurologists based on the McDonald criteria (Sambrook and Russell, 2006) and MRI test was performed for all. An additional 100 healthy individuals were selected that did not have any personal or family history of autoimmune disease. Patients and controls are all from South East of Iran, matched for age and gender as the patient group. DNA was extracted from blood cells using phenol-chloroform method (Sambrook and Russell 2006). The present study applied “Taq DNA Polymerase 2X Master Mix Red” (Ampliqon, Denmark) for PCR amplification. We used Tetraplex ARMS-PCR technique for genotyping of *PIK3CA* gene regarding to its SNPs (Figure 1, 2). Sequences of utilized primers and other supplementary information are shown in Table 1 [Kordi-Tamandani, D.M. and A. 2016]. The PCR amplification was performed using two pairs of primers at the followings conditions: 95°C for 5 min followed by 30 cycles of; 94°C for 30s, 58 °C for 30 Seconds as annealing temperature and 30 seconds in 72°C, and also 1 additional 72°C segment for 5 minutes as a final extension. Volume and concentrations of essential ingredients which are required for PCR reaction in each microtube are mentioned as follow: 1.5µl template DNA, 1µl of each pairs of primers, 11µl Taq DNA Polymerase 2X Master Mix Red, 3.5µl DDW; the total volume of reaction was 20 µl.

**Statically Analysis:** All statistical analyses were performed using SPSS 20 (IBM Company, USA). Risk of MS was determined by estimating *Odds Ratios* (OR) and 95% confidence intervals (95% CI) between cases and controls group. Categorical data were tested using Pearson's X<sup>2</sup>. The significance was set less than 0.05.

## RESULTS AND DISCUSSION

The present case-control study recruited 100 patients with MS and 100 healthy controls. Genotypic and allelic frequencies of *PIK3CA* polymorphisms were compared between MS and healthy controls as listed in Table 2 and 3.

We observed significant differences regarding to rs7640662 and rs7621329 polymorphisms between case and control groups ( $P < 0.05$ ). Phosphoinositide-3 kinases (PI3Ks) are key players in cell signaling and

Table 1. Primers sequences for PIK3CA and annealing temperature

SNP	primer	Sequence (5'→3')	Product size(bp)	Annealing temperature
rs7640662	Forward inner	ATTGGTGGAGTCCATTACACCTTCACC	125	58
	Reverse inner	TGGTGATTCTGCCAATACTTATAGGCTTAC	237	
	Forward outer	ATTATTGGCTAGTGCCTATTTTCACAGCA	304	
	Reverse outer	GGCTGTGCAAGGACAATATTTTCAAA		
rs7621329	Forward inner	GAAAAAATATTGAAATTAGACTACTGAC	107	58
	Reverse inner	ATGGTTTCATTTTCAGATTGGAGTGTA	203	
	Forward outer	ACTGAACTGTATTTTTTTCTAGGAGGT	254	
	Reverse outer	ATAAAAGTTAGGGTTCCAAAATGTAATT		

Table 2. Number and frequency of PIK3CA genotypes for 2 SNPs in MS and healthy controls.

	*Case N=100	Control N=100	OR	CI 95%	P-Value
rs7640662(C/G)					
CC	61	0	1(Ref)		
CG	39	100	0.0033	0.0002 - 0.0538	0.0001
GG	0(0)	0	-	-	-
CG+GG	39	100	0.0033	0.0002 -0.0538	0.0001
rs7621329(C/T)					
CC	28	10	1(Ref)	-	-
CT	72	90	0.2847	0.1318 - 0.6153	0.001
TT	0(0.0)	0	-	-	-
CT+TT	72	90	0.2847	0.1318 -0.6153	0.001

\*The data are presented as absolute numbers with % in parentheses

act as mediators for relaying signals from cell-surface receptors to relevant downstream proteins (Kulkarni *et al.*, 2011), and their inhibitors are potential therapeutics for autoimmune disorders [Ball and Ward, 2014], as MS. The Src/MAPK/PI3K/NF- $\kappa$ B pathway is critical for neuroinflammation that plays important roles in multiple sclerosis (MS). In addition to the lymphocytes, the underlying mechanisms also could be mediated by astrocytes (Yi *et al.*, 2014). In addition, essential role of PI3K in apoptosis has been investigated by cell based assays, (Yao *et al.*, 2015; Qu and Shen 2015).

In this context, PI3K is important in MS and its polymorphisms could alter the function of protein and risk of MS development as a consequence. *Graumann et al.* studied gene expression pattern by Microarray analy-

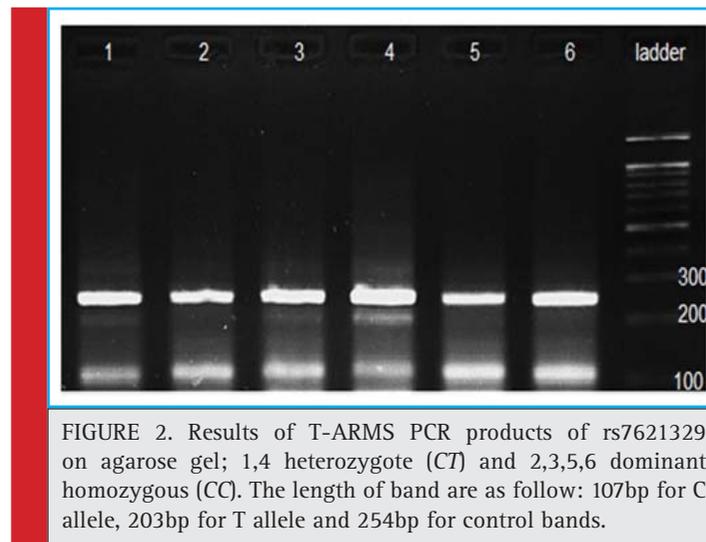
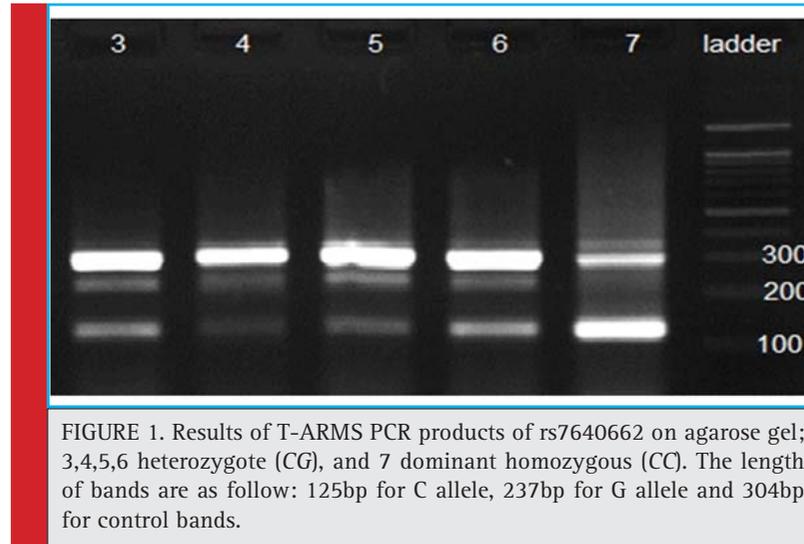
sis in MS patients and observed upregulation of some transcription factors such as HIF-1 $\alpha$  and association of PI3K/Akt signaling pathways with MS (Graumann *et al.*, 2003). *Bomprezzi et al.* explained a downregulation of PIK3R4 in MS patients opposing healthy participants (Bomprezzi *et al.* 2003).

Additionally aberrant PI3K signaling has been identified as an involving factor in pathophysiology of more psychiatric disorders as well as schizophrenia and autism (Sullivan *et al.*, 2000). There are few reports considering the effect of changes in sequence of the mentioned gene (*PIK3CA*) and its relation to risk of MS, our knowledge constrained to comparing the present data to any result. To the best of our knowledge, this is the first study interesting these polymorphisms and its correla-

Table 3. Allele frequency (%) and number of PIK3CA among individual with MS and healthy controls.

	*Cases =100	Controls =100	OR	CI 95%	P-Value
rs7640662(C/G)					
C	80	100	4.0667	2.6507 - 6.2391	<0.0001
G	20	100	0.2459	0.1603 - 0.3773	<0.0001
rs7621329(C/T)					
C	64	110	1.45	0.9880 - 2.1479	0.05
T	36	90	0.68	0.4656 - 1.0121	0.05

\*The data are presented as absolute numbers with % in parentheses.



tion with risk of MS. Ultimately, we recommend more sophisticated studies on larger sample size and various genetic populations to find the exact role of this gene in development of Multiple Sclerosis disease.

### ACKNOWLEDGEMENTS

The authors wish to thank the patients with MS who willingly contributed in the study we also thank Maryam Rajabi-Moghaddam in gathering blood samples.

**Competing interests:** The authors have declared that no competing interest.

### REFERENCES

Ball, J., S. Archer, and S. Ward, PI3K inhibitors as potential therapeutics for autoimmune disease. *Drug Discov Today*, 2014. 19(8): p. 1195-9.

Bomprezzi, R., et al., Gene expression profile in multiple sclerosis patients and healthy controls: identifying pathways relevant to disease. *Hum Mol Genet*, 2003. 12(17): p. 2191-9.

Cully, M., et al., Beyond PTEN mutations: the PI3K pathway as an integrator of multiple inputs during tumorigenesis. *Nat Rev Cancer*, 2006. 6(3): p. 184-92.

Dyment, D.A., G.C. Ebers, and A.D. Sadovnick, Genetics of multiple sclerosis. *Lancet Neurol*, 2004. 3(2): p. 104-10.

Engelman, J.A., J. Luo, and L.C. Cantley, The evolution of phosphatidylinositol 3-kinases as regulators of growth and metabolism. *Nat Rev Genet*, 2006. 7(8): p. 606-19.

Franke, T.F., et al., Direct regulation of the Akt proto-oncogene product by phosphatidylinositol-3,4-bisphosphate. *Science*, 1997. 275(5300): p. 665-8.

Gomez Del Pulgar, T., et al., Cannabinoids protect astrocytes from ceramide-induced apoptosis through the phosphatidylin-

- ositol 3-kinase/protein kinase B pathway. *J Biol Chem*, 2002. **277**(39): p. 36527-33.
- Graumann, U., et al., Molecular changes in normal appearing white matter in multiple sclerosis are characteristic of neuro-protective mechanisms against hypoxic insult. *Brain Pathol*, 2003. **13**(4): p. 554-73.
- Izadi, S., et al., Significant increase in the prevalence of multiple sclerosis in Iran in 2011. *Iran J Med Sci*, 2014. **39**(2): p. 152-3.
- Kalaany, N.Y. and D.M. Sabatini, Tumours with PI3K activation are resistant to dietary restriction. *Nature*, 2009. **458**(7239): p. 725-31.
- Khwaja, A., et al., Matrix adhesion and Ras transformation both activate a phosphoinositide 3-OH kinase and protein kinase B/Akt cellular survival pathway. *Embo j*, 1997. **16**(10): p. 2783-93.
- Kostic, M., et al., Deleterious versus protective autoimmunity in multiple sclerosis. *Cell Immunol*, 2015.
- Knight, Z.A., et al., A pharmacological map of the PI3-K family defines a role for p110alpha in insulin signaling. *Cell*, 2006. **125**(4): p. 733-47.
- Kordi-Tamandani, D.M. and A. Mir, Relationship between phosphoinositide-3-kinase genetic polymorphism and schizophrenia. *Nordic journal of psychiatry*, 2016. **70**(4): p. 272-275.
- Kulkarni, S., et al., PI3Kbeta plays a critical role in neutrophil activation by immune complexes. *Sci Signal*, 2011. **4**(168): p. ra23.
- Leevers, S.J., B. Vanhaesebroeck, and M.D. Waterfield, Signaling through phosphoinositide 3-kinases: the lipids take centre stage. *Curr Opin Cell Biol*, 1999. **11**(2): p. 219-25.
- Murray, E., N. Buttner, and B. Price, Depression and psychosis in neurological practice. *Neurology in Clinical Practice*, 6th Edition. Bradley WG, Daroff RB, Fenichel GM, Jankovic J (eds.) Butterworth Heinemann. April, 2012. **12**(201): p. 2.
- Ptasznik, A., et al., Phosphatidylinositol 3-kinase is a negative regulator of cellular differentiation. *J Cell Biol*, 1997. **137**(5): p. 1127-36.
- Qu, M. and W. Shen, [Role of PI3K/Akt pathway in endoplasmic reticulum stress and apoptosis induced by saturated fatty acid in human steatotic hepatocytes]. *Zhonghua Gan Zang Bing Za Zhi*, 2015. **23**(3): p. 194-9.
- Sambrook, J. and D.W. Russell, Purification of nucleic acids by extraction with phenol:chloroform. *CSH Protoc*, 2006. **2006**(1).
- Sospedra, M. and R. Martin, Immunology of multiple sclerosis. *Annu Rev Immunol*, 2005. **23**: p. 683-747.
- Sullivan, P.F., M.C. Neale, and K.S. Kendler, Genetic epidemiology of major depression: review and meta-analysis. *Am J Psychiatry*, 2000. **157**(10): p. 1552-62.
- Yi, H., et al., IL-17A induces MIP-1alpha expression in primary astrocytes via Src/MAPK/PI3K/NF-kB pathways: implications for multiple sclerosis. *J Neuroimmune Pharmacol*, 2014. **9**(5): p. 629-41.
- Yao, P., D.W. Yang, and D.R. Hu, [Role of PI3K/AKT pathways in mitomycin-mediated apoptosis of WB-F344 cells]. *Zhonghua Gan Zang Bing Za Zhi*, 2015. **23**(3): p. 200-3.