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**SCIENCE FOR LIFE** 

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## The prevalence of overweight and obesity among adults with intellectual and developmental disabilities in Ahvaz, Iran

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#### ABSTRACT

The prevalence of overweight and obesity among people with intellectual and developmental disabilities (IDD) is 4 times more than any other people in the community, but a little research have been examined the prevalence of overweight and obesity among people with intellectual disabilities (ID) recently, So the present study aimed in order to estimate the prevalence of overweight and obesity in ID people in Ahvaz, Iran.205 adults with IDD who had referred to five rehabilitation centers to receive rehabilitation services participated in this cross-sectional study. In addition to demographic information of ID people, data on their height and weight were collected to measure the body mass index (BMI). 69 percent of participants are male and 97 individuals had Down syndrome. The results of the present study Demonstrated that the prevalence of overweight and obesity among people with ID is high and about 57 percent. The results showed that there is a statistically significant difference between gender, IQ level, family size; and disability type with the prevalence of overweight and obesity.Implementation of intervention programs such as physical activities over the week in supportive institutions, as well as increasing parent awareness of IDD people about overweight and obesity among people with IDD.

KEY WORDS: OVERWEIGHT, OBESITY, PREVALENCE, PEOPLE WITH INTELLECTUAL AND DEVELOPMENTAL DISABILITIES

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#### **INTRODUCTION**

One of the most important health problems in many countries is overweight or obesity of adults (Wille *et al.* 2008; James *et al.* 2004). The prevalence of overweight and obesity in adults are estimated 6 billion and 400 million respectively which have doubled in the last 20 and it seems to increase as an epidemic and common problem in communities in addition (World Health Organization, 2008; World Health Organization, 2007). They cause many other diseases such as diabetes, hypertension, gallbladder and osteoarthritis disorders (James, 2001). Overweight and obesity is considered as an epidemic and common problem in communities it is increasing; moreover obesity and its related complications impose significant costs on society (Obesity, 2000).

The prevalence of overweight and obesity among people with IDD in United States is 4 times more than any other people in the community (Rimmer and Yamaki, 2006; Mikulovic et al. 2011), but very few studies are conducted regarding the prevalence of overweight and obesity among people with IDD newly and the majority of studies have addressed the prevalence of overweight and obesity in different age groups and among adolescents and young people (Barzin et al. 2009). Hsieh et al. in the United States showed that over 38% of people with mental disabilities had a BMI more than 30 and women are more obese than men in this study. In addition, people with Down syndrome have highest prevalence of obesity among different groups with IDD and they plus had more health problems than other community members (Hsieh et al. 2012).

The result of another study by Bhaumik *et al.*(2008) in the UK showed that only 34.6% of people with IDD had normal BMI and most of them had overweight and obesity problem. Beside, in the study it is found that people with IDD had higher blood pressure, poorer nutritional status and more high-risk behaviors than healthy people,(Bhaumik *et al.* 2008). People with ID often have a mortality rate greater than the general population, their health status is less than others and the prevalence of obesity in them is higher than other members of society due to immobility, lack of exercise and poor nutritional status (Koritsas and Iacono, 2015).

According to our research, Iranian scientific resources show that no study has been conducted on the prevalence of overweight and obesity in individuals with IDD, so this study was aimed to investigate the prevalence of overweight and obesity among adults with IDD in Ahvaz and its results could contribute in developing health care programs to support these people.

#### MATERIAL AND METHODS

#### STUDY DESIGN AND DATA COLLECTION

This study has been designed and conducted to investigate the prevalence of overweight and obesity among people with IDD in Ahvaz. 205 adults with IDD (like: Down syndrome, cerebral palsy, autism spectrum disorders and intellectual disability) who had referred to eight rehabilitation centers (medical and vocational rehabilitation centers) to receive rehabilitation services participated in this cross-sectional study. The demographic information of the people with IDD have been obtained from existing records in centers and this information includes items such as: age, gender, language, IQ, race, ethnicity, disability type, place of residence, educational status and employment status. Data on their height and weight has been collected over a period of two months from May to July 2016 by two professionals.

#### STATISTICAL ANALYSIS

For calculating the overweight or obesity the body mass index (BMI) was used such that first the height is measured by the wall by stadiometer with accuracy of 0.5 and then their weight was obtained by minimum clothing and no shoes on a scale with an accuracy of 100 grams. BMI was achieved by dividing weight (in kilograms) by the square of height (in meters) and someone with a BMI of less than 18.5 is underweight, between 18.6 and 25 is normal, between 25.1 and 30is overweight and the one with the BMI higher than 30 is obese (International Obesity Task Force, 2007). Data has been analyzed using SPSS version 16 software. Descriptive statistics such as mean, SD and frequency percentage are used to report BMI, age and gender. As well, the Chi Square and ANOVA tests have been applied used to evaluate the prevalence of overweight and obesity in terms of gender, ethnicity, location and different age groups.

Parents of all people with IDD were announced of the purpose of the study and they signed the informed consent. This research ethics code IR.AJUMS.REC 263.1395 has been confirmed by Jundishapour University of Medical Sciences Ethics Committee.

#### RESULTS

The results showed that 133 of participants (69%) were male and 73 participants were female. 97 people with had Down syndrome, 81 with intellectual disability (ID), 13 individuals had autism, and 14 of participants had cerebral palsy (CP) that 53% (108 cases) had IQ within the range of 51-70 and

17 . 11		Frequency
Variables	Categories	n (%)
Gender	Male	133(65)
	Female	72(35)
Age (year)	15-25	132(64)
	26-35	59(29)
	36-44	14(7)
IQ	<50	58(28)
	51-70	109(53)
	>70	38(19)
Race	Persians	84(41)
	Arabs	121(59)
Residential Area	Urban	175(85)
	Rural	30(15)
Education	Diploma	16(8)
	Under Diploma	189(92)
Occupation	Supportive Employment	70(34)
	Sheltered Employment	38(19)
	Unemployed	97(47)
parent's Education	Illiterate	99(48)
	Diploma	76(37)
	Academic	30(15)
Family Size	<7	76(37)
	≥7	129(63)
Disability Type	Down Syndrome	97(47.3)
	Intellectual Disability only	81(39.5)
	Autism	13(6.4)
	Cerebral Palsy	14(6.8)

58 cases had the IQ range less than 50. Fifty nine percent of respondents were Arabic speakers and 41% of them were Farsi speakers; and about 73% of them lived in large families (more than 7 members). Most people with intellectual and developmental disabilities were urban dwellers and had under diploma education. Only 15% of parents of persons of these people had academic degree and about 88% of them were covered by social security insurance. The demographic features of the participants have been reported in Table 1. As figure 1 suggests, 57% of the people with IDD suffer from overweight and obesity, 13.7% are underweight and only 29% have normal BMI. Among the various IDD, prevalence of obesity is higher in people with Down syndrome than other types of disability (Figure 2). Based on the results presented in Figure 3, the prevalence of overweight and obesity among women is higher than men.

The results presented in table 2 show there is a significant difference between gender of participants and the prevalence of overweight and obesity (P=0.001), but statistically there is no difference between participants ethnicity and the prevalence of overweight and obesity (P= 0.32). ANOVA test results has demonstrated that there is no significant difference between different age groups and the prevalence of overweight and obesity (P=0.502). The results also has depicted that the prevalence of overweight and obesity of people with an IQ less than 50 is higher than the other groups (P=0.02). The prevalence of obesity among large families (more than 7 members) has a significant difference with smaller families (less than 7 members) (P=0.031). Table 2 shows the results of the relationship between the prevalence of overweight and obesity and demographic data of individuals with IDD.

#### DISCUSSION

The current research has been designed and performed in order to estimate the prevalence of overweight and







Table 2. BMI status and its relation with participant variables							
Variables	Cotocomios	BMI St	atus	BMI Status			
variables	Categories	overweight	p-value	Obesity	p-value		
Gondor	Male	26.75	0.001	32.06	0.001		
Genuer	Female	29.23	0.001	36.47	0.001		
	15-25	27.74		33.25			
Age groups (year)	26-35	28.83	0.502	34.16	0.672		
	36-44	28.39		33.92			
IQ	<50	28.63		36.54			
	51-70 26.18 0.02		0.02	32.37	0.001		
	>70	26.35		33.74			
Posidontial Area	Urban	29.32	0.012	35.24	0.001		
Residential Area	Rural	26.07	0.012	31.15			
Family Siza	<7	27.14	0.02	31.78	0.02		
Family Size	≥7	29.59	0.03	35.41	0.02		
	Down Syndrome	29.34		36.32	0.001		
Disability Type	Intellectual Disability only	27.88	0.01	32.63			
Disability Type	Autism	27.31	0.01	30.82			
	Cerebral Palsy	26.8		30.01	1		

obesity among adults with IDD in Ahvaz. The results showed that the prevalence of overweight and obesity in adults with IDD is about 36% which indicates the high rate of obesity in this group. Hsieh et al.(Hsieh et al. 2012) in their research on adults with ID living in the American community have noted that the prevalence of obesity in the population was about 38% which in keeping with the results of the present research. A study by Mikulovic et al. (Mikulovic et al. 2011) on people with ID showed that 19% of 535 cases have overweight which in consistent with the results of the current. In Mikulovic study the prevalence of obesity among people with ID is reported about 4% which is inconsistent with the present results. The reason for this high difference in the prevalence is perhaps due to the individuals that in Mikulovic study only persons with ID are studied while in our study, most individuals have Down syndrome that usually the prevalence is high in this population compared to other people.

The findings of various studies indicate that the prevalence of overweight among men is less than women; the results also show that women are more obese than men (Hsieh et al. 2012). The results of these studies are consistent with the present study, the present study showed that the prevalence of overweight (22.6% Vs 28.7%, P=0.001) and obesity (32.5% Vs 48.4%, P=0.001) in women is higher than men. Yamaki and Rimmer research's results on obesity consideredthat the prevalence of obesity in people with Down syndrome is higher than other disabilities and it is about 71%, as well people with ID have the second place in the prevalence of obesity among people with IDD (9). The present study considered that people with Down syndrome have the highest prevalence of obesity among other disabilities. In the present research, people with CP had the lowest prevalence of obesity which is consistent with Rimmer and Yamaki research.

El Raghi et al.in Sudan stated that there is no significant correlation between age and the prevalence overweight and obesity (P =0.4) (El Raghi et al. 2016). Emerson in his research on adults with ID showed that there is no significant difference between the prevalence of obesity and different age groups (Emerson, 2005) which is consistent with the present research findings. The results revealed that the prevalence of obesity among families with more than 7 members and people with the IQ less than 50 is more than other groups. El Raghi indicates that there is no significant difference between the prevalence of obesity and IQ which is not consistent with the results of the present study (El Raghi et al. 2016). The reason might be due to the fact that people with 50> IQ due to the cultural issues and they may cause harm to others are kept at home and have low mobility and this lifestyle has led to gain extra weight and

obesity compared to the other groups. Another interesting result of this study is that there is a significant difference between the prevalence of overweight and obesity in terms of the place of residence such that the prevalence of overweight and obesity in rural dwellers is lower than urban dwellers. Hseih *et al.*in their study to determine the factors influencing obesity among people with intellectual disabilities found that urban lifestyle compared to rural lifestyle leads to higher prevalence of obesity and overweight which is consistent with the present study (Hsieh *et al.* 2012).

#### LIMITATIONS AND ADVANTAGES

The participants of this study were the ones who referred to educational and supportive institutions and these people might not be the representative of the entire people with IDD in Ahvaz. Additionally, in this study the effect of factors such as diet habits, movement restrictions and drug usage are not studied on overweight and obesity. One of the most important advantages of the present study is that this is the first study conducted to estimate the prevalence of overweight and obesity among people with IDD in Iran.

#### CONCLUSION

The results of the present study showed that the prevalence of overweight and obesity among adults with IDD is high (57%); and it is higher than other community groups which necessitates the intervention. Implementation of intervention programs such as physical activities over the week in supportive institutions, as well as, increasing parent awareness of intellectual and developmental disabilities people about overweight and obesity could help to reduce the prevalence of overweight and obesity among people with intellectual and developmental disabilities.

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# Investigating the relationship between gingivitis disease and *Pemphigus vulgaris* in Razi hospital

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#### ABSTRACT

One of the frequent protests, especially in the early stages of periodontal disease pemphigus vulgaris lesions to skin protests. (1) Gingivitis Gingivitis is the most common form of periodontal disease. This study aimed to investigate the relationship pemphigus vulgaris is the most common disease of periodontal disease gingivitis as was done in 2011-2012 years. The Historical Cohort study on 40 cases, 40 patients (control group) were performed. The data, viewing, clinical examination, patient interview and a visit to the medical records along with the completed forms were used. Both groups were matched for age, sex, smoking and use of toothbrushing, matched. Clinical examination criteria introduced by (CPITN) Community Periodontal Index and treatment need was carried out in which factors of dental calculus, pocket depth, bleeding on probing were evaluated. SPSS software (version 16) was used to analyze the results. 45% of the control group were diagnosed with periodontal disease, while 77.5% of cases the disease gingivitis And the difference was statistically significant. The incidence of oral manifestations in pemphigus need to question and search dentists and physicians noticed the symptoms in patients, because finding some oral symptoms in the early stages can be effective in prognosis through early treatment.

**KEY WORDS:** PEMPHIGUS VULGARIS, PERIODONTAL DISEASE, GINGIVITIS

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#### INTRODUCTION

One of the frequent protests, especially in the early stages of periodontal disease pemphigus vulgaris lesions to skin protests (Azizi, 2008). Gingivitis is the most common form of periodontal disease. Inflammation confined to the soft tissues surrounding the teeth and dental plaque after plaque accumulation occured (Shankar *et al.* 2010). Glossy surface, spongy and bleeding on probing the consistency of the clinical signs are conflict free gum and gum adhesive (Esmaili *et al.* 2007). Pemphigus vulgaris (PV) causes blisters and ulcers in the mucosa and skin. The first symptom in 60% of cases appear in the mouth and in 90-80% of cases, the lesions spread over the course of the disease (Manoj Kumar *et al.* 2010).

These lesions sometimes even up to 4 months earlier skin symptoms appear (Akman, 2008). The prevalence of oral lesions of pemphigus vulgaris in various studies, between 90% - 50 have been reported (Yazdanfar, 2010). Except gingivitis is multifactorial disease and systemic disease, one of the these factors are considered (Javali and Zainab, 2012). Also, patients with pemphigus vulgaris in the form of long-term local and systemic steroids or other immunosuppressive drugs that weaken the body's immune response to the pathogen are the factors periodontics (Mitsohiro *et al.* 2010).

In a study entitled pemphigus limited to the gums which was conducted in 2010 by Mitsuhiro et al.patients with a history of gingival lesions was a year old, for his final diagnosis was confirmed pemphigus vulgaris. In this study, it was found pemphigus vulgaris can rarely intact blisters that form on your gums show this may be a delay in diagnosis of underlying disease (Ayoubian, 2008). In another study Manojkumar and colleagues in 2010 a study entitled "Impact of pemphigus vulgaris (PV) periodontal health" performed. This study showed there is no difference in the two groups (PV) and healthy subjects assessed for indicators. But the amount of plaque in the PV group was significantly different than the control group (Javali and Zainab, 2012). Based on the above information gap that existed in this field in Iran, this study aimed to investigate the relationship pemphigus vulgaris is the most common disease of periodontal disease gingivitis as was done in 2011-2012.

#### MATERIALS AND METHODS

The Historical - cohort of all patients with pemphigus vulgaris the control group eligible for pemphigus vulgaris referred to Razi hospital in 2011-2012 were enrolled after informed consent form filling.Required volume studies were at least 14 in each group. For data collection, observation, clinical examination, the question of referring the patient and medical record along with the completed forms and laboratory methods such as immunofluorescence test and biopsy were used.

Clinical examination criteria introduced by (CPITN) Community Periodontal Index and treatment Need was carried out in which the following variables were analyzed: dental calculus, pocket depth, bleeding on probing. These factors should be considered in their teeth were 37, 36, 31, 41, 46, 47, 26, 21, 11, 16, 17. Factors associated with periodontal diseases such as gingivitis free and sticky around the teeth 21, 26, 27, 47, 46, 41, 31, 36, 37, 17, 16, 11 in terms of consistency (consistency), colour, stippling view to verify gingivitis and also the mass rally, bleeding on probing (BOP), pocket depth (PD) were evaluated. The results were scored according to criteria CPITN. According to the table, scoring was done as follows:

- 1. The absence of any lesion: zero
- 2. Bleeding on probing mild: score 1
- 3. Oral offenses: score 2
- 4. There is less and equal to 5 mm pocket depth: score 3
- 5. There are bags with a depth of more than 6 mm: grade 4

SPSS software (version 16) was used to analyze the results.

#### RESULTS

The study included 40 patients with pemphigus vulgaris (PV) and 40 healthy subjects. In addition to the similarity of the two groups in terms of socio – economic (referred to a hospital) were similar in terms of synchronization. The two groups in terms of sex, age, smoking, use of toothbrushing and the lack of any other systemic disease were similar and this difference was not statistically significant. (By taking the P-value = 0.05). (Table 1) 45% of people with periodontal disease are not PV%, 77.5 patients with PV, had periodontal disease. Chi – Square test showed that this difference was statistically significant (p=0.003), with mean if people, PV are with the incidence of periodontal disease is almost 2 times more than non-affected individuals.

Table 2. shows Distribution of patients with pemphigus vulgaris and controls and patients with gingivitis attending.

#### DISCUSSION AND CONCLUSION

In this study, the relationship between pemphigus vulgaris disease and gingivitis in 40 samples and 40 control subjects were studied as a result of 77.5% of patients

Table 1. Distribution of patients with Pemphigus vulgaris and separate controls for confounding factors									
Confounding variable Pemphigus	Ту	pe	Age	Smoking or other tobacco		Use toothbrushing			
	Female	Man		Non-smoking Smoker		Yes no			
None (control)	28 person	12 person	2.50	32	2	12 28			
Yes(case)	29 person	11 person	1.46	40		25 15			
Test result	chi-se 0.8	quare 807	Independent simple t-test 0.647	Fisher exact 0.473		chi-square 0.478			

Table 2. Distribution of patients with pemphigus vulgaris and controls the separation of gingivitis disease in patients									
Periodontal disease	Bleeding on probing	Pocket	depth	Dental plaque	Gingivitis				
Pemphigus Vulgaris	(BOP)	Higher than 6mm Less or equal to 5mm							
None (control)	(42%)17	(62%)25	(37%)15	(40%)16	(42%)17				
Yes(case)	(80%)32	(27%)11	(72%)29	(70%)28	(82%)33				
Test result	chi-square 0.001	chi-se 0.0	quare 002	chi-square 007.0	chi-square P<0.001				

with PV who has symptoms of gingivitis has no significant relationship was found between PV and disease gingivitis. Study Mitsuhiro et al. (Esmaili et al. 2007), which was conducted in 2010, a year-old man with a history of gingival lesions were examined and the diagnosis was confirmed PV about him and it was concluded that early detection and proper oral lesions initiation of appropriate therapy, can prevent disease cutaneous protests. The study presented a case of pemphigus limited to the gums and thus result we achieved is in line with research in a study by Dr. Ayoubian (Manojkumar et al. 2010) in 2008 as pemphigus vulgaris and generalized aggressive periodontitis were developed and presented a case report of 40 years old woman PV diseases with severe alveolar bone resorption was generalized to the lack of proper oral hygiene with the PV disease was noted in the development of bone destruction. Progressive periodontal involvement in this case is also in line with the results. Oral lesions of pemphigus vesicles range from small to large Bula. When Bula tear caused extensive injuries. Almost every area of the mouth area may be involved, but multiple lesions often occur in areas of irritation or trauma. In cases of gum, erosive gingivitis clinical diagnosis of oral pemphigus is sometimes as the

only manifestation (Akman *et al.* 2008). However, the incidence of oral manifestations in pemphigus need to question and search dentists and physicians noticed the symptoms in patients, because finding some oral symptoms in the early stages can be effective in prognosis through early treatment.

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## The prediction of psychological distress of prisoners based on personality traits and dimensions of spirituality

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#### ABSTRACT

The aim of this study was to prediction of psychological distress prisoners based on personality traits and dimensions of spirituality. For this purpose, 288 prisoners were selected from Chenaran imprisonment with Simple Random Sampling .The tools used in this study consisted of NEO Five-Factor Inventory, for anxiety, depression, stress (DASS) and McDonald's dimensions of spirituality. Data were analyzed using spss software and regression method. The results showed that two factors for neuroticism and Experimental- Phenomenology dimension of spirituality caused to increasing of anxiety, depression and stress. While, the dimension of paranormal beliefs led to decreasing of depression and stress and increasing the anxiety.

**KEY WORDS:** PERSONALITY, DIMENSIONS OF SPIRITUALITY, PSYCHOLOGICAL DISTRESS, PRISONERS

#### **INTRODUCTION**

The investigating of mental health status of prisoners and providing services in the field of mental health to them has been concerned of experts in psychiatry and health of several countries and yet addressed problems relating to criminals and prisoners specially in its relation to psychiatric problems is one of the most challenging of research areas (Arasteh *et al.*, 2008). In recent years, there is increasing in the prison population in the world-

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\*Corresponding Author: Sima.mortazavi.psy@gmail.com Received 28th Dec, 2016 Accepted after revision 6th March, 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/ wide that it is alarm for society (Fazel. . Baillargeon, 2011; Watson *et al.*, 2004); Now the world's prison population is more than 10 million people (Fazel and Siyald, 2012) and based on the reports that have been published in the last two decades, it show that people imprisoned dramatically experienced higher rates of mental health problems compared to the general population, because the imprisonment could be an important psychological impact on them (Birmingham, 2004) so that it is raised as a risk factor for a variety of bad emotional stress.

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Also, the prison population improperly faced with trauma, mental deficiencies and a little ability to deal with difficulties and statistics have shown that psychological stress and bottlenecks especially being very high for people who had been unintentional crime (Durcan, 2008). So that the studies conducted in the prison show that the onset of mental disorders among prisoners is higher than in the general population (Albokordi *et al.*, 2010).

In one of the studies, Ashkani *et al* (2010) in study on 200 prisoners reported that 21.21% of them had a depressive disorder. On the other hand, one can be said that the harsh prison conditions can be one of the risk factors for developing of anxiety and threatened mental health; the prison have unique conditions and features that is one of the most stressful and anxious conditions for every human. Studies show that %18-19 of prisoners is exposed to basic mental disorders during sentencing. Also, a study on Iranian prisons indicates that about 5.87% of prisoners are suspected to having a mental disorder, stress and anxiety (Almasi *et al.*, 2012).

The presence of these mental distresses that defined as a set of symptoms of psycho-physiology and behavioral such as anxiety, depressive reactions, stress, restlessness and etc. are result of the interaction between several different factors. One of the variables that have been investigated in this study in relation to psychological distress prisoners is characteristics of personality. Parvin and John (2001) suggest the following definition as personality: "Personality represents those of the person or people features including its fixed patterns of thought, emotion and behavioral" (Parvin and John, 2007). In fact, we can say that the personality is certain patterns of behavior and ways of thinking that determines how compatibility of person's with the environment (Atkinson et al., 2009). Joyce and Meredith demonstrated that there is very strong relationship among health and general health and his personality and if a person does not have the normal growth and development of personality, it can be said he/she is deprived of mental health (Bono et al., 2007).

In fact, researchers have confirmed that each characteristic of personality has an impact on health care outcomes (Baghiani moghadam *et al.*, 2011). Momeni *et al* (2012) in a study found that the dimensions of personality were predicted 44% of the variance in mental health.

There was a significant negative correlation between neuroticism and mental health and there were significant positive correlation between openness and conscientiousness with mental health and there were not observed significant relationship between extraversion and agreeableness with mental health. Beyrami and Gholizadeh (2011) in their study concluded that the experience of depressive symptoms were significantly positively associated with neuroticism. Studies show that people with high neuroticism evaluate little negative stimuli just like strong negative pressure. The results of Baghiani moghadam *et al* (2011) showed that significant relationship was observed between public health and neuroticism.

The analysis of regression also showed that 39% of public health changes were predicted by neuroticism. Khanjai et al (2014) also found that three variables of neuroticism, body image and mental stress are able to predict the physical and mental health in students. Steele *et al* (2008) found in a study in the context of the relationship between personality traits and well-being that personality traits were explained 39 to 63 percent of variance of well-being. In fact, people that in the main dimensions of personality, extraversion and conscientiousness are high and in the neuroticism are low, have greater mental health. Ahadi (2007) in a research also founds that conscientiousness, extraversion and neuroticism have significant role in predicting of mental health. Increasing of conscientiousness and extraversion and decreasing of neuroticism has most significantly relationship with mental health. Irani (2010) also concluded that there is a significant positive relationship between neurosis and anxiety.

Another variable in the study is spirituality. Spirituality is a term that most commonly used and has different meanings for different people in different cultures and era. Asonigten knows spirituality as outer protests and function of the human spirit and his definition of spirituality is an aspect of human existence which gives humanity (Aukst-Margetic et al., 2005). Clinical trials have confirmed on the relationship between spirituality and health so that there is a significant relationship among spirituality and depression and anxiety disorders and recently will be more attention in mental health by certified of religious beliefs, because it is known that the religious beliefs will be inhibiting of negative attitudes and thus prevented of thought disorder and mental illness (Ganji et al., 2010). Studies have shown that people who have high spiritual level, have higher well-being and happiness, more life satisfaction, and significantly higher purpose, higher self-esteem, more rapid implementation of mourning, receive more social support and less alone, less depression and faster recovery rates of depression, lower levels of suicide, less anxiety, lower psychosis and more marital stability (Hatami, 2011).

The results of Kazemi *et al* (2011) showed that there is a significant relationship between depression and religious beliefs. Nelson (2002) states that undoubtedly, faith is most effectiveness treatment for anxiety. Also Pournamdarian (2012) in their study concluded that meta-cognitive beliefs, especially negative beliefs associated with non-controllability have most contribution in predicting depression. Also Bahrami *et al* (2012) the v showed that there is significant relationship between spirituality and religiosity and mental health. Spirituality can be predicted the mental health of people by increasing ability for dealing with stress, deep under-

ality can be predicted the mental health of people by increasing ability for dealing with stress, deep understanding of the meaning and objectives or reduce the sense of hopelessness. Lotfi, Kashani *et al* (2012) also found that spiritual intervention is effective in reducing distress in mothers

intervention is effective in reducing distress in mothers of children with cancer. Also, Reyhani *et al* (2014) in a study found that the pastoral care training can reduce psychological stress and increasing distress tolerance mothers with premature infants in the neonatal intensive care unit. On the other hand many studies have shown that the presence of spiritual beliefs and participation in religious ceremonies resulted in decreased depression and anxiety among the people (Mohr *et al.*, 2006; Van Olphen *et al.*, 2003).

Given the mentioned contents, it is important that does imprisonment healthy exits from jail psychologically or he/she will be face with disorder rather to prevent from disease severity. The aim of this study is to provide a context in prison to the paying attention to predicting personality traits and religious and spiritual thoughts of people exposed at risk of psychological distress and to prevent to the disease by improvement of the spiritual atmosphere of the prison and psychotherapy.

#### MATERIAL AND METHODS

The studied populations were all prisoners of Khorasan Razavi that were 1400 imprisonments based on statistical reports. According to Morgan table (Kiamanesh, 1195) 300 subjects were randomly selected. Out of the questionnaires distributed, only 288 completed questionnaires can be verified. The tools used in this study were:

### 1. Depression Anxiety Stress Scales (DASS-21) questionnaire

This questionnaire was developed in 1995 by Lovibond, S. H. & Lovibond .The short form version was used in this study which has 21 items that to be evaluated each of the depressive mental structures, anxiety and stress by 7 different items; this questionnaire has been validated by Sahebi *et al* (2005) for the addicted Iranian population. Graford and Henri in England by 1771 samples compared this tool with two other tools in term of depression and anxiety and the reliability of the tool was reported with Cronbach's alpha for 0.95 depression, 0.90 anxiety and 0.93 stress 0.97 for total scores, In Iran, Moradipanah, Sahebi and Aghebati has been confirmed the validity of the scale. It is scored from zero to three and the range of responses are from never to always so that Cronbach's alpha have been reported in the area of depression for 0.94, anxiety 0.92 and stress 0.82.

#### 2. Five Factor- Personality Inventory (Neo-FFI):

The questionnaire was designed in 1985 by Mckerry and Costa. The questionnaire contains 60 questions that measured the five main factor of personality and 6 characteristics in each factor, ie 30 characteristics. The questionnaire was conducted by Mckerry and Costa over 208 American college students within three months that its validity was obtained 0.83 to 0.75. The questionnaire was conducted by an Iranian group (2001) over a sample size of 200 students that the correlation coefficient of main five factors was reported 0.65 to 0.87. Cronbach's alpha was found to vary from 0.85, which indicates that this questionnaire has good reliability. It is scored from zero to four and the range of responses is from strongly disagreeing to strongly agree.

# 3. MacDonald spirituality Questionnaire-scale revised version

This questionnaire has been prepared by McDonald's in 1997. This scale has 32 items, which to be measured generally five dimensions of spirituality: Cognitive orientation toward spirituality, the empirical / phenomenological spirituality, existential well-being, paranormal beliefs, and religiosity. From 32 items, there are additional 2 items which considered as indicators of validity and reliability of response. Its Scoring on five levels from strongly agree to strongly disagree that gave it a score of 0 to 4 awarded, Cronbach's alpha of the scale is in the range of 0.80 to 0.89. Data analysis using the software Spss-19 and using Pearson correlation coefficient and stepwise regression analysis was performed.

#### **RESULTS AND DISCUSSION**

NEO personality test scores, psychological distress and spirituality is presented in Table 1.

Some of the variables in the regression test results are presented in Table 2.

In Table 3, standardized coefficients Beta and zeroorder correlation coefficients, separation and quasi-plot for predicting anxiety is presented. As you can see the p is less than 5 (p<.05). Thus, desired components have an impact on anxiety. Beta coefficient is also positive for all predictor variables and it means that with increasing experience, Neurosis and the paranormal, the anxiety increases.

#### Sima Mortazavi

Table 1. Descriptive findings for anxiety						
	mean standard deviati		number			
Anxiety	72639	476849	288			
Neurosis	342708	690222	288			
Extroversion	317813	427015	288			
Experience	373194	372514	288			
Agreeableness	402743	544063	288			
Conscientiousness	439167	828878	288			
Religious orientation	117813	309952	288			
Empirical phenomenological	123750	490022	288			
Spiritual well-being	139757	348857	288			
Paranormal believes	138889	209400	288			
Religiosity	114306	332167	288			

Table 2. S	Table 2. Summary statistics of regression and analysis of variance									
model	variables	resources	sum of squares	Degrees of Freedom	Mean Square	F	Р	R	Squared R	
	Experimental	regression	1802525	1	1802525	109142	0.005	0.526	0.276	
1	phenomenology 1	Error	4723420	286	16515					
		Total	6525944	287						
	experimental	regression	2163713	2	1081856	70681	0.0005	0.756	0.322	
2	neurosis	Error	4362232	285	15306					
	phenomenology	Total	6525944	287						
3	experimental phenomenology Neuroticism Paranormal beliefs	regression	2320186	3	773395	52225	0.0005	0.576	0.356	
		error	4205758	284	14809					
		total	6525944	287						

Depression descriptive statistics are presented in Table 4.

Regression test results are presented in Table 5.

As you can see in table 6, the p is less than 5 (p<.05). Thus, studied variables have an impact on depression. Beta coefficient is also positive for all experimental and neurosis variables and negative for paranormal variable,

it means that with increasing experience, Neurosis the depression increases and the depression decreases with increasing of paranormal variable.

Descriptive statistics for stress variable is reported in Table 7.

The results of the regression analysis are presented in Table 8.

Table 3. Standard and nonstandard regression analysis to predict of anxiety through variables predicting									
variables	В	B error	Beta	t	р	Zero-order correlations	semi-partial correlation	Separation correlations	
Fixed	0.987	0.1890		0.522	602				
Experimental	0.382	0.052	0.393	0.7374	0.000	0.526	0.526	0.526	
neurosis	0.189	0.037	0.273	05147	0.000	0.526	0412	0.370	
paranormal	-0.355	0.109	-0.156	-0.3251	0.001	0.442	0.277	0.235	

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Table 4. Descriptive finding	s of depression	on	
	mean	standard deviation	number
Depression	67326	465852	288
Neurosis	342708	690222	288
Extroversion	317813	427015	288
Experience	373194	372514	288
Agreeableness	402743	544063	288
Conscientiousness	439167	828887	288
Religious orientation	117813	309952	288
Empirical phenomenological	123750	490022	288
Spiritual well-being	139757	348857	288
Paranormal believes	138889	209400	288
Religiosity	114306	332167	288

Table 5.	Summary statistics	of regression	n and analysi	s of variance					
model	variables	resources	sum of squares	Degrees of Freedom	Mean Square	F	Р	R	Squared R
		regression	1744065	1	1744065	111232	0.005	0.529	0.280
1	Experimental phenomenology	Error	44844384	286	15680				
	1 05	Total	62288413	287					
	experimental	regression	2023683	2	1011841	68583	0.0005	0.570	0.325
2	neurosis	Error	42047	285	1475330				
	phenomenology	Total	6228413	287					
3	experimental phenomenology Neuroticism Paranormal beliefs	regression	2267554	3	755851	54196	0.0005	0.603	0.364
		error	3960859	284	13947				
		total	6228413	287					

As you can see in table 9, the p is less than 5 (p<.05). Thus, studied variables have an impact on stress. Beta coefficient is also positive for experimental and neurosis variables and negative for paranormal variable, it means that with increasing experience and neurosis the stress increases and the stress decreases with increasing of paranormal variable

One of the findings from this study is that the depression increases by increasing the experimental phenomenology of spirituality and neuroticism in term of personality and decreases with the increasing of paranormal variables. The present research findings on the positive and significant relationship between neurosis and depression are consistent with study the Momeni

Table 6. regree	Table 6. regression coefficient											
variables	В	B error	Beta	t	р	Zero-order correlations	semi-partial correlation	Separation correlations				
Fixed	2347	1735		1279	202							
Experimental	383	50	403	7612	000	529	412	360				
neurosis	169	36	251	4750	000	422	271	225				
paranormal	443	106	199	4182	000	227	241	198				

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Table 7. Descriptive statistic	Table 7. Descriptive statistics for stress										
	mean	standard deviation	number								
Stress	74007	471010	287								
Neurosis	342439	689910	287								
Extroversion	318014	426388	287								
Experience	373136	373032	287								
Agreeableness	402997	543307	287								
Conscientiousness	438920	829265	287								
Religious orientation	117735	310215	287								
Empirical phenomenological	123884	488796	287								
Spiritual well-being	139826	349271	287								
Paranormal believes	138920	209699	287								
Religiosity	114286	332730	287								

Table 8	Table 8. Summary statistics of regression and analysis of variance								
model	variables	resources	sum of squares	Degrees of Freedom	Mean Square	F	Р	R	Squared R
		regression	1756983	1	1756983	109143	0.005	0.526	0.277
1	Experimental phenomenology	Error	4587937	285	16098				
		Total	6344920	286					
	experimental	regression	2302762	2	1151381	80895	0.0005	0.602	0362
2	neurosis	Error	4042158	284	14233				
	phenomenology	Total	6344920	286					
3	experimental phenomenology Neuroticism Paranormal beliefs	regression	2444345	3	814782	59115	0.0005	0.621	0.385
		error	3900575	283	13783				
		total	6644920	286					

Table 9. standard and non-standard coefficients of regression analysis to predict stress through predicting variables											
variablesBB errorBetatpZero-order correlationssemi-partial correlationSeparation correlations											
Fixed	-0.163	1824		-0.89	0.929						
Experimental	0.354	0.050	0.368	7065	0.000	0.526	0.387	0.329			
neurosis	0.230	0.35	0.337	6497	0.000	0.493	0.360	0.303			
paranormal	-0.337	0.105	-0.15	-0.3205	0.002	-0.172	-0.187	-0.149			

*et al* (2012) that indicates the personality dimension predicts 44% of the variance in mental health. There was a significant negative correlation between neuroticism and mental health and a positive correlation between openness and conscientiousness mental health was a significant and between extraversion and agreeableness was no significant relationship with mental health.

Beyrami and Gholizdeh (2011) in their study concluded that experience in depressive symptoms were significantly positively associated with neuroticism. Studies show that people with high neuroticism evaluate little negative stimuli just like strong negative pressure. The results are consistent with the study of the paranormal spirituality and depression by Ganji (2010) so that shown that people who have high spiritual level, have higher well-being and happiness, more life satisfaction, and significantly higher purpose, higher self-esteem, more rapid implementation of mourning, receive more social support and less alone, less depression and faster recovery rates of depression, lower levels of suicide, less anxiety, lower psychosis and more marital stability. Kazemi, (2011) found a significant relationship between depression and religious beliefs. Bahrami (2012) also found that Meta-cognitive beliefs, especially negative beliefs associated with non-controllability has the largest contribution in the prediction of depression.

Another finding of this study is that the anxiety increases by increasing the experimental phenomenology, neuroticism and paranormal beliefs. These results are consistent with the Irani (2010), which found a positive and significant relationship between neuroticism and anxiety. Steele et al (2008) found in a study in the context of the relationship between personality traits and well-being that personality traits were explained 39 to 63 percent of variance of well-being. In fact, people that in the main dimensions of personality, extraversion and conscientiousness are high and in the neuroticism are low, have greater mental health. These results are consistent with Ellison (2009). The results of the study of the influence of spirituality on anxiety are consistent with Nelson (2002) that undoubtedly, faith is most effectiveness treatment for anxiety. The results are consistent with Mohr et al (2006) which in their study stated that the presence of spiritual beliefs and participation in religious ceremonies resulted in decreased depression and anxiety among the people

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# Assessment of the status of agricultural irrigation with wastewater and effluent in Kurdistan

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#### ABSTRACT

More than eighty percent of the wastewater in the world enters the environment without collection and treatment and urban people are the main source of wastewater production. Iran, as one of the Middle Eastern countries, is faced with the loss of renewable water resources, hence one of the main social and economic policies in the Islamic Republic of Iran is to make optimal use of renewable resources. In view of that, there is an emphasis on water turnover and reuse, groundwater recharge, and human and industrial wastewater treatment and reuse in agriculture and other activities. The aim of this study was to investigate agricultural irrigation with wastewater and effluent in Kurdistan province in 2015. This cross-sectional descriptive study was conducted in summer 2015. The study used the available data collected in Wastewater Health Program which had been administered by health deputy of the Kurdistan University of medical sciences. After reviewing the available data, statistical analysis of data was performed by means of Excel software. The results of the study showed that the amount of effluent used for agricultural irrigation in the two cities of Sanandaj and Marivan, respectively, was 500 and 450 liters per second. Due to the decrease in water resources, the area of cucurbits farms irrigated with effluent increased from zero in 2014 to 898 hectares in 2015 and the area of non-cucurbits farms irrigated with effluent increased from 41.5 hectares in 2014 to 260 hectares in 2015. In addition, the area of cucurbits farms irrigated with raw wastewater increased from zero in 2014 to 1.5 hectares in 2015 and the area of non-cucurbits farms irrigated with raw wastewater increased from zero in 2014 to 225 hectares in 2015. Finally, it can be concluded that the authorities in the country must pay serious attention to wastewater and effluent management, because it will help to prevent the damages to agricultural fields which is now occurring due to contamination of groundwater and soil. Wastewater management could help to provide a better health perspective for the next generations of people in this country.

**KEY WORDS:** EFFLUENT, WASTEWATER, AGRICULTURAL IRRIGATION

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#### INTRODUCTION

More than eighty percent of the wastewater in the world enters the environment without collection and treatment and urban people are the main source of wastewater production (World Water Assessment Programme, 2012). Every year, 80 million tons of nitrogen and 10 million tons of phosphorus created due to agricultural activities are evacuated into waterways and coastal areas (UN-Water Decade Programme on Capacity Development, 2013).

The presence of nutrient materials is one of the reasons for using wastewater for agricultural irrigation in developing countries. However, maintaining proper levels of these substances is a challenge. Moreover, the wastewater contains high levels of dissolved salts and organic matter.

Iran, as one of the Middle Eastern countries, is faced with the loss of renewable water resources; hence one of the main social and economic policies in the Islamic Republic of Iran is to make optimal use of renewable resources. In view of that, there is an emphasis on water turnover and reuse, groundwater recharge, and human and industrial wastewater treatment and reuse in agriculture and other activities (Environmental regulations for the use of returned water and effluent, 2010).

The use of wastewater to irrigate agricultural fields has many economic benefits for farmers, because it conserve water resources, reduces the disposal of contaminated wastes to surface water, reduces the use of fertilizers, and reduces the cost of water consumption and irrigation (Paranychianakis et al, 2006; Haruvy, 1998; Fatta and Kythreotou, 2005, and Corcoran et al, 2010). Salinity is the most important factor limiting the use of waste water and returned water for the land reclamation in desert habitats; however, with a proper management we can overcome this problem (Alinejad, 2013). Heavy metals and trace elements are among other impurities found in the wastewater treatment plants especially in industrial areas; such materials can accumulate in soils and groundwater and reach a concentration which is toxic to plants (Tabatabaei et al. 2001).

The use of wastewater can lead to a decrease or increase in soil pH (Saber, 1986) and can also increase chloride (Mahida, 1981) and other chemical compounds. In addition to pathogenic microorganisms, domestic and industrial wastewater contains different chemical compounds such as drugs, hormones, antibiotics, and other substances that affect hormone system (Fatta and Kythreotou, 2005). Kurdistan province has a precipitation of about 500 mm per year (more than double the average precipitation in Iran) and is one of the Iranian provinces with the highest level of water resources. However, unfortunately, in recent years the province has been faced with a sharp decline in rainfall. This has motivated the farmers to use wastewater and effluent. To use the effluents and to authorize the farmers to use the remains of wastewater treatment it is necessary to observe the standards related to the wastewater disposal. The standards cover most of qualitative parameters including physical, chemical, microbiological features of waste water and heavy metals. However, these standards are not much observed in our country. The aim of this study was to investigate agricultural irrigation with wastewater and effluent in Kurdistan province in 2015.

#### MATERIAL AND METHODS

This cross-sectional descriptive study was conducted in summer 2015. The study used the available data collected in Wastewater Health Program which had been administered by health deputy of the Kurdistan University of medical sciences. Kurdistan province, with an area of 28203 square kilometers, is one of the provinces located in the western part of Iran which is adjacent to the provinces of West Azerbaijan, Zanjan, Hamedan, and Kermanshah; it has also more than 200 kilometer of common borders with Iraq. Sanandaj is the capital of the province and is located at an altitude of 1373 meters above the sea level. The other cities of the province are: Shaqez, Marivan, Qurveh, Baneh, Bijar, Dehgolan, Divandarreh, Kamyaran, and Sarvabad.

In Kurdistan province, the cities of Sanandaj, Saqez, Marivan, Qurveh, and Bijar have wastewater treatment plants; however, the wastewater treatment plant n Bijar has not been launched yet. The data required for the Wastewater Health Program are collected from the district health centers every six months. After reviewing the available data, statistical analysis of data was performed by means of Excel software.

#### RESULTS

Farmers in Sanandaj and Marivan use the effluents of wastewater treatment plants to irrigate their crops. Tables 1 and 2 present the status of effluent and wastewater used to irrigate agricultural fields in Kurdistan province. As shown, the amount of effluent used for agricultural irrigation in the two cities of Sanandaj and Marivan, respectively, was 500 and 450 liters per second. The most common agricultural products in Sanandaj are garden fruits, cucurbits (chamber cucumber, tomatoes, okra, and cucumber) and in Marivan the products are tobacco, alfalfa, and vegetables. The two parameters of BOD and COD are the only analysis parameters listed in national standards of the effluent which had been analyzed and both of them were less than the allowed vales (100 and 200 milligram per liter, respectively).

Table prov	e 1. Status ( ince	of effluents used fo	or irrigation of agricu	ltural field in urban	areas of	f Kurdistan	
No	District	The amount of effluent used	Characteristic of a	Characteristic of agriculture crops			
INO.	District	(l/s)	Type of crops	Cultivated area (hectare)	BOD	COD	
1	Sanandaj	500	Garden fruits, cucurbits (chamber cucumber, tomatoes, okra, and cucumber)	893	56	110	
			tobacco	200			
2	Marivan	450	alfalfa	60	61.4	100	
			vegetables	5			

Table 2. Status of effluents used for irrigation of agricultural field in rural areas of Kurdistan province

01 1101	aiotaii provin				
No.	District	Raw was used for in agricultu	stewater rigation of ral fields	Characteristic cro	of agriculture ops
		Place of use	Amount of use (l/s)	Type of crops	Cultivated area (hectare)
1	Divandareh	Qazal ozen river bank	50	Garden fruits (apple) and alfalfa	150
		Dehgolan	64	Meadow (animal consumption)	15
2	Debgolan	Bolban Abad	0.8	Garden and meadow	6
2	Dengolan	Qarebelaq panjeh	1.25	Cucumber and wheat	5 (Cucumber: 1.5 and wheat: 5)
		Bashmakh	3.7	Potato	0.5
3	Kamyaran	Bolan	20	Corn and wheat	50

As shown in Table 2, the farmers in rural areas of Divandarreh, Dehgolan, and Kamyaran used raw wastewater for irrigation of gardens and cucurbits farms. The irrigation of cucurbits farms with wastewater can increase the risk of transmission of enteric diseases. It should be noted that about 1 hectare of cucurbits farms irrigated with raw effluent in Qorveh was destroyed this year.

As shown in Figures 1 and 2, due to decreasing rainfall in recent years, the area of cucurbits farms irrigated with raw wastewater increased from zero in 2014 to 1.5 hectares in 2015 and the area of non-cucurbits farms





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irrigated with raw wastewater increased from zero in 2014 to 225 hectares in 2015.

According to Figures 3 and 4, due to the decrease in water resources, the area of cucurbits farms irrigated with effluent increased from zero in 2014 to 898 hectares in 2015 and the area of non-cucurbits farms irrigated with effluent increased from 41.5 hectares in 2014 to 260 hectares in 2015.

#### DISCUSSION

Climatic conditions, characteristics of produced effluent, type of crops, and economic, social, technological, cultural, and health conditions in different countries are diverse; as a result the countries cannot simply enjoy the results of studies conducted in the other countries to make successful planning.

To ensure the continuity and long-term success of the plans designed for the use of wastewater in agriculture it is necessary to makes such plans based on data and results obtained from multiple short-term and long-term researches conducted in local conditions. The researches should be conducted on a variety of subjects such as: positioning, type of crop and cropping patterns, environmental and health risks, determination of acceptable risk levels, determination of the risk management methods to reduce risk, management of costs associated with the various options to reduce risks, localization of guidelines and standards, providing good alternatives, training farmers and people, etc (Danesh and Alizadeh, 2008).

Some of the problems and challenges in the field of irrigation with effluent and wastewater are as follows:

- 1. Lack of wastewater treatment plant for treating wastewater in a number of towns and villages of the province
- 2. Improper functioning of the urban wastewater treatment plants which prevents urban waste water treatment plants to meet the standards designed for a number of items
- 3. Low rainfall and lack of self-purification in the revivers and water resources which receive effluent streams in most parts of the province
- 4. Lack of coordination between the concerned departments (environment and agriculture organizations) and the district health centers to legally react against offenders who use effluent or wastewater for irrigation of crops. Are the health centers the only body responsible for reacting against the offenders?
- 5. It is not clear under what time frequency (monthly / quarterly / annual) should the effluents would be compared with the standards.
- 6. Water scarcity and declining the levels of surface water and groundwater have motivated the farmers to use effluent and raw wastewater to irrigate farms.
- 7. Lack of laboratory for detecting and counting nematode eggs while it is one of the important prerequisites for using wastewater in agricultural fields in the province.
- 8. Need for funds for the development of wastewater treatment plants.
- 9. Preventing farmers from the use of raw wastewater for irrigation of agricultural fields.

The following items are suggested to improve and promote the use of wastewater in agriculture.

- 1. Paying attention to all the parameters and standards recommended for the use of wastewater in agricultural fields.
- 2. Providing the instruments and equipment required for the analysis of the wastewater and launching them in the reference laboratories of the health centers in all the provinces, or at least in the three provinces in the country.
- 3. Reviewing the effluent standards based on the standards of wastewater use in agriculture pro-

posed by the World Health Organization or other important global centers.

- 4. Increasing the area of farms under the cultivation of rain-fed crops in the country.
- 5. Conducting short-term and long-term research in this field.
- 6. Evaluating the status of agricultural soil salinity and other important parameters in this field.

Finally, it can be concluded that the authorities in the country must pay serious attention to wastewater and effluent management, because it will help to prevent the damages to agricultural fields which is now occurring due to contamination of groundwater and soil. Wastewater management could help to provide a better health perspective for the next generations of people in this country.

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# Assessment of the tolerance of various cultivars of barley towards salinity stress in germination and early growth stages

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#### ABSTRACT

In order to assess the tolerance of some of barley cultivars towards salinity stress in germination and early growth stages in greenhouse condition an experiment was carried out in Ardabil islamic Azad University research farm in 2015-2016 agriculture year. This research was carried out in 2 factorial designs in completely randomized design with three replications. The first factor included twelve cultivars of barley including Afzal, Nosrat, Valfajr, Kavir, Yousef, Torsh, Sahra, Nimruz, Zehek, Dasht, Bahman and Reyhan 2. The second factor included four levels of salinity of without stress and salinity stresses of 6, 12 and 18 Decisiemens per meter (dS/m). The first experiment was carried out in Petri dishes and characteristics related to germination (including velocity of germination and seedling characteristics) were recorded. In the second experiment, the velocity and percentage of seedling emergence of barley were measured. Characteristics analysis of variance results suggested that salinity stress impact was significant on all characteristics except for percentage of seedling emergence in pots. The difference between barley cultivars was significant, except in weight per hundred seeds, length of coleoptile and percentage of emergence.

KEY WORDS: SALINITY STRESS, BARLEY, ELECTRICAL CONDUCTIVITY, GERMINATION PERCENTAGE

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#### INTRODUCTION

Salinity is one of the main problems in the farms in the world so that millions of tons of salt enters agricultural soils through irrigation, annually. Increase in the concentration of salts in soil solution or irrigation water has been considered one of the oldest agricultural and environmental problems, globally. Presence of high rate of salts in the soil or irrigation water confronts the plant with salinity stress. The saline soils area in Iran is 25 million hectares which is increasing due to the weak management in irrigation (Pakniat et al., 2003). Barley is one of the most important crops and among the small grains, it shows resistance towards heat, base and salt. Barley is significant due to its capacity to grow in less fertile areas which are limited by drought, low temperature and salinity (Mottaki et al., 2004). Germination speed and early growth of barley decrease under salinity stress. The growth differences of barley cultivars under salinity stress shows the genetic difference in the potentials of the cultivars in confronting salinity stress. Since it seems that barley cultivars with higher emergence speeds and better early growth have higher resistance towards salinity, this research tries to study the conditions of germination, emergence and early growth of twelve barley cultivars under salinity stress.

Results from Kholq sima et al. (2013) suggested that there is a positive correlation between salinity tolerance in the planet during germination and vegetative growth. Considering the aforementioned requirements, this experiment was carried out in order to study the impact of sodium chloride salinity on germination and determining threshold of salt tolerance in a number of commercial barley cultivars for identification and introduction of the most tolerant cultivar in greenhouse condition. Salinity is among the most serious dangers threatening environment and agriculture in many parts of the world, and it impacts the performance of crops yield in arid and semi-arid regions. Considering the significance of barley in feeding animals and also malting industry in Iran, presence of saline soils and water in Iran proper for planting barley and also presence of various genotypes tolerating salinity, which are introduced recently, make conducting research in this regard inevitable.

#### MATERIALS AND METHODS

This experiment began in autumn 2015 and continued in spring and summer 2016 in Ardabil islamic Azad University research farm located in Hasan Baruq town (5 km west of Ardabil). Height above sea level was 1,350 meters and the longitude and latitude were 48° 30' E and 38° 15' N, respectively. The climate in which the experiment was carried out was cold semi-arid and the soil in the region was clay loam soils which is poor is organic materials.

#### EXPERIMENT DESIGN

This research was conducted in 2 factorial designs in completely randomized design with three replications. The first factor included twelve cultivars of barley including Afzal, Nosrat, Valfajr, Kavir, Yousef, Torsh, Sahra, Nimruz, Zehek, Dasht, Bahman and Reyhan 2. The second factor included four levels of salinity of without stress and salinity stresses of 6, 12 and 18 Decisiemens per meter (dS/m). The first experiment was carried out in Petri dishes and characteristics related to germination (including velocity of germination and seedling characteristics) were recorded. In the second experiment, the velocity and percentage of seedling emergence of barley were measured. In this experiment, in order to control the electrical conductivity of water, a saucer was put under each pot so that the water salinity could be measured and the uniformity of salinity during the experiment could be controlled. The seeds were planted in 5-liter plastic pots which were filled with 1:1:1 of sand, agricultural soil and Well-rotted washed farmyard manure. The uniform seeds of all twelve barley cultivars were disinfected by Vitavax fungicide and planted.

#### SALINITY STRESS APPLICATION PROCESS

Initially, the seeds were irrigated by water every other day until the growth of bushes and reaching stemming and subsequently, salinity stress was applied after the stage of growth through irrigation by NaCl solution (Table 1).

Table 1. How to sa	Table 1. How to salinity stress									
Growth medium	Normal irrigation	1 <sup>st</sup> irrigation	2 <sup>nd</sup> irrigation	3 <sup>rd</sup> irrigation	4 <sup>th</sup> irrigation	5 <sup>th</sup> irrigation				
Without Stress	0mM 250 cc	0 mM 500cc	0 mM 500 cc	0 Mm 500 cc	0 mM 500 cc	0 mM 400 cc				
6ds/m	0 mM 250 cc	50 mM 500 cc	50 mM 500 cc	0 mM 400cc	0 mM 500 cc	25 mM 400 cc				
12ds/m	0 mM 250 cc	50 mM 500 cc	100 mM 500 cc	50 mM 400 cc	0 mM 500 cc	50 mM 400cc				
18ds/m	0 mM 250 cc	50mM 500 cc	100 mM 500 cc	50 mM 500 cc	0 mM 500 cc	75 mM 400cc				

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#### MEASURED CHARACTERISTICS

#### **Final Germination Percentage**

According to Almadras (1998), final germination percentage (FGP) is calculated through dividing germinated seeds on the total number of seeds and through the following formula:

 $FGP = Ng/Nt \times 100$ Ng = the total number of germinated seeds Nt = the total number of assessed seeds

#### **Coefficient of Velocity of Germination**

Coefficient of velocity of germination (CVG) is calculated through counting the number of germinated seeds per day. CVG is calculated through the following formula:

 $CVG = 100 \times \sum Ni / \sum NiTi$ Ni = the number of germinated seeds per day Ti = number of days since the beginning of the experiment

#### **Germination Rate Index**

Germination rate index (GRI) is calculated by the percentage of the number of germinated seeds per day during the experiment. Germination rate index is calculated through the following formula:

GRI = G1/1+G2/2+...+Gx/xG1 = percentage of germination on the first day

#### G2 = percentage of germination on the second day, etc.

### Number of Radicles, Length of Radicle and Length of Coleoptile

In order to measure seedling characteristics, 10 seedlings were chosen from each dish and the number of radicles, the length of radicle and the length of coleoptile were measured and their average was recorded as the input for each pot.

#### **Emergence Percentage**

Emergence percentage of seedlings in pot is calculated through the following formula:

EP = EN/TN

In which EP is the emergence percentage which is calculated through dividing the number of emerged seeds (EN) on the total number of planted seeds (TN). Notetaking and observation were carried out fifteen days after planting the seeds.

#### Velocity of Emergence

Velocity of emergence of seedlings in the pot was calculated by the formula presented by Pirasteh-Anisheh *et al.*, 2011):

 $ER = \Sigma n/Dn$ 

In which: velocity of emergence (ER) is calculated by the total of germinated seeds per day (n) on the number of each day (Dn).

#### **RESULTS AND DISCUSSION**

#### ANALYSIS OF VARIANCE OF CHARACTERISTICS

#### Analysis of Variance of Germination Characteristics

Results for analysis of variance of the characteristics related to germination are provided in Table 2. As it could be observed from the table, the replication effect is significant in length of radicle and length of coleoptile, emergence percentage and velocity of emergence. Although the experiment was of petri dish and pot, various stories of the seed germinator machine and also places of the pots in the greenhouse as a block, had a significant impact on some of the characteristics. The salinity stress impact was significant on all characteristics except for the seedlings' emergence percentage. The salinity stress impact on this characteristic might be due to the fact that the measurement of this characteristic is carried out before the real salinity of the pot soil reached the target amounts, since electrical conductivity of the pot soil did not reach the target amount by the first irrigation by saline water. The difference between barley cultivars were significant except for the length of coleoptile and emergence percentage which indicates the presence of genetic diversity among the assessed cultivars based on their tolerance of salinity stress.

Т	Table 2. Analysis of Variance of the Characteristics Related to the Germination										
	Velocity of Emergence	Emergence Percentage	Length of Coleoptile	Length of Radicle	Number of Radicles	GRI	CVG	FGP	Df	Sov	
	0/209**	156/77*	2/14*	9/53*	824/0 <sup>ns</sup>	107/69 <sup>ns</sup>	43/146 <sup>ns</sup>	333/4 <sup>ns</sup>	2	R	
	1/265**	17/3 <sup>ns</sup>	4/02**	75/09**	1/34*	4158/7**	2296/47**	1504/9**	3	Salinity Stress	
	0/081**	37/9 <sup>ns</sup>	0/531 <sup>ns</sup>	7/61**	1/88**	1211/1**	381/80**	1082/3**	11	Cultivar	
	0/026 <sup>ns</sup>	28/67 <sup>ns</sup>	1/24**	5/463**	0/572 <sup>ns</sup>	191/2*	159/71*	2114/6 <sup>ns</sup>	33	C * S	
	0/035	41/7	0/488	2/385	0/509	124/4	89/203	163/8	94	E	
	8/08	6/87	25/5	25/3	15/0	22/8	22/25	16/22		cv%	

Results from this research are in accordance with the results from Hang and Redman (1995) and also findings of Kaya *et al.* (2006).

Results from Mohammadi et al. (2011) suggested that the effect of salinity, genotypes and their interaction was significant at one percent. The interaction of cultivar × salinity was significant in characteristics of velocity of germination, germination rate index, length of radicles and length of coleoptile which indicates the different reaction of cultivars to the various levels of salinity stress. Also, Dadashi et al. (2007) expressed that the majority of measured characteristics in 10 genotypes of barley in both normal condition and salinity stress condition had a significant difference at 1 and 5 percent and this shows that there is a genetic diversity among the 10 genotypes of barley based on their resistance or sensitivity towards stress. Bechini et al. (2010) found a considerable genetic diversity among the barley cultivars during studying the salinity stress.

#### THE IMPACT OF SALINITY STRESS ON GERMINATION CHARACTERISTICS

#### **Final Germination Percentage**

As it could be observed from Table 3, by the beginning of salinity stress final germination percentage has initially increase slightly and subsequently, it decreased by the increase in the salinity stress to 12 dS/m. it seems that weak salinity leads to better stimulation of germination. In Maqtuli Chaichi (1999) research, germination percentage mean comparison in various salinity stress levels, the germination percentage decreased, but this decrease was significant in 200 Mmol level, only. Salinity decreases germination in the plant through three main factors including osmotic potential, production of toxic ions and changes in nutrient elements. Decrease in final germination percentage under impact of salinity is reported in alfalfa by Aminpur and Ja'faraqai (1998). In studying the resistance of canola towards salinity, Baybverdi and Tabatabi (2009) expressed that by the increase in salinity, the final germination percentage decreases. The decrease in the number of germinated seeds could be related to the water absorption due to the formation of osmatic potential by the increase in salinity and also sodium toxicity impact on plants metabolic processes which lead to disorder in the seed embryo development and as a result the radicle exist the shell. In Movafeq et al. (2012) research, salinity stress decreased the final germination percentage.

#### **Coefficient of Velocity of Germination**

As it could be observed in Table 3, coefficient of velocity of germination has not decreased until 6 dS/m level, but by the increase in the stress intensity, it decreased in the next levels. It seems that coefficient of velocity of germination does not show any sensitivity to low levels of stress. Salinity stress decreases the water absorption through osmotic stress and by concentration sodium and chloride ions lead to an imbalance in absorption

Table 3. Impact of Salinity Stress Levels on Characteristics Related to Germination												
Velocity of Emergence Length of Length of Number of GPL CVG EGP Salinity Stress												
Emergence	Percentage	Coleoptile	Radicle	Radicles	GNI	CVG	FOF	Levels				
2/50A	93/89A	2/71A	7/19A	4/84AB	57/13A	55/77A	80/89B	Without Stress				
2/36B	94/02A	3/09A	7/35A	4/99A	59/10A	50/78A	87/00A	6 ds/m				
2/37B	95/00A	2/86A	5/67B	4/63B	41/70B	39/10B	75/33 BC	12 ds/m				
2/06C	93/33A	2/29A	4/20C	4/56B	37/82B	36/14B	72/33 C	18 ds/m				

Ta	ble 4. Cultivars	Means Compariso	on in Without	Stress Level					
	Velocity of Emergence	Emergence Percentage	Length of Coleoptile	Length of Radicle	Number of Radicles	GRI	CVG	FGP	Cultivar
	2/42A	86/66A	2/55AB	8/10ABCD	4/44B	46/56DE	52/06BC	70/66 BCD	Afzal
	2/53A	91/66A	2/83AB	9/72AB	5/11AB	59/64BCD	47/62BC	89/33 AB	Nosrat
	2/49A	91/66A	2/82AB	9/82A	5/11AB	59/17BCD	48/52BC	86/66 AB	Valfajr
	2/55A	96/66A	2/55AB	7/99ABCD	4/22B	34/70E	42/69C	58/66 D	Kavir
	2/63A	98/33A	2/66AB	8/88ABC	4/22B	79/63A	64/69AB	98/66 A	Bahman
	2/46A	95/00A	1/88B	5/72DEF	4/66AB	59/53BCD	49/47BC	84/00 ABC	Zahak
	2/50A	95/00A	2/72AB	7/33ABCD	4/99AB	71/28ABC	51/29BC	98/66 A	Dasht
	2/46A	95/00A	2/33AB	4/44EF	4/88AB	52/28CDE	50/90BC	77/33 ABCD	Yousef
	2/70A	98/33A	3/38A	7/10ABCDE	5/55AB	75/48AB	73/47A	89/33 AB	Sahra
	2/45A	96/66A	2/99AB	3/77F	4/21B	39/84DE	43/32C	61/33 CD	Reyhan 2
	2/41A	90/00A	2/77AB	6/88BCDE	5/88A	56/83BCD	47/79BC	82/66 ABC	Nimrooz
	2/36A	91/66A	2/99AB	6/55CDE	4/77AB	52/63CDE	49/41BC	73/33 BCD	Torsh

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of nutrient elements and formation of toxicity (Kaimakanova, 2009). Shamsi Mahmud Abadi (2007) expressed that by the increase in salinity, the seeds are not capable of absorbing water for germination and cell development and on the other hand, the enzymes which are important in plant activation and growth are damaged or activated by dely. Due to the same reason, by the increase in salinity, the velocity of germination is decreased initially and then the germination percentage changes. Through the conducted studies in this experiment, it is concluded that the lack of germination in many of the studied seeds is related to the disorder in water absorption in water absorption due to osmotic potential impact of the salt solution. Also, the toxicity due to the concentration of some ions leads to prevention of germination through forming disorder in metabolism of the embryo.

#### **Germination Rate Index**

As it could be observed from Table 3, germination rate index has not decreased until 6 dS/m level, but by the increase in the stress intensity, it decreased in the next levels. It seems that germination rate index decreases in stresses higher than 6 dS/m. Turhan and Ayaz (2004) came to this conclusion that increase in salinity levels decreases the seedling germination by impacting cell division and metabolism of the plant. They also found out that the inhibitory effect of sodium chloride on germination of sunflower seed depends on the absorption of chloride and sodium ions by the hypocotyl.

#### Number of Radicles

As it could be observed in Table 3, the number of radicles do not have any significant difference both in without stress and 6 dS/m stress. However, by the increase in the stress intensity, the mean decreases. Salinity stress and lack of water and nutrient resources are among the main factors in decreasing yield in crops. Healthy and developed roots increase the water and nutrients absorption and it leads to increase in yield (Rezaatai et al., 2013). The volume of root and the number of root hairs are among the characteristics which are of a great significant in optimal situation (water and nutrients). In optimal situation, the plant tries to absorb water and nutrients by increasing the volume and number of roots in surface layer of the soil, while in stress situation, the length of the roots and the ratio of the length of the roots to the shoots becomes more important (Canbar et al., 2009) In Bechini et al. (2010), salinity stress led to a significant decrease in the number of radicles in barley cultivars.

#### Length of Radicle

As it could be observed from Table 3, in both without stress and 6 dS/m stress, there is no difference between

the characteristics and it has decreased in the next stress levels. Hence, the best growth of length of radicle was in without stress and 6 dS/m stress levels. Uniformity and velocity of germination showed a positive and direct relation with the length of radicle and plumula. In Movafeq *et al.* (2013) salinity stress led to a decrease in the length of radicle. In the study of Mohammad Yousefi *et al.* (2011), the length of plumula to radicle had a higher decrease in salinity stress.

#### Length of Coleoptile

As it could be observed from Table 3, the length of coleoptile has not undergone salinity stress. Hence, it could be concluded that the length of coleoptile has the least sensitivity towards salinity stress. According to Francis et al. (1986) and Kaimakanova et al. (2009), under salinity stress the ratio of coleoptile elongation decreases by the low water potential of the soil and due to the weakness of coleoptile, the seedling is not established well. Salinity decreases the seedling growth through decreasing the nutrient reserve, and suspends the cell division and damages it by preventing axis development on the cotyledon. Also, under salinity stress, under salinity stress the ratio of coleoptile elongation decreases by the low water potential of the soil (Francis et al., 1986) and as due to the weakness of coleoptile, the seedling is not established well.

#### **Emergence Percentage**

As it could be observed in Table 3, there was no significant difference found between the mean of emergence of percentage in the bushes in the pots. Tis is due to the fact that by the first irrigation, the salinity treatment had not reached the targeted limit. The emergence capacity of the seeds, especially in undesirable conditions such as farms, is a significant index of seed vigor. Results from this experiment proves the abovementioned issue. According to Monez and Toaster (2008), salinity decreases the early emergence of the plant through three factors including osmotic potential of the solution, production of toxic ions and changes in nutrient elements balance. In low salinity concentrations, decrease in osmatic potentials is a limiting factor for germination and emergence. However, in high salinity concentrations

#### Velocity of Emergence

Considering Table 3, the velocity of emergence had the highest mean in without stress level and, the velocity of emergence decreased by the increase in stress and the lowest mean was at 18 dS/m level, which has decreased in this level. Plants from vigorous seeds have a higher velocity of emergence, comparing with plants from weak and worn-out seeds (Wave, 1977).

#### COMPARISON OF MEANS OF CULTIVARS BASED ON GERMINATION CHARACTERISTICS

#### **Final Germination Percentage**

As it could be observed from Table 4, in without stress level, cultivars of Dasht, Bahman, Nosrat, Sahra, Valfajr, Zahak, Nimruz and Yousef with common letter of A were in the first group and had the highest rate of the characteristics. In salinity stress level of 6 dS/m (Table 5), cultivar of Kavir had the lowest rate of the characteristics and other cultivars with common letter of A did not show any significant difference. In salinity stress level of 12 dS/m (Table 6), cultivars of Reyhan 2 and Afzal had the lowest rate of the characteristics and other cultivars with common letter of A did not show any significant difference. In salinity stress level of 18 dS/m (Table 7), cultivars of Afzal, Nosrat and Kavir had the lowest rate of the characteristics and other cultivars with common letter of A did not show any significant difference. Results from Mohammadi et al. (2011) showed that the genotypes showed a significant difference at one percent in confrontation with salinity stress. Generally said, by the increase in salinity stress level, germination percentage decreased.

#### **Coefficient of Velocity of Germination**

As it could be observed from Table 4, in without stress level, cultivars of Bahman and Sahra, with common letter of A were in the first group and had the highest rate of the characteristics. In salinity stress level of 6 dS/m (Table 5), cultivars of Dasht, Zahak and Nosrat with common letter of A were in the first group and had the highest rate of the characteristics. In salinity stress level of 12 dS/m (Table 6), all 12 cultivars with common letter of A did not show any significant difference. In salinity stress level of 18 dS/m (Table 7), cultivars of Dasht,

Valfajr and Afzal with common letter of A did not show any significant difference.

#### **Germination Rate Index**

As it could be observed from Table 4, in without stress level, cultivars of Bahman, Sahra and Dasht, with common letter of A were in the first group and had the highest rate of the characteristics. In salinity stress level of 6 dS/m (Table 5), cultivars of Sahra, Dasht, Zahak, Nosrat and Afzal with common letter of A were in the first group and had the highest rate of the characteristics. In salinity stress level of 12 dS/m (Table 6), cultivars of Bahman, Nimruz, Valfajr, Sahra, Torsh, Yousef and Dasht with common letter of A had the highest rate of the characteristics. In salinity stress level of 18 dS/m (Table 7), cultivars of Valfajr, Dasht, Yousef, Sahra, Bahman and Zahak and Afzal with common letter of A had the highest rate of the characteristics. Decrease in germination could be due to the osmatic effects or the toxicity of salt or a combination of these two factors. In other words, decrease or delay in emergence of seedling might be due to the lack of the seed vigor in overcoming external osmatic potential and also absorption of the required water for the embryo (Khosh kholq et al., 2008).

#### Number of Radicles

As it could be observed from Table 4, in without stress level, cultivars of Nimruz, Sahra, Nosrat, Valfajr, Dasht, Yousef and Zahak, with common letter of A were in the first group and had the highest rate of the characteristics. In salinity stress level of 6 dS/m (Table 5), all cultivars with common letter of A showed no significant difference. In salinity stress level of 12 dS/m (Table 6), cultivars of Afzal, Zahak and Valfajr with common letter of A were in the first group and had the highest rate of the characteristics. In salinity stress level of 18 dS/m (Table 7), cultivars of Sahra, Nimruz, Dasht, Zahak and

Table 5. Cultivars Means Comparison in Stress Level of 6 dS/m								
Velocity of	Emergence	Length of	Length of	Number of	GRI	CVG	FGP	Cultivar
Emergence	Percentage	Coleoptile	Radicle	Radicles				
2/39AB	88/33A	3/33AB	8/10AB	4/33A	61/14AB	51/65BC	88/00 AB	Afzal
2/63A	93/33A	3/33AB	8/94AB	5/27A	65/80 AB	57/01 A	92/ AB	Nosrat
2/35AB	98/33A	2/94AB	8/49AB	5/21A	58/96BC	44/96C	88/00 AB	Valfajr
2/15AB	88/33A	2/99AB	9/33A	4/66A	54/71 BC	47/21BC	69/33 B	Kavir
2/30AB	100/00A	2/38B	5/77B	5/05A	54/77BC	49/70BC	94/66 A	Bahman
2/36AB	95/00A	2/88AB	7/72AB	5/11A	65/88A	58/73A	96/00 A	Zahak
2/51A	98/33A	3/66AB	6/32B	4/99A	66/66A	64/30A	86/66 AB	Dasht
2/24AB	91/66A	2/99AB	7/77AB	5/10A	46/23BC	40/85C	81/33 AB	Yousef
2/50A	93/33A	3/22AB	6/77AB	5/22A	67/28A	50/96BC	88/00 AB	Sahra
2/16AB	91/66A	3/99A	7/44AB	5/21A	50/97BC	45/48C	86/66 AB	Reyhan 2
2/49A	98/33A	2/77AB	7/11AB	5/10A	59/62BC	48/07BC	86/66 AB	Nimrooz
2/118	91/66A	2/55B	4/44C	4/55A	57/64ABC	50/37BC	86/66 AB	Torsh

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Table 6. Cultivar	s Means Compa	arison in Stre	ess Level of 1	2 dS/m				
Velocity of Emergence	Emergence Percentage	Length of Coleoptile	Length of Radicle	Number of Radicles	GRI	CVG	FGP	Cultivar
2/46A	93/33A	3/55A	6/10A	5/55A	33/10BCD	35/00A	65/33 B	Afzal
2/46A	96/66A	3/27ABC	50/55AB	4/88B	31/20BCD	30/75A	72/00AB	Nosrat
2/22A	88/33A	3/77A	7/33A	4/99AB	49/48AB	43/14A	81/33AB	Valfajr
2/37A	98/33A	3/55A	6/11A	4/55B	27/95CD	31/87A	73/33 AB	Kavir
2/23A	98/33A	2/38 BCD	5/88AB	4/22B	55/94A	44/46A	92/00 A	Bahman
2/49A	95/00A	3/72A	5/88AB	5/22AB	51/26AB	45/53A	88/00 AB	Zahak
2/38A	95/00A	2/88ABC	5/50AB	4/88B	39/19ABC	36/27A	81/33 AB	Dasht
2/36A	95/00A	2/83ABC	5/66AB	4/44B	43/60ABC	38/45A	77/33 AB	Yousef
2/31A	96/66A	2/00CD	4/55AB	4/55B	49/25AB	45/98A	72/00 AB	Sahra
2/31A	96/66A	1/44D	3/10B	3/99B	18/44D	34/76A	38/67 C	Reyhan 2
2/44A	93/33A	2/66A-D	5/99AB	4/11 B	51/68AB	43/89A	82/67 AB	Nimrooz
2/24A	93/33A	2/22BCD	6/44A	4/22B	49/21AB	39/00A	80/00 AB	Torsh

Bahman with common letter of A were in the first group and had the highest rate of the characteristics.

## Length of Radicle

As it could be observed from Table 4, in without stress level, cultivars of Valfajr, Nosrat, Bahman, Afzal, Kavir, Dasht and Sahra, with common letter of A were in the first group. In salinity stress level of 6 dS/m (Table 5), except for cultivars of Dasht, Bahman and Torsh, all other cultivars with common letter of A were in the first group and had the highest rate of the characteristics. In salinity stress level of 12 dS/m (Table 6), except for cultivar Reyhan 2, all other cultivars with common letter of A were in the first group and had the highest rate of the characteristics. In salinity stress level of 18 dS/m (Table 7), except for cultivars of Nosrat and Kavir, all other cultivars with common letter of A showed no significant difference. In the study of Mohammad Yousefi et al. (2011), cultivar mean comparison showed that cultivar of Reyhan had the highest rate in length of radicle and cultivars of Valfajr and Afzal did not have any significant difference.

#### Length of Coleoptile

As it could be observed from Table 4, in without stress level, all cultivars, except for cultivar of Zahak, had common letter of A and were in the first group. Also, in salinity stress level of 6 dS/m (Table 5), all cultivars, except for cultivars of Bahman and Torsh, had common letter of A and were in the first group. However, cultivars of Reyhan 2, Dasht and Afzal were in the first ranks. In salinity stress level of 12 dS/m (Table 6), cultivars ofZahak, Afzal, Kavir, Nosrat, Dasht, Yousef and Nimruz had the highest and cultivars of Sahra, Reyhan and Torsh had the lowest rate of length of coleoptile. In salinity stress level of 18 dS/m (Table 7), cultivars of Yousef, Sahra and Dasht, had the highest rate of length of coleoptile, although they were in the first group with the next 5 genotypes (with common letter of A).

#### **Emergence Percentage**

Considering the lack of significance in difference between the cultivars in this characteristic, there was no

Table 7. Cultiv	vars Means Com	ıparison in St	ress Level of	Table 7. Cultivars Means Comparison in Stress Level of 18 dS/m										
Velocity of Emergence	Emergence Percentage	Length of Coleoptile	Length of Radicle	Number of Radicles	GRI	CVG	FGP	Cultivar						
2/26A	91/66A	2/33ABC	3/88AB	4/22BCD	29/83BCD	39/32ABC	53/33 C	Afzal						
2/10A	95/00A	1/11C	2/88B	3/33D	15/29D	23/24C	53/33 C	Nosrat						
1/98A	93/33A	2/44AB	4/44AB	4/22BCD	58/18A	49/42AB	85/33 A	Valfajr						
2/11A	95/00A	1/11C	2/88B	3/99CD	28/05BCD	30/32C	57/33 BC	Kavir						
1/90A	90/00A	2/33ABC	4/32AB	4/55ABCD	42/93ABC	33/36BC	89/33 A	Bahman						
1/92A	90/00A	2/44AB	4/99AB	4/88ABC	39/87ABC	35/06BC	86/66 A	Zahak						
1/96A	93/33A	2/55AB	3/55AB	5/33A	58/11A	54/51A	82/66 A	Dasht						
2/04A	93/33A	3/55A	6/21A	4/44BCD	44/31AB	37/06BC	77/33AB	Yousef						
2/21A	93/33A	2/46A	5/16AB	5/82A	43/53AB	37/77BC	80/00 AB	Sahra						
2/06A	96/66A	1/66BC	3/99AB	4/44BCD	22/46CD	26/52C	65/33 ABC	Reyhan 2						
2/21A	96/66A	1/99BC	3/99AB	5/44AB	35/21BCD	34/30BC	66/66ABC	Nimrooz						
2/00A	91/66A	2/55AB	4/22AB	4/10BCD	35/98BC	32/77BC	70/66 ABC	Torsh						

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significant difference was found between all the stress levels. While showing the negative effect of salinity on the seedling emergence percentage, Taddayon and Emam (2007) reported the highest and lowest seedling emergence percentage in cultivars of Reyhan and Afzal. They attributed this negative effect to the decrease in the soil osmatic potential and presence of high rates of sodium and chloride. Studies have showed that salinity has a considerable inhibitory effect on emergence of the seeds and this inhibitory effect is a significant limiting

#### Velocity of Emergence

factor for planting crops in saline lands.

As it could be observed from Table 4, in without stress level, all cultivars, had common letter of A and there was no significant difference found between the cultivars. In salinity stress level of 6 dS/m (Table 5), cultivars of Nosrat, Dasht and Sahra had the highest velocity of emergence, although they did not have any significant difference with the next 8 cultivars (with common letter of A. In this level, cultivars of Reyhan 2, Kavir and Torsh had the lowest velocity of emergence. In the study of Emam et al., (2013), the highest rate of velocity of emergence in both desirable and saline conditions was related to the cultivar of Nosrat, and it was significantly higher than the other cultivars. In this research, the highest rate of decrease in emergence and velocity of emergence in the seedling under salinity stress was in the cultivar of Shirin, while the lowest rate of decrease in emergence and velocity of emergence in the seedling under salinity stress were in cultivars of Nosrat and Abolfazl, respectively. In salinity stress levels of 12 and 18 dS/M (Table 6 and 7), all 12 cultivars had the common letter of A and there was no significant difference was found among them.

# CONCLUSION

Analysis of variance results in characteristics showed that salinity stress effect was significant on all characteristics except for the seedling emergence in the pots. The difference between barley cultivars was significant, except in weight per hundred seeds, length of coleoptile and percentage of emergence, which shows the genetic diversity among the studied cultivars in their resistance towards salinity stress. The interaction of cultivar × salinity was significant in characteristics of seed yield, number of fertile tillers and number of grains per spike, coefficient of velocity of emergence, germination rate index, length of radicle and length of coleoptile, which shows the different reaction of cultivars towards various levels of salinity stress. The significance of the difference between cultivars in measured characteristics show that studied cultivars have difference potentials and it is possible to access genotypes with higher characteristics. Crops are different in their resistance towards various concentrations of salt in their root region. Hence, choosing plants for the maximum production under salinity stress will be among the most significant and useful options (Khan *et al.*, 1992).

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# The mediating role of religious belief according to personality traits, identity, conflict and marital satisfaction among couples in Tehran

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# ABSTRACT

The purpose of the present study is to investigate "the mediating role of religious belief according to personality traits, identity, conflict and marital satisfaction among couples in Tehran". The research method is descriptive by correlation method. The population of this study included students and young couples of Tehran that at least one year has passed since their marriage. The results of the responses of 232 subjects that's mean 116 couples have been extracted and analyzed. To do this study, three questionnaires "NEO Personality" (Costa and McCrae, 60 questions), "Islamic marital satisfaction (Jodeyri, 50 questions) and the "religious adherence» (Janbozorgi, 60 questions) were used. Data were analyzed with the help of T test, F test, LSD test and analysis of variance. The results of this study can be helpful in counseling before and after marriage, indicates that there is no significant relationship between personality characteristics introversion / extroversion and satisfaction of marriage. Also the relationship was not found between identity / contradiction of the character traits and marital satisfaction that therefore cannot offer a good mix of couples to predict higher levels of marital satisfaction but there is a positive significant relationship between religious adherence of couples with their marital satisfaction.

KEY WORDS: IDENTITY/CONFLICT, INTROVERSION, EXTROVERSION, RELIGIOUS ADHERENCE, MARITAL SATISFACTION

### INTRODUCTION

One of the basic topics of psychology science is the study of personality characteristics. Since these features form the foundation of people's behavior, can

#### ARTICLE INFORMATION:

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two ways; these two ways are always there in every person, but the person is more inclined to a trend, in other words, it can be seen that one end of the axial position of the person on introspection and the other end of extroversion. In other words, it can be seen that one end of the axial position of the person on introspection and the other end of extroversion. In the case of introspection, the main orientation of the individual and the self. Introverted person, hesitant, thoughtful and cautious. Extroverted people tend to go out to the outside world. Socially extroverted person is engaged, active and enterprising. Introspections are more reticent than extraversion and prevent further development of their feelings. It is on this basis that introverts get their energy from inside (the ideas and concepts of mind) and extraverts' energy from the outside world and in relation to others (Parvin, 1993). Characteristics of introversion and extraversion, personality characteristics affecting marital satisfaction is important. Unique features of every human being, but it seems that it can be classified. Introversion and extraversion as two ways of being and feeling, facing each other and they reflect two different views (Shahandeh, 2008).

Morris and Carter (2000) consider factors such as personality traits, attitudes, expectations and gender and communication patterns including marital satisfaction factors (Tirgari, 2004). From a religious viewpoint, marital satisfaction is a situation in which the couple marry each other and being together, pour and feel at their ease. Couples' marital satisfaction is a process that occurs throughout life and it needs to adapt tastes, knowledge of personality traits, creating rules of conduct and interaction is the formation of patterns (Ahmadi et al.2005). Thus it can be said that couples with satisfaction in various areas of life are in agreement with each other. Such wives and husbands of their type and level of verbal and nonverbal relationships are satisfied with their sexual relationships enjoyable and rewarding know, common religious beliefs, their own time and financial issues are well planned and managed, on issues that disagree, the good life and the good of your family prefer a high level of flexibility, are satisfied with the type and quality of leisure time and traveling with family and friends and finally, the number and type of education their children together share (Jodeyri, 2009).

According to research results, as well as with respect to the effect that religious beliefs and personality traits such as extroverted and introverted on human behavior and interpersonal relationships, current study will be planned and implemented in order to answer the question of whether it can be given to the religious beliefs of couples with similar determination, contradiction and characteristics of introversion, extroversion as one of the most important and influential personality characteristics, marital satisfaction of couples predicted or not? We will also examine the relationship between religious beliefs and adhere to it with marital satisfaction. In addition, we want to achieve the highest levels of marital satisfaction, the best combination in terms of identity, contradiction and personality characteristics introversion and extraversion.

Given that marriage is one of the most important decisions a person during their lifetime encounters with it and also began to take shape a new era in one's life as a result, it's expected to reach perfection and growth, be sure to choose a spouse before marriage and at the factors that affect the future of marriage can be given to couples with a rational right choice rather than on emotion and feelings, enter into marital life and a healthy and constructive environment to be created by the next generations, the progress of society, culture and the transmission of values. Among the factors influencing the religious beliefs and adherence to it, social class, age, appearance, education level and etc. and is one of the most important couples' personality traits. Features such as introspection and extroversion are the fundamental factors that can have an impact on marital life. Due to this it is necessary to know the couple adhere to religious and otherwise, in terms of the character traits what should be combined to benefit from a successful life. According to Cal and Heaton (1997) since the institution of religion and family emphasized similar values and to strengthen the socialization of family members are interdependent, the researchers predict that the close relationship between the two. This orientation led to the express statements like these that religion can reinforce and strengthen the marital relationship.

Hunler and Gencoz (2005) also believe that religious attitudes can be effective in the marital relationship, because religion provides guidelines for life and system of beliefs and values that these features can affect the married life (Khodayarifard and others, p. 612). Corporate (2004) after his studies came to the conclusion that religious differences between family members could cause problems to continue in marriage that the issue that leads to increased satisfaction and reduce conflicts and marital discord and divorce (Rouhani, 2008, p. 193). Bradbery, Fincham and Beach (2000) states that one who is thinking of getting married or married expects the mobile life with happiness and satisfaction and enjoy every minute of your life and your marriage because what is more important to success or satisfaction among couples in marriage (Jodeyri, 2009).

*Sinha* and Macerjec (1990) consider a situation where the marital satisfaction of married couple being together with each other and feel happy and satisfied (Ahmadi and others, 2005, ). Considering the unique research in the field of relationship between personality characteristics and marital satisfaction, we find that most of these studies have been done on a spouse but the relationship between couples is considered together with lower marital satisfaction. In addition, it examines the similarities, contrasts these personality characteristics and marital satisfaction is very important cases that have been neglected, in this research, the study of this relationship, moderating variable that the relation between belief and religious adherence is the communication patterns of couples is considered.

## MATERIAL AND METHODS

The research method is descriptive by correlation method. The population of this study included students and young couples of Tehran that at least one year has passed since their marriage. The results of the responses of 232 subjects that's mean 116 couples have been extracted and analyzed. To do this study, three questionnaires "NEO Personality" (Costa and McCrae, 60 questions), "Islamic marital satisfaction (Jodeyri, 50 questions) and the "religious adherence» (Janbozorgi, 60 questions) were used. Data were analyzed with the help of T test, F test, LSD test and analysis of variance.

## RESULTS

The main hypothesis of this study is that "there is a positive significant relationship between personality traits similar introversion / extroversion and degree of marital satisfaction." This means that wives and husbands who are both introverted or extroverted both, are entitled to more marital satisfaction. In order to evaluate the different modes personality trait introversion / extroversion at the level of marital satisfaction, one-way analysis of variance among subjects was used.

Data of Table 1 shows that is (P>0.05), so the difference between different states of introversion / extroversion in marital satisfaction with degree of freedom 3 and 228 will not be significant. So we can conclude that there is no significant relationship between different states of introversion / extroversion and marital satisfaction.

# DATA ANALYSIS BASED ON THE SECOND HYPOTHESIS

The first hypothesis of this study is that "there is a positive significant relationship between religious adherence and marital satisfaction level, as well as religious adherence has a significant relationship with the traits of introversion / extraversion."

Data of Table 2 shows that is (P>0.05), so it will be a significant difference between groups in marital satisfaction with the degree of freedom 2 and 113 religious adherence. So we can conclude that there is a significant relationship between religious adherence and marital satisfaction.

Based on the results of Table 3 there are significant differences among couples that both adhere to the religion and couples who are both non-adherence to religion, because is (P>0.05). In this case, both adhere to the religion of marital satisfaction is more than the satisfaction of couples who are both non-adherence to religion. There are also significant differences among couples that are both religious non-compliance with couples where only one of them is committed to religion because is (P>0.05), in this case, marital satisfaction, both of which are religious non-compliance will be less satisfaction than couples who adhere to the religion are just one of them. The second part of the first sub-study hypothesis is that "there is a significant relationship between religious adherence and character trait introversion / extroversion." This means that the individual's religious adherence will vary with the characteristics of introversion / extroversion.

According to the above table because is 0.05>0.575, it must be said that the amount of variance are equal and

Table 1. An satisfaction	Table 1. Analysis of variance result among the characteristics of introversion / extroversion and marital satisfaction								
Sum of squares   Degrees of freedom   Mean Square   F   Signif									
Between grou	ıps	1225.025	3	408.342	1.221	0.303			
Within group	)S	76264.406	228	334.493					
Total		77489.431	231						

Table 2. Analysis of variance result between religious adherence and marital satisfaction										
	Sum of squares	Degrees of freedom	Mean Square	F	Significance level					
Between groups	5005.065	2	2502.532	12.996	0.001					
Within groups	21759.651	113	192.563							
Total	26746.716	115								

Table 3. The results of multiple comparison test after the event between religious adherence and marital satisfaction levels **Confidence** interval Couples Couples Average Standard 95% Dependent adherence Significance adherence difference error variable (B) level Lower Upper (F) (F - B) bound bound Both are non-14.9250 (\*) 2.96543 0.000 7.5691 22.2809 adherence Both are One is adherence adherence and 4.5065 3.31276 0.399 -3.7110 12.7239 other is nonadherence Both are non-14.9250 (\*) 2.96543 0.000 -22.2809 -7.5691 adherence Marital satisfaction Both are non-One is adherence adherence and 10.4186 (\*) 3.40205 0.011 -18.8575 1.9796 other is nonadherence Both are One is 4.5065 3.31276 0.399 -12.7239 3.7110 adherence adherence and other is non-Both are non-10.4186 (\*) 3.40205 0.011 1.9796 18.8575 adherence adherence (\*)Correlation significance in the level of 0.05

to obtain T value, we use top tier values. In this section, T value indicates that the introvert and extrovert groups in terms of religious adherence are significantly different from each other because of T value (4.893) and is (0.05), therefore, there is a significant difference between the two groups introvert and extrovert and introvert and the extrovert average religious adherence is not like each other. So our first assumption is acceptable that means there are differences among individuals within and external, in the religious adherence. According to the introvert and extrovert average groups can say that extroverts than introverts are more religious adherence.

# DATA ANALYSIS BASED ON THE THIRD HYPOTHESIS

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The second hypothesis of this study is that "both wives and husbands who are extroverted, marital satisfaction has both wives and husbands who are more introverted."

According to the above table because is 0.197>0.05, it must be said that the amount of variance are equal and

to obtain T value, we use top tier values. In this section, T value indicates that the introvert and extrovert groups in terms of religious adherence are not significantly different from each other because of T value (-1.892) and is (0.064<0.05), therefore, there is no significant difference between the two groups introvert and extrovert and the average marital satisfaction as the characteristics of introversion / extroversion (the couple both introverted and extroverted both couples) like each other. So our null hypothesis is rejected, which means that there is no significant difference between the two groups in the degree of marital satisfaction.

# DATA ANALYSIS BASED ON THE FOURTH HYPOTHESIS

The third hypothesis of this study is that "extreme introversion and extraversion couples with one of them, reducing marital satisfaction."

Data of Table 8 shows that is (P>0.05), so it will be a significant difference between groups in marital sat-

Table 4. Variable descriptive indicators personality trait introversion / extroversion basedon religious adherence								
Variable	Introversion / extroversion	Number	Average	Standard deviation	Average standard deviation			
Policious adhoronas	Introverted	117	60.2222	15.211349	1.40649			
Kengious aunerence	Extroverted	115	69.8174	14.64587	1.36573			

Table 5. Cor extroversion	Table 5. Comparing the mean scores of subjects to determine the different characteristics of introversion /   extroversion in religious adherence									
Variable		Le for e va	vine test equality of ariances	T test for equality of means						
		F	Significance level	Т	df	Two-sided significance level	Average difference	Standard error of difference		
	Assuming equal variances	0.316	0.575	-4.893	230	0	-9.59517	1.96111		
Couples adherence	Assuming unequal variances			-4.894	229.901	0	-9.59517	1.96047		

Table 6. Couples descriptive indicators such as the characteristics of introversion / extraversion on the basis of marital satisfaction

Variable	Hypothesis 3	Number	Average	Standard deviation	Error standard deviation
Marital anti-faction	Both introspective	29	140.9138	14.39002	2.67216
Maritai satistaction	Both extrovert	28	148.5179	15.93533	3.01149

Table 7. Con introversion	Table 7. Comparing the mean scores of subjects to determine the similarities and contrasts between features introversion / extroversion in marital satisfaction								
Variable		L for	Levine test for equality of T test for equ variances			test for equalit	ity of means		
		F	Significance level	Т	df	Significance level	Average difference	Standard error of difference	
	Assuming equal variances	1.706	0.197	-1.892	55	0.064	-7.6041	4.01880	
Satisfaction	Assuming unequal variances			-1.889	53.984	0.064	-7.6041	4.02611	

isfaction with the degree of freedom 6 and 109 marital satisfaction. So we can conclude that there is a significant relationship between extreme states of introversion / extroversion and marital satisfaction. In Table 4-27 has been shown that significant differences of which group with another.

Based on the results of Table 9 only there were significant differences among couples that are both extreme

extrovert and couples who are both two extreme introvert because is (P < 0.05). In this case extrovert, both of which are extreme marital satisfaction of couples who both inward satisfaction is greater extreme. In other cases there is no significant difference in Table 4-28. According to the tables and accurately in different conditions Average concluded that the null hypothesis is rejected, this means that the intensity of the personality

Table 8. Analysi satisfaction	Table 8. Analysis of variance result between extreme states of introversion / extroversion and marital satisfaction									
	Sum of squares	Degrees of freedom	Mean Square	F	Significance level					
Between groups	4215.244	6	702.541	3.396	0.004					
Within groups	22549.472	109	206.876							
Total	26746.716	115								

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Table 9. The results of multiple comparison test after the event between the states of introversion / extraversion extreme and marital satisfaction								
Dependent	Introversion / extraversion	Introversion /	Average	Standard	Significance	Confidenc 95	e interval %	
variable	(B)	(F)	(F - B)		level	Lower bound	Upper bound	
		One extreme extrovert	-1.9219	4.09984	1	16.7592	12.9154	
		Both extreme extrovert	-15.9205	5.39914	0.203	35.4599	3.6190	
		One extreme introvert	0.7284	4.18060	1	-14.4012	15.8581	
	Normal conditions (non-extreme)	Woman extreme introvert and man extreme extrovert	-8.0625	6.01692	0.936	-29.8377	13.7127	
		Man extreme introvert and woman extreme extrovert	-11.1875	6.01692	0.749	-32.9627	10.5877	
		Both extreme introvert	8.3750	6.01692	0.924	-13.4002	30.1502	
		Normal conditions (non-extreme)	1.9219	4.09984	1	-12.9154	16.7592	
		Both extreme extrovert	-13.9986	5.02710	0.267	-32.1917	4.1945	
		One extreme introvert	2.6503	3.68762	0.998	-10.6952	15.9958	
Marital satisfaction	One extreme extrovert	Woman extreme introvert and man extreme extrovert	-6.1406	5.68545	0.978	-26.7163	14.4350	
		Man extreme introvert and woman extreme extrovert	-9.2656	5.68545	0.849	-29.8413	11.3100	
		Both extreme introvert	10.2969	5.68545	0.772	-10.2788	30.8725	
		Normal conditions (non-extreme)	15.9205	5.39914	0.203	-3.6190	35.4599	
		One extreme extrovert	13.9986	5.02710	0.267	4.1945	32.1917	
		One extreme introvert	16.6489	5.09319	0.110	1.7833	35.0812	
	Both extreme extrovert	Woman extreme introvert and man extreme extrovert	7.8580	6.68329	0.966	-16.3289	32.0448	
		Man extreme introvert and woman extreme extrovert	40.7330	6.68329	0.998	-19.4539	28.9198	
		Both extreme introvert	(*) 24.2955	6.68329	0.048	0.1086	48.4832	
		Normal conditions (non-extreme)	-0.7284	4.18060	1	-15.8581	14.4012	
		One extreme extrovert	2.6503	3.68762	0.998	-15.9958	10.6952	
		Both extreme introvert	-16.6489	5.09319	0.110	35.0812	1.7833	
	One extreme introvert	Woman extreme introvert and man extreme extrovert	-8.7909	5.74397	0.884	-29.5784	11.9965	
		Man extreme introvert and woman extreme extrovert	-11.9159	5.74397	0.636	-32.7034	8.8715	
		Both extreme introvert	7.6466	5.74397	0.938	-13.1409	28.4340	

		Normal conditions (non-extreme)	8.0625	6.01692	0.936	-13.7127	29.8377
	Woman extreme	One extreme extrovert	6.1406	5.68545	0.978	-14.4350	26.7163
	introvert and	Both extreme introvert	-7.8580	6.68329	0.966	-32.0448	16.3289
	man extreme	One extreme introvert	8.7909	5.74397	0.884	-11.9965	29.5784
	extrovert	Man extreme introvert and woman extreme extrovert	3.1250	7.19159	1	-29.1514	22.9014
		Both extreme introvert	16.4375	7.19159	0.519	9.5889	42.4639
		Normal conditions (non-extreme)	11.1875	6.01692	0.749	-10.5877	32.9627
		One extreme extrovert	9.2656	5.68545	0.849	-11.3100	29.8413
	Man extreme	Both extreme introvert	4.7330	6.68329	0.998	-28.9198	19.4539
	introvert and woman extreme	One extreme introvert	11.9159	5.74397	0.636	-8.8715	32.7034
	extrovert	Woman extreme introvert and man extreme extrovert	3.1250	7.19159	1	-22.9014	29.1514
		Both extreme introvert	19.5625	7.19159	0.295	6.4639	45.5889
		Normal conditions (non-extreme)	-8.3750	6.01692	0.924	-30.1502	13.4002
		One extreme extrovert	-10.2969	5.68545	0.772	-30.8725	10.2788
		Both extreme introvert	(*) 24.2955	6.68329	0.048	48.4823	-0.1086
	Both extreme	One extreme introvert	-7.6466	5.74397	0.938	-28.4340	13.1409
	introvert	Woman extreme introvert and man extreme extrovert	-16.4375	7.19159	0.519	-42.4639	9.5889
		Man extreme introvert and woman extreme extrovert	-19.5625	7.19159	0.295	-45.5889	6.4639
(*) Correlation sig	nificance in the level o	extrovert of 0.05					

characteristics introversion / extraversion specific and does not have significant impact on the level of marital satisfaction of couples.

# DATA ANALYSIS BASED ON THE FIFTH HYPOTHESIS

The fourth hypothesis of this study is that "optimal combination of both wives and husbands who are extrovert." It means that the wives and husbands who are both extrovert, are entitled to more marital satisfaction. The results of Table 10 shows that there is no significant difference between the groups in terms of marital satisfaction averages characteristics of introversion / extraversion because is (P < 0.05). So it is concluded that there is no difference between various combinations of couples in terms of introversion / extroversion at the level of marital satisfaction.

The results of Table 11 shows that there is no significant difference between any of the different groups of introversion / extraversion that this indicates that there is a good mix at the level of marital satisfaction and all groups are in the same situation.

Table 10. Analysis of variance result between the characteristics of introversion / extroversion and marital satisfaction									
	Sum of squares	Degrees of freedom	Mean Square	F	Significance level				
Between groups	1589.334	3	529.778	2.357	0.076				
Within groups	25175.382	112	224.780						
Total	26764.716	115							

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	Table 11. One b	able 11. One by one comparison of marital satisfaction based on characteristics of introversion / extraversion						
	Dependent variable	Introversion / extraversion (B) Introversion / extraversion (F)	Introversion /	Average St	Standard	Significance	Confidence interval 95%	
			difference (F - B)	difference error (F - B)	level	Lower bound	Upper bound	
			Both extrovert	-7.6041	3.97227	0.305	-18.8792	3.6711
		Both introvert	Man extrovert and woman introvert	4.7384	4.18618	0.734	-16.6207	7.1440
			Woman extrovert and man introvert	1.4693 3.74098	0.985	9.1493	12.0880	
			Both introvert	7.6041	3.97227	0.305	-3.6711	18.8792
	Marital satisfaction	Both extrovert	Man extrovert and woman introvert	2.8657	4.21911	0.381	9.1102	14.8415
			Woman extrovert and man introvert	9.0734	3.77780	0.130	1.6498	19.7966
			Both introvert	4.7384	4.18618	0.734	-7.1440	16.6207
		Man extrovert	Both extrovert	2.8657	4.21911	0.927	-14.8415	9.1102
		introvert	Woman extrovert and man introvert	6.2077	4.00212	0.495	5.1522	17.5676
		Both introvert	1.4693	3.74098	0.985	-12.0880	9.1493	
		Woman extrovert	Both extrovert	9.0734	3.77780	0.130	-19.7966	1.6498
		introvert	Man extrovert and woman introvert	6.2077	4.00212	0.495	-17.5676	5.1522

# RESULTS

The purpose of this study was to investigate "the mediating role of religious belief according to personality traits, identity, conflict and marital satisfaction among couples in Tehran". To do this study, three questionnaires "NEO Personality" (Costa and McCrae, 60 questions), "Islamic marital satisfaction (Jodeyri, 50 questions) and the "religious adherence» (Janbozorgi, 60 questions) were used. Data were analyzed with the help of T test, F test, LSD test and analysis of variance. The results of this study can be helpful in counseling before and after marriage, indicates that there is no significant relationship between personality characteristics introversion / extroversion and satisfaction of marriage. Also the relationship was not found between identity / contradiction of the character traits and marital satisfaction that therefore cannot offer a good mix of couples to predict higher levels of marital satisfaction but there is a positive significant relationship between religious adherence of couples with their marital satisfaction.

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# The effect of Swedish massage on fasting glucose levels, insulin resistance, cortisol, adrenaline and heart rate in women with type II diabetes

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# ABSTRACT

The aim of this study was to evaluate the effect of Swedish massage on some physiological factors in women with type II diabetes. The experimental group included 12 women with type II diabetes and also had 12 patients with type II diabetes in the control group. The subjects received Swedish massage for four weeks (three sessions a week) in the back and in the abdomen respectively for 10 and 20 minutes. The blood samples were collected 24 hours before the first session of massage and 24 hours after the last session and the changes of factors were measured at rest, as well as the mean blood pressure and resting heart rate before and 24 hours after the first massage session of massage. Independent and dependent T-test was used to analyze the data. Results of the study did not show any statistically significant changes in fasting blood glucose levels and insulin resistance in experimental and control groups. Cortisol, adrenaline and heart rate changes were significant from the perspective of between-group changes. Overall, this paper showed that massage as an external factor did not have significant impact on the physiological factors affecting diabetes, it can only have positive effects on the heart rate and stress factors, which means massage can be helpful as a relaxing factor.

KEY WORDS: SWEDISH MASSAGE, PHYSIOLOGICAL FACTORS, DIABETES TYPE II

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# **INTRODUCTION**

Diabetes is a common diseases in Iran and worldwide. This chronic disease is progressive and costly, and is considered as a public health problem and creates numerous complications (Eslami, 2010; Mousavi, 2008). Type II diabetes is a complex metabolic and endocrine disorder in which the interaction between multiple genetic and environmental factors causes a variation of insulin resistance and dysfunction of beta cells in pancreas and ultimately leads to diabetes (Heidari Safa, 2011). Massage involves a series of movements and manual skills that are applied regularly on human body tissues to affect neuromuscular system and the general circulation (Baumgart *et al.* 2011). Massage can be effective in the balance of nervous system and the correction of physical balance (Bucher, 2002).

Diabetes is a source of tension for people, and has negative psychological effects other than physical ones, and thus, these make the treatment and the control of the disease so difficult for them and has destructive effects on their quality of life (Moghaddasian and Ebrahimi, 2008). According to the importance of moderating blood pressure in people with type II diabetes, and despite the scientific evidences on the effects of massage, only a few studies have specifically examined the long-term effects of massage on mean blood pressure. These studies give different results on the effectiveness (Williams and Hopper, 1999; Ignatviciuce and Workman, 2006; Aourell *et al.* 2005) or ineffectiveness (National Institute of Diabetes and Digestive Kidney Diseases, 2010) of massages on the blood pressure.

Considering the importance of moderating blood sugar levels as well as regulating the amount of stress hormones, especially cortisol and adrenaline in diabetics, and considering the importance of the role of women in society, the question is that whether Swedish massage in women with type II diabetes can cause changes in physiological indicators such as heart rate, insulin resistance, as well as changes in hematological parameters such as glucose, cortisol and adrenaline.

#### MATERIALS AND METHODS

This study has a quasi-experimental design in which the preliminary test (pre-test) and final (post-test) were conducted in two experimental and control groups.

### PARTICIPANTS

Statistical population of the research includes 50 old women with the range of 40-45 years old with diabetes type 2. Among the candidates, 24 people randomly divided into two equal groups that comprised massage group and a control group.

#### **INCLUSION CRITERIA**

Having at least one year from history of the disease.

All participants used the same drug conditions

Having files at Neyshabur Diabetes Prevention Association. Non-Smokers

Having no history of regular physical activity at least for the last six months.

The scope of their blood sugar levels be between 150 to 250 mg per dl.

#### **EXCLUSION CRITERIA**

Patients with diabetes type I

People with special diseases

People with hyperlipidemia and hypertension

People with complications of diabetes (neuropathy, nephropathy, retinopathy)

Lack of regular participation in physical activity

### **METHOD**

From 50 people who had been referred to the Neyshabur Diabetes Clinic, 24 patients who had the conditions of research selected and randomly divided into two groups: experimental (n = 12) and control (n = 12). The experimental group received Swedish massage for four weeks, which were included three sessions per week, each session lasting 30 minutes. In this period, the control group did not perform any particular physical activity.

### SWEDISH MASSAGES PROTOCOL

Swedish massage in every session consist of 10 minutes of massage in the back and 20 minutes in the abdomen. This is performed with effleurage (string), petrissage (rubbing) percussion (impact), and vibration movements. Effleurage is a slipping movement performed in the hands to improve blood circulation. Petrissage is performed to improve blood and lymph circulation. In petrissage the muscular mass is put up and is rotated or compressed slowly. In the percussion movement, throbbing movements which are light and fast and continuous are performed by the edges of the hands or by palms to the muscles. Vibration is performed by vibrating the tips of fingers or by palms. The aim of the vibration gesture is to help calm the muscles and increase blood circulation is localized.

## **BLOOD SAMPLING AND MEASURING THE FACTORS**

Blood samples were collected 24 hours before the first massage session and 24 hours after the last session, while the subjects had been fasting for 12Hours.Glucose test was done using enzymatic colorimetric by biosystem's kit.

Table1. Profile groups	Table1. Profile of subjects in two experimental and control groups			
Group	Count	Age (y)	Height (cm)	Weight (kg)
Experimental	12	51±5/15	161/38±7/92	71/3±11/77
Control	12	51±4/16	157/26±6/74	71/7±9/03

Insulin resistance was calculated by the homeostasis assessment of insulin resistance (HOMA-IR) according to the following formula.

HOMA-IR = {[fasting insulin ( $\mu$ U / ml)] × [fasting glucose (mmol / l)]} / 22.5.

Cortisol was evaluated by Vidas-Rosch kit and immunofluorescence method, by the Vedas mini blue machine which is made in France, and Adrenaline was evaluated using adrenaline ELISA kit LDN LABER DIAGOSTIKA and Elisa method by ELISA reader machine version stat fax 303 made in Germany.

## STATISTICAL ANALYSIS

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For survey the effect of massage on selected factors on each factor, dependent t test was used and to compare pretest and post-test data means in each group, the statistical independent t test was used. All the statistical tests were performed at the 95 percent confidence level (p < 0.05).

#### **RESEARCH FINDINGS**

In Table 1, descriptive information of the participants of the two groups has been shown.

In Table 2 the results of paired t-test for intergroup changes during the four-week are presented.

As Table 2 shows, a course of massage can cause significant changes in cortisol, adrenaline and heart rate in the experimental group. It means twelve sessions of massage can have a positive impact on mentioned factors. While in control group, who did not receive

Table 2. Results of paired t-test variables measured in two groups.					
Group	Variable	Test	M±SD	t	Value
	Glucose (mmol/L)	Pre- test	136/92±30/69	2/14	0/056
		Post- test	145/75±32/4	-2/14	
	Insulin Resistance	Pre- test	3/87±2/38	0/79	0/44
		Post- test	3/56±1/47	-0/78	0/44
<b>P</b> • • • 1	Cortical (mag)	Pre- test	184/5±63/93	2/24	0/02*
Experimental	Cortisor (mcg)	Post- test	154/5±54/08	-2/34	0/03"
		Pre- test	0/27±0/15	2/24	0/008*
	Adrenaline (ACIH)	Post- test	0/14±0/09	-3/24	
	Heart Rate (bpm)	Pre- test	83/91±7/22	-2/21	0/04*
		Post- test	80±7/03		
	Glucose (mmol/L)	Pre- test	141/92±2894	0/48	0/63
		Post- test	146/08±36/37		
	Insulin Resistance	Pre- test	4/37±3/41	1/26	0/23
		Post- test	3/86±2/98	-1/20	
Control	Continel (mag)	Pre- test	166/08±64/16	2/05	0/06
Control	Cortisor (incg)	Post- test	193/42±53/78	2/05	
	Adronalina (ACTH)	Pre- test	0/28±0/18	0/26	0/70
	Aurenanne (ACTII)	Post- test	0/3±0/17	0/30	0/72
	Heart Rate (hnm)	Pre- test	83/25±7/56	0/2	0/84
	Heart Kate (bpm)	Post- test	83/41±5/83	0/2	0/84
* Significance level (p <0.05)					

Table 3. Comparing the	able 3. Comparing the changes of physiological factors in the two groups			roups
Variable	Group	Means variations	t	Value
Glucose (mmol/L)	Experimental	8/83	0/49	0/37
	Control	4/16	0,15	1212
Insulin Resistance	Experimental	-0/3	0/36	0/88
	Control	-0/51		0/00
Cortical (max)	Experimental	-30	-3/1	0/75
Corrisor (mcg)	Control	27/33		0/75
Advensions (ACTII)	Experimental	-0/31	-2/05	0/20
Adrenaline (ACIH)	Control	0/23	0/29	
Heart Rate (hnm)	Experimental	-3/66	-2/06	0/16
freure nace (bpm)	Control	0/16		0,10

any massage, none of the factors showed significant changes.

As in Table 3, independent t-test results show that no significant differences were obtained comparing experimental and control groups in effectiveness of one session Swedish massage on aforementioned factors. In other words, people with diabetes who have been receiving Swedish massage did not show any statistically significances compared to people who did not.

# DISCUSSION AND CONCLUSION

The results of this study showed significant reduction in cortisol, adrenaline and heart rate in women with type II diabetes in the experimental group after 12 sessions of massage (p <0/05).

However, according to the between-group results, no statistically significant decline was observed in experimental group compared to the control group. The results of cortisol levels, were consistent with the results of the research performed by Christopher Moyer (2004), but were conflicted with the results of studies performed by Sicree (2010), French *et al* (2010) and Anderson and colleagues (2001).

As mentioned about the relationship between stress and diabetes, one of the most important psychological factors influencing diabetes is stress. Scientists have different comments about the relationship between stress and diabetes; The reaction of the organism when faced

an unusual disorder is an over activity of the hypothalamic/pituitary/adrenal axis; In the neuroendocrine system or hypothalamic/pituitary/adrenal cortex axis, stress (such as exams, paragliding, etc.) leads to the release of corticotropin increasing agents by stimulating paraventricular nuclei of hypothalamus. This agent causes synthesis of adrenocorticotropin in the anterior pituitary gland and thus stimulation of adrenal and secretion of glucocorticoids (like cortisol) (Kreyer, 2003). Therefore, stimulating the central sympathetic/adrenal and hypothalamic/pituitary/adrenal cortex axes will result in secretion of catecholamines and glucocorticoids and an increase in heart rate, blood pressure, respiratory rate and metabolism (Goyman and Wingfield, 2004). Massage may alter the activity of the autonomic nervous system (ANS) responses from sympathetic to parasympathetic responses. In this case, cardiovascular activity and stress hormones are reduced and the person feels relaxed and comfortable.

The pressure applied during the therapeutic massage, stimulates the vagus nerve activity, which in turn leads to reduced stress hormones levels and physiological arousal and then parasympathetic response from the ANS (Bjorntorp *et al.* 1999).

The cause of variation with French *et al* (2010) findings, may be due to the small number of massage sessions per week (one session per week) by Vandal. The samples taken by Vandl were urine samples while in this study they were blood samples of participants receiving massage 3 sessions a week. The variation of findings with Edward *et al* (2010) findings may be due to the presence of both sexes (male and female) and participants' age (45 to 72 years). The results of this study reported a significantly decrease in heart rate of women with type II diabetes in experimental group after 12 massage sessions (p <0/05). However, no statistically significant decline was observed when comparing the results of the two (experimental and control) groups.

These findings are consistent with Zolriasatian and colleagues (2013), Ramezanpour and colleagues (2010), Hassanvand and colleagues (2010), Rahmani Anaraki and colleagues (2001), and Moyer and colleagues (2004) findings. No research was found to be in contrast with the present study findings.

Massage increases blood flow to the arteries, veins, and regional blood flow and stroke volume. It improves lymph drainage and increases serotonin, dopamine and cortisol levels (French, 2010). Therapeutic massage also stimulates the central nervous system parasympathetic tone and reduces the heart rate and respiratory rate and thereby makes one feel relieved (Sarafino, 2002).

# **CONCLUSION**

12 sessions of Swedish massage in women with type 2 diabetes were unable to cause significant changes in glucose levels and insulin resistance. However, this study showed that massage can be somewhat effective in reducing stress hormones levels such as cortisol and adrenaline, as well as reducing the heart rate at rest.

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# The role of probiotics in nosocomial infections

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# ABSTRACT

There is an increasing scientific and commercial interest in the use of beneficial microorganisms, or "probiotics," for the prevention and treatment of disease. The microorganisms most frequently used as probiotic agents are lactic-acid bacteria such as *Lactobacillus rhamnosus* GG (LGG), which has been extensively studied in recent literature. Multiple mechanisms of action have been postulated, including lactose digestion, production of antimicrobial agents, competition for space or nutrients, and immunomodulation. We have reviewed recent studies of probiotics for the treatment and control of infectious diseases. Studies of pediatric diarrhea show substantial evidence of clinical benefits from probiotic therapy in patients with viral gastroenteritis, and data on LGG treatment for Clostridium difficile diarrhea appear promising. However, data to support use of probiotics for prevention of traveler's diarrhea are more limited. New research suggests potential applications in vaccine development and prevention of sexually transmitted diseases. Further studies are needed to take full advantage of this traditional medical approach and to apply it to the infectious diseases of the new millennium.

KEY WORDS: INTENSIVE CARE UNITS; PEDIATRIC; CROSS INFECTION; BACTEREMIA; PNEUMONIA; URINARY TRACT INFECTION; PROBIOTICS

# **INTRODUCTION**

Despite marked improvements in antimicrobial therapy and critical care technology, nosocomial infection remains a significant cause of morbidity and mortality in critically ill patients (Salminen *et al.* 1998; Savaiano *et al*, 1984; DeVrese *et al.* 2001; Kim and Gilliland, 1983). Because the final common pathway of Gram-negative bloodstream infection, ventilator-associated pneumonia, and urinary tract infection (UTI) involves pathogenic enteric organisms, recent interest has emerged in how to suppress the growth of these organisms. Multiple studies have demonstrated that the colonization of the bowel with nonpathogenic commensal bacteria

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(probiotics) competitively inhibits the attachment of these pathogenic organisms (Kolars *et al.* 1984; Allen *et al.* 2003; Guandalini *et al.* 2000). In addition, probiotics have been shown to augment the local gut immunity by enhancing immunoglobulin (Ig)-A–specific responses to enteric pathogens (Shornikova *et al.* 2003; Pant *et al.* 1996). Probiotics also are thought to produce a variety of antimicrobial substances that may interfere with the growth of pathogenic bacteria (Raza *et al.* 1995; Sepp *et al.* 1995; Szajewska *et al.* 2001; Mastretta *et al.* 2002). Finally, probiotics have been shown in numerous animal models to reduce intestinal permeability and decrease the bacterial translocation of pathogenic bacteria (Oberhelman *et al.* 1999; Shornikova *et al.* 1997; Cetina-Sauri and Sierra Basto, 1994).

Moreover, probiotics also have been shown to nonspecifically stimulate the systemic immune system. Probiotic bacteria have been shown in several studies to enhance the phagocytic ability of neutrophils (Ho"chter *et al.* 1990; Arvola *et al.* 1999). Multiple trials also have demonstrated an improvement in natural killer cell activity following the administration of various probiotic agents (Vanderhoof *et al.* 1999). Probiotic intake also has been shown to modulate production of interleukin-6 and -10, as well as tumor necrosis factor- (Armuzzi *et al.* 2001a). Specific stimulation of the systemic immune system also has been shown using probiotic bacteria as vehicles for vaccines with resultant increases in antigen specific T-cell and immunoglobulin G responses (Cremonini *et al.* 2002; Armuzzi *et al.* 2001b).

As a result of these studies demonstrating stimulation of local and systemic immune defenses and a reduction in bacterial translocation, there has been a rapidly growing interest in the clinical applications of probiotics. A few small clinical trials in intensive care settings have begun looking at the incidence of nosocomial infections with probiotic use and have demonstrated promising results (Siitonen *et al.* 1990). Therefore, the purpose of this study was to evaluate the hypothesis that the administration of probiotics in infants and children admitted to a pediatric intensive care unit setting would reduce the incidence of nosocomial infection, bloodstream infection, pneumonia, tracheobronchitis, and UTI.

## MATERIAL AND METHODS

Episode occurring after 48 hours of hospitalization, resulting in a positive blood, CSF, or urine culture.4 Hospital-acquired bloodstream infection: clinical signs of sepsis occurring after 48 hours of life and followed by a positive blood culture drawn after 48 hours of life. If culture was positive for a coagulasenegative Staphylococcus species, an additional positive culture with the same organism was required for confirmation and treatment. Nosocomial pneumonia: development of respiratory distress after 48 hours of hospitalization evidenced by rapid, noisy, or difficult breathing, respiratory rate .60 breaths per minute, chest retractions or grunting, and confirmed with a chest radiograph, a blood culture, or additional blood work. If the chest radiograph was suggestive of pneumonia and the blood culture was negative, clinical signs of sepsis or laboratory tests were required for diagnosis (Duke28 modified definition). Chest radiograph suggestive of pneumonia: presence of nodular or coarse patchy infiltrate, diffuse haziness, or granularity, or lobar or segmental consolidation. Clinical signs of sepsis: presence of lethargy, recurrent apnea, hypothermia (axillary temperature ,37°C) or hyperthermia (.38°C).

Laboratory tests suggestive of sepsis: a leukocyte count out of the reference range (neutropenia ,5000 or neutrophilia .25 000), a ratio of immature to total neutrophilic forms .0.2 or an elevated C-reactive protein. Urinary tract infection: clinical signs of sepsis and a positive urine culture with .104 organisms of a single pathogen obtained by the use of standard sterile technique and urethral catheterization.4 Meningitis: clinical signs of sepsis with a CSF white blood cell count .29/mm3 and neutrophil count .60%, or a positive CSF Gramstain, culture, or polymerase chain reaction for bacterial antigens.4 Feeding intolerance: any of the following: recurring emesis, gastric residuals with 50% or more of the previous feed volume, abdominal distension, or the presence of macroscopic blood in stools. Necrotizing enterocolitis: modification of Bells criteria for stage II29 based clinical and/ or radiographic data: (1) pneumatosis or portal vein gas, (2) localized pneumatosis, fixed dilated bowel loops, or pneumoperitoneum AND 2 GI signs/ symptoms and 1 systemic sign/ symptom, or (3) thickened bowel loops AND an abnormal gas pattern AND 2 GI and 2 systemic signs/ symptoms. GI signs: abdominal distension or tenderness, feeding intolerance, erythema of the abdominal wall, and decreased bowel sounds. Systemic signs: lethargy, increased frequency or severity of apnea, temperature instability, new-onset metabolic acidosis, hemodynamic instability, and disseminated intravascular coagulation or thrombocytopenia.

# **RESULTS AND DISCUSSION**

# DOCUMENTATION OF THE HEALTH EFFECTS OF PROBIOTICS FOR HUMAN DISEASES AND DISORDERS

Lactose malabsorption. A large number of people, as they age, experience a decline in the level of lactase (bgalactosidase) in the intestinal brush border mucosa. This decline causes lactose to be incompletely absorbed, resulting in flatus, bloating, abdominal cramps, and moderate-to-severe (watery) diarrhea. This results in a severe limitation in consumption of dairy products among the elderly population. There have been several studies that have demonstrated that, during the fermentative process involved in the production of yogurt, lactase is produced, which can exert its influence in the intestinal tract (Savaiano et al, 1984; DeVrese et al. 2001; Kim and Gilliland, 1983; Kolars et al. 1984). The organisms commonly used for the production of yogurt are Lactobacillus bulgaricus and Streptococcus salivarius subsp. thermophilus. Kim and Gilliland (Kim and Gilliland, 1983) found that feeding lactose-intolerant individuals yogurt caused a significant reduction in the level of breath hydrogen compared with that in subjects who were fed milk. The level of hydrogen in the breath is an indication of the extent of lactose metabolism in the large bowel. Kolars et al. (Kolars et al. 1984) observed that the ingestion of 18 g of lactose in yogurt caused the production of 67% less hydrogen in the breath compared with that produced by a similar dose of lactose delivered in milk. Analysis of aspirates obtained from the duodenum 1 h after the consumption of yogurt showed significant levels of lactase (Kolars et al. 1984). These studies indicate that the delivery of lactase to the intestine via the consumption of lactase-producing probiotics is a practical approach for treatment of lactose malabsorption. Acute diarrhea. There are at least 12 studies that have reported the use of probiotics to either treat or prevent acute diarrhea (Allen et al. 2003; Guandalini et al. 2000; Shornikova et al. 2003; Pant et al. 1996; Raza et al. 1995; Sepp et al. 1995; Szajewska et al. 2001; Mastretta et al. 2002; Oberhelman et al. 1999; Shornikova et al. 1997; Cetina-Sauri and Sierra Basto, 1994; Ho"chter et al. 1990). The majority of these studies were done with infants or children, the etiologic agent was either

rotavirus or unknown, and the probiotic used was Lactobacillus rhamnosus strain GG (Lactobacillus GG) (ATCC 53103) (Guandalini et al. 2000; Shornikova et al. 2003; Pant et al. 1996; Raza et al. 1995; Sepp et al. 1995; Szajewska et al. 2001; Mastretta et al. 2002; Oberhelman et al. 1999). Other probiotics that have shown positive results for the treatment of acute gastroenteritis include Lactobacillus reuteri and Saccharomyces boulardii (Shornikova et al. 1997; Cetina-Sauri and Sierra Basto, 1994; Ho"chter et al. 1990). The European Society for Pediatric Gastroenterology, Hepatology, and Nutrition conducted the most extensive trial using Lactobacillus GG for the treatment of moderate-to-severe diarrhea in children (Guandalini et al. 2000). The study included 287 children aged 1-36 months from 10 countries. The patients were randomized to be given either placebo or Lactobacillus GG along with the standard treatment, oral rehydration solution. Patients who received Lactobacillus GG had decreased severity and shorter duration of illness and a shorter hospital stay and were found to have a decreased likelihood of persistent diarrheal illness (Guandalini et al. 2000).

A similar study was conducted with 137 children aged 1–36 months who were admitted to the hospital with diarrhea and were randomized to receive placebo or Lactobacillus GG plus oral rehydration solution. Children given Lactobacillus GG had a significantly shorter duration of illness (Shornikova *et al.* 2003). A study of 26 children in Thailand with watery diarrhea showed a significantly shorter duration of symptoms for those who received treatment with Lactobacillus GG (Pant *et al.* 1996). A similar investigation involving 40 children that was conducted in Pakistan found that those who received treatment with Lactobacillus GG were less likely to have persistent diarrhea and had fewer episodes of vomiting, compared with the placebo group (Raza *et al.* 1995). In a preventive study of 81 children aged

Table 1. Medical applications in humans for different classes of probiotics			
Medical condition	Class(es) of probiotic	Reference(s)	
Lactose maldigestion	LAB and Streptococcus salivarius subsp. Thermophiles	[2-5]	
Gastroenteritis Acute diarrhea	LAB, Bifidobacterium species, or Saccharomyces boulardii	[6-17]	
Antibiotic-associated diarrhea	LAB or S. boulardii	[18-24]	
Traveler's diarrhea	LAB	[25, 26]	
Clostridium difficile-induced colitis	LAB	[32-34]	
Dental caries	LAB	[35]	
Intestinal inflammation in children with cystic fibrosis	LAB	[36]	
NOTE. LAB, lactic acid bacteria.			

1-36 months who were hospitalized for illnesses other than diarrhea, symptoms of hospital-acquired rotavirus gastroenteritis were prevented by administration of Lactobacillus GG (Szajewska et al. 2001). In another prevention study conducted in Peru, 204 children aged 6-24 months who were undernourished were randomized to receive placebo or Lactobacillus GG. There was a significant decrease in the rate of incidence of diarrhea among the children who received Lactobacillus GG who were not being breast-fed (Oberhelman et al. 1999). In one study, Lactobacillus reuteri was shown to shorten the duration of diarrhea in children (Shornikova et al. 1997). In a clinical trial involving 130 children, S. boulardii was found to be effective for the treatment of acute diarrhea in children (Cetina-Sauri and Sierra Basto, 1994), and, in another study of 92 adults, a similar finding was reported (Ho"chter et al. 1990).

Probiotic Use and Safety Probiotics are widely considered to be safe for human oral and vaginal use and there is a long history of the use of fermented milk products with minimal recorded reported side effects. The number of probiotic products available on the world market is estimated to be over 2000 (Shornikova *et al.* 2003), but the industry remains largely unregulated and unstandardized—making comparative studies difficult. To begin filling this void, scientists have formalized groups such as the International Scientific Association for Probiotics and Prebiotics (ISAPP), a nonprofit founded in 2002 to

Table 2. Present and future clinical applications of probiotics, by level of evidence of efficacy
Applications with strong evidence
Gastroenteritis
Acu
Antibiotic associated
Applications with substantial evidence of efficacy
Allergic reactions, specifically atopic dermatitis
Applications that have shown promise
Childhood respiratory infection
Dental caries
Nasal pathogens
Relapsing Clostridium difficile-induced
Gastroenteritis (prevention)
Inflammatory bowel disease
Potential future applications
Rheumatoid arthritis
Irritable bowel syndrome
Cancer (prevention)
Ethanol-induced liver disease
Diabetes
Graft-versus-host disease

raise the scientific credibility of the field by working with experts and conducting meetings on high quality research. By providing an objective, science-based voice, ISAPP hopes to benefit the end users of these products by helping them make informed choices (Pant et al. 1996). ISAPP has endorsed the guidelines set by the World Health Organization (WHO) and the United Nations Food and Agriculture Organization (FAO) for evaluation of probiotics-governing, strain designation, efficacy/effectiveness and safety (Kim and Gilliland, 1983; Raza et al. 1995). For example, new strains and products should be proven safe in human studies amend those bearing some limitations, (such as use of S. boulardii [S. cerevisiae]) in patients with a leaky gut or other risks) should be clearly labeled (Sepp et al. 1995). In the United States, probiotics are currently classified as dietary supplements, (not -drugs) and as such, the Food and Drug Administration (FDA) only requires premarket notification, with no demonstrations of safety and efficacy required (Szajewska et al. 2001). Due to their overall safety, guidelines for use of probiotics in the hospital are generally lacking, although some caution is advised for use in certain disease states (e.g., severe colitis, bowel leaks, neutropenia) where the potential exists for the probiotic to enter the blood or peritoneum (Mastretta et al. 2002). Likewise, special care should be taken by healthcare personnel who handle both probiotic capsules and venous catheters in order to avoid transfer to the bloodstream (Szajewska et al. 2001). Of more recent interest and concern are safety considerations relating to transferable genetic elements that may confer antibiotic resistance from the probiotic to pathogenic strains, or even to the commensal flora (Oberhelman et al. 1999).

In a mouse model have demonstrated a possible role for these agents in the prevention or treatment of graftversus-host disease in transplant recipients (ksanen *et al.* 1990).

# **FUTURE DIRECTIONS**

The following are some of the future possibilities for these biological products in the field of infectious diseases. The use of LAB as live vectors for oral immunization appears to be an exciting approach, on the basis of their safety, ability to persist within the indigenous flora, adjuvant properties, and low intrinsic immunogenicity. Medaglini *et al.* [38] have recently developed a genetic system for the expression of heterologous antigens from human papillomavirus and HIV type 1 (HIV-1) in the surface of the human commensal Streptococcus gordoonii and L. casei. Local and systemic immune responses were detected in BALB/c mice and Cynomolgus monkeys after vaginal colonization with the aforementioned

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recombinant strains. Both macrophage activation and IL-12/g-IFN pathway stimulation are promising areas of research with regard to resistance to intracellular pathogens by enhancement of mucosal and systemic immunity (Malchow *et al.* 1997; Guslandi *et al.* 2000). More experimental and clinical studies are needed to clarify the role of probiotics as immunomodulators, not only in infectious diseases of the GI tract, but also for inflammatory and allergic conditions.

# **CONCLUSIONS**

The current and proposed uses of probiotics cover a wide range of diseases and ailments. An attempt has been made to classify the quality of evidence that supports these various applications (Nase et al. 2001). These classifications are based on existing studies, most of which are cited in this article, and not on an exhaustive review of the entire literature on probiotics. The broad classifications include (table 2) applications with proven benefits, applications with substantial evidence that require additional support, promising applications that need substantial additional evidence, and proposed future applications. Proven benefits of probiotics include the treatment of acute and antibiotic associated diarrhea; applications with substantial evidence include the prevention of atopic eczema and traveler's diarrhea; promising applications include the prevention of respiratory infections in children, prevention of dental caries, elimination of nasal pathogen carriage, prevention of relapsing C. difficile- induced gastroenteritis, and treatment of inflammatory bowel disease; and proposed future applications include the treatment of rheumatoid arthritis, treatment of irritable bowel syndrome, cancer prevention, prevention of ethanol-induced liver disease, treatment of diabetes, and prevention or treatment of graft versus-host disease.

The mechanisms of action of probiotics are strain specific but can be summarized mainly in three areas: changes of gut ecology, modulation of gut mucosal barrier and regulation of the immune response through interaction with gut-associated immune system (Savaiano et al, 1984). Several studies regarding the supplementation of probiotics in nosocomial infections have been conducted mainly in adult population. Among pediatric studies major findings have been observed in treatment of acute gastroenteritis, primarily caused by Rotavirus (DeVrese et al. 2001; Kim and Gilliland), and in the prevention of antibiotic associated diarrhea (AAD) (Kolars *et al.* 1984). Supplementation with probiotics has proven useful even in the treatment of Clostridium difficile disease (CDD), the most common pathogen involved in AAD (1983Allen et al. 2003). Data from meta-analysis and cochrane review on the prevention of necrotizing

enterocolitis (NEC) show an overall benefit of probiotic supplementation (Guslandi et al. 2000). The limitations of the above cited studies are mainly related to heterogeneity in terms of strain, dosage and duration of treatment and the lack of studies on extremely low birth weight preterm infants. Data on nosocomial pneumonia and ventilatorassociated pneumonia in neonatal and pediatric age is scanty. In a large randomized, double-blind placebo controlled study, Hojsak et al demonstrated that supplementation with Lactobacillus GG significantly decreased the risk of nosocomial respiratory tract infections (Shornikova et al. 1997). On the other hand, the data from adult studies have been conflicting, with a tendency towards the demonstration of probiotic efficacy in reducing the incidence of ventilatorassociated pneumonia (Pant et al. 1996). Meticillin-resistant Staphylococcus aureus is a multidrug-resistant nosocomial pathogen; a recent review of literature (Raza et al. 1995) showed that many probiotic strains inhibit MRSA growth in vitro. Furthermore, this review describes that there is little published clinical data on the use of probiotics in prophylaxis or treatment of MRSA-mediated infections (Nase et al. 2001).

The use of probiotics in medical practice is rapidly increasing, as are studies that demonstrate the efficacy of probiotics. A note of caution should be applied: negative findings are being reported, as would be expected as more studies are being performed and as more applications are being sought for the use of probiotics. Overall, probiotics appear to be here to stay as part of the physician's armamentarium for the prevention and treatment of disease; however, more evidence-based research is required to firmly establish medical areas of use and areas in which probiotics are not applicable.

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# Enhanced fire retardancy of poly methyl methacrylate by combination with aluminium hydroxide and magnesium hydroxide

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# ABSTRACT

The use of polymeric materials in life, due to their unique properties such as low weight and easy process, significantly increased. But polymers are relatively high combustibility and most of them produce smoke and toxic and corrosive gases during burning. As a result of modification of the polymer behavior against fire is the main challenge to make them more useful. Retardant additives reduce the risk of fire and release of it. The performance of this class of materials is by increase in combustion time, improve in inflammability of polymer, reduce in heat release rate and prevent of dripping during burning. In this study, it is tried to improve thermal resistance of polymethyl methacrylate PMMA by synthesis and characterization of nanoparticles of magnesium hydroxide and aluminum hydroxide nanoparticles by SEM and XRD and use it as fillers for polymers, which is highly used in Industry. 4 composite samples with ratios of 10/90, 20/80, 30/70 and 40/60 of PMMA and Mg(OH)2 and 4 composite samples with ratios of 5/5/90, 10/10/80, 15/15/70 and 2/20/40 of PMMA and Mg(OH)2 and Al(OH)3 were prepared and their thermal behavior was studied. The results show that increasing the percentage of magnesium hydroxide in the composites, heat resistance of polymer and the melting temperature and the percentage of residual mass in composite increased. The addition of aluminum hydroxide to composite increased the thermal resistance and increased the percentage of residual mass in some of them.

KEY WORDS: FIRE RETARDANCY, NANO ALUMINUM HYDROXIDE, POLY(METHYLMETHACRYLATE), NANO MG(OH)2, NANO COMPOSITE

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# **INTRODUCTION**

The research and developments on new engineering materials belong to the important fields of material science. One can see the continuous competition between the traditional inorganic engineering materials and polymers. Since polymeric materials (including composites) are promising, due to their economic versatile applicability, they are widely used in many applications, such as housing materials, transport and electrical engineering (Almeras et al. 2003; Anna et al. 2002; Bourbigot et al. 1996a; Bourbigot et al. 1996b). These commercial polymers are easily flammable. The flame retardant can act in various ways i.e. physically or chemically. Many types of flame retardants are used in consumer products (Troitzsch, 1990; Sain, 2004; Zhu, 2003). They are mainly phosphorus, antimony, chlorides and bromides, magnesium and boron-containing compounds (Seymour et al. 1978).

Al(OH)3can act also as a reinforcing agent and smoke suppressant additive with low or zero emissions of toxic or hazardous substances. The main advantages of polymeric materials over many metal compounds are high toughness, corrosion resistance, low density and thermal insulation. Improvement of the flame retardancy and thermal stability of polymers is a major challenge for extending their use for most applications. The higher level of flame retardancy of nanoparticles is due to their bigger surface to volume fractions which let them disperse into the polymeric matrix homogeneously, and hence leads to formation of a compact char during the combustion (Grigsby *et al.* 2005; Wang *et al.* 2007; Kuljanin *et al.* 2006).

Poly(methyl methacrylate) (PMMA) isa highly flammable polymer, improving its thermal stability is very important. There are several fire retardants available in the market. Although they improve the fire resistance of PMMA, they have a lot of disadvantages. Many additives are effective only at high loadings, generally from 10 wt% to 40 wt%, which changes the physical properties of the polymer. Most flame retardants additivesare halogenated compounds (Bundersek et al. 2012a). On the other hand, metaloxides are halogen-free products, which can also be used for improving thermal stability and fire properties of PMMA. Aluminum hydroxide (Al(OH)3) and magnesium hydroxide (Mg(OH)2) are environmentally benign, butneed to be added in high concentrations to be effective (Beyer, 2002). Transparency of PMMA in the visible region is reason that PMMA is an important thermoplastic for numerous uses (Beyer, 2005; Beyer, 2002; Chiang et al. 2009; Bundersek et al. 2012b).

Inorganic compound magnesium hydroxide [Mg(OH) 2] as a smoking- and toxic-free additive has been exten-

sively used in halogen-free flame-retardant polymeric materials. However, its fatal disadvantages are low flame-retardant efficiency and thus very large usage amount, which lead the mechanical properties of a flame-retardant polymeric material to drop down sharply. The surface modification of magnesium hydroxide in order to increase the compatibility between Mg(OH)2 particles and polymers can enhance the mechanical strength of composites (Wang *et al.* 2001).

Finally, to improve the properties of composites made of PMMA, some changes in proposed structures are necessary. Therefore, in this study, Nano-magnesium hydroxide and aluminum hydroxide nanoparticles as mineral retardant fillers are synthesized and identified by XRD and SEM. Then, composites of PMMA with different ratios of Mg (OH) 2 were built DSC-TGA and LOI test were carried out on them. At the end, composites composed of PMMA with different ratios of Mg(OH)2 and Al(OH)3 were made and the same tests with the previous composites were done on them and thermal behavior of composites containing aluminum hydroxide were compared.

# MATERIALS AND METHODS

All materials and solvents used in the synthesis of Nano magnesium hydroxide and Nano aluminum hydroxide were purchased from Sigma Aldrich and Merck and used without any further purification. the melting points (°C) of the complexes were recorded on a Kruss instrument and TG/DSC curves were obtained from a Diamond TGA PerkinElmer 60 Hz. Poly methyl methacrylate (PMMA) was obtained from I Tech polymer company Iran with melt mass flow rate (MFR) of 0.9 - 27 g/10 min at 125°C and density 1.15 - 1.19 g/cm3.. Infrared spectra were recorded as KBr disks on Tensor 27 Bruker spectrophotometer. The evaluation of Al(OH)3oxide and synthesized Nano composites were monitored by powder X-ray diffraction Philips PW 1800 diffractometer with Cu Ka radiation. Atomic force microscopy was carried out on a Denmark Dual scope/Raster scope C26, DME microscope. Scanning electron microscopy measurements was performed on a VEGA\\TESCAN at an accelerating voltage of 15 kV. The LOI values were measured using a ZRY type instrument (made in China) on the sheets of  $120 \cdot 60$ ·3 mm3 according to ASTM D2863-77 standard.

#### 2.1 Synthesis of Nano magnesium hydroxide

To prepare magnesium hydroxide nanoparticles, first 5 g (MgS04.7H20) was solved in 40 ml of deionized water and 5 ml of sodium hydroxide was added to it. Then, the obtained solution was stirred with 1600 rpm for 1 hour

in 60 °C. The obtained solution was passed from Nano filter paper by Buchner funnel and then was rinsed with deionized water in order to completely rinse the Ammonia. The remaining sediment was put in an oven with 105 °C for 8 hours and finally magnesium hydroxide nanoparticles will be synthesized.

## 2.2 Synthesis of Nanoaluminum hydroxide

1g Al(NO3)2 9H20 were dissolved 33 ml of water. Then various precipitation agents ethylenediamine, propylene diamine, triethylenetetramine, tetraethylenepentamine were added until the pH of the solution adjust to 8. A white precipitate is obtained confirming the synthesis of Al(OH)3. The white precipitate was centrifuged and washed with distilled water to removing the surfactant, and later dried at 70°C for 24h in a vacuum dryer.

## Preparation of PMs composites

In this study, 4 samples with different percent of magnesium hydroxide and PMMA were prepared to study thermal properties that were named as follows:

To prepare the composite samples, a two-armed mixer device was used and its temperature and speed were adjusted respectively as 110°C and 60 rpm and then 10 minutes was considered for the formation of composites.

## 2.4 Preparation of PMAs composites

To study the effect of aluminum hydroxide nanoparticles in retardaning PMs composite samples, 4 samples of PMAs composite were prepared with different percent of aluminum hydroxide, magnesium hydroxide and PMMA and then were named as follows:

To prepare the composite samples, a two-armed mixer device was used and its temperature and speed were adjusted respectively as 110°C and 50 rpm and then 15 minutes was considered for the formation of composites.

Table 1. The properties of PMs composite samples		
Compounds	Composite	
PMMA 90% - Mg(OH)210%	PM-10	
PMMA80% - Mg(OH)220%	PM-20	
PMMA70% - Mg(OH)230%	PM-30	
PMMA60% - Mg(OH)240%	PM-40	

Table 2. The properties of the produced compositesamples		
Compounds	Composite	
PMMA90% - Mg(OH)25%-Al(OH)35%	PMA-10	
PMMA80% - Mg(OH)210%-Al(OH)310%	PMA-20	
PMMA70%- Mg(OH)215%-Al(OH)315%	PMA-30	
PMMA60% - Mg(OH)220%-Al(OH)320%	PMA-40	

## Thermal gravimetric

The tests related to differential thermal analysis were performed by TGA device under ASTM-E1131 standard. Thermal analysis, changes in the sample weight (losing the weight of the sample that is controlled under a heating program) is considered as the basis of Thermogravimetry analysis (TG) and test conditions are similar for all produced composites and the temperature increases to 10 centigrade per minute and the temperature range from ambient conditions is to 600 °C.

# Characterization of Mg(OH)2 Nanoparticlesand of AI(OH)3Nanoparticles

The typical powder XRD pattern of Mg(OH)2 nanoparticlesis given in Fig. 1. All diffraction peaks canbe indexed as the hexagonal structure of Mg(OH)2 with the lattice constants comparable to the values of JCPDS7-239. No XRD peaks arising from impurities such as NaCl and MgO were detected. Moreover, the peaks of the samples are significantly broadened. This indicates that the Mg(OH)2 particles have a very small grain size, which can be calculated from the broadened XRD peaks by means of Scherrer formula (Staudenmaier, 1898).

XRD pattern of Al(OH)3 nanoparticles is shown in Fig. 2. The pattern of as prepared Al(OH)3 nanoparticles is indexed as a pure monoclinic phase (space group:P21/n) which is very close to the literature values (JCPDS No. 33-0018), the narrow sharp peaks indicate that Al(OH)3 nanoparticles are well crystallized.

The crystallite size measurements were also carried out using the Scherrer equation,  $Dc = K\lambda/\beta Cos\theta$ , Where b is the width of the observed diffraction peak at its half maximum intensity (FWHM), K is the so-called shape factor, which usually takes a value of about 0.9, and  $\lambda$  is the X-ray wavelength (CuK $\alpha$  radiation, equals to 0.154 nm). The estimated crystallite size is about 8 nm.





Scanning electron microscopic analysis (SEM) on magnesium hydroxide nanoparticles was shown in figure 3.and Scanning electron microscopic analysis (SEM) on aluminum hydroxide nanoparticles was shown in figure 4. As is clear, the magnesium hydroxide nanoparticles like aluminum hydroxide nanoparticles have a good and uniform distribution.

### Thermal analysis

The results of the thermal behavior of composites PMs in Table 4 and the results of the thermal behavior of PMAs composites are shown in Table 5. Degradation began in PMs series of composite with increasing Mg(OH)2 nanoparticles in three samples are almost identical an at the final sample due to changes in the physical structure of PMMA it was decreased. The peak temperature of degradation and thermal resistance of composites in



FIGURE 4. Effect of vemicompost and azotobacter on kernel weight



FIGURE 3. Effect of vemicompost and azotobacter on kernel weight

Table 4, increases from top to bottom that shows the effect of Nano-Mg(OH)2 nanoparticles in burning behavior of composites this series. In Table 5, thermal behavior of composites of PMAs series is provided and the difference over PMs series is the nanoparticles of Al(OH)3 in produced composites structure. It is well shown that the temperature composites. Degradation temperature in PMAs series is not much different from PMs composite series but peak temperature of degradation in PMAs composite series improved by average of 7 ° C in PMs series.

#### Analysis of the residual mass of the composite material

The results of the composite residual mass after thermal analysis is provided in Table 6 for composites of PMs Series and in Table 7 it is provided for composites of PMAs. It is well shown that by increasing the amount of retardant in the composite structure, a smaller percentage of them disappears. By comparing Tables 6 and 7 it clear that apart from PMA-20 composite that its percentage of residual mass compared to composite of PM-20 is significantly improved, the percentage of residual mass of other composites in Tables 6 and 7 are almost the same in comparison.

#### Limited Oxygen Index (LOI) analysis

LOI test results of PMs composites and PMAs composites series are respectively shown in Figure 5 in Figure 6. It is well shown that by increasing the percentage of Mg(OH)2, the amount of oxygen required for combustion of samples has increasing trend. LOI of pure PMMA sample was 17 % and with an increase of Mg(OH)2 in PMMA it had a rising trend so that LOI of PM-40 that 40% of composite products is Mg(OH)2 is 30. In the case of Figure 6, the same trend is visible and LOI of PAM-

Table 3. Thermal behavior of PMs composites Series			
End Temperature of demolition °C	Peak Temperature of demolition °C	First Temperature of demolition °C	Sample
425	301	199	PM-10
430	300	198	PM-20
442	330	200	PM-30
490	420	190	PM-40

Table 4. Thermal behavior of PMAs composites Series			
End Temperature of demolition °C	Peak Temperature of demolition °C	First Temperature of demolition °C	Sample
430	298	200	PMA-10
436	301	200	PMA-20
450	331	220	PMA-30
495	410	188	PMA-40

Table 5. Amount of residual massafter the thermal Analysis in PMscomposites Series	
The Remaining Percentage	Sample
3.22	PM-10
8.70	PM-20
24.67	PM-30
49.33	PM-40

Table 6. Amount ofafter the thermal APMAs composites	of residual mass Analysis in Series
The Remaining Percentage	Sample
4.38	PMA-10
21.05	PMA-20
26.56	PMA-30
49.19	PMA-40



on kernel weight

40 composite is 31.5 that 20% of produced sample is Mg(OH)2 and 20% is Al(OH)3.

By comparing Figures 5 and 6, the close test results of LOI between PMAs and PMs series composites is realized and it is clear that except PMA-20composite, which had about 22.5 % favorable performance than PM-20 composites, other sample results are almost the same.

# **RESULTS AND DISCUSSION**

Given the importance and high consumption of poly methyl methacrylate (PMMA) in different industries including construction, automotive, electronics, etc. in this project we tried to improved thermal resistance of PMMA using magnesium hydroxide and aluminum hydroxide nanoparticles as additives. Although the addition of fillers weakens the mechanical and physical properties and behavior of the polymer. According to



FIGURE 6. Effect of vemicompost and azotobacter on kernel weight

the results, resistance of composite made from magnesium hydroxide particles against fire increased and melt rate increased as well. Increase in the amount of magnesium hydroxide in composite improved the residual mass of composite. The LOI test results show that composite had achieved a good resistance against fire and smoke of process of burning is reduced. By comparing the degradation temperature magnesium hydroxide and aluminum hydroxide nanoparticles it can be concluded that the degradation temperature was between 180° C -200 ° C and given the degradation reaction reduced the flammability of polymer and produced Al2O3 provides a thermal insulation coating and the resulting water vapor diluted the flammable gases and provided a thin protective gas layer. However, due to lower degradation point compared to magnesium hydroxide, when it was used in PMAs composites it decreased the peak degradation temperature of the composite compared to degradation temperature of PMs series. It is because of Magnesium hydroxide nanoparticles degradation temperature, which is about 350° C. The residual mass percentage of composite and LOI test results indicated an improvement in polymer properties of PMAs series.

Generally, by comparison of eight composites, average degradation temperature is more favorable in PMAs series and according to initial thermal resistance against the destruction of the best examples of PAM-30 is made of composite.

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# Investigation of photocatalytic degradation of diazinon using titanium dioxide (TiO2) nanoparticles doped with iron in the presence of ultraviolet rays from the aqueous solution

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# ABSTRACT

Diazinon is one of organophosphate pesticides which it is classified as a relatively dangerous substance (Class II by World Health Organization). The aim of this study was to determine the efficiency of photocatalytic degradation of diazinon using titanium dioxide (TiO2) nanoparticles doped with iron in the presence of ultraviolet light in aqueous solution. This cross-sectional study was conducted at the laboratory scale in a 2 L reactor. The nanoparticles were synthesized by sol-gel method. The degradation of diazinon was evaluated in various amounts of pH, time, nanoparticles dosage, and the concentration of diazinon. The obtained results were analyzed using Excel2007 and SPSS V.16 software and regression test. The results showed that the increasing pH, reducing the concentration of diazinon and increasing contact time can lead to increase the removal efficiency. The optimum pH was obtained to be in neutral range and at the pH=7. In addition, the optimum amount for contact time, nanoparticle dosage and diazinon concentration was found to be 60 min, 100mg/L and 50mg/L, respectively. The maximum removal efficiency was 98.58%. Photocatalytic processes have high capacity in removing of diazinon and can effectively mineralized this compound. Furthermore, the TiO2 nanoparticles are not toxic and they can be used to remove the pollutants in various industries. Thus, doped nanoparticles due to the small amount of nano-materials, low energy consumption and high efficiency can be used as a good alternative to the removal of diazinon.

**KEY WORDS:** DIAZINON, PHOTOCATALYTIC DEGRADATION, DOPING, TIO2

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# INTRODUCTION

A variety of methods such as degradation by ultrasonic waves (Mahmoodi *et al.* 2007), biodegradation (Daneshvar, 2007), optical degradation (Čolovič*et al.* 2011), ozonation (Wu, 2009; Yuk Sing and Chongyu, 2007), degradation by gamma rays (Yuk Sing and Chongyu, 2007), Fenton (Wang and Lemley, 2002), treatment with UV / H2O2 (APHA and WEF, 2005) and photocatalytic degradation (Li *et al.* 2002, Kansal *et al.* 2007) have been used to remove the diazinon.

The problems of these methods are including process complexity, high cost and high consumption of chemicals. However, the nano photocatalytic method has rarely applied. In general, common physical techniques such as flocculation, aeration, adsorption on activated carbon and reverse osmosis may effectively remove the contaminants; however, these methods are not able to destroy the pollutants and contaminants from water and they only can transfer these pollutants to another phase and this is led to the formation of a secondary environmental pollution which it is casused to require retreatment and increase total cost. Photocatalyst is an advanced oxidation technology with bright future and it has been utilized in Usa, Europe and Japan in order to purify the water of pollutants (Ugurlu and Karaoglu, 2009). Advanced oxidation processes produce a strong oxidizing agent (hydroxyl radicals) that they destroy the pollutants in wastewater completely (Mesgari et al. 2012).

One of the chief wastewater treatment process technologies is the photocatalysts and semiconductor that have been shown to be potentially useful for the treatment of wastewater contaminants (Liu et al. 2005; Mekprasart, 2011). Among the various semiconductor materials (oxides, sulfides), TiO2 has gained more popularity and attention due to high Photocatalytic activity, chemical stability, resistant against optical corrosion, economic acceptability, cost-effectiveness and lack of toxicity (Zhou et al. 2006; Sun et al. 2009). Although the efficiency of TiO2 with relatively high energy band gap (3.2eV) has limited, but various methods such as increasing surface to volume ratio, connecting TiO2 to other semiconductor particles, splashing of various types of TiO2 into the zeolite pores and doping the metal and non-metal ions with TiO2 have been developed to increase the photocatalysis activity of TiO2 particles (Zhu et al. 2006). The conductive ion metals can lead to the formation of doped energy level between the conduction and valence bands of TiO2 which it has identified as an effective way for increasing of the Photocatalytic activity of TiO2. Moreover, the doped ions may be act as electrons or holes traps and they boost the catalytic activity of TiO2 (Liu and Chen, 2009). Previous studies

have clarified that the transition metal ions, e.g Fe+3 can be utilized to increase the Photocatalytic activity (Rezaei kalanteri *et al.* 2014; Fadaei and Sadeghi, 2013).

Metal ions Fe+3 can be easily accommodated among TiO2 network due to half-filled electron configurations and with an ionic radius close to the ionic radius of Ti+4 (Sorouri Zanjani *et al.* 2009) and it is caused to increase the photocatalytic activity in the visible light region. In addition, Fe+3 ions can create a surface trap on TiO2 network for electrons and holes arising from radiation, thereby it can increase Kvantayy efficiency and photocatalytic activity by reducing the recombination of generated electrons and holes. Thus, Fe+3 ions are considered as a striking doping factor (Rezaei kalanteri *et al.* 2014, Samadi *et al.* 2010).

For many years, the mankind uses the various types of chemicals to eliminate the pets. This material has brought severe and irreparable damage to nature, environmental health, balance and stability of ecosystems and living creatures (Balschmiter et al. 1983). A part of pollutants such as organic material are often degraded through the biological processes but other materials such as pesticides are resistant against degradation and remain in the aquatic environment for a long time (EsmailiSari, 2001). Organophosphates, as a group of pesticides, were replaced with organochlorine a few decades ago due to their lesser resistant and stability (Girón-Pérez et al. 2007). These poisons are capable to create serious effect on non-target animals such as invertebrates, mammals, birds and fish due to widespread distribution in the aquatic environment (Vandergeest et al. 1997; Castano et al. 1986). The exposure of fishes with fatal doses of diazinon is caused to anemia (Anees et al. 1978), reduction of DNA, RNA and protein in the liver (Ansari, 1988), effect on the nervous system, the anomaly in the gills, increasing the amount of macrophages and the effect on the reproductive behavior (Dutta and Maxwell, 2003). Diazinon is partially soluble in water (40 mg/L at 25°C); non-polar and resistant against degradation in soil (APHA and WEF, 2005) which its characteristics are given in Table 1. Unlike to chlorinated pesticides, they have not accumulative nature in the body and are faster degraded in the environment (Shemer and Linden, 2006).

Diazinon is one of the Organophosphate insecticides which are classified as relatively dangerous materials (Class II by the World Health Organization). It makes toxicity for aquatic organisms at a concentration of 350 ng/l (Li *et al.* 2002), and its LC50 for fish is 4.4 ppm (Zhang and Pehkonen, 1999). More than 13 million pounds of diazinon are annually used in the United States (10). Thus, the releasing of this compound into the groundwater is one of the major concerns. The toxic effect of Diazinon, like other organic phosphorus pesticides, is to stop the acetylcholinesterase (Li *et al.* 2002, Zhang and Pehkonen, 1999). It was also reported that diazinon has a negative effect on the immune system (Immunotoxic), cells (Cytotoxic) and genes (Genotoxic) (Mahmoodi *et al.* 2007).

Since the diazinon is the most widely use and dangerous pesticides for the environment, especially aquatic organisms, thus, the aim of this study was to determine the efficiency of photocatalytic degradation of diazinon using titanium dioxide nanoparticles doped with iron in the presence of ultraviolet light is the aqueous medium.

The most conducted studies in Iran have revealed that the concentration of diazinon in the water is more than standard levels. Shaeghi *et al* has found that the diazinon concentration in Gharehsou and Gorgan rivers in Golestan province was 22.4ppm and 6.74ppm, respectively which it was higher than the standard levels (Daneshvar, 2007). Khazaeii and colleagues has also observed that the concentration of diazinon in a number of water samples was higher than standard levels (Wu, 2009).

# MATERIALS AND METHODS

In this study, a reactor made of Pyrex with the overall volume of 2.7 liters was used. The diameter and height of this reactor was 14 cm and 18 cm, respectively. A medium pressure Lamp UV (125 watt, length of 12 cm and a diameter of 1 cm and coating quartz with external diameter of 2.5cm, internal diameter of 2 cm and a length of 12.5 cm) has been installed in the middle of the reactor lid made of multilayer aluminum foil. There was another hole on the reactor lid which it was for sampling and it was covered during the process. The maximum wavelength emitted by the UV lamps was 247.3 nm and in UV-C range. The reactor was covered by aluminum foil to protect against the radiation. Mixing in the reactor was carried out using a magnetic stirrer and magnet. Free height of 5.5 cm inside the reactor was intended to move the magnet. Samples with different concentrations of diazinon, which was prepared by diluting the diazinon 60 percent, were entered into the reactor and the samples were taken under different conditions and at different times.

The detection of diazinon level was performed by reverse phase method of high performance liquid chromatography (HPLC). Chromatographic conditions were as following: mobile phase of methanol + water was applied at a ratio of 70:30 and C18 was used as the columns. The determination of dizazinon level was performed with a UV detector at 220 nm. Diazinon was prepared from Sigma-Aldrich CO, USA. A hanger radiometer instrument (ECL-X model) which it was to measure the intensity of light in UV-C range was utilized to determine the intensity of the lamp UV125 watt medium pressure used in reactors radiation. Intensity of lamps were measured and controlled in half the diameter of the reactor (about 7 cm) at different times.

The formula for calculating the radiation intensity:

D=L ×T T: time (s) L: radiation intensity (mw/s/cm2)

The diazinon removal percentage is calculated by following equation:

degradation (%) = 
$$100 \times (\frac{C_0 - C}{C_0})$$

Where CO and C are the initial and final concentration of Diazinon, respectively.

#### Test method and statistical analysis

Samples were taken in different states from the reactor and were centrifuged at 4000 rpm for 30 minutes and then were filtered with a 0.23µm filter to remove particles of TiO2. The DX8 and SPSS V.16 software and the ANOVA test were applied for design of experiments, drawing graphs and statistical analysis of results and LSD POST HOC was used to distinguish between different modes. Also, DX8 software was used to determine the optimal mode and model.

#### Nanoparticle characterization

Fig 2& depict the SEM images and diameter distribution of TiO2 nanoparticles before doping with Fe, respectively. The diameter measurement of nanoparticles was performed with the Measurement software and their average diameter was determined and it is approved that they are nanoparaticles. In this case, the average diameter of the nanoparticles was determined to be 42.4 nm.



FIGURE 1. Schematic of reactor used in the process (1) Trans of lamp 150 watt, (2) glass reactor, (3) cooling water, (4) Magnet (5) magnetic stirrer (6) reactor doors, (7) UV lamp 150 watt medium pressure (8) covering quartz, (9) pump, (10) the water tank (11) pipes for water.



The X-ray diffraction pattern (XRD) for doped TiO2 nanoparticles with Fe is represented in Fig 6. The observed peaks (maximum peak at 250) in XRD pattern indicates that TiO2 doped with Fe has Anatase structure.

Strong peaks at 27, 36 and 55 degrees are indicative of TiO2 in the rutile phase. On the other hand strong peaks at 25 and 48 degrees is represented TiO2 is in anatase. The Fig 6 shows that highest amounts are related to anatase phase while rutile phase exists with anatase phase, heterogeneously. Titanium dioxide can be observed in 3 forms including Anatase, Rutile and Brucite which anatase and rutile have light catalytic activity. The Anatase shows more light activity than Rutile; thus, it is more applicable.



In addition, Fig 48t5 are related to the SEM images and diameter distribution of the doped TiO2 nanoparticles with Fe, respectively. The average diameter of nanoparticle was obtained to be 37.89 nm. The comparison of the Fig 2 and Fig 4 show that the doped nanoparticle structure is smaller while it was bulky before doping. Furthermore, it was clarified that the average size of doped nanoparticles (Fig5) is smaller than un-doped nanoparticles (Fig 3). To obtain the optimum pH, the experiments were conducted in different pH (3, 5, 7, 9, 11) while other parameters including time, Diazinon concentration and nanoparticle dose were kept constant. The results are presented in fig 7. The results clarify that the maximum removal efficiency was achieved to be 97.52% at pH=7 and therefore, this pH was considered as optimum pH for next experiments. It is also observed that the removal efficiency was decreased at the pH<5 and pH>9.







To determine the optimum time, the studied parameter were kept constant except the time. It was varied from 5 to 90 min. it was observed that best removal efficiencies was obtained in 60, 75 and 90 min. the removal efficiency percentage in 60, 70 and 90 min was obtained to be 98.57%, 98.06% and 98.66%, respectively. In



this study, 60 min was selected as optimum time. The obtained results were presented in fig 8.

The optimum diazinon concentration was determined by keeping constant of the pH, time and nanoparticle dose and the varying of the diazinon concentration in range of 1-100 mg/L. The highest removal efficiency was related to diazinon concentration of 50 mg/L (97.52%) and 25mg/L (97. 40%). It is clear that the removal efficiency for 50 mg/L is slightly more than 25mg/L; thus the 50 mg/L was accepted as optimum diazinon concentration. The results of this section are shown in Fig 9.

The optimum dose of nanoparticle was determined by varying the nanoparticle doses between 50-300 mg/L and keeping constant of other parameters. The best results were observed in the dosage of 100 mg/l (97.52%), 150mg/L (98.16%) and 200 mg/L (98.58%). Since there is no significance difference in diazinon removal efficiency in mentioned concentrations; therefore, there the nanoparticle dosage of 100 mg/L were selected as optimum dose. The results are shown in fig 10.







# DISCUSSION AND CONCLUSION

In the present study, photocatalytic decomposition of diazinon using TiO2 nanoparticles doped with iron in the presence of ultraviolet rays from the aqueous medium was studied. In addition, the effect of different parameters including pH, dose of TiO2 nanoparticles doped with iron, reaction time and concentration of diazinon was discussed.

The results indicated that the increasing of pH, decreasing of the diazinon concentration and increasing of time is resulted in higher removal efficiencies.


Best pH for diazinon removal is obtained to be in neutral range and t pH of 7 which it is in accordance with Merabat study (2009); in his study, the photocatalytic decomposition of Indole was evaluated and the optimum ph was found to be in range of 6-7.

Daneshvar *et al* (2007) has investigated the photocatalytic decomposition of diazinon with UV-C/ZNO and the results indicated that the 80 min is required to remove 80% of diazinon; it shows that the results of present work is better than their results because the optimum time of present work is 60 min. furthermore, the results showed that the best dosage of nanoparticles to obtain the highest removal rate was 100 mg/L in addition, 50 mg/L of diazinon was selected as optimum concentration. Zhang *et al.* (2011) has neeb reported that TiO2 is effective on photocatalytic removal process that it is agreed with the results of present study. According to the results, the TiO2 dosage and contact time have positive role on diazinion removal efficiency.

Bazrafashan *et al* (2007) has found that higher electrical potential or contact time is needed to remove the higher concentration of diazinon. For any specified time, the removal efficiency has significantly increased by increasing the voltage. The highest Electrical potential (40 V) was led to fastest treatment with an over 99% of removal efficiency of diazinon after 60 minutes which it is consistent with present study. The removal efficiency was 97.52% after optimum time of 60 min.

Diazinon is one of widely used as well as most dangerous pesticides for environment and especially aquatic organisms. The photocatalytic processes have high capacity in removal and effective mineralization of diazinon. Besides, the TiO2 nanoparticles can effectively use to remove the toxic pollutants in various industries because they are not toxic; thus, the doped nanoparticle can be used as a suitable alternative to remove the diazinon due to small amounts of nano-materials, low energy consumption and high efficiency.

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# To evaluate the effectiveness of the laser diode on bleaching colors changed teeth under laboratory conditions

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# ABSTRACT

White teeth, are an important measure of beauty, and today, the use of laser tooth bleaching, is growing. The purpose of this study, is evaluating the effectiveness of laser diodes, on whitening teeth, discolored previously by tea, coffee, and pomegranate juice pigments. In this experimental study, 72 healthy bovine incisors were selected, were prepared, and were divided into three groups of 24 numbers. They were placed in a solution of tea, coffee and pomegranate juice, for two weeks. Each group was divided into two sub-groups of 12, following the first group; both groups were bleached by the bleaching gel 35%, and 940 nm diode laser. Laser was applied to each tooth, with four cycles of 30 seconds, and the power of 7 watts. The second groups were bleached by 35% gel, for 16 minutes as controls. Next, the teeth were stained measured by spectrophotometry. Data were entered into the software SPSS version 20, and were analyzed using descriptive statistics, analysis and t-test, and ANOVA, with a significance level (p<0.05). After placement of tooth colored materials (coffee, tea and pomegranate juice), three groups of pigments, creating significant color change (0.000 P-value = in each group), the component (l, a, b). Most discoloration was created in coffee, and any change in the color of pomegranate juice. Effectiveness of whitening discolored teeth, with and without laser diodes, showed no significant statistical difference (P-values  $\geq 0.05$ ). In treatment groups, with and without laser, the highest effectiveness of bleaching (13.90 =  $\Delta E$  with laser),  $(11.31 = \Delta E$  without laser) in the group tea, and least effective bleaching (6.51 =  $\Delta E$  with laser), (5.85 =  $\Delta E$  without laser) was obtained in the group pomegranate juice. Regardless of the type of tooth discoloration, this study suggests that there is a relationship between type of discoloration of enamel, and efficacy of treatment of bleaching. 940 nm laser diodes did not increase the effectiveness of catalytic bleaching.

**KEY WORDS:** BLEACHING, TEETH WHITENING, LASER DIODES

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#### INTRODUCTION

Need to bleaching, in the population is growing. Contemporary bleaching systems are primarily based on hydrogen peroxide, or one of its derivatives, which are often established with liquid peroxide which is used in different concentrations (Lagori *et al.* 2014). Bleaching is defined as a way to lighten the color of teeth using organic oxidizing agents of pigment. Increased release of hydroxyl radicals from hydrogen peroxide, with increasing temperature is according to the following equation (Pare and Loganathan, 2012).

#### H2O2+211KJ/Mol $\rightarrow$ 2HO

Bleaching reactions, is dependent on the chemical and physical changes, during operation (concentration, temperature, light, pH, co-catalyst, and duration) (Tano *et al.* 2012).

Raising the temperature to C° 10 increases the hydrogen peroxide decomposition to x2.21. The use of light sources such as laser (Light Amplification by strengthening and emitting a radiation) light hybrid (HL), halogen, LED, plasma arc, and UV lamps are used to accelerate the release of free radicals.First used wavelengths, were argon laser (480 nm), and CO2 (10600 nm), but today laser Diode (810 and 980 nm), and potassium phosphate Titanil KTP (532 nm) are proposed too. Laser diodes are used as well as pulsed or continuous, and have the wavelengths of 830, 810 and 980 nm. Diode laser has less absorption of water and minerals of the teeth; they are absorbed in pigments and have a lot of depth, in hard tissue of teeth. Clearly, the best laser parameters, such as power, wavelength, frequency, and duration of use in dental treatment, totally depends on, different color themes, tooth type, and change its color depends on the skill and experience of the dentist , which should be considered in reviews, as a key element (Nokhbe alfogahaei et al. 2012). Different types of lasers, they create different effects, depending on the wavelength used, and the type of material that causes discoloration, and each wave laser, the whitening effect on a certain type of dye. In fact, a particular type of bleaching gel, when coupled with different lasers and different color elements, creates dissimilar results (different) (Torres et al. 2011).

#### MATERIAL AND METHODS

After preparing freshly extracted teeth of cattle, and washed with water and physiological solution, to split between their teeth. Selected teeth healthy, and was free of any cracks, decay and enamel defects. Root, cut from the junction of the cement enamel, diamond bur, and the pulp was removed. The teeth were kept for a week for decontamination in 0.5% thymol solution. Teeth brushing of the orifice were closed, light-cured composite. The teeth were randomly numbered from 1 to 72, and numbers were recorded in each tooth lingual, by fine milling. Then color parameters were measured in pigments, by a spectrophotometer (spectrophotometer KONIKA MINOLTA Model CS-2000\_ Japan) before wrapping teeth (BS).The teeth have been prepared before measuring the color. In this case, the first four points were prepared in Bacall level, just a quadrilateral the dimensions of 5 x 5 mm, and at every step, measuring the color of a part that was fixed between points, done. This is done by milling the fine of turbines. And then, a specific form for each tooth must be prepared, with the proviso that, all templates are the same.

It should be noted that, at any time by spectrophotometer colorimetric, to enhance the accuracy of the study is to determine the color of teeth in each series, three consecutive colors was determined, and the average results achieved in statistical surveys and The evaluation results was done. To stain teeth, 3 different types of dye, tea, coffee, and pomegranate juice were used. Instant tea Tea bags intensity using a number (Golestan-Iran), in 250 ml of boiling water, the tea out of the water, so cooler full of boiling water. 10 grams of soluble coffee using coffee powder (Nestle - Switzerland), which is normally used for consumption, mixed in 250 ml of boiling water, then it was filtered, and

Pomegranate juice, pomegranate seeds by mixing 50 grams in 250 ml of distile water, grains, were crushed well in it, and then filtered solution was obtained (Lagori *et al.* 2014). The teeth were immersed in the solution, so that the numbers 1 to 24 in a mixture of tea, coffee 25 to 48, and 49 to 72 in pomegranate juice, were stored for two weeks at 37 ° C (incubator ), and mixed daily. After two weeks, the teeth out of solution and were washed with brushes. Then, they were placed in physiological solution, and again were measured by spectrophotometric color of the teeth (AS).

Bleach the teeth were prepared for the case that the first half of the teeth of each group were white using a laser, and the second half without a laser. In the examples, along with laser bleaching: teeth were dried, and a drop of 35% carbamide peroxide gels Pola office (SDI Australia) were placed on each, and was broadcast by micro-brush, as a uniform layer. Remained gel on the teeth for about 8 minutes, and during this time, it was under the influence of diode laser radiation (laser diode Biolase, model Epic10 940 nm wavelength, and the 7 watt United States), for each tooth, two 30-second cycle with a rest period of one minute (power 7 w). After 8 minutes, the teeth were rinsed with water. And the process was repeated. In total, on each of these examples, the bleaching gel and laser for 2 minutes and 16 minutes were used according to manufacturer's recommendations. In the examples, without using a laser bleaching was: were dried teeth, and bleaching gel was placed on each drop, and it was broadcast by Mykrvbrash, as a uniform layer. Remained gel on the teeth for about 8 minutes. The teeth were washed with water, and the process was repeated. And finally, the re-evaluation was carried out by a spectrophotometer color. Evaluation of color changes, ( $\Delta E$ ) were calculated and obtained by the formula  $\Delta E = (\Delta L2 + \Delta a2 + \Delta b2) 1/2$ .

### RESULTS

To study findings, the color component data were collected, and then entered in SPSS version 20, and then, the analysis was performed assumptions.

Color parameters L, a, b, after exposing the pigment of tea, coffee, and juice, have changed significantly. (P-value = 0) (Table 1, 2, 3) Color parameters L, a, b, changed significantly after the placement of the brown pigment. Color parameters L, a, b, changed significantly after exposure to Pigment pomegranate juice.

After placement of teeth in color,  $\Delta E$  increased significantly, so that the greatest change was observed in the group coffee, and any change colors in the group

Table 1. compares the color components before and after exposure to tea						
Color component mean Standard deviation P-value						
86.20 76.80	1.749 7.066	* 0.0				
0.5036 4.573	0.6422 3.304	* 0.0				
15.92 21.21	2.219 4.019	* 0.0				
	he color c a mean 86.20 76.80 0.5036 4.573 15.92 21.21	Best color components bea         mean       Standard deviation         86.20       1.749         76.80       7.066         0.5036       0.6422         4.573       3.304         15.92       2.219         21.21       4.019				

\* Is significant (P-value ≤0.05).

Color parameters L, a, b, tea pigment after exposure, have changed significantly.

Table 2. compares the color components before and after exposure to coffee						
Color component mean Standard deviation P-value						
L before color	87.98	2.006	* 0.0			
L after color	75.08	6.046				
a before color	0.5480	0.5403	* 0.0			
a after color	4.332	1.695				
b before color	13.96	2.370	* 0.0			
b after color	19.56	2.914				

Is significant (P-value ≤0.05)

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Color parameters L, a, b, after exposing the brown pigment, have changed significantly.

Table 3. compared the relationship between color, before and after exposure pomegranate juice

Color component	Mean	Standard deviation	P-value	
L before color	86.90	2.278	* 0.0	
L after color	80.42	4.186		
a before color	0.5453	0.6840	* 0.0	
a after color	3.187	1.129		
b before color	15.65	2.047	* 0.0	
b after color	18.03	2.498		
* Is significant (P-value ≤0.05) Color parameters L, a, b, after the placement of the pigment pomegranate juice, have changed significantly.				

Table 4. Compare, $\Delta E$ before and after bleaching the teeth, between the control group and laser Tea				
Group	P-value			
$\Delta E$ control	11.31	6.507		
ΔE Laser 13.90 3.687 * 0.243				
* Is not significant (P-value ≤0.05) There was no significant difference in ΔE of teeth discolored by tea, between control and laser, (although ΔE in white with lasers, be higher).				

Table 5. compared $\Delta E$ , before and after bleaching the teeth, between the control group and lasers, in coffee					
Group	P-value				
$\Delta E$ control	10.53	4.102	* 0 000		
ΔE Laser 13.80 5.136					
* Is not significant (P-value ≤0.05)					
There was no significant difference in $\Delta E$ of					
discolored teeth, by coffee, between control and laser					

(although  $\Delta E$  in white with the laser above).

Table 6. compares the $\Delta E$ before and after
bleaching the teeth, between the control
group and laser pomegranate juice

Group	Mean	Standard deviation	P-value	
$\Delta E$ control	5.851	4.486		
ΔE Laser	6.510	2.887	" 0.673	

\* Is not significant (P-value ≤0.05)

There was no significant difference in  $\Delta E$  of discolored teeth, by the PJ, between control and laser (although  $\Delta E$ , in the White Group with lasers, be higher).

Table 7. Comparison with laser teeth whitening effectiveness among the three color groups Mean P-value Group Difference tea Coffee 0.108 0.998 7.39 \*0.003 Pomegranate juice coffee 0.108 0.998 tea Pomegranate juice 7.29 \*0.004 Pomegranate 7.39 \*0.003 tea juice coffee 7.29 \* 0.004 \*Is significant (P-value ≤0.05)

pomegranate juice. Also it was observed statistically significant differences in  $\Delta E$  of teeth discolored by tea, the control group, and laser (p-value <0.05) (although  $\Delta E$  in white with the laser above). (Table 4). It was observed statistically significant differences in  $\Delta E$  of discolored teeth, by coffee, between control and laser (p-value <0.05), (although  $\Delta E$  in the White Group by laser, was higher). (Table 5) There was no significant statistical difference in  $\Delta E$  of discolored teeth, by Pomegranate between the control group and lasers. (P-value <0.05) (Although  $\Delta E$  in white with lasers, be higher). (Table 6)

In the group, was done with laser bleaching,  $\Delta E$  between the three groups, discolored by tea, coffee, and juice will be significantly different. (Table 7); the lowest was in part due to discolored teeth with pomegranate juice, and the most effective, was on teeth discolored by tea, as it will, the difference was pomegranate juice with both pigment of tea and coffee meaningful, and the difference between tea and coffee, was not statistically significant.In the group, was done without laser teeth whitening,  $\Delta E$  discolored between the three groups, with tea, coffee, and juice, was significantly different (highest color change was observed in the group tea, and any change colors, in the group pomegranate juice). (Table 8)

Table 8. Comparison of bleaching teeth, no laser, the three groups color				
gro	oup	Mean Difference	P value	
	Coffee	0.783	0.887	
tea	Pomegranate	5.46	*0.007	
	juice			
	tea	0.783	0.887	
coffee	Pomegranate	4.68	*0.023	
	juice			
Pomegranate	tea	5.46	*0.007	
juice coffee		4.68	*0.023	
*Is significant (P-value ≤0.05)				

#### DISCUSSION

Photons can have a significant impact on the molecule. If a molecule can absorb a photon, it can be irritating or even split apart. The bleaching process, needs to disintegrate, or transform molecules, which cause tooth discoloration. This process can take place, resulting in absorption of photons by molecules, or indirectly, by raising the temperature of the gel and accelerate the production of free radicals, and activate redox chemical reactions, which leads from the disrupting dye molecules. In this process, many free radicals are produced from the decomposition of hydrogen peroxide, which is very active in breaking the double bonds. Hydroxyl radicals (OH) are the most powerful radicals. Many studies have shown that, by increasing the production of hydroxyl radicals, can achieve better results in tooth whiteners. As I was indicating, optical and laser sources, cause temperature rise of hydrogen peroxide, and accelerate the formation of free radicals. Every 10 ° C increase in temperature, accelerate the detachment of hydrogen peroxide bonds 2.2 times (Lagori et al. 2014).

On the other hand, we are faced with a multi-criteria decision, to choose an appropriate, the dental bleaching. Although the main objective is to achieve beauty in bleaching, but significant effects on the patients teeth are impossible to ignore. So, dentist in bleaching is always faced with an interaction between beauty and health, which are both important (Nokhbe alfoghahaei, 2012).

In the present study, bovine teeth were used for a variety of reasons. No caries, and a better overall situation, which is consistent with the study. Providing more convenient incisors cattle, towards humans, because humans produce healthy incisor, the high number of working problems. As well as physically for chemical similarity to human teeth (Schilke *et al.* 2000), and (showing similar behavior in the process of bleaching and staining, (Attia *et al.* 2009) Please refer to the source).

In the present study, the colored components, l, a, b after placing the samples in color, significantly changed. Most discoloration ( $\Delta E$ ), was in the group coffee, then tea, and any change in the color of pomegranate juice, the result is similar to the study Lagori G, the biggest change was the color of coffee (Lagori *et al.* 2014). Of course, the shelf life of the dye solution, in the two-week study, which is more than the Lagori G (a week).

In the present study, the use of 940 nm diode laser, it can whiten significantly improved results, with 35% hydrogen peroxide, was not in any of the groups compared to the control group.

This result was similar to the results of previous studies Marson FC), Auschill TM, Sulieman M and Polydorou) (Auschill et al. 2005; Sulieman et al. 2005; Marson et al. 2008; Polydorou et al. 2013). But the result was different with the results of clinical studies Zekonis R and his colleagues, who had applied bleaching agent, for a period of 60 minutes on the teeth (Zekonis et al. 2003). Also, it was different from the results Ozgul Baygin, the use of 980 nm diode laser with a power of 0.8 Watt and 1 Watt for 30 seconds, and Whiteness HP was used as bleaching agent, and concluded that, laser bleaching to increase effectiveness. But the study Baygin, the teeth were not dye the material, and the material was bleached and varying concentrations (38%) (Baygin, 2012). According to a study Wetter NU, the effectiveness of laser diode with a bleaching agent Whiteness HP better than Opalescence xtra. Also, 10 minutes had been used in the control group or without laser which in this study; it increased to 16 minutes, which can increase the effectiveness of laser bleaching in groups (Wetter, 2004).

The results Lagori G, was somewhat different with the study, so that the laser diode, only on teeth discolored by coffee was effective, because of this difference, it could be a different wavelength laser diode, in two studies, and use of different bleaching agents (Lagori *et al.* 2014). After bleaching, spectrophotometer, can detect very small differences between the color of the teeth before and after treatment. However, clinical outcomes are not detectable to the eye until the  $\Delta E$  not be higher than 3. In the present study, in groups with and without laser, in all pigments, after bleaching,  $\Delta E$  was higher than 3.

The results of this study, the effectiveness of laser bleaching, discolored between the three groups with tea, coffee, and juice, were significantly different. The efficacy was significantly observed in teeth, discolored with pomegranate juice (6.510 =  $\Delta E$ ). There was no statistically significant difference between the effectiveness of whitening teeth discolored by tea (13.90 =  $\Delta E$ ) and coffee (13.80 =  $\Delta E$ ). These results were different from the results Lagori G, which saw the lowest effective whitening laser diode, the Group of pigment coffee, and tea, and the most effective laser diode on the pigment of red fruits, the Department of red fruits of Lagori G, consisting of a combination of pigments strawberries, raspberries, and blueberries, which are not comparable with pomegranate juice in this study. Regardless of colored fruits, laser diode greatest effect was observed on tea pigment, which is similar to the current study (Lagori et al. 2014).

The results of this study, the effectiveness of bleaching without the use of lasers, the Group discolored by tea, was the highest, and it was lowest in the group pomegranate juice (statistically significant difference was observed between the groups of pomegranate juice with tea and coffee) the result is similar to the study Lagori G, the following groups of red fruits, the highest efficacy of bleaching was observed in the control group (without laser) in the pigment tea (Lagori *et al.* 2014).

Although pomegranate juice group showed minimal changes in pigment color during storage, after bleaching (with and without laser), which showed the lowest result in improved color. This result could be due to the acidity of pomegranate juice, as reported in previous studies, acidic drinks, causes loss of surface material, and created more rough enamel, which it makes, more stable materials color, and this change could reduce the effectiveness of bleaching the surface (De Araújo *et al.* 2013).

#### CONCLUSION

- 1. After making tooth-colored material (tea, coffee and juice), three groups of pigments, creating significant color change (0.0 p-value =, in each group). The greatest change in color was brown, and the lowest color change was observed in the group pomegranate juice.
- 2. In-all color groups (coffee, tea, and juice) the effectiveness of whitening teeth discolored, with and without laser diode showed no significant difference.
- 3. In both groups, with and without laser, the lowest efficacy of bleaching was observed in discolored teeth with pomegranate juice, and the most effective whitening, teeth discolored by tea.

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# Forging pre-form dies optimization using artificial neural networks and continuous genetic algorithm

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# ABSTRACT

In forging process of complex parts, the raw material cannot be transformed in one forging stage to the final shape; therefore, using one or several pre-form dies would be necessary. An optimal pre-form die should be capable of meeting several design criteria's. Among such design criteria's one can mention the defect-free parts manufacturing with minimum raw materials, minimum plastic strain, minimum force requirement for fulfilling the process as well as filling completely the final die. In this research, the Genetic Algorithm (GA) is used as a tool for Cartesian path generation. For this reason, at first, several different pre-form dies are produced using random mathematical functions. Then, using finite elements simulation, the optimal die selection criteria's are calculated. An artificial neural network (ANN) is learned by the data obtained from simulation so that it can predict the results of the simulation. The ANN and design criteria's are used as a target function for optimization using continuous GA. Finally, the best pre-form die geometry is calculated using the continuous GA. Also this method is used for H-shape parts to evaluate the method performance. The optimal pre-form die is recommended for the H-shape part and its forging results extracted by the continuous GA. Also, the finite element simulation performed for the optimal die and the obtained results compared to the predicted results of the ANN. The results showed that the obtained optimal model meets the predefined criteria's and this method can be used for optimization of pre-form dies successfully.

**KEY WORDS:** OPTIMAL PRE-FORM DIE, FINITE ELEMENT SIMULATION, ARTIFICIAL NEURAL NETWORKS, CONTINUOUS GENETIC ALGORITHM, FORGING PROCESS.

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Among manufacturing processes, forging process has a particular importance, since it helps to produce parts with excellent mechanical properties and minimum material wastes. In forging, the raw material has a relatively simple shape. This material is transformed like wax during one or more operations to a product with relatively complex composition. Forging usually needs the relatively expensive instruments. As a result, this process is attractive economically when the manufactured parts are in mass volume or when special mechanical properties are required for the final product. The material's increasing costs, energy and particularly the human force requires that the forging processes and instruments are designed with minimum trial and error and minimum possible time. Therefore, making use of computerized methods, i.e. CAE, CAM, CAD and particularly finite elements analysis-based computerized simulation is an absolute requirement (Altan et al. 2006).

For H-shaped parts, considering complexity parameter, if the section height-to-width ratio be high, the part shape would be complex and in order to produce it, the pre-form die is needed. So far, there have been used different methods for pre-form die designing but none of them is suitable for die optimal design.

Lanka et al. (1991) proposed a new method for designing the pre-form dies in plane strain forgings. In this method, the number of pre-form stages required for the forging is investigated. The design criteria's also were stress rate and strain rate. Grandhi et al. (1993) used design parameters control algorithm in forging process. The mentioned parameters include dies velocity for in-built strain rate control. They performed the analysis on solid and visco-plastic materials in finite elements model. Zhao et al. (1995) provided the pre-form die design using a node separation criterion in forging reverse simulation with finite elements model. In this method, the complexity factor which shows the process difficulty is used. Zhao et al. (1997) applied sensitivity analysis model with finite elements model for designing pre-form dies in accurate forging. Also, the applicability of this method in plane strain and axisymmetric forging was investigated. Using electrical field theory, Lee et al. (2002) proposed a method for manufacturing the axisymmetric parts' pre-form in which the shape complexity parameter is investigated. Then, using neural networks the optimal die was obtained.

Abri Nia *et al.* (2006) obtained the dimensions and coordinate of the part considering the contact time parameters for middle dies of the H-shaped parts using reverse transformation method-based algorithm as well as nonlinear finite elements model. Li *et al.* (2007) presented a novel intelligent optimization approach that integrates machine learning and optimization techniques. An intelligent gradient-based optimization scheme and an intelligent response surface methodology were proposed, respectively. Then optimization algorithms implemented more effectively to find optimal design results. An extrusion forging process and a U channel roll forming process are studied as application samples and the effectiveness of the proposed approach is verified.

Bonte *et al.* (2010) used Sequential Approximate Optimization (SAO) for optimizing forging processes. Three variants of the SAO algorithm which differ by their sequential improvement strategies have been investigated and compared to other optimization algorithms by application to two forging processes. The results showed that SAO provides a very efficient algorithm to optimize forging processes using time-consuming FEM simulations.

Khalili and Fonoudi (2010) investigated hot forging process of AISI-1025 using Deform3D software. They used an artificial neural network to predict forging force and strain based on the initial billet temperature, die velocity, die displacement and friction between billet and dies. The input data gathered using FEM simulations. The obtained results showed that friction and die displacement are the most effective parameters on the forging force respectively.

Hosseinzadeh et al. (2010) outlined the Taguchi optimization methodology, to optimize the effective parameters in forming cylindrical cups by the new die set of sheet hydroforming process. It was shown that the Taguchi method is suitable to examine the optimization process. Khalili et al. (2011) studied the optimum blank shape design for the deep drawing of Elliptical-shape cups with a uniform trimming allowance at the flange. In this research, a new method for optimum blank shape design using finite element analysis has been proposed. For this reason they applied Response Surface Methodology (RSM) with Reduced Basis Technique (RBT) to assist engineers in the blank optimization in sheet metal forming. The proposed method is found to be very effective in the deep drawing process and can be further applied to other stamping applications. Lu et al. (2011a) investigated three direct search algorithms, i.e. a modified simplex, random direction search and enhanced Powell's methods together with a new localized response surface method and applied to solve die shape optimization problems in metal forming processes. Their main motivation is to develop efficient and easy to implement optimization algorithms in metal forming simulations.

The optimization results from the three case problems show that direct search based methods especially the modified simplex and the localized response surface methods are computationally efficient and robust for net-shape forging and extrusion optimization problems. It is also suggested that these methods can be used in more complex forging problems where die shape design and optimization are essential for achieving net-shape accuracy.

Lu *et al.* (2011b) based on the evolutionary structural optimization (ESO) concept, developed a topological optimization method for preform design. In this method, a new criterion for element elimination and addition on the work piece boundary surfaces is proposed to optimize material distribution. Two 2D case problems including forging of an airfoil shape and forging of rail wheel are evaluated using the developed method. The results suggest that the developed topology optimization method is an efficient approach for preform design optimization.

Shamsi-Sarband *et al.* (2012) utilized finite element method and sensitivity analysis for optimizing a preform die shape in the superplastic forming (SPF) process. In their study, the effect of friction coefficient on the optimized preform die shape is investigated. They showed that friction coefficient has an important effect on the optimized preform die shape and thickness distribution.

Naeemi (2013) used the reverse transformation method for designing the pre-form die and ANN for predicting the forging process and finally, among 500 preform dies designed, the optimal die meeting the design criteria's is selected. Shamsi-Sarband et al. (2013) used a combination of sensitivity analysis and FEM to design a preform for a two-stage superplastic forming process. The results showed that the geometric parameters have a significant effect on the preform shape. By increasing the height and the cone angle of the final cup, the depth of the preform in the inner cavity decreases and the dome region is approached to the center of the preform cup. By increasing the corner radius of the finaldie, only the height of the dome region decreases. Shao et al. (2015) presented a recent work on preform design optimization in bulk metal forming process based on a topological approach. In the paper, to obtain a forging preform shape with reduced material consumption but enhanced uniform material deformation, a new element removal and addition criterion has been established with consideration of hydrostatic stress and strain components. They implemented their method to forging of a 3D aero engine blade. Considering the feasibility of producing a preform, different constraints are applied in the optimization process to affect the preform shape. The optimization results suggest that the developed topology optimization method is an efficient approach for 3D preform design and optimization.

In this research, the capability of continuous GA for Cartesian path generation is used as a tool for die shape optimization. At first, several different pre-form dies are produced by random mathematical functions. Assuming that the selected part is axisymmetric, one can simulate it as a 2D die; therefore, a univariate function is used for producing the parts die shape. Then, the optimal die selection criteria are calculated using process simulation in ABAQUS software. The design criteria's considered include final die's filling percentage, maximum force exerted on the final die and the part's maximum plastic strain. The ANN has been taught using the information obtained from simulation so that the relationship between die shape and optimal design criteria's are simulated. These networks can be used as target function in the continuous GA. Finally, the best pre-form die shape is recommended using continuous GA which is a mathematical function and by plotting this function in Cartesian coordination system, the die shape would be obtained. This model is used for H-shaped parts to evaluate the method performance.

#### MATERIAL AND METHODS

#### FORGING PROCESS

In forging, a part with primary shape is transformed between 2 instruments (dies) like a wax until it reaches the final desirable shape. Therefore, a simple part geometry becomes complex in this way that the instrument forms the desirable geometry on the part and the pressure is exerted via the contacting surfaces between die and material on the transforming material. Today, the forging process is of significant importance in industry and this is due to its advantages. In the following some of them are mentioned:

- The forging parts are designed in such a form they have the final product's geometry as much as possible. Hence, in this process the material wastes would be minimum relative to the machining one.
- Due to lack of gas bubbles or suck which is observed in other processes such as welding and casting, the parts' mechanical and physical properties would be better in forging.
- Due to the fact that in forging the die walls control the material flow, the part's mechanical properties would improve significantly.

As a consequence, potential economical energy and material use would be resulted from forging; particularly in average-high production quantities in which the instrument cost can be easily depreciated. Forging is a process based on experience. For years, the technical knowledge and experience in this field have been obtained using trial and error methods. However, the forging industry was capable to supply complex products from new alloys with minimum plasticity (Altan *et al.* 2006). Physical phenomena which defines a forging process is hardly explainable using quantitative relations. Metal flow, friction in material and die contacting surface, heat production and transfer during waxy flow as well as process conditions and properties are difficult to predict and analyze. Often, in separate parts manufacturing, several forging processes (pre-forming) are required to transform the simple primary geometry to a complex one without material defect or degradation of properties (Altan *et al.* 2006).

#### 2.2 Optimal pre-form die design using continuous GA and ANN

#### 2.2.1 H-shaped part's properties and geometry

In figure 1 the assumed part is indicated with its dimensions in mm. For modeling this part in ABAQUS, 1/4 of the part is considered as indicated in figure 2.

# Final die shape and raw material for H-shaped part forging

Considering the part shape, its final die is modeled as curve-shaped as showed in figure 3. The pre-form die for this part is also similar to the curve-shaped final die. Of course, there would be a narrow path in final die for better material flux and the extra materials are extracted as pleated one. The raw part is considered for a cylindrical die with height of 0.9 m and radius of 0.3 m. since the







raw part is axisymmetric, for its modeling <sup>1</sup>/<sub>4</sub> of the part is used which is rectangular with height of 450 mm and width of 300 mm.

#### Raw material physical properties

AL2014 is selected as raw material. Since, forging processes are performed in high temperature (400° C), the elastic and plastic properties of this aluminum are required in high temperature. These properties are (Altan *et al.* 1983):

- Primary yield stress=23.7 MPa
- Poisson's coefficient= 0.33
- Elasticity module=27.8 GPa
- Stress-strain relationship in plastic state

$$\sigma_{v} = max[s, c\varepsilon^{m}] \tag{1}$$

In this equation, s is the primary yield stress, c is the flow constant and m is the strain-rate hardening which are c=1.02e8 MPa and m=0.11 for aluminum at 400° C.

#### 2.2.4 The required pre-form phases' number

In forging, at first the required number of pre-form phases' has to be determined. For this purpose, one can make use of trial and error method or proposed methods in the previous articles. In this research, considering the H-shaped part for forging, in order to determine the pre-form phases' number, the Thomas' method is used. Considering the part's height-width ratio, the number of phases required is listed in Table 1.

Considering the part's dimensions used in this research, only one pre-form phase is needed. For this reason, the part forging includes 2 stages. At the first phase, pre-form and in the second stage the final die would be applied.

Table 1. Number of required pre-forms based on height-width ratio			
required pre-forms height-width ratio			
No need to pre-form	0-2		
1 pre-form phase	2-3		
2 pre-form phases	3 and more		

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# 2.2.5 Mathematical function used for the H-shaped part's pre-form

The pre-form's geometry is estimated from mathematical functions and the final die shape. Figure 4 demonstrates the mathematical functions used for pre-form die shape estimation. This curved-shape consists of 2 tangent hyperbolic functions interconnected in point m.

Equation 2 expresses the combination of these 2 functions as a new function.

$$y = \begin{cases} tanh(a_1 \times (x - m)), \ x \le m\\ tanh(a_2 \times (x - m)), \ x > m \end{cases}$$
(2)

In this relation, x is the pre-form die's width coordinate, y is the pre-form die's height coordinate before mapping,  $a_1$  and  $a_2$  are hyperbolic tangent functions' coefficients and m is the interconnection point of both functions.

The pre-form die's dimensions are selected according with the final part shape and primary part shape. Considering that the part forging process has one pre-form phase, the pre-form die shape is considered a middle shape between final part and primary part's shapes. The curve width formed by equation 2 is selected between the primary part's width (300 mm) and the final part's width (500 mm) which would be 400 mm. also, change of its height equals half of the final part's height change (150 mm). As a result, the pre-form die height would be 75 mm. therefore, the die width and height intervals would be [0, 400] and [0, 75] respectively. Relations 3 indicates the function used in equation 2 which is mapped in to the required width interval.

$$y = \begin{cases} \tanh\left(\frac{a_1 \times (x-m)}{m}\right), & 0 \le x \le m\\ \tanh\left(\frac{a_2 \times (x-m)}{(400-m)}\right), & m < x \le 400 \end{cases}$$
(3)

In equation 3, x is the pre-form die width coordinate; y is the pre-form die height coordinate before mapping,  $a_1$  and  $a_2$  are hyperbolic tangent functions coefficients and m is interconnection point of both functions. Relations 4 indicates the function used in equation 3 which is mapped to the required width interval. This equation is the final problem relation.

$$Y = \frac{75}{y_{max}} \times (y+1) \tag{4}$$

In this equation, y is the pre-form die height coordinates before mapping, Y is the pre-form die height coordinate after mapping and  $y_{max}$  is a point of pre-form die with highest height.



#### **RESULTS AND DISCUSSION**

# FINITE ELEMENTS SIMULATION AND RESULTS OF FORGING

#### **Required parts formation**

The parts required for forging process simulation are raw part, pre-form die and the final die which are modeled in part setting of ABAQUS. All three parts are modeled in axisymmetric form.

In case of pre-form die, the part is modeled in analytic rigid type and wire-shaped. The raw part which is modeled from deformable type and shell-shaped one. In case of final die, similar to pre-form die, the modeling was analytic rigid type and wire-shaped. The final die geometry is indicated in figure 5.

#### Parts assembly

For parts assembling, the left end of pre-form and final die is places on the top surface of the raw part. Figure 6 indicates the parts assemble.

#### Loading and boundary conditions definition

In this subsection, motion and the loading as well as parts boundary conditions are determined. In this process, loading condition is applied in the form of die displacement. In the first phase, the pre-form die moves down 187.5 mm and in the second phase the final die moves down 375 mm. The die's motion type is also selected as smooth step.

In case of boundary conditions, for all motion steps, the axis line of the raw part is in horizontal direction and its rotation is about the vertical axis on the surface. The down surface of the raw part is also fixed in the vertical direction.

#### Part meshing

This section deals with the suitable meshing in order to solve the problem. The pre-form and final dies need no elements due to their final selection as rigid body and the only raw material needs meshing. Element type for raw part is CAX4R. This element is of quadrilateral axisymmetric and 4-node type reduced by integration. The sufficient elements number for part meshing is selected as 2128 to reach convergence.

#### Problem solving results demonstration

In this research, in order to find filling percentage, the Photoshop software is used. For this reason, at first the simulation result obtained from the ABAQUS with format of PNG is stored with the resolution of 1056×453 pixels. Then, the PNG file is loaded in Photoshop and the pleated zone is removed and using its analysis tool, the number of pixels for the final part is calculated. Comparing this number of pixels with the final die pixels number in completely filled state, the filling percentage of the die is obtained. The next parameter obtained from simulation is the maximum force required for forging. As it is seen in figure 7, plotting the diagram of exerted force on the final die against time, one can obtain this maximum force. Maximum force required for this model is 226 MN.

#### Simulation validating

In order to validate simulation and results, several check points are implied as follows.





### Kinetic energy-internal energy ratio

In cases the mass scale method is used for problem solving, the energy ratio should be validated. For validating, the maximum kinetic energy-maximum internal energy ratio is used. The value of this proportion should not be more than 0.1. This means that the maximum kinetic energy is 10% of the maximum internal energy. Figure 8 represents the kinetic energy and figure 9 shows internal energy diagram against time. These diagrams can be helpful in calculating the maximum kinetic and internal energy. As it is observed from figures 8 and 9, the maximum kinetic energy value is 54.4 MN/m and maximum internal energy value is 16.2 GN/m. the ratio of these energies is about 0.34% which is acceptable.

#### Evaluation of elements' number and results convergence

Making use of sufficient elements in order to make sure the solutions' validity is of significant importance. Lower elements than the necessary level causes wrong solutions. Following, if the elements' number be more than the necessary level, this would not cause large changes





Table 2. Simulation results for different number of elements					
Elements Die filling number percentage		Maximum plastic strain	Maximum force (MN)	Processing time (s)	
150	97.75	3.130	134	11.4	
600	98.61	5.145	179	60.50	
950	98.94	5.484	190	114.7	
1350	98.88	7.525	208	166.4	
1734	99.10	7.336	217	139.7	
2128	99.36	10.316	226	306.6	
2301	99.08	9.253	224	358.0	
2400	99.14	11.489	223	385.3	

in the solution and only takes more time to solve the problem which is costly. Here, for validating the simulation, the necessary results of the problem for 8 different number of elements are calculated and the results are listed in table 2.

As it is seen from the above table, the output parameters change significantly up to 2128 elements and after that the changes are negligible.

#### 3.1.6.3 Step time

The considered time for solving the problem in step module is effective on the problem results. If the time considered be very low, then the results would be wrong and if the time was very high, then the software would require more time for problem solving which leads an increase in problem processing time. Table 3 lists the results obtained from applying different times in step module. As it is seen from results, 0.1 s seems sufficient.

It is important to note that due to the fact that the process is isothermal and material properties are considered independent of temperature and strain rate, the step

Table 3. Simulation results by applying different step times				
StepDie fillingtime (s)percentage		Maximum plastic strain	Maximum force (MN)	
0.05	99.31	10.566	222	
0.07	99.13	11.257	221	
0.10	99.36	10.316	226	
0.12	99.97	10.837	220	



Table 4. I	Results obtai	ned from r	networks run w	ith different to	opologies
Serial	Topology	MSE	Correlation coefficient	Minimum error	Maximum error
1	5,12,3	0.0089	0.87	-0.33	0.47
2	12,15,3	0.0023	0.97	-0.14	0.35
3	18,12,3	0.00021	0.94	-0.21	0.10
4	20,40,3	0.00005	0.99	-0.03	0.05

time doesn't significantly affect the output parameters dramatically.

# Finding an optimal pre-form die using ANN and continuous GA

#### **Designing an Artificial Neural Network**

Since the FEM simulation is very time consuming, an ANN is used to estimate the forging process results for different settings. A multilayer feed forward Perceptron network is chosen for this reason and the forging process input and output data are used for learning the network parameters. The network parameters include weights and biases which should be adjusted in such a way to optimize the network performance. The network performance is considered the minimum error between network outputs and targets. In order to optimize, one must define a performance index. In this research, mean square error is used as a performance index. MSE is the most common and desirable error function used for multi-layer networks.

#### Transfer functions selection

Transfer functions are determined based on the requirements of a problem. Considering recent studies and researches for correct results prediction from network as well as making use of the back propagation method in





this research, the only requirement for these functions is that they have to be differentiable in the whole domain, since their differential is used in the learning process. Among most applicable functions, the sigmoid and linear functions are used widely. Figure 10 indicates some of these functions.

In this research, the sigmoid hyperbolic tangent functions in network hidden layers and the linear transfer function in last layer are used.

#### **ANN Optimal topology**

In this section, several neural networks are designed with different topologies. Then, these networks are trained and on the basis of performance index, the optimal network is selected for this research. Of course, for training the network, all data has to be normalized.



	Table 5. Results obtained from normal and real scale									
	Scale	Raw part's width	m	a1	a2	Die filling percentage	Maximum plastic strain	Maximum force (MN)		
	Normal	0.5	0.0481	0.4214	0.9214	1.03	0.3038	0.17077		
	Real	302.5	205.8	9.6	13.9	100.06	8.887	271		
Real     302.5     205.8     9.6     13.9     100.06     8.887     271										
	FIGURE 14. Plastic strain contour related to optimal state									

#### **Optimal network selection**

Table 4 lists the results obtained from network run for several different topologies. In this table, the numbers in the topology column defines the number of neurons in different layers. As it is seen, the last network with three layers containing 20 and 40 neurons in the hidden layers has the best MSE and correlation coefficient.

Figure 11 indicates the correlation coefficient for training and test data and figure 12 indicates the net-work performance.

These figures show the chosen network capabilities, so this network would be used to simulate the forging process as a fitness function in optimization using GA.

# 3.2.5 The optimal pre-form die obtained by continuous GA

Figure 13 indicates the fitness convergence diagram and the best generation diagram. It is notable that to make sure the GA results are global minimum, the optimiza-



Table 6. Comparison between finite elements and GA results								
Results	Die filling percentage	Maximum plastic strain	Maximum force (MN)					
ABAQUS	99.96	8.895	270					
GA	100.06	8.887	271					

tion process using GA is iterated 20 times and the best result is considered so that its validity was assured.

Following, the best generation values are substituted in neural network and its results were extracted. The results obtained were in normal state; therefore, parameters values returned to their primary scale. Table 5 lists the results obtained in normal and real scale.

# 3.2.6 Optimal pre-form die finite element simulation and results comparison

Using the optimized parameters obtained from the GA method, the forging process is simulated in ABAQUS and the results obtained would be compared to the results obtained from the GA. Figure 14 demonstrates the plas-

tic strain contour and figure 15 indicates the exerted force on the final die.

Table 6 lists the results of the optimal pre-form die finite element simulation in comparison with the results obtained from the GA. As it is observable from the results, there is very small difference between NN results and ABAQUS results. This means that NN is designed well and can predict the process as well.

To ensure the obtained result is the optimum state of the pre-form die, several random states were simulated and their FEM results are shown in the Table 7 in comparison to best result obtained by the GA method. This table proofs the optimality of GA results versus other states.

In figure 16, the cut section of the optimal state of the part is represented at the end of the final die application.

#### **CONCLUSION**

In this paper, necessity of using pre-form dies in forging process declared and pre-form die designing methods were studied. Following, the GA capabilities were out-

Table 7. Cor	Table 7. Comparison of GA result and five random states									
state	Raw part's width	Die filling percentage	Maximum plastic strain	Maximum force (MN)						
Random 1	300	99.18	10.254	223						
Random 2	301	98.91	9.985	210						
Random 3	302.5	99.89	13.834	524						
Random 4	305	100	13.779	530						
Random 5	304	99.16	13.510	528						
best	302.5	99.96	8.895	270						



lined such as their application on continuous problems optimization. It was indicated how to make use of mathematical functions in GA. Following, a new method for designing the optimal pre-form dies was proposed. In this method, without simplifying the pre-form die shape and only using different mathematical functions combination, the optimal pre-form die shape was designed. To this end, after selecting the suitable function for pre-form die shape, several random pre-form die shapes were produced and then using finite elements model and ABAQUS software, the pre-form die forging process was simulated and results were extracted. These results were used for training the ANN, a network which can predict the forging process performed in finite elements model due to its time consumption. Finally, using designed ANN and effective parameters on forging, the target function required for GA was formed and following the algorithm running, the optimal pre-form die was obtained. This method was used for an H-shaped part which was axisymmetric to evaluate its performance. The results show that combination of ANN and GA makes a powerful tool for designing complex pre-form dies. Here, the method was used for a part which needs only one step pre-form die, and may be used for more complex parts with several pre-form dies to validate its potential. Also the method can be extended using more parameters including number of pre-form dies, flux stress, friction coefficient and so on. Finally comparison of theoretical optimized results with experimental data is suggested.

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# Statistical evaluation of chemical and biological contamination in Yamchi Dam basin water

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## ABSTRACT

Rivers are the most vulnerable water resources due to carry urban and industrial wastewater and agricultural wastes. In this study, the trend of changes of water quality of main branches of Yamchi Dam and water of dam reservoir during the time series were evaluated according to the Spatiality changes and the most sensitive branch was identified due to produce contamination as well as the time and location of changes (amounts) of water quality parameters to Yamchi Dam were evaluated. According to the statistical results in 2001 to 2015 related to the stations studied, it can be concluded that Nir River among all the variables studied is as the most pollutant river from the three main rivers of the upstream region of Yamchi Dam. According to the results, the river's water quality parameters from 2001 onwards has been increasing process, variables of fecal coliform, bicarbonate, DO, BOD and sodium respectively, as main factors have the greatest impact on water quality survey of the main branches of Yamchi Dam. Three main branches of Yamchi Dam are different in terms of rate and amount of variables mentioned and have had significant effect on water quality of Yamchi Dam. Variables studied except DO in all stations are considered pollutant in terms of the drinking water standard

KEY WORDS: YAMCHI DAM, WATER QUALITY, STATISTICAL INDICATORS

## **INTRODUCTION**

Today, surface water quality is one of the major concerns and considers a health index for community (Charu and Verma, 2008). Data that describes temporal and spatial variations of water quality in river can be used to identify the relative importance of natural and human effects (Ramazani and Hashemi, 2011). Over the past

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water quality of Haraz Watershed in Iran (during the summer and fall 2007 and winter and spring 2008). To assess the temporal and spatial variations of water of Jajrud River in Iran, they investigated water samples in a three-year period for each month in the 18 stations with PCA and CA statistical analysis. CA and PCA led to similar results, box plots show that PCA can show the temporal and spatial variations approximately (Razm-khah *et al* 2010).

Vega and colleagues in evaluating the seasonal changes and pollutants effects of river water quality of Pisuerga Spain using statistical analysis investigated variables of physicochemical of water during 2.5 years from 3 stations. The PCA showed that the mineral amount, human pollution and the temperature has dropped. (Bardvaj et al 2010) In investigating water quality of Kali Gandaki River in India using PCA, they analyzed factors such as shelves, poor drainage, ion exchange, intensity of use of nutrients and household pollutions. The results of this study showed that in some areas, due to increase of alkalinity, water becomes hard and is not suitable for drinking and irrigation purposes. To assess water quality of upstream basin of Yamchi Dam, first the quality parameters related to the main branch of Nir, Lai and Jurab were collected from the Department of environment and regional water organization of Ardabil province from 2001-2002 to 2014-2015 which contains concentrations of salts (TDS), acidity (pH), dissolved oxygen (DO), biological oxygen demand (BOD), chemical oxygen demand (COD) and total hardness (TH).

#### MATERIAL AND METHODS

#### THE STUDY AREA

Yamchi Dam basin with area of 709.18 square kilometers is placed in the geographic area 28" 46' 47 ° to

57" 05' 48 ° east longitude and 24" 01' 38 ° to 15" 09' 38 ° north that limits from north with Meshkinshahr, from North-East with Ardebil, from west and south to Eastern Azarbaijan and from southeast to the basin of Ghuri Chay. Yamchi Dam main branches included Nirchay, Laichay and Lamchay that after connecting to each other make a great river that is called up Balgelychay that is one of the important branches of Aras River in the North West of Iran that flows in South North and collects the waters of the main branches of Yamchi Dam from East and South of the area. YamchiDam main branches because of flowing from important residential areas such as Nir and villages in the region and also placing some industrial and resort centers near the river and because of the drinking and agriculture water supply of area is one of the major dams of Azerbaijan region. On the other hand, the area because of the ruling of the above conditions and serious threats caused by wastewater of industry and domestic sewage is constantly threatened by pollution. Therefore, such a situation increases the vulnerability of the study area to the issue of pollution. Figure 1 shows Yamchi Dam position in the North West of Iran, West of Ardebil and also the position of hydrometric stations studied.

#### RESEARCH METHODOLOGY

Compliance with statistical principles to prevent from wasting time and increasing the accuracy, first the variables studied were minimized. Since the number of parameters mentioned above is large and it is not possible to check all of them in the form of a master's thesis therefore, it was acted to minimize the variables using principal component analysis (PCA). After determining the main variables of all three stations (Nir, Lai and Jurab) by adopting a common statistical base, shared variables were selected from three stations. After



selecting the common parameters at the later stage, it was acted to group comparisons based on common variables. So that it was acted to investigate the presence or absence of significant difference between the three main branches of Yamchi Dam ie Nir, Lai and Jurab using multivariate analysis of variance, at this stage the presence or absence of difference between the three stations is determined. After this stage, it was acted to group averages of the variables among three stations and it became clear which of the variables of these three groups are different. In the next step, it was acted to compare the amount of shared variables with standard value using One Sample T-test; the purpose of this step is to identify the most polluted river of the main branches of Yamchi Dam. In this study, a sample T-test hypotheses are: 1. The null hypothesis: The value of investigated variables is in permitted range. 2. Hypothesis: The value of investigated variables is not in permitted range. Finally, to determine the trend of changes of data and identify the type and time of it, it was acted to analyze the trend of time series using Mann-Kendall non-parametric test, and the presence or absence of changes was specified.

Kolmogorov-Smirnov test was used to assess the normality of variables. Determining the appropriateness of data was performed using the KMO index and Bartlett test, in components analysis, maximum equity (Eigenvalue) belongs to the first component (Pc1) and gradually by increasing class of components, this amount decreases. It should be noted in this method, each component is independent of other components (Yao *et al.*, 2013). Each component is a linear combination of variables that its equation can be shown as equation 3-1 (Jolliffe, 1986).

$$PC_1 = a_{11}X_1 + a_{12}X_2 + ... + a_{ij}X_j$$

In this equation, PC is the main component, is the coefficient or special vector (Eigen Vector) and is variable considered (Jolliffe, 1986). In order to select the number of effective components, components were selected that their Eigenvalue was more than one. To interpret the effective features in a component that controls the most changes, selection criteria was used (Doran and Parkin, 1994).

$$SC = \frac{0.5}{(PCeigenvalue)^{0.5}}$$

In this equation, SC is selection criteria, PC is the main component and Eigenvalue is the special value (Doran and Parkin, 1994). After identifying the most influential variables in each station by considering the common base among the main station variables, variables that were present in all three stations were selected as the major variables in qualitative studies of upstream water of Yamchi Dam. All statistical analyzes were conducted in SPSS v.20 software.

In this study, the method of multivariate analysis of variance was used to investigate the significant difference between the variables of factor analysis (including five variables of bicarbonate, sodium, DO, BOD and fecal coliform) in three main branches of Yamchi Dam (Nir, Lai and Jurab).

Among the groups after the significant difference among the main branches of Yamchi Dam was approved then, using Duncan method from grouping methods of averages, it was acted to identify the different variables in the three branches.

In order to understand the trend of changes of data and identify the type and time of it, it was acted to analyze the time series using the Mann-Kendall nonparametric test and the presence or absence of changes was specified. In this study, the graphical method of Mann - Kendall test was used. About the graphical method, mentioning points about the statistic U and U 'is necessary. If the sequence U and U ' based on i is drawn as a graph, in the significance mode of the trend, two graphs at the starting point of phenomena outside the scope intersect each other and will move in opposite direction of each other, this point of collision is called mutation. While if there isn't trend, two sequences U and U 'move almost in parallel or will act in several times of collision, so that does not lead to change direction. U graph to the year (axis X) is drawn and for that significance of trend and point of its mutation to be achieved, the sequence U 'is defined.

#### **RESULTS AND DISCUSSION**

Principal components analysis (PCA) was used in order to determine the minimum effective variables in investigating qualitative changes of upstream water of Yamchi Dam (main branches of Nir, Lay and Jurabchay). First KMO factor was used in determining the suitability of the data for principal components analysis to achieve this goal. The value of this factor is always variable between zero and one. If the value of this ratio is less than 0.5, the data will not be suitable for factor analysis and if its value is between 0.5 to 0.69, it can be analyzed main components more carefully. If KMO coefficient is larger than 0.7, principal components analysis in the decrease of data will be effective (Jolliffe, 1986). As well as to ensure correlation between input variables or independent, Bartlett's test was used. Based on the results, KMO coefficients in three main branches of Nir, Lai and Jurabchay was obtained 0.769, 0.782 and 0.724 respectively that the amount confirms the correlation between input variables for principal components analysis. Bar-

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Table 1. Investigate KMO and Bartlett tests to detect changes in upstream water quality of Yamchi Dam						
Significant level	Bartlett test	Test KMO	Station			
0.000	86.774	0.769	Nir			
0.000	89.345	0.782	Lai			
0.000	82.761	0.724	Jurab bridge			

tlett's test was significant for all three rivers in 0.01 so the data are suitable for PCA.

The main components analysis was used to assess the water quality changes of main branches of Yamchi Dam. Therefore, variables that at least one of the coefficients of them is used to form the component have relatively high amount. According to Table 2, Nir, Lai and Jurab stations had 4, 5 and 4 main components and in total according to the considered criteria, it was specified among 10 variables, Nir, Lai and Jurab stations have respectively 9, 3 and 5 main variable. Because of the variety in number and type of main variables in each station, considering common base between main variables related to each of the three stations, three variable of D0, BOD and fecal coliform were selected as the main variables (effective factors). So the variables of fecal coliform and D0 and BOD as the main factors have the greatest impact and other variables have the least impact in investigating water quality of the main branches of Yamchi Dam.

According to the results of analysis of variance, there is a significant difference between the three main branches. Values Sig. that for stations studied is less than 0.05, and then by 95% confidence level, there is a significant difference between the main branches of Yamchi Dam based on five variables (bicarbonate, sodium, DO, BOD and fecal coliform). In other words, three main branches of Yamchi Dam in terms of amount of variables mentioned are different with each other and have significant effect on water quality of Yamchi Dam.

It was specified in the results of multivariate analysis of variance that there is a significant difference between three main branches, but it is not clear which of the variables (bicarbonate, sodium, DO, BOD and fecal coliform) are different. Comparisons of the average of variables in groups surveyed by Duncan method showed bicarbonate amount in rivers of all three with Sig. equal one in each three main branches are different, sodium amount among two branches of Nir and Jurab with Sig. equal to 0.763, there is no significant difference but the amount of sodium in the Lai branch with sodium in two branches of Nir and Jurab is quite different. The number of fecal coliform in the water of branches of Lai and Jurab is very similar but the number of fecal coliform

Table 2.	Table 2. Number of main components,: EV (Eigenvalue),: SC (selection index) and: Cu (cumulative variance) in assessing the changes of water quality of the main branches of Yamchi Dam											
Fifth main component		Fourth main component		Third main component		Second main component		First main component		Station		
-	EV	2.017	EV	2.538	EV	6.898	EV	8.746	EV			
-	SC	0.352	SC	0.313	SC	0.19	SC	0.169	SC	Nir		
-	Cu	96.184	Cu	6.581	Cu	74.495	Cu	41.648	Cu			
1.228	EV	2.109	EV	4.33	EV	5.365	EV	6.967	EV			
0.451	SC	0.344	SC	0.24	SC	0.215	SC	0.189	SC	Lai		
100	Cu	93.358	Cu	83.313	Cu	61.664	Cu	34.837	Cu			
-	EV	1.966	EV	2.314	EV	3.702	EV	11.078	EV			
-	SC	0.356	SC	0.328	SC	0.259	SC	0.15	SC	Jurab		
-	Cu	95.304	Cu	85.473	Cu	77.901	Cu	55.391	Cu			

Table 3. The results of multivariate analysis of variance								
Source	Dependent Variable	Type III Sum of Square	df	Mean Square	F	Sig.		
	Bicarbonate	59233.637	2	29616.818	180.443	.000		
	Sodium	1921.608	2	960.804	69.644	.000		
Three froups of Nir. Lai.	DO	1.264	2	4.632	1.509	.000		
Jurab	BOD	5.621	2	2.810	8.002	.000		
	Fecal coliform	5411.641	2	2705.820	4.072	.000		

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Table 4. A sample t test results with constant value of main three branches variables											
One-Sam	One-Sample Test										
Station	Common	т	Degree of	Sig	Difference	Confidence level 95%					
Station	variables	1	freedom	Jig.	of average	Less	More				
	Sodium	-98.84	8	0.000	-175.11	-179.2	-171.03				
	bicarbonate	-14.31	8	0.000	-84.46	-98.07	-70.85				
Nir	fecal coliform	4.8	8	0.000	47.61	24.75	70.47				
	DO	-3.05	-3.05 8		-0.46	-0.81	-0.11				
	BOD	-51.93	8	0.000	-12.67	-13.24	-12.11				
	Sodium	-2618.4	8	0.000	-193.26	-193.4	-193.09				
	bicarbonate	-132.2	8	0.000	-155.68	-158.4	-152.9				
Lai	fecal coliform	3.907	8	0.05	24.39	9.9	38.7				
	DO	0.206	8	0.862	0.056	-0.568	0.68				
	BOD	-69.4	8	0.000	-13.015	-13.447	-12.582				
	Sodium	-145.6	8	0.000	-175.64	-178.4	-172.8				
	bicarbonate	-9.809	8	0.000	-42.18	-52.097	-32.26				
Jurab	fecal coliform	6.353	8	0.000	58.31	37.146	79.48				
	DO	-0.467	8	0.653	-0.098	-0.579	0.384				
	BOD	-79.762	8	0.000	-11.92	-12.267	-11.57				

in Nir branch is different with two other branches (Table 4).The amount of BOD in water, branches of Lai and Jurab not have much difference with each other but the amount of this variable in Nir branch is very different from the other two branches. DO variable situation is similar to variable BOD.

According to the results of a sample t test, the significance level (Sig) is larger than 0.05, then, the null hypothesis is confirmed with confidence of 95 percent. As the value of Sig of one sample t-test in all parameters

except DO is less than 0.05 so the variables considered in all stations except DO in terms of the standard of the drinking water are considered pollutant. DO variable in two stations of Lai and Jurab is equal to the threshold of pollution and is not considered statistically pollutant.

According to the results of Mann - Kendall non-parametric test, all stations follow the process of changing the station of Nir that is why only the results of Station Nir is provided. In the graph of the annual average DO of station, a significant mutation with positive trend in





2007 can be seen that is presented as graph. In the graph of annual average bicarbonate of station Nir, two significant mutations with positive and negative trend in 2003 and 2007 can be seen as in 2007 has undergone a sudden change and governance of its trend is negative. It is concluded from investigating the behavior of changes U and U 'related to annual average BOD of station Nir that, without significant change and mutation has experienced the normal process of maximum Sodium. In the graph of average annual fecal coliform of station Nir, a significant mutation with the positive trend in years 2005 is seen. As in 2007, it has experienced a mutation and its trend is declining.

According to the results of the previous sections and referring to the multi-year average related to the stations studied (Fig. 3), it can be concluded that Nir river in all the variables studied is as the most pollutant river among the three main rivers of the upstream region of Yamchi Dam.

## CONCLUSION

According to the results of this study, it can be said evaluating water quality conducted in this study has integrated and comprehensive expertise knowledge. As it can be acted to better understanding, manage and reduce its pollution by the selection of the main factors in water quality. Based on the results obtained, features such as fecal coliform, bicarbonate, DO, BOD and sodium were selected as effective factors, which are a combination of chemical and biological parameters of water. Research about selecting effective factors, determining the minimum or the most optimal effective characteristics on water quality in different regions can be guidance for proper assessment of water quality by spending a minimum cost and time. Reviews related to multivariate analysis of variance indicate high accuracy and ability to detect the presence or absence of difference between study stations.

The use of this method in the analysis of different groups with different variables is very effective and provides significant results. About the identification of variables that shows significant difference among the stations studied, the Duncan method due to advantages compared to other methods such as LSD, Dunnett and can be compared groups (Nir, Lai and Jurab stations) mutually and to be ensured the significant difference between the variables of the stations. So it is concluded Duncan method has a highly accurate in identifying different variables between stations. A sample T test as a standard method to examine the value of variables with standard value of them has a high efficiency and the results obtained of it indicate pollution of parameters investigated in available stations. As Nir station has the highest pollution among the stations studied. The reason for this is the flowing Nir River through urban area of Nir and adjacent villages as well as industries in the region, which always production waste in these industries and urban sewage directly enter the river and is a serious threat to aquatic and Yamchi Dam that is as producer reservoir of drinking water for Ardabil. Of the results obtained of time series of Mann-Kendall can be clearly observed that parameters investigated during 13 years, have maintained its upward trend and are rising. This implies the increase of human-produced pollutants that without attention to the rights of posterity and due to mismanagement is destroying environment.

#### RECOMMENDATIONS

Due to the sensitive situation of the region and the expansion of residential and industrial areas adjacent to rivers in the region, it is recommended to be used drainage system suitable for agricultural lands overlooking the river. In order to prevent the entry of industrial wastewater and domestic sewage to the rivers of area, sewage system is reconstructed in area and in sections that is deprived of sewage, proper system of sewage to be implemented. Lands use changes, especially deforestation and gardens and convert them to residential areas in riverbanks to be prevented and in accordance with the river privacy to be prevented the entry of more pollution to groundwater and surface water sources.

It is suggested to be achieved necessary information from potential of land for various uses before use the land in the area, with land capability assessment for different uses. According to the capabilities of GIS in land planning, it is suggested to be implemented the logistic plan in the region by taking advantage of the capabilities of this system. It is suggested to be investigated the effect of other parameters such as the amount of soil erosion, rainfall and flooding also with more details on the amount of dissolution time.

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# Comparison of accuracy of Epsilon and Quadratic loss function for predicting saturated hydraulic conductivity by SVR and SVR-GA models

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# ABSTRACT

Saturated hydraulic conductivity is one of the most effective hydraulic characteristics of the soil processes. One of the methods to measure saturated hydraulic conductivity above water table is applying cased boreholes. Support vector machine is a classifier which uses statistical train theory for classification and regression; and genetic algorithm is a searching technique in optimization problems inspired from the nature and the evolution of the creatures. In this research Epsilon and quadratic loss functions are compared against each other in support vector machine model (SVR) and support vector machine-genetic algorithm model (SVR-GA). These models are developed by the core radial function to predict the saturated hydraulic conductivity to be a suitable replacement for Reynolds analytical solutions in cased boreholes. The data used in this study are consisting of soil moisture percentage, saturated soil moisture percentage, the water table fall versus time, time, size of boreholes and the quantities of saturated hydraulic conductivity of the soil calculated by Reynolds solution. 70 percent of data is used for the train, 20 percent for the test and 10 percent for the validity. In order to analyze the results we have used three different statistical indicators including correlation coefficient (R2), root mean square error (RSME), and normalized root mean square error (NRMSE). Accord-

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ing to the results of SVR-GA model in all three types of flow the coefficient of determination was above 0.99 and root mean square error and mean absolute error were less than 0.02. The results of this research indicate that Epsilon loss function had better accuracy than quadratic loss function but in terms of execution time quadratic loss function is considerably more efficient than Epsilon loss function.

KEY WORDS: GENETIC ALGORITHM, LOSS FUNCTION, SUPPORT VECTOR MACHINE, SATURATED HYDRAULIC CONDUCTIVITY

## **INTRODUCTION**

Although the equations calculating hydraulic conductivity of soil which are including a variety of hydraulic processes are quite accurate but they include a lot of computational stages. On one hand adding different aspects of processes within these equation has increased their accuracy, but it has enhanced the computational load as well. One of the methods to confront increasing computational load is using a meta-model. In other words developing an alternative model instead of the main model which has learnt the relations based on input and output can be more effective in computational efficiency. Applying the appropriate solutions to increase the accuracy of approximated models and efficient use of them can be known as alternative meta-model management. Nowadays the topic of alternative model management has been known as a new field of research and has attracted a lot of attention to it.

Saturated hydraulic conductivity is one of the most effective hydraulic characteristics affecting the soil processes (Reynolds and Topp, 2008). These parameters play a fundamental role in controlling the hydrological processes of underground flows (Reynolds and Elrick, 2005). In order to measure saturated hydraulic conductivity of soil different methods are available according to the soil type and the difference between the levels of underground water wit surface. One of the methods of measuring hydraulic conductivity is borehole method which in known as the falling head lined boreholes permeameter method (Navin et al. 2008). Philip has presented an approximately analytical solution for this type of borehole. Philip borehole only studies vertical flows. In the following, Reynolds studied different geometries of flow and various radiuses of tanks and Philip's borehole as well and analyzed them. Due to the high volume of computing in these analyses we can use an alternative model which has been developed by artificial intelligence in order to predict saturated hydraulic conductivity of soil. Artificial intelligence (AI) models has been used in a wide range of fields. AI models are quick, robust, and convenient to use for the prediction and solving complex problems compared with conventional methods which impose more difficulties, time consumption, and high expenses.

Shams Emamzadeh *et al*, (2017) in a study has compared the performance of Multi-Layer Perceptron (MLP) and Radial Basis Function (RBF) in neural networks for estimation of the soil saturated hydraulic conductivity. Amongst the AI models with high accuracy are support vector machine model (SVR) and genetic algorithm- support vector machine combined model (SVR-GA). In this study the prediction of saturated hydraulic conductivity of soil via SVM and SVM-GA model has been calculated using soil moisture percentage, saturated soil moisture percentage, the water table fall versus time, time, and size of the boreholes and the values of saturated hydraulic conductivity of soil calculated by Reynolds solution (Mehmandoust, 2014).

SVM is a collection of training techniques by the machine which is used for classification and or regression and is introduced based on statistical train theory and minimization of loss probability (Kalanaki and Soltani, 2013a; Vapnic, 2010). Genetic algorithm (GA) is a metaheuristic also one of the numerical optimization algorithms which is inspired from the nature and is a good option for the models use regression for prediction. These algorithms are by relying on bio-inspired operators such as crossover, mutation and natural selection. SVM has better efficiency comparing neural networks for flood probability prediction (Liong and Sivapragasam, 2000). Yang Shao and Huang Yuan Fang (Yang and Huang, 2007) used SVM model in order to predict the parameters of hydraulic characteristics of soil and concluded that there was no obvious difference between the predicted results and the observed ones. Navin Twarakawi et al (Navin et al. 2008) used SVM model to estimate hydraulic parameters of soil, in this study all the parameters which were estimated based on transfer function and via SVM model showed better reliability compared with ROSETTA PTF program.

Kalanaki *et al.* (2013) conducted a comparative study about different Kernel functions and loss functions in support vector machine using SVM\_GA combined model in order to predict the refraction rate of the pipes in water distribution network. The findings of this study showed the better efficiency of radial Kernel functions and quadratic loss functions. Krzysztof Lamorski *et al* (Lamorski *et al.* 2011) modelled soil water retention using SVM with the optimized model of genetic algorithm. The findings of the study showed that suing SVM model with the optimized genetic algorithm for soil water retention modelling is better than the prior tested methods. Chen Hai Yan *et al* (Chen *et al.* 2011) used SVR-GA model to predict aquifer hydraulic conductivity and water surface table computation. The findings of their study proved that the model had performed accurate in predicting hydraulic conductivity.

This research aims at assessing and comparing regression support vector machine and hybrid model of genetic algorithm and regression support vector machine (SVR-GA) by Epsilon and quadratic loss functions with the help of the prior study's findings (Asadollah Zade, 2013) which apply Reynolds and Philip methods to predict hydraulic conductivity of soil; and also with developing an artificial intelligence model finds an alternative model for analytical Reynolds model which involves a great deal of computational processes.

### MATERIALS AND METHODS

One of the methods of measuring hydraulic conductivity is using boreholes which is known as the falling-head lined boreholes permeameter method (Philip, 1993). The method uses cased boreholes and gives saturated hydraulic conductivity based on the drop in levels of water versus time. In Philip Solution, the walls of the borehole are all covered and permeation occurs only from the floor and vertical. In Reynolds method, the most common and probable types of flow geometry and various radii of tanks for permeameter of boreholes are taken into consideration which consist of: only vertical flow (Philip), only radial flow (permeable wall with the length L and impermeable floor) and a combination of vertical and radial flows where the permeable section has the length L and the radius a. The data used in the model were collected from 27 drilled boreholes in 1 in 1 meter grid with 3 repetitions and for three types of flow including vertical, horizontal and vertical-horizontal flows (radial). Plastic pipes were used to cover the walls of the borehole and the size of the boreholes included three diameter 4, 6 and 8 cm with different lengths (Asadollah Zade, 2013).

# HYDRAULIC CONDUCTIVITY

Saturated hydraulic conductivity values used in the models are obtained from Reynolds' approximate analytical solution. These solutions include many equations and long computational steps which require input data such as soil moisture percentage, saturated soil moisture percentage, drop in water levels versus time, time, borehole's size including the borehole's radius and the covered length as well as uncovered length in different considered geometries.

# SUPPORT VECTOR MACHINE

Support vector machine is a collection of train methods by machine which is used for classification and regression and is based on statistical train theory and loss probability minimization (Shams Emamzadeh *et al.* 2017; Vapnic, 1995; Kalanaki *et al.* 2013). The function that is used to calculate regression support vector machine is in the form of mapping from the input space of Xi to output space of Yi and is represented by equation (Asadollah Zade, 2013):

$$\mathbf{F}(\mathbf{x}) = \mathbf{W} \mathbf{x} \cdot \mathbf{b} \tag{1}$$

Where W and b represent weight and bias respectively. In regression support vector machine the aim is estimating b and W in order to achieve the best results. In regression support vector machine represents the difference between the actual data and the results data and the variable represents an allowed extent of error that can occur by various factors such as noise (Kalanaki *et al.* 2013; Smola and Scholkopf, 1998). Margin is defined as the ration of and to maximize margin we should minimize. These stages are considered in equations (2) and (3) which are the building blocks of regression support vector machine (Simunek *et al.* 2006; Lamorski *et al.* 2011):

Minimize 
$$\frac{1}{2} ||\mathbf{w}||^2 + C \sum_{i=1}^n \xi_i$$
 (2)

Subject to:

$$y_i(w^Tx_i+b) \geq 1-\xi_i \ , \qquad \xi_i \geq 0 \qquad \ (3)$$

C determines an exchange between the size of margin and the extent of error in train and controls over-fitting in train. We use Kernel functions because working with above functions can be costly and time-consuming. Kernel function is a linear classifier based on dot product of vectors which is equal to k Kernel function is equivalent to the inner product in the feature space. Therefore, instead of costly calculations in feature space we apply Kernel function. Here W is obtained from equation (Kalanaki and Soltani, 2013a). Finally, the regression support vector machine with the effect of Kernel functions is obtained from equation (Kalanaki and Soltani, 2013a):

$$W = \sum_{i} (\alpha_{i} - \overline{\alpha}_{i}) X_{i}$$
<sup>(4)</sup>

$$F(\mathbf{x}) = \sum_{i=1}^{b} \left( \overline{\alpha_i} \cdot \alpha_i \right) K(\mathbf{x}_i, \mathbf{x}) + b$$
 (5)

One of the most useful basis-functions is Gaussian basis function or radial basis function (RBF) which is shown in equation (Lamorski *et al.* 2011):

$$K(x_i, x_j) = \exp \mathbb{E} - \frac{\|x_i - x_j\|^2}{2\pi^2}$$
 (6)

Where Xi and Xj are support vectors and is the bandwidth of the radial basis Kernel function. To minimize the error and other risks we aim at finding a function which is shown in equation (Liong and Sivapragasam, 2000):

$$R_{emp} [f] = \frac{1}{1} \sum_{i=1}^{1} c(x_i, y_i, f(x_i))$$
(7)

Function refers to cost function and indicates the penalty for estimate function according to experimental data. Remp represents the experimental error. Loss function determines the penalty of data while estimating. In this study two types of loss functions are utilized which are Epsilon loss function and quadratic loss function. Figure (1) shows the diagrams of these functions.

The values of epsilon and quadratic loss functions are obtained respectively by equations (8) and (9):

$$c(x_i, y_i, f(x_i)) = \begin{cases} \left| f(x_i) - y_i \right| - \epsilon & \left| f(x_i) - y_i \right| \ge \epsilon \\ 0 & \text{otherwise} \end{cases}$$
(8)

$$c(x_i, y_i, f(x_i)) = (f(x_i) - y_i)^2$$
 (9)

## **GENETIC ALGORITHM**

Genetic algorithm was introduced by John Holland according to evolution theory of Darwin in the early 1970s. The optimization search procedure in genetic algorithm is based on a guided random procedure. The procedure has been inspired from the nature and the evolution of living creatures. In this method each member of the population is shown through a string composed of variables where each variable is called gene and the string composed of genes is called chromosome. In fact, initially for a number of responses which is called population a set of objective parameters are generated randomly. After running numerical simulator program which represents the fitness of the set of data, a fitness value will be attributed to the member of the population. This will repeat for each and every developed member, after calling genetic algorithm operators such as crossover, mutation and selection operators and while retaining the top part of the population, the next generation will be formed and this procedure will continue till one

of the stop conditions is satisfied. At the end, the member of the population that has the best fitness value will be selected (Kalanaki and Soltani, 2013a; Kalanaki and Soltani, 2013b).

#### MODEL DEVELOPMENT

The studies conducted in this research are carried out in the research field of Abureyhan campus of Tehran University which is located in Pakdasht. In order to develop and run SVR model we need to adjust the parameters c,  $\epsilon$  and  $\sigma$  in the models engaging Epsilon loss function and the parameters c and  $\sigma$  must be modified in the models involving quadratic loss function. In order to find the most suitable combination of this parameters in SVR model, trial and error method must be used and the combination with the least amount of error and the highest correlation must be selected. It can be mentioned that one of the downfalls of SVR model is finding such a combination using trial and error method. In order to find the best combination GA optimization model was applied. The model was developed and implemented for three kinds of flows introducing input data matrixes which were composed of the combinations of applied variables in Richards and Van Genuchten-Maulem equations and the dimensions of the boreholes and output matrix including the values of hydraulic conductivity calculated by HYDRUS, Kernel and the desired loss function selection and introducing the optimal parameters and the values of correlation coefficient, root mean square error and normalized root mean square error were calculated. Equations (10) to (12) show these relations respectively:

$$R^{2} = \begin{bmatrix} \frac{[(\Sigma XY)\frac{\Sigma X \Sigma Y}{n}]^{2}}{[\frac{\Sigma X^{2}(\Sigma X)^{2}}{n}][\Sigma Y^{2}\frac{\Sigma Y^{2}}{n}]} \end{bmatrix}^{0.5}$$
(10)

$$RMSE = \left[\frac{\sum_{i=1}^{n} (P_i - Q_i)^2}{n}\right]^{0.5}$$
(11)

NRMSE = 
$$\frac{\left[\frac{1}{n}\sum_{i=1}^{n} (P_{i} - Q_{i})^{2}\right]^{0.5}}{\frac{1}{n}\sum_{i=1}^{n} Q_{i}}$$
(12)

Where Pi represents the estimated or stimulated value, Qi is the observed value and n is the number of samples.

In developing GA, the number of the initial population was 20, the combination type was single point, selection rate was 0.5, mutation rate was 0.25 and the number of replications was considered 300. Equation (13) represents the fitness function in genetic algorithm.

$$f = \sum_{i=1}^{n} \frac{|y_{\text{test}} - y_{\text{model}}|}{n}$$
(13)

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In the equation above, f represents the average of errors, n is the number of test's data, ytest is the experimental values and y model is the estimated values. Genetic algorithm using a variety of different parameters' combinations converges to a certain extent of error in desired replications. In this study after normalization in order to use Kernel function, 70 percent of data were used for train, 20 percent for test and 10 percent for validation. In order to write and run the codes we have used MAT-LAB software.

The optimal parameters achieved by the hybrid model were used in Support Vector Machine. Set of chromosomes make up the population. The encoding process of each chromosome in the consolidated SVR-GA model includes  $\varepsilon$ , C and. A set of chromosomes make up the population (Kalanaki *et al*, 2013; Kalanaki and Soltani, 2013a; Kalanaki and Soltani, 2013b; Smola and Scholkopf, 1998; Shams Emamzadeh *et al*. 2017; Vapnic, 1995; Vapnic, 2010; Yang and Huang, 2007).

# **RESULTS AND DISCUSSION**

The diagram shown in figure 2 represents the convergence of the objective function of genetic algorithm in a horizontal flow at an Epsilon loss function. The results of the SVR and SVR-GA models with radial Kernel function at Epsilon loss functions are represented in table 1 in three different flows including horizontal, vertical and vertical-horizontal.

The results of the SVR and SVR-GA models with radial Kernel function for quadratic loss functions are represented in table 2 in three different flows including

Figures 3 and 4 represent the diagrams regarding the prediction of hydraulic conductivity by using of SVR model with test and train data for Epsilon and quadratic loss functions in horizontal flows respectively. The longitudinal axis shows the number data and the transverse axis shows the values of hydraulic conductivity.

Figures 5 and 6 represent the diagrams regarding the prediction of hydraulic conductivity by using of SVR-GA model with train and test data for Epsilon and quadratic loss functions in horizontal flows respectively. The longitudinal axis shows the number data and the transverse axis shows the values of hydraulic conductivity.

As it can be seen in table-1 SVR model has accurate and desirable results for three different types of flows (high correlation coefficient and low levels of error) and SVR-GA model also has excellent results (correlation coefficients close to 1 and error percentage close to zero). In SVR model of all three different flows determi-



Table 1. The results of SVR and SVR-GA for epsilon loss function									
Run-time (seconds)	ε	с	σ	NRMSE	RMSE (m.s-1)	R2 (%)	Model typ	e	Flow type
07022	0000010/0	70	0004/0	19474/0	09244/0	9786219/0	prediction	CVD	Horizontal flow
97922	0000019/0	70	0004/0	19018/0	13031/0	9591991/0	validity	SVK	
02021	00000701/0		00021040/0	00175/0	00089/0	9999973/0	prediction	- SVR-GA	
93021	00000791/0	5005/72	00021049/0	00169/0	00117/0	9999955/0	validity		
02121	000004/0	00	0004/0	15938/0	06601/0	9897919/0	prediction	SVR	Horizontal- vertical flow
92131	000004/0	90	0004/0	17917/0	09329/0	9780319/0	validity		
00456	00000750/0	170/40	00001433/0	00292/0	00033/0	9999997/0	prediction	CUT CA	
90456	00003758/0	1760/48	00001433/0	00173/0	00025/0	9999998/0	validity	SVK-GA	
102005	0007/0	110	00002/0	16723/0	11536/0	9492773/0	prediction	CUD	
103985	0007/0	110	00003/0	16578/0	12313/0	9356536/0	validity	SVR	- Vertical flow
0.4700	000000045/0	02245/0 5493/40	00001598/0	01309/0	00995/0	9994702/0	prediction	CUT CA	
94783	00002245/0			01271/0	01095/0	9991326/0	validity	SVK-GA	

Table 2. The resu	Table 2. The results of SVR and SVR-GA for quadratic loss function										
Run-time (seconds)	с	σ	NRMSE	RMSE (m.s-1)	R2 (%)	Model type		Flow type			
20217	20	0007/0	45416/0	19230/0	9248/0	prediction	CVD				
29217	30	0007/0	46718/0	19246/0	9269/0	validity	SVK	Horizontal			
22600	2766/155	00020126/0	07426/0	03494/0	9973/0	prediction	- SVR-GA	flow			
23699	3700/155	00029126/0	06967/0	02133/0	9989/0	validity					
27660	0.5	00075/0	39274/0	17164/0	9462/0	prediction	SVR	Horizontal- vertical flow			
27660	65	00075/0	34866/0	18326/0	9424/0	validity					
21510	1207/122	00001560/0	05838/0	02105/0	9991/0	prediction	SVD C A				
21518	1387/132	00021562/0	08277/0	02385/0	9985/0	validity	SVK-GA				
22222	100	0005/0	27422/0	19525/0	8506/0	prediction	CUD				
32223	160	0005/0	26374/0	16398/0	8459/0	validity	- SVR				
20416	0202/246	00004794/0	09189/0	06917/0	9782/0	prediction	- SVR-GA	Vertical flow			
28416	9392/246		08563/0	02049/0	9977/0	validity					





with test and train data by using of SVR model, with quadratic loss function in horizontal flow

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nation coefficient is above 0.93 and root mean square error and mean absolute error are less than 0.2; in the event that SVR-GA model of all the flows determination coefficient is more than 0.99 and root mean square error and mean absolute error is less than 0.02. Thus, hybrid model with epsilon loss function is apparently more efficient. This superiority is shown in Figure 5.

According to the results seen in table 2 for SVR model does not contain good results for quadratic loss function but SVR-GA model shows very desirable results. In SVR model for all three flows, determination coefficient is more than 0.84 and root mean square error and mean absolute error are less than 0.47; in SVR-GA model for all three flows determination coefficient is above 0.97



with test and train data by using of SVR-GA model, with quadratic loss function in horizontal flow

and root means square error and mean absolute error are below 0.1. Therefore, hybrid model is much more efficient as it can be observed. The results obtained from epsilon loss function are more accurate as compared to the results gained from quadratic loss function. The results are demonstrated graphically in figure 6. In both models the results obtained from epsilon loss function were more precise. This procedure is obvious in diagram 3 to 6. But the considerable point is the execution time for epsilon loss function in both models is quite insignificant. According to the findings it can be declared that model hybrid model with epsilon loss function is an appropriate alternative for analytical Reynolds solutions.

Eventually, Results show that epsilon function accuracy is better than the quadratic function, but in terms of run time, quadratic function is superior to epsilon function significantly. Results show that accuracy of epsilon function is better than the quadratic function. Hybrid model with the epsilon loss function is superior. For quadratic loss function, the results of SVR model are not acceptable but SVR-GA model have a very good results. According to the results, we can say that a hybrid model with epsilon loss function very good alternative for the Reynolds analytical solution. The results of epsilon loss function in both models have higher accuracy in comparison with the quadratic loss function, but in terms of run time, quadratic function is superior to epsilon function significantly.

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### **Excavation Methods and Excavation Modelling from** South Wells of Iran by Poro-elastic Method

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#### ABSTRACT

Excavation fluids are important sections on excavation operations which are being used to control well and propel excavation barrels to ground surface. Thus, they play important role in the operations without having excavation operations. Today, some of cases which used in excavation are made as artificial but all manufacturers insist on adaptability and the rigid laws pertain to geographical situation and regional limitations. Excavation clay consists of water and other materials in order to facilitate and continue excavation operation which has been used in Iran and different materials with physical and chemical properties have been added. In this article, by geo-mechanical modelling of tank and well with poro-elastic model which is derived from continuation, compromise, balance, hook and darcy equations, Poro-elastic equations are located in Matlab environment and solve by limited element in order to increase tensions and pressure around well during certain duration.

KEY WORDS: EXCAVATION CLAY, EXCAVATION CLAY SYSTEM, PORP-ELASTIC, LIMITED ELEMENT MODEL

#### INTRODUCTION

Excavation clay has long term history since last past to now, at first, the Chinese understood that the clay softens what is on structure and they believed that excavation clay helps to rise up the barrels from bottom of well. Regardless some well which excavated by Chinese in 18th century, some well excavated in row of stones by hand which the first well was excavated by two brothers

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named David and JospehRafner at 1806 to 1807 for salt water (Hartman, 1959).

In this regard, in 1829, when excavation was continued to excavate salt water in one of the states of America, immediately, 1000 barrels of oil were propelled from well instead of salt water. In systems which have been used till 1846 and after that, flowing water has been used. No data about excavation method. In 1890, Chapman pointed that water and plastics can and this

is start of modern engineering in history of excavation clay. He obtained applications of excavation clay that means ability to prevent from watering in layers and concluded that another material has been used to cover well wall (Rothenburg *et al.* 1994).

Chapman pointed to application of soil, core of wheat, grains, cement and similar materials. In 1889, a watery well employer named Androw from America pointed that paste soils can be applied to make wall voids. At same year, person named John Yakingham stated that fat materials have been used instead of water to apply soil clays.On October 1990, Krat Mill stated that when excavation fluid was wetted by soil, it helped to make well significantly. Apparently, in that period, excavation fluid could not attract others and physical properties were not suitable to influence on it.It can be imagined that clay was made by well solids is so heavy or high granular and it has been used to slight it. If total granule is reduced or adds from tanks into new clay system, excavation is continued. If total weight is slight, well evaporates and if the drop is so much, falling of well wall caused cleavage of pipes(Hutin et al. 2001).

There are not effective additives ingredients for control physical properties and it was made by claying. 13 years after advent the first excavation clay for Lucas at 1901, the model was emerged as necessity in excavation industry in order to discuss excavation investigations. This problem was discovered in 1914 after vast research was performed by PoulardVehigourg who used more concentrated clay for excavating well in Oklahoma State. They stated that use of clay and soil is not new phenomenon in excavation industry and the first well has been excavated in Texas by clay but till 1913, when the wells were excavated by tower and without using clay, suitable clay is one which is so concentrated and can block voids of classes as if the fluid cannot penetrate into well, so that it has able to block sand voids, prevent from dropping of well and control gas pressures(Williamson, 1968).

#### MATERIAL AND METHODS

In order to display tension and penetration pressure of porosity environment, the fluids are obtained by combination, continuation, balance, compromise, hook and Darcy equations (1).

$$G\nabla 2u + (G + \lambda)\nabla divu - (\mathbf{1} - \frac{\kappa}{\kappa_m})\nabla p = 0$$
(1)

$$(1-\frac{\kappa}{\kappa_{\rm m}})\,\mathrm{div}\,\mathrm{ut}\,+\left(\frac{1-\varphi}{\kappa_{\rm M}}+\frac{\varphi}{\kappa_{\rm F}}-\frac{1}{\left(3\kappa_{\rm m}\right)^2}i^{\rm T}Di\right)P_t+\frac{\kappa}{\mu}\nabla 2p=0 \tag{2}$$

In which y is fixed, Lame, G is shearing model, K stability, U is viscosity of fluid and u and p are replacement and pressure, t is time and u is porosity, D matrix of elastic fatigue, K, Km, KfYalk model of building, matrix and fluid (0, 11), i= two dimensions calculations also D is function of F (Young model) and V (Poison coefficient).

Modelling or solving element is written in Matlab environment.

Poro-elastic model was obtained as limited element model (2).

$$\begin{bmatrix} M & -C \\ 0 & H \end{bmatrix} \begin{bmatrix} u \\ p \end{bmatrix} + \begin{bmatrix} 0 & 0 \\ C^{\mathsf{T}} & S \end{bmatrix} \begin{bmatrix} u_t \\ p_t \end{bmatrix} = \begin{bmatrix} f^U \\ f^p \end{bmatrix}$$
(3)

In this model, parameters (4) are:

$$M = \int B^T D B dv \tag{4}$$

$$\mathbf{H} = (\mathbf{K}/\boldsymbol{\mu}) \int (\nabla N) (\nabla N^T) dv \tag{5}$$

$$S=\int N[((1-\phi)/K_S) + (\phi/K_W) - (1/(3K_m)2) iTDi] NT dv$$
 (6)

$$C = \int \left[ B^T i N - B^T D\left(\frac{i}{3Km}\right) N \right] dv$$
(7)

One of the best methods for solving equations is obtained by Zozanagheh (3).

$$\begin{bmatrix} M & -\theta C \\ C^T & S + \theta \Delta t H \end{bmatrix} \begin{bmatrix} u_{n+1} \\ p_{n+1} \end{bmatrix} = \begin{bmatrix} (\theta - 1)M & -(\theta - 1)C \\ C^T & S + (\theta - 1)\Delta t H \end{bmatrix} \begin{bmatrix} u_n \\ p_n \end{bmatrix} + \begin{bmatrix} f^u \\ \Delta t f^p \end{bmatrix}$$

In which,  $\theta = 1.2$  is considered.

In order to discuss effect of weight increment on tensions of clay and penetration pressure, firstly, a tank with pressure 500 psi (34e5pa) is considered and clay pressure is increased to 870 (60e5pa) and its effects are discussed on tension and pressure.

Borderline situations are displayed for following figure:







FIGURE 3. Increment of tension in step of x (PASCAL) to second



#### **RESULTS AND DISCUSSION**

In order to discuss effect of weight increment for tensions and well of wall, firstly, a tank with pressure of 500 is considered and scale of pressure is increased till 870.

Entrance data are: E=560e5 Pa, K=16.e-14 m2  $\mu$ =26222 Pa.s v=2624,  $\phi$ =2614  $\lambda$ T=162, Kf=1e12 Pa, Km=22e5 Pa,  $\rho$ fcf=1022242  $\rho$ scs=1520222  $\beta$ s=14e-. °C-1,  $\beta$ f=322e-. °C-1, Sigmah=360e.Pa, SigmaH=4e. Pa fu,fp

Which are node load of pressure and replaced node of pressure equal to zero and all nodes are equal to tank pressure.

#### CONCLUSION

With increment weight of excavation clay and pressure around well is increased and in the lacking calculation of total weight, in this article, by increment of weight of clay from 34e5 to 60e5 in Pascal and as for information it was increased as 96% from tension around well.

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## The effect of strength and resistance training on changes in total fat, body mass index and serum leptin as well as their correlation in obese sedentary employees

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#### ABSTRACT

This study aims to investigate the effect of strength and resistance training on changes in total fat, body mass index (BMI), and serum leptin as well as correlation between serum leptin and BMI in obese sedentary employees. Research variables include total fat, serum leptin, body mass index, and strength training protocol for a month and in 3 sessions per week, each session lasts for 84 minutes as well as 60 to 70 percent of maximum heart rate. The strength training protocol lasts for one month and the weight training for 3 times per week, 60 to 75% for 1 repetition maximum (1RM) and the total exercise lasts for 70 minutes per session. In this study, the research method is experimental. 30 out of 110 obese employees are randomly selected as the statistical sample. The sample is categorized into three groups, including control (n = 10), resistance (n = 10), and strength (n = 10). In pre-test, demographic and physical characteristics of the sample are measured and recorded. In the post-test and after the course of the training protocol, the previous measurements are repeated. Statistical methods to compare training groups in the test process include repeated measures ANOVA, the Bonferroni post hoc test whenever a significant difference between three or more sample means has been revealed by an analysis of variance (ANOVA), and Pearson correlation coefficient to investigate the relationship between variables. Spss version 19 software is used to analyze the data and the error rate in all cases is ( $\alpha = 0.5$  %). The findings of the study include: 1) for both groups, the resistance training has no significant effect on serum leptin level, 2) endurance training has a significant effect on body mass index, but strength training has no significant effect on body mass index, 3) Strength and resistance training have a significant effect on total fat, 4) for the group with resistance training, there is a positive correlation between the variables of leptin and body mass index, 5) for the group with strength training, there is a positive correlation between the variables of leptin and body mass index. These changes are associated with an increase in the level of readiness for participants in both training protocol groups. Perhaps by increasing the statistical population, the intensity, and duration of exercise activities, there will be a different effect on changes of variables and their significance.

KEY WORDS: TOTAL FAT, BODY MASS INDEX, SERUM LEPTIN OBESE SEDENTARY EMPLOYEES

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#### INTRODUCTION

Obesity is considered as a major risk factor for diseases such as diabetic and coronary heart diseases. Levels of the hormone leptin are associated with body fat mass and can be regulated by hunger, eating a meal, insulin and many other factors. Exercise is one of the strategies to reduce the obesity (Jockehovel et al. 1997). The ratio of leptin to fat mass is relatively constant during the period of sexual maturity. However, the reason for obesity in youth is resistance against leptin through changing hypothalamic leptin receptor isoforms due to mutations of the coding region of leptin receptor long isoform. It can be said circulating leptin concentrations have a positive correlation with body fat stores. Leptin plays an important role as a signal in the regulation of adipose tissue and body weight. Performance of Leptin is controlling food intake and stimulating energy consumption. However, leptin as the circulating signal is effective in attenuating appetite. There are many questions related to the effect of physical activity (exercise) on the concentration of leptin. Physical activity (exercise) is in effective in reduction of obesity. A study has shown that serum leptin concentration is related to body mass index. Among employees, the issue of an appropriate physical norm and overweight is important. In Iran, if the employee is overweight his / her next promotion is delayed until reaching the ideal weight. Therefore, investigating the effectiveness of exercise in reducing the risk factors of obesity can help the employees. Given that the effects of strength training on serum leptin concentration and body mass index are less important. Knowledge in this area, in particular, its effects on endocrine system still remain somewhat unknown. In most studies, comparing the two groups of strength and resistance is used without control group and assessment inside the group. This study aims to investigate the Effect of strength and resistance training on changes in total fat, body mass index (BMI), and serum leptin as well as correlation between serum leptin and BMI in obese sedentary employees.

#### METHODOLOGY

#### PARTICIPANTS

A public call for the voluntary participation in research design was used and 52 out of 110 people announced their readiness based on completed questionnaires, clinical examination, not having an orthopedic injury history, lack of medicine consumption, not 28 k/m2. After briefing session and filling out the consent form, Physical Activity Readiness Questionnaire (PAR-Q), and Health History Questionnaire, those who had no history or symptoms of infection from a month ago, cardiovascular disease, thalassemia, diabetes, arthritis, and respiratory disorders, insulin resistance, and other disease statuses, medicine consumption and ergogenic supplements were removed from the research. Finally, a total of 22 people dropped out or were forced to quit and 30 people remained. According to the classification by one of the colleagues, these 30 people were randomly categorized into three groups in terms of body mass index, age, and the fat content determined by body composition analyzer. The groups include control (n = 10), resistance (n = 10), and strength (n = 10). The selected people were requested to take the commitment to regularly participate in the research plan in due time and the control group was requested not to do any exercise but attend the exercises. Statistical description of characteristics for participants in terms of central tendency and dispersion are given in Table 1.

#### MEASURING INSTRUMENTS AND METHODS

As scheduled in coordination with blood samples, the participants were requested to take the pre-test. Then, according to program, leptin levels of both the experimental group and the control group were measured by the relevant specialist and his assistant in the laboratory through Leptin ELISA Kit manufactured by the German company sensitivity 0.1 ng per milliliter. Next, they attended the sport conference center and height and weight were measured without shoes on the device

Table 1. Mean and standard deviation of age, height and weight of the participants in three groups								
	Age (y	year)	Body weight (kg)		Height (m)			
Group	Mean	standard deviation	Mean	standard deviation	Mean	standard deviation		
Resistance	27.1	3.87	94.29	5.38	1.8	0.046		
Strength	26.4	3.71	91.5	7.48	1.76	0.036		
Control	26.1	4.25	99.3	8.79	1.81	0.069		
Total	26.53	3.83	95.03	7.82	1.79	0.054		

(Seca weighing scale, model 220, the accuracy of 0.1 kg, and with height measuring rod). The participants were standing on two legs in order to divide the weight equally and their look was parallel to the horizon after a normal expiration. In this way, the horizontal ruler was placed on the man's head and the end of the ruler was on the graded tape. Body mass index and body fat percentage were measured by Body Composition Analyzer (model GAIA 359 PLUS). 1-Mile Walking Test was used to determine Vo2Max and 1 repetition maximum (1RM). According to this test, the participants in the experimental group of resistance walked a distance of a mile as fast as they could. The distance time and heart rate were recorded after finishing walking. By adding weight and age to these factors, Vo2Max was calculated through the following equation:

Vo2 Max =  $(6965.2 + 20.02 \text{ (Body weight in kg)}) - 25.7 \times (Age in years) + 595.5 \times (1) -224.00 \times (Test time in minutes) -11.5 (Heart rate per minute)/ (Body weight in kg)$ 

Weights of fitness equipment (manufactured by IMPLUS) were recorded for the experimental group of strength. The experimental groups did their own exercises at specified dates and times (9 to 11 am). After completion of the training period, height, weight, body mass index, fat percentage, and maximum oxygen consumption were re-measured in the post-test. In addition, previous blood tests in the laboratory were repeated in due date. The amount of blood serum in the posttest was sent to the hormone laboratory for the analysis of changes in levels of leptin. Furthermore, all participants in the pre-test (24 hours before exercise) and in the posttest (24 hours after exercise) attended the laboratory for blood sampling at 9 am after fasting for 12 hours. Before going to the laboratory, participants were announced by a guide about the main points on the nutrition (24hour dietary recall questionnaire in three days), physical activities, and disease before and after 4 weeks of physical exercises in order to be careful about the mentioned points. In the laboratory, blood samples of 30 ml were taken from a vein in the right arm and blood was slowly poured into the test tube. When blood was clotted, the tubes were balanced. Then, the tubes were placed into Hettich centrifuge. Next, serum was separated from blood clots and was frozen for testing leptin.

#### TRAINING PROTOCOLS

In this study, the protocol of aerobic exercise (resistance) included two months, 3 sessions per week, 84 minutes in each session, at 2 stations (stationary bike and treadmill), 2 sets of four-minute, training intensity by 60 to 70 percent for the maximum heart rate. To follow the principle of overload, a half minute per session was added to the training time in order that the aerobic exercise time reaches 96 minutes in the last session. Forasmuch as participants did not regularly the exercises, 12 minutes for rest time between two sets and 20 minutes for rest time between two stations were considered as the duration of the break in aerobic exercise. The strength training protocol included Two months for weight training, the 3 session exercise per week, 9 stations, 8 to 12 repetitions in three sets, 60 -75% of one repetition maximum with 45 seconds for the rest time between sets and 1.5 minutes between stations. In the strength training protocol, the total exercise time was 70 minutes per session. The one repetition maximum test was given for the principle of overload at the end of each session. The strength training program was designed according to 60-75 percent of the one repetition maximum test after three training sessions. Statistical methods to compare training groups in the test process include repeated measures ANOVA, the Bonferroni post hoc test whenever a significant difference between three or more sample means has been revealed by an analysis of variance (ANOVA), and Pearson correlation coefficient to investigate the relationship between variables. Spss version 19 software is used to analyze the data and the error rate in all cases is ( $\alpha = 0.5$  %).

#### RESULTS

Table 2 shows changes of scores from pre-test to posttest for all groups based on their BMI, hormone leptin, and total fat.

The first null hypothesis: there is no significant difference for the leptin level between the training groups (resistance, strength and control). A 2x3 repeated measures ANOVA was used to investigate the data obtained from the effects of exercise on hormone leptin. The results of the Shapiro–Wilk test showed that the blood leptin

Table 2. Mean and standard deviation of the variables in pre-test and post-test									
Variables	Body mass i	ndex	Hormone le	ptin	Total fat				
Groups	pre-test post-test		pre-test	pre-test post-test		post-test			
Resistance	29.08±0.704	28.59 <u>+</u> 0.875	16.6±4.25	12.69 <u>+</u> 2.38	46.26±2.08	45.15±1.86			
Strength	29.25±1.27	29.2±1.16	14.71 <u>+</u> 2.91	13.59 <u>+</u> 2.13	44.01±1.29	44.22±1.18			
Control	30.06±1.23	30.02±1.27	13.4±3.91	13.13±3.88	44.94±0.88	44.93±0.84			

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Table 3. E training g	Table 3. Evaluation of homogeneity of variance between the training groups in the pre-test and post-test (Levin test)							
Test/statistics Levin statistics df1 df2 Sig.								
pre-test		0.621	2	27	0.545			
post-test		2.569	2	27	0.95			

level has a normal distribution for all training groups in pre-test and post-test sessions (p>0.05). According to Table 3, the Levin test shows that there is homogeneity of variance between the scores of the training group in the pre-test and post-test (p>0.05).

According to Table 4, the results of the repeated measures ANOVA show that the effect of the test is sig-

effect (Test \* Group) was significant, the paired sample t-test was used to compare the pre-test and post-test. The results of the paired sample t-test showed that there is a significant difference between the pre-test and post-test in the resistance training group (t=4.960, p= 0.001) but there is no significant difference between the pre-test and post-test in other groups.

The second null hypothesis: there is no significant difference for the Body mass index between the training groups (resistance, strength and control). A 2x3 repeated measures ANOVA was used to investigate the data obtained from the effects of exercise on hormone leptin. The results of the Shapiro–Wilk test showed that the blood leptin level has a normal distribution for all train-

Table 4. The repeated measures ANOVA to compare the groups in the pre-test and post-test							
Indexes <sup>®</sup> Sources of Variation⁻		Sum of squares	Degrees of freedom	Mean Square	F	Р	
	Test	37.763	1	37.763	23.901	0.000	
Intragroup	Test * group	25.658	2	12.829	8.12	0.002	
	Error	42.659	27	1.589			
Interdecup	Group	13.773	2	6.887	0.330	0.721	
Intergroup	Error	562.71	27	20.841			

nificant. In other words, there is a significant difference between the pre-test and post-test regardless of the type of training. In addition, the interaction effect is significant. However, the results show that the main effect of the group is not significant. It means that there is a significant difference between the different training groups regardless of the type of training. Hence, the null hypothesis is confirmed. Forasmuch as the interaction

ing groups in pre-test and post-test sessions (p>0.05).
According to Table 3, the Levin test shows that there
is homogeneity of variance between the scores of the
training group in the pre-test and post-test (p>0.05).

According to Table 6, the results of the repeated measures ANOVA show that the effect of the test is significant. In other words, there is a significant difference between the pre-test and post-test regardless of the type of train-

	Table 5. Evaluation of homogeneity of variance between the training groups in the pre-test and post-test (Levin test)								
	Sig.								
	pre-test	1.005	2	27	0.379				
	post-test	0.339	2	27	0.716				

Table 7. Evaluation of homogeneity of variance between the training groups in the pre-test and post-test (Levin test)										
Test/statistics Levin statistics df1 df2 Sig.										
pre-test 5.97 2 27 0.007										
post-test	nost-test 2.249 2 27 0.012									

Tal po	Table 6. The repeated measures ANOVA to compare the groups in the pre-test and post-test									
In of	dexes® S Variatio	ources n <sup>-</sup>	Sum of squares	Degrees of freedom	Mean Square	F	Р			
		Test	0.574	1	0.574	7.352	0.012			
Int	tragroup	Test * group	0.663	2	0.332	4.246	0.025			
		Error	2.109	27	1.078		~			
Int	torgroup	Group	15.181	2	7.591	3.179	0.05			
Int	tergroup	Error	64.468	27	2.388					

Table 8. The repeated measures ANOVA to compare the groups in the pre-test and post-test							
Indexes® Sources of Variation <sup>-</sup>		Sum of squares	Degrees of freedom	Mean Square	F	Р	
	Test	1.368	1	1.368	8.176	0.008	
Intragroup	Test * group	5.105	2	2.552	15.288	0.000	
	Error	4.558	27	0.167			
Intergroup	Group	25.193	2	12.597	3.179	0.048	
Intergroup	Error	106.973	27	3.962			

ing.. Hence, the null hypothesis is rejected. Because of differences between groups Bonferroni post hoc test was used to determine the location of difference. The results showed that there was a significant difference between resistance and control groups. Forasmuch as the interaction effect (Test \* Group) was significant, the paired sample t-test was used to compare the pre-test and posttest. The results of the paired sample t-test showed that there is a significant difference between the pre-test and posttest in the resistance training group (t=2.985, p= 0.015) but there is no significant difference between the pre-test and post-test in other groups.

The third null hypothesis: there is no significant difference for the total fat between the training groups (resistance, strength and control). A 2x3 repeated measures ANOVA was used to investigate the data obtained from the effects of exercise on hormone leptin. The results of the Shapiro–Wilk test showed that the blood leptin level has a normal distribution for all training groups in pre-test and post-test sessions (p>0.05). According to Table 3, the Levin test shows that there is homogeneity of variance between the scores of the training group in the pre-test and post-test (p>0.05).

Table 9. correlation leptin level and boo resistance training	betwe ly mas group	een the variables ss index in the po	of blood ost-test in the
		blood leptin level	body mass index
blood leptin level	R P	1	0.675 0.032
body mass index	R P	0.675 0.032	1

Table 10. correlation between the variables of blood leptin level and body mass index in the post-test in the strength training group							
blood leptin body m level index							
blood leptin level	R P	1	0.183 0.613				
body mass index	R P	0.183 0.613	1				

According to Table 6, the results of the repeated measures ANOVA show that the effect of the test is significant. In other words, there is a significant difference between the pre-test and post-test regardless of the type of training. Hence, the null hypothesis is rejected. Because of differences between groups Bonferroni post hoc test was used to determine the location of difference. The results showed that there was a significant difference between resistance and control groups. Forasmuch as the interaction effect (Test \* Group) was significant, the paired sample t-test was used to compare the pre-test and posttest. The results of the paired sample t-test showed that there is a significant difference between the pre-test and post-test in the resistance training group (t=4.418, p= 0.02) but there is no significant difference between the pre-test and post-test in other groups.

The fourth null hypothesis: there is no significant relationship between the blood leptin level and body mass index of the participants in the resistance training group.

Pearson correlation test was used to examine the relationship between these two variables. Table 9 shows the correlation between variables. The results showed that there is a significant positive relationship between two variables of the blood leptin level and body mass index in the posttest. Hence, the null hypothesis is rejected.

The fifth null hypothesis: there is no significant relationship between the blood leptin level and body mass index of the participants in the strength training group.

Pearson correlation test was used to examine the relationship between these two variables. Table 10 shows the correlation between variables. The results showed that there is a significant positive relationship between two variables of the blood leptin level and body mass index in the posttest. Hence, the null hypothesis is rejected.

#### DISCUSSION AND CONCLUSION

This study investigated the effect of strength and resistance training on changes in total fat, body mass index (BMI), and serum leptin as well as correlation between serum leptin and BMI in obese sedentary employees. Although many researches have done on serum leptin concentration and its relationship with body mass index, Factors such as intensity, time, type of training, physical conditions of the people, their sex and age, and ways of measuring body mass index lead to different reactions in the body. In addition, there are a few studies on the effects of strength training on leptin and body mass index. Strength and resistance training has no significant effect on serum leptin concentrations in obese and overweight men. This result can affect the leptin level due to changes in hormones concentration affecting leptin such as insulin, cortisol, testosterone, growth hormone, and catecholamine (Hamedinia et al. 2011). Other studies showed that lack of reduction in serum leptin in spite of decreasing the body fat percentage is because of high cortisol levels and creating conditions for overtraining due to the exercise protocol in athletes (Noland et al, 2001). In another study, despite a significant decrease in fat mass, and serum testosterone, there was no change in serum leptin concentrations after six weeks of strength training in physical education students because of an increase in serum leptin concentrations in comparison with body fat mass (Jones *et al*, 2009). Furthermore, the results of some studies showed that in spite of a decrease in percentage of body fat, there was no change in the serum leptin level resulting from exercises (Thong and Hudson, 2002; Lau et al, 2010; Kraemer et al, 2002). Some studies concluded that the reason for the reduction of the leptin level is a decrease in percentage of the body fat (Kraemer et al, 1998). Some others concluded that the effect of exercise on the leptin level is positive and independent from changes in the body fat (Gaini et al, 2000; http://www.ensani.ir/fa/content/303352/ default.aspx). We can say that the apparent differences in training protocol and type of participants and their individual characteristics can explain the difference in the percentage of the body fat and leptin. In a study, it was concluded that the lack of changes in leptin was the limitation of the leptin performance (Maestu et al, 2008; Erikson *et al*, 2008).

In the present study, the volume of exercises such as the intensity and duration of exercise was not enough to affect the leptin level. There may also be another possibility that explains the lack of changes in the leptin level in this study. Leptin is either free (possibly active) or protein bound. The free leptin level is greater in obese people and concentration of free leptin decreases after weight loss even more than total leptin concentration (Unal *et al.* 2005). Exercise in spite of no reduction in total leptin is effective in changing in the ratio of free leptin to protein bound leptin (resulting in changes in leptin activity). Measuring the amount of leptin binding protein requires the measurement of leptin receptor in plasma. This issue was not measured in the present study.

It seems that there are many other factors involved in the effect of training on the serum leptin level. These factors include enzymes involved in the biosynthesis of testosterone as a result of stress caused by exercise (Nidle et al. 2002), the inhibitory effect of cortisol on LH receptors in Leydig cells of the testes, and reduction in the secretion of testosterone (Cooke *et al*, 1999). Therefore, high cortisol levels may decrease the secretion of testosterone and LH receptors (Gotshalk et al, 1997). Researches have shown a strong inverse relationship between leptin and testosterone (Dohem and Louis, 1978). Leptin also affects the production and secretion of cortisol (Lowndes et al, 2008) and cortisol is stimulus of leptin gene expression. There is a direct correlation between leptin and cortisol resting levels (Smilios et al, 2003). With regard to the inverse relationship between cortisol and testosterone, an increase in the hormone cortisol results in increasing stress (Cooke et al, 1999). It leads to decreasing testosterone and the emergence of a factor in line with the lack of a significant effect of the exercises, including strength training and resistance training protocol, on the hormone leptin. Kraemer et al investigated the effect of the resistance exercises on cyclists. Glucocorticoids play an important role in the physiological regulation of leptin and cortisol is simultaneously effective in the production and disposal of leptin (Kraemer et al, 2002).

There was a significant difference between different groups in relation to the effects of two methods of exercise training on body mass index. According to the results of the Bonferroni post hoc test in the present study, there is a significant difference between the control and resistance groups. It can be concluded that this change occurs due to an increase in fat oxidation for the control of body composition in the resistance training group.

This issue is consistent with the control of the variable of fat in the present study. According to the reduction in body mass index in strength and resistance groups in this research, it seems that the way of training in this study has the required intensity and energy cost threshold for changing the weight levels of the participants. Given that there was a significant change in body mass index and height is stable according to the middle age range of the participants, the weight loss occurred for the participants. The overall conclusion indicated that both of the exercises lead to the similar results. Most changes in body mass index were related to the resistance training.

Therefore, it is suggested that the resistance exercises are further used to prevent obesity and many diseases caused by inactivity and obtain the desired effect of exercises based on physical preparation and reducing overweight.

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## Synthesis of 4, 4'-(1, 3 and 1, 4-phenylene) bis (6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5carboxylate) via a one- pot three-component reaction of Urea with dialdehydes and acetoacetates in the presence of hydrochloric acid and heteropolyacid

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#### ABSTRACT

A simple and efficient synthesis of 4, 4'-(1, 3 and 1, 4-phenylene) bis (6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate) via a one- pot three-component reaction of Urea with dialdehydes and acetoacetates in the presence of hydrochloric acid and heteropolyacid is described. All synthesized compounds were characterized on the basis of their spectral and microanalytical data. In the first stage we report a convenient synthesis of new 4, 4'-(phenylene) bis tetrahydropyrimidines 4a-4f by a one-pot three-component reaction of Urea 1, dialdehydes 2a-4b, and acetoacetates 3a-3c in refluxing hydrochloric acid. And then, in the second stage, we used heteropolyacids in this reaction. We report reaction conditions (solvent, temperature, reaction time, catalyst type, and concentration) were studied to optimize in this procedure. Melting points were recorded on a Stuart SMP3 melting point apparatus. The IR spectra were obtained using a Bruker Tensor 27 spectrophotometer using KBr discs. The 'H NMR (300 MHz) was recorded with Bruker-300 MHz spectrometers. The <sup>13</sup>C-NMR was recorded with Bruker-300 MHz spectrometers at 75 MHz frequencies. The mass spectra were scanned on an Agilent Technologies instrument at 70 eV. Elemental analysis was performed on a Thermo Finnigan Flash EA microanalyzer.

**KEY WORDS:** BIS (1, 2, 3, 4-TETRAHYDROPYRIMIDINE-5-CARBOXYLATE), HETEROPOLYACID, UREA, ACETOACETATES, DIALDEHYDES, BIGINELLI REACTION

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#### INTRODUTION

3,4-Dihydropyrimidin-2-(1H)-ones (DHPMs) and their derivatives gained considerable interest from the first reported in 1891 until today both in academia and industry because of their important and promising therapeutic and pharmacological properties (Biginelli *et al.* 1891). For instance, they have emerged as integral backbones of several channel blockers, antihypertensive agent  $\alpha$ -1antagonists, neuropeptide Y (NPY) antagonists and anticancer activities (Singh *et al.* 2009; Russowsky *et al.* 2006; Kumar *et al.* 2009; Da Silva *et al.* 2012).

The classical Biginelli reaction involves the strong acid-catalyzed cyclocondensation reaction of ethyl acetoacetate, benzaldehyde and urea in ethanol at reflux temperature for long reaction time. Furthermore, this one-pot three-component procedure often provides with relatively low yields of the dihydropyrimidine derivatives. In order to improve the effiency and synthetic procedure of the classical one-pot Biginelli reaction, using different types of catalysts and conditions have been reported by different research groups. The most of these procedures are all similar, using different acid catalyst such as BF<sub>2</sub>.OEt<sub>2</sub> (Hu et al. 1998), FeCl<sub>2</sub>.6H<sub>2</sub>O (Xu et al. 2004), MgCl<sub>2</sub>.6H<sub>2</sub>O (Zhang et al. 2004), MgBr<sub>2</sub> (Gulten, 2013; Salehi, 2004), BiCl, (Ramalinga et al. 2001), InCl, (Ranu et al. 2000), ZnO nano particles (Hassanpour et al. 2015), zeolites (Radha et al. 2001), LaCl<sub>2</sub>.7H<sub>2</sub>O (Lu et al. 2000), LiClO<sub>4</sub> (Yadav et al. 2001), Mn(OAc)<sub>3</sub>.2H<sub>2</sub>O (Kumar et al. 2001), NiCl<sub>2</sub>.6H<sub>2</sub>O (Lu, 2010), and so on, in solvent such as CH<sub>2</sub>CN, CH<sub>2</sub>Cl<sub>2</sub>, THF, EtOH or H<sub>2</sub>O. In addition procedures employing ultrasound, microwave (Kappe, 1999), solid and fluorous (Studer et al. 1997) phase syntheses have reported.

A number of procedures under solvent free conditions using different acid catalyst have also been reported (Zhang *et al.* 2015). However, despite their potential utility some these procedures use expensive catalysts, strong acidic conditions, higher temperatures, stoichometric amounts of catalyst, toxic reagents, large amount of solvents, unsatisfactory yields, inconvenient prurification techniques, incompatibility with other functional groups and require longer reaction times are not all acceptable in the context of green synthesis.

On the other hand, Polyoxometalates (POMs) are a large class of metal oxide cluster compounds consisting of transi-tion metal atoms bridged by oxygen atoms. POMs can exist in a variety of different size and structure, and compounds belonging to this class have been studied extensively because they possess interesting electronic and molecular properties, such as wide-ranging reduction potentials, acidities, and polarities. Based on their attractive properties, POMs have also been used in a variety of different application, including catalysis,

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biomedicine, magnetism, nanotechnology, and materials science (Müller *et al.* 1998; Pope and Müller, 2001; Davoodnia *et al.* 2013; Coronado *et al.* 1998; Okuhara *et al.* 1996). The development of methods using heteropolyacids (HPAs) as Catalyst for the synthesis of fine chemicals, such as flavors, pharmaceuticals, and in food industries, has gained attention in the last decade (Chwegler *et al.* 1991).

Catalysts based on heteropolyacids have many advantages over liquid-acid catalysts. They are not corrosive and are environmentally benign and present fewer disposal problems.

Solid heteropolyacids have attracted much attention organic synthesis owing to easy work-up procedures, easyfiltration, and reduction of cost and waste generation through reuse and recycling of the catalysts.

#### MATERIAL AND METHODS

In spite of much work on the synthesis of substituted tetrahydropyrimidines, to the best of our knowledge, the synthesis of 4, 4'-(1, 3 and 1, 4-phenylene) bis (6-methyl-2-oxo-1, 2, 3, 4-tetrahydropyrimidine-5-carboxylate) has not been reported in the literature. In this paper, in the first stage we report a convenient synthesis of new 4, 4'-(phenylene) bis tetrahydropyrimidines 4a-4f by a one-pot three-component reaction of Urea 1, dialdehydes 2a-4b, and acetoacetates 3a-3c in refluxing hydrochloric acid. And then, in the second stage, we used heteropolyacids in this reaction. We report reaction conditions (solvent, temperature, reaction time, catalyst type, and concentration) were studied to optimize in this procedure (Scheme 1).

#### **RESULTS AND DISCUSSION**

Although we did not investigate the reaction mechanism, two plausible mechanisms for this three-component reaction as have been depicted in Scheme 2. For example in route 1, it is proposed that the reaction occurs via initial formation of the intermediate I as a result of a nucleophilic attack of Urea at the carbonyl group of dialdehydes. Dehydration of the intermediate I follows the intermediate II. Reaction of acetoacetates with this intermediate then gives the intermediate III which after cyclization followed by dehydration afforded final products **4a-4f**. As shown in Scheme 2, we propose that Hydrochloric acid and Heteropolyacid  $\equiv$  Het activate the reactants and the intermediates in this reaction.

A one-pot three-component reaction of Urea 1, an dialdehydes 2a-2b and acetoacetates 3a-3c in the presence of hydrochloric acid under reflux for 4h leads to the facile formation of 4, 4'-(1, 3 and 1, 4-phenylene)

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bis (6-methyl-2-oxo-1, 2, 3, 4-tetrahydropyrimidine-5-carboxylate) **4a-4f** in 80-90% yields (Table 1).

The structures of the products were deduced from their spectral and microanalytical data. For example, the <sup>1</sup>H NMR spectrum of compound 4a which this is a symmetrical produce, exhibited one sharp signal at  $\delta$  2.250 and 3.541ppm for methyl groups,  $\delta$  5.109ppm for CH groups,  $\delta$  7.736 and 9.231ppm for NH groups, as well as the signals in the aromatic region,  $\delta$  7.189 ppm, due to 4 aromatic protons indicating the formation of the compound 4a. The IR spectrum of 4a showed strong absorptions at 3430 cm<sup>-1</sup>for NH absorption, 3028 and 2943 cm<sup>-1</sup> due to the aromatic and aliphatic protons, two strong absorptions in 1697 and 1661 cm<sup>-1</sup> for stretching C=O in the pyrimidine ring, two strong absorptions as doublet in 1433 and 1385  $\text{cm}^{-1}$  for stretching C=C in rings and a medium absorption in 1238  $\text{cm}^{-1}$  for C-N respectively.

The MS (APCI) of 4a showed a peak at m/z 414.1([M]<sup>+</sup>) corresponding to the molecular formula  $C_{20}H_{22}N_4O_6$ . This product gave also satisfactory proton decoupled <sup>13</sup>C NMR data in 18.30, 51.32, 53.99, 99.40, 129.78, 144.25, 149.15, 152.62, 166.28 ppm.

In the second stage, we studied the efficiency using two heteropolyacids contain Keggin-type  $H_3[PMo_{12}O_{40}]$  and preyssler  $H_{14}[NaP_5W_{30}O_{110}]$ . The results are reported in Table1 with the order of efficiency as follows:  $H_3[PMo_{12}O_{40}] > H_{14}[NaP_5W_{30}O_{110}]$ .

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Table1.	Table1. Synthesis of some new 4, 4'-(phenylene) bis tetrahydropyrimidines 4a-4f										
			HCla		H <sub>3</sub> [PM0 <sub>12</sub> 0 <sub>40</sub> ] <sup>b</sup>		$H_{14}[NaP_5 W_{30} O_{110}]^{b}$				
Produc	t <sup>c</sup> R	Ar	Time(hr)	Yield (%) <sup>d</sup>	Time(min)	Yield (%)	Time(min)	Yield (%)	M.P. (°C)		
4a	Me	1,4-phenylene	4	84	30	86	60	84	315 dec.		
4b	Et	1,4-phenylene	4	87	30	90	60	86	310 dec.		
4c	PhCH <sub>2</sub>	1,4-phenylene	5	90	30	92	60	88	294-296		
4d	Me	1,3-phenylene	6	85	30	88	60	80	279-281		
4e	Et	1,3-phenylene	4	80	30	85	60	84	289-291		
4f	PhCH <sub>2</sub>	1,3-phenylene	5	85	30	85	60	82	300 dec.		
an ci	1		111 1 0 01	(1 1)		1) 12 1					

<sup>a</sup>Reaction conditions : Urea 1 (2 mmol), a dialdhyde 2a-2b (1 mmol), an acetoacetate 3a-3c (2 mmol), Ethanol (6 ml), Hydrochloric acid (4-5 drops), reflux. <sup>b</sup>Reaction conditions : Urea 1 (2 mmol), a dialdhyde 2a-2b (1 mmol), an acetoacetate 3a-3c (2 mmol), Ethanol (6 ml), Hydrochloric acid (4-5 drops), H<sub>3</sub>(PMo<sub>12</sub>O<sub>40</sub>] or H<sub>14</sub>[NaP<sub>5</sub> W<sub>30</sub> O<sub>110</sub>] (0.1gr), temperature room.

<sup>c</sup>All the products were characterized according to their spectral and microanalytical data. <sup>d</sup>Isolated yields.

The effect of varying the reaction duration was studied for the synthesis of **4a** by reaction of Urea **1**, Terephaldialdhyde **2a**, and methyl acetoacetate **3a**.

The effect of solvent on the synthesis of 4a was studied on solvents including  $C_6H_5CH_3$ , DMF, DMSO,  $H_2O$ ,  $CH_2Cl_2$ ,  $CHCl_3$ , and EtOH. Ethanol proved to be the best in terms of yield (Table 2).

The effects of temperature, and the amounts of heteropolyacid, had showed respectively Tables 3 and 4.

#### **CONCLUSION**

Melting points were recorded on a Stuart SMP3 melting point apparatus. The IR spectra were obtained using

Table 2. Effect of Solvent on the yields of 4a <sup>a</sup>								
Entry	Solvent Time(hr) Yield (%)							
1	H <sub>2</sub> 0	3	38					
2	DMSO	3	32					
3	DMF	3	35					
4	C <sub>6</sub> H <sub>5</sub> CH <sub>3</sub> 3 Trace							
5	$CH_2Cl_2$	3	Trace					
6	CHCl <sub>3</sub>	3	Trace					
7	EtOH	30(min)	86					
<sup>a</sup> Reaction co Terephthald <b>3a</b> (2 mmol Hydrochlor	onditions : Urea ialdhyde 2a (1 n ), solvent (6 ml), ic acid (4-5 drop	1 (2 mmol), nmol), methyl a H <sub>3</sub> [PMo <sub>12</sub> O <sub>40</sub> ] (0 s), temperature	cetoacetate ).1gr), room.					

Tal	Table 3. Effect of temperature on the yields of $4a^a$							
En	try	Temperature (°C) Product (gr) Yield (%						
1		Room	0.356	86				
2		50	0.228	55				
3		110	0.141	34				
*Rea mm (0.1	action Iol), me gr), Hy	conditions : Urea 1 (2 mm ethyl acetoacetate <b>3a</b> (2 m rdrochloric acid (4-5 drop	nol), Terephthaldiald Imol), solvent (6 ml) s).	hyde 2a (1 , H <sub>3</sub> [PMo <sub>12</sub> O <sub>40</sub> ]				

Table H <sub>3</sub> [PI	Table 4. Effect of the amounts of Keggin $H_3[PMo_{12}O_{40}]$ on the yields of $4a^a$								
Entr	у	amounts of Keggin(gr)	Time (min)	Yield (%)					
1		0.05	30	28					
2		0.07	30	68					
3		0.10	0.10 30 86						
4		0.12	30	63					
5		0.15	30	52					
<sup>a</sup> React 2a (1 Hydro	ion co mmol) chlori	onditions : Urea 1 (2 ), methyl acetoacetat c acid (4-5 drops), te	mmol), Terephtha e 3a (2 mmol), sol emperature room.	ldialdhyde vent (6 ml),					

a Bruker Tensor 27 spectrophotometer using KBr discs. The <sup>1</sup>H NMR (300 MHz) was recorded with Bruker-300 MHz spectrometers. The <sup>13</sup>C-NMR was recorded with Bruker-300 MHz spectrometers at 75 MHz frequencies. The mass spectra were scanned on an Agilent Technologies instrument at 70 eV. Elemental analysis was performed on a Thermo Finnigan Flash EA microanalyzer.

Synthesis of bis-1, 2, 3, 4-tetrahydropyrimidines 4a-4f; (general procedure). A mixture of urea 1 (2 mmol), an aldehyde 2a-2b (1 mmol),  $\beta$ -ketoester 3a-3c (2 mmol) and conc. HCl (4-6 drops) in EtOH (6mL) was heated under reflux for 4-6 hours. After the completion of the reaction, the solvent was evaporated in vacuo. The crude product was collected and re-crystallized from ethanol to give compounds 4a-4f in 80-90% yields.

Table 5. Synthesis of <b>4a</b> with recycled Keggin $H_3[PMo_{12}O_{40}]^a$ .							
	1 <sup>st</sup> run	2 <sup>nd</sup> run	3 <sup>rd</sup> run	4 <sup>th</sup> run			
Time (min)	30 30 40 50						
Yield (%) 86 78 76 70							
<sup>a</sup> Reaction con 2a (1 mmol), u H <sub>3</sub> [PMo <sub>12</sub> O <sub>40</sub> ] (	ditions : Ure nethylaceto 0.1gr), Hydi	ea 1 (2 mmol) acetate <b>3a</b> (2 rochloric ació	), Terephthal mmol), solv l (4-5 drops)	ldialdhyde vent (6 ml), I.			

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Synthesis of bis-1, 2, 3, 4-tetrahydropyrimidines 4a-4f in presence of heteropolyacids; (general procedure). To a mixture of urea 1 (2 mmol), a dialdehyde 2a-2b (1 mmol), and  $\beta$ -ketoester 3a-3c (2 mmol), a catalytic amount of heteropolyacid (0.1 gr) was added and the resulting mixture was stired in solvent (6 mL). The progress of the reaction was monitored by TLC. On completion, the catalyst was filtered off, the solvent was evaporated and the pure product was collected and recrystallized from ethanol to give compounds 4a-4f in 85-92 % yields.

Dimethyl 4, 4'-(1, 4-phenylene) bis (6-methyl-2oxo-1, 2, 3, 4-tetrahydropyrimidine-5-carboxylate) (4a). Yield 84-86%, yellow powder, mp 315°C >decomposed, IR spectrum, v, cm-1: 3430(N-H), 3028 (arom-CH), 2943 (aliph-CH), 1697(C=0), 1661(C=0), 1433 and 1385 (C=C), 1238(C-N), 1094(C-O). <sup>1</sup>H NMR spectrum (DMSO-d<sub>6</sub>), δ, ppm (J, Hz): 2.250(s, 6H, -CH<sub>2</sub>); 3.541(s, 6H, -CH<sub>2</sub>); 5.109(s, 2H, -CH); 7.189(s, 4H, C<sub>6</sub>H<sub>4</sub>); 7.736(s, 2H, N-H exchange with D<sub>2</sub>O), 9.231(s, 2H, N-H exchange with  $D_2O$ ). <sup>13</sup>C NMR (DMSO-d<sub>e</sub>),  $\delta$ , ppm: 18.30(CH<sub>2</sub>), 51.32(CH<sub>2</sub>), 53.99(CH), 99.40(C), 126.78(Ar), 144.25(Ar), 149.15(C), 152.62(C=O), 166.28(C=O). Mass spectrum (EI, 70 eV), m/z (I<sub>rel</sub>, %): 414.1[M]<sup>+</sup> (10), 413.1[M-H]<sup>+</sup> (15), 375.1(40), 311.1(20), 260.1(20), 182.9(20), 131.0(25), 97.1(45), 71.0(43), 43.1(100). Elemental Analysis: Found, %: C 55.43; H 5.21; N 12.89; C<sub>20</sub>H<sub>22</sub>N<sub>4</sub>O<sub>6</sub>. Calculated, %: C 57.97; H 5.35; N 13.52.

Diethyl 4, 4'-(1, 4-phenylene) bis(6-methyl-2oxo-1, 2, 3, 4-tetrahydropyrimidine-5-carboxylate) (4b). Yield 86-90%, white powder, mp 310°C decomposed, IR spectrum, v, cm<sup>-1</sup>: 3308(N-H), 3019 (arom-CH), 2931 (aliph-CH), 1703(C=0), 1660(C=0), 1453 and 1372 (C=C), 1235(C-N), 1085(C-O). <sup>1</sup>H NMR spectrum (DMSO-d<sub>6</sub>), δ, ppm (*J*, Hz): 1.067-1.128(t, 6H, CH<sub>2</sub>); 2.242(s, 6H, -CH<sub>2</sub>); 3.949-4.018(q, 4H, -CH<sub>2</sub>);5.115(s, 2H, -CH); 7.190(s, 4H,  $C_6H_4$ ); 7.704(s, 2H,N-H exchange with D20), 9.197(s, 2H, N-H exchange with  $D_2$ 0). <sup>13</sup>C NMR (DMSO-d<sub>6</sub>), δ, ppm: 14.53(CH<sub>2</sub>), 22.88(CH<sub>2</sub>), 54.06(CH), 59.69(CH<sub>2</sub>), 99.69(C), 126.78(Ar), 144.40(Ar), 148.76(C), 152.53(C=O), 165.77(C=O). Mass spectrum (EI, 70 eV), *m*/*z* (I<sub>rel</sub>, %): 442.3[M]<sup>+</sup> (15), 441.2[M-H]<sup>+</sup> (22). Elemental Analysis: Found, %: C 58.46; H 5.68; N 12.07; C<sub>22</sub>H<sub>26</sub>N<sub>4</sub>O<sub>6</sub>. Calculated, %: C 59.72; H 5.92; N 12.66.

Dibenzyl 4, 4'-(1, 4-phenylene)bis(6-methyl-2oxo-1, 2, 3, 4-tetrahydropyrimidine-5-carboxylate) (4c). Yield 88-92%, white powder, mp 294-296 °C, IR spectrum, v, cm<sup>-1</sup>: 3356(N-H), 3107 (arom-CH), 2958 (aliph-CH), 1693(C=O), 1641(C=O), 1453 and 1380 (C=C), 1223(C-N), 1090(C-O). <sup>1</sup>H NMR spectrum (DMSOd<sub>6</sub>),  $\delta$ , ppm (*J*, Hz): 2.281(s, 6H, -CH<sub>3</sub>); 5.028(s, 2H, -CH); 5.148(s, 4H, -CH<sub>2</sub>); 7.127-7.331(m, 14H, C<sub>6</sub>H<sub>4</sub> and C<sub>6</sub>H<sub>5</sub>); 7.754(s, 2H, N-H exchange with D<sub>2</sub>O), 9.301(s, 2H, N-H exchange with D<sub>2</sub>O). <sup>13</sup>C NMR (DMSO-d<sub>6</sub>),  $\delta$ , ppm: 18.36(CH<sub>3</sub>), 54.09(CH), 65.31(CH<sub>2</sub>), 99.21(C), 126.85(Ar), 128.06(Ar), 128.20(Ar), 128.76(Ar), 128.78(Ar), 136.96 (Ar), 144.28(Ar), 149.74(C), 152.53(C=0), 165.52 (C=0). Mass spectrum (EI, 70 eV), m/z ( $I_{rel}$ , %): 566.3[M]<sup>+</sup> (5), 259.0(20), 183.0(18), 90.9(100), 44.0(95). Elemental Analysis: Found, %: C 66.34; H 5.04; N 9.13;  $C_{32}H_{30}N_4O_6$ . Calculated, %: C67.83; H5.34; N 9.89.

Dimethyl 4, 4'-(1,3-phenylene)bis(6-methyl-2oxo-1, 2, 3, 4-tetrahydropyrimidine-5-carboxylate) (4d). Yield 80-88%, white powder, mp 279-281 °C, IR spectrum, v, cm<sup>-1</sup>: 3408(N-H), 3031 (arom-CH), 2950 (aliph-CH), 1696(C=O), 1646(C=O), 1436 and 1318 (C=C), 1233(C-N), 1092(C-O). <sup>1</sup>H NMR spectrum (DMSO-d<sub>6</sub>), δ, ppm (J, Hz): 2.249(s, 6H, -CH<sub>2</sub>); 3.550(s, 6H, -CH3); 5.124(s, 2H, -CH); 7.142-7.169(m, 3H,  $C_{e}H_{a}$ ); 7.280-7.332(m, 1H, C<sub>c</sub>H<sub>a</sub>); 7.769(s, 2H,N-H exchange with D<sub>2</sub>O), 9.249(s, 2H, N-H exchange with D2O). <sup>13</sup>C NMR (DMSO-d<sub>c</sub>), δ, ppm: 18.24(CH<sub>2</sub>), 51.19(CH<sub>2</sub>), 54.29(CH), 99.56(C), 124.43(Ar), 125.63(Ar), 129.04(Ar), 145.51(Ar), 149.01(C), 152.65(C=O), 166.18(C=O). Mass spectrum (EI, 70 eV), m/z (I<sub>rel</sub>, %): 414.2[M]<sup>+</sup> (4), 169.0(100), 137.0(50), 42.1(40). Elemental Analysis: Found, %: C 57.24; H 5.12; N 12.98; C<sub>20</sub>H<sub>22</sub>N<sub>4</sub>O<sub>6</sub>. Calculated, %: C 57.97; H5.35; N 13.52.

Diethyl 4, 4'-(1, 3-phenylene)bis(6-methyl-2oxo-1, 2, 3, 4-tetrahydropyrimidine-5-carboxylate) (4e). Yield 80-85%, yellow powder, mp 289-291 °C, IR spectrum, v, cm<sup>-1</sup>: 3360(N-H), 3118 (arom-CH), 2978 (aliph-CH), 1699(C=O), 1649(C=O), 1461 and 1385 (C=C), 1225(C-N), 1093(C-O). <sup>1</sup>H NMR spectrum (DMSO-d<sub>c</sub>), δ, ppm (*J*, Hz): 1.048-1.095(t, 6H, -CH<sub>2</sub>); 2.227(s, 6H, -CH<sub>2</sub>); 3.913-3.998(q, 4H, -CH<sub>2</sub>); 5.101(s, 2H, CH); 7.118-7.138(m, 3H, C,H,); 7.256-7.309(m, 1H,  $C_{6}H_{4}$ ; 7.761(s, 2H,N-H exchange with D<sub>2</sub>O), 9.182(s, 2H, N-H exchange with  $D_2O$ ). <sup>13</sup>C NMR (DMSO-d<sub>6</sub>),  $\delta$ , ppm: 14.55(CH<sub>2</sub>), 18.18(CH<sub>2</sub>), 54.41(CH), 59.60(CH2), 99.70(C), 124.55(Ar), 125.78(Ar), 128.93(Ar), 145.53(Ar), 148.80(C), 152.52(C=O), 165.69(C=O). Mass spectrum (EI, 70 eV), m/z (I<sub>rel</sub>, %): 442.1[M]<sup>+</sup> (6), 441.0[M-H]+(20). Elemental Analysis: Found, %: C 58.91; H 5.38; N 11.96; C<sub>22</sub>H<sub>26</sub>N<sub>4</sub>O<sub>6</sub>. Calculated, %: C 59.72; H 5.92; N 12.66.

Dibenzyl 4, 4'-(1, 3-phenylene)bis(6-methyl-2oxo-1, 2, 3, 4-tetrahydropyrimidine-5-carboxylate) (4f). Yield 82-85%, white powder, mp 300°C decomposed, IR spectrum, v, cm<sup>-1</sup>: 3369(N-H), 3048 (arom-CH), 2933 (aliph-CH), 1697(C=0), 1644(C=0), 1451 and 1382 (C=C), 1227(C-N), 1084(C-0). <sup>1</sup>H NMR spectrum (DMSO-d<sub>6</sub>),  $\delta$ , ppm (*J*, Hz): 2.260(s, 6H, -CH<sub>3</sub>); 4.990(s, 2H, CH); 5.179 (s, 4H, -CH<sub>2</sub>); 7.153-7.276(m, 3H, C<sub>6</sub>H<sub>4</sub>); 7.454(m, 1H, C<sub>6</sub>H<sub>4</sub>); 7.835(s, 2H,N-H exchange with D<sub>2</sub>O), 9.310(s, 2H, N-H exchange with D<sub>2</sub>O). <sup>13</sup>C NMR (DMSO-d<sub>6</sub>),  $\delta$ , ppm: 18.32(CH<sub>3</sub>), 54.26(CH), 65.23(CH<sub>2</sub>), 99.30(C), 124.61(Ar), 125.79(Ar), 128.79(Ar), 129.57(Ar), 137.03(Ar), 145.39(Ar), 148.83(Ar), 149.75(C), 152.55 (C=0), 165.49(C=0). Mass spectrum (EI, 70 eV), *m/z* ( $I_{rel}$ , %): 565.9[M]<sup>+</sup> (3), 565.0[M-H]+(20), 220.9(15), 137.0(10), 97.1(65), 91.1(100), 43.6(85) . Elemental Analysis: Found, %: C 64.82; H 5.11; N 9.06;  $C_{32}H_{30}N_4O_6$ . Calculated, %: C 67.83; H 5.34; N 9.89.

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### Protective effects of Vitamin C on kidney performance of an adult male rat exposed to formaldehyde

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#### ABSTRACT

Formaldehyde is a chemical material with a nasty smell which is used in fixing cadavers, histology processes, synthetic resins, wooden and plastic productions and industrial fiber production. Formaldehyde has also a negative effect on body organs such as kidney. The target of this study is investigation of protection effect of Vitamin C on kidney performance of male rate exposed to formaldehyde, with regard to this fact that antioxidants like Vitamin C play a crucial role on protection against the damage occurred by smelling formaldehyde. 24 adult male rats were involved in this study with 250-300 gr weights. The rats were divided into 3 groups. The first group called control group (c) receive 1cc/kg formaldehyde and the second group (E1) received 10mg/kg formaldehyde and the third group (E2) received 10 mg/kg formaldehyde with 200 mg/kg Vitamin C for 10 days by daily injection. After 3 weeks of the last injection, phlebotomy was performed and the serum level of urea and creatinine was evaluated and compared in three groups. The result of Urea level comparison was meaningful among three groups (P<0.05). In the groups receiving formaldehyde and Vitamin C at the same time, there were not any significant difference related to the Urea level with control group (P=0.239). The Urea level of E2 group in comparison with E1 group was not meaningful (p=0.149). However, the comparison of creatinine was meaningful among these groups (P<0.05). However, treatment with Vitamin C in the E2 group, could not significantly effect on creatinine increase (P<0.05). The level of creatinine in E2 group is not meaningful rather than E1 group. In conclusion, it was observed that 10 days injection of 200 (mg/kg) Vitamin C in the peritoneal can avoid increasing of Urea due to formalin among adult rats.

**KEY WORDS:** FORMALDEHYDE, KIDNEY, VITAMIN C, RATS

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#### **INTRODUCTION**

Formaldehyde is a chemical material with a nasty smell (Golalipour et al. 2007). Which is used in fixing cadavers, histology processes, synthetic resins, wooden and plastic productions and industrial fiber production formaldehyde has a negative effect on performance of body organs (Mendis-Handagama et al. 2007). It is metabolized to formic acid by dehydrogenase formaldehyde and dehydrogenase aldehyde enzymes in the liver and erythrocyte which is exorcised through urine, excretion and breathing with different macromolecules such as protein, acid nucleic or interact with the light molecules like amino acid (Cheng et al. 2003; Collins and Lineker, 2004). Formaldehyde can cause oxidative stress in the body and has a bad effect on respiratory system and blood circulation and kidney (Kini et al. 2004). Antioxidants such a components that help body to destroy free radicals oxidative stress is actually imbalance between oxidants and antioxidants. When the amount of oxidants increases, the cells are damaged. Antioxidants include Vitamin A, E, C, Zn and selenium which play a crucial rate on inhibition of free radicals and stability of cell membrane (Kini et al. 2004). Vitamin C (Ascorbic Acid) is a white or yellow odorless solid substrate with the molecular formulation of C6H806. Ascorbic Acid is produced in the liver of plants and animals (except some special kind and human). Vitamin C operates as antioxidants in the body and cause acceleration of Fe, Cu and also revives of folic acid and collagen making (Kum et al. 2011). Vitamin C as a soluble antioxidant becomes active by moving oxygen and nitrogen elements (Rekha et al. 2011).

Vitamin C has also an important role in protecting the kidney and it can prevent increasing urea and creatinine in the oxidative damage (Sokkary and Awadalla, 2011; Agarwal et al. 2010; Yurdakul et al. 2010). One of the most important damage of formaldehyde is kidney damage (Umemura et al. 2009; Coronel et al. 2010). Oxidants are able to change proliferative in the glomerule structure of kidney (Coronel et al. 2010; Saleem et al. 2012). Antioxidants consumption can prevent damage of kidney (Djeffal et al. 2011; Ememghorashy et al. 2012; Claudia et al. 2003; Qiu et al. 2010; Zhou et al. 2006). The kidney performance can be evaluated by investigating the indicators of blood (Hai Xia et al. 2012; Ukmali et al. 2011). With regard to the formaldehyde effects in making oxidative stress, free radicals and their effect on kidney performance and in accordance with the performed studies related to the formaldehyde on the kidney tissue changes as glomerule vascular congestion and also minor decline holes in the pipe cells and studies about the protection effect of Vitamin C on prevention of formaldehyde damage (Sajadi et al. 2008; Farmahini

et al. 2008), in this study, we decided to investigate the protection effect of Vitamin C on kidney performance of mats after exposing to formaldehyde.

#### METHODOLOGY OF PLAN PERFORMANCE

Ether was used in this study to anesthesia the rats and 5cc syringe with anatomy tools was used for phlebotomy and also centrifugal tool for separating rat's serum. In this study 24 adult rat of vista bread were selected and divided into 3 equal groups. The first group (c) received 1cc/kg of normal saline and the second group (E2) received 10 mg/kg formaldehyde and the third group (E3) received both 10mg/kg formaldehyde and 200 mg/ kg Vitamin C in 10 days by injection into peritoneal. During the study, the rats were under normal condition of shelter with 24±2 temperature and appropriate feeding. 3 weeks after finishing the injection phlebotomy, after anesthesia by sterile syringe was performed. After making flocculation by centrifuge, samples were separated with 1500 rpm during 10 minutes and they were kept in -20 c till testing for evaluation of urea and creatinine. The amount of urea and creatinine by using Pars Azmoon kits and auto analyzer tool (Biotectica Instrument BT 1000) were evaluated and Calorimetric was done on kits to evaluate urea and jaffe was performed to evaluate creatinine. Data analysis after entering the data to SPSS Ver 18 was done by using Shapiro-wilk test to investigate normality of cantinas quantitative data distribution. The explicit result of the groups was reported as average and deviation from standard deviation. The comparison between the investigated groups was performed by using ANOVA test. If the average differences of statistic results were meaningful the LSD test were used to compare them. The meaningful level was considered less than 0.05 (P<0.05)

#### RESULTS

The urea result was meaningful in 3 groups (P<0.05) and the increase of urea in E1 group (after receiving formaldehyde) rather than C group (after receiving normal saline) was also meaningful (P<0.05). While the increase amount of urea in E2 group (after receiving formaldehyde and Vitamin C) rather than C group was not meaningful (p=0.239). The increase amount of urea in E1 group rather than E2 was not meaningful (p=0.149). The creatinine result in 3 groups was meaningful (p<0.05). The increase amount of creatinine of E1 group in comparison with C group was also meaningful (p<0.05) and the increase amount of creatinine in E2 group in comparison with C group was also meaningful (p<0.05). While the increase amount of creatinine in E2 group in comparison with C group was also meaningful (p<0.05). While the increase amount of creatinine in E2 group in comparison with C group was also meaningful (p<0.05). While the increase amount of creatinine in E2 group in comparison with C group was also meaningful (p<0.05). While the increase amount of creatinine in E2 group in comparison with C group was also meaningful (p<0.05). While the increase amount of creatinine in E2 group in comparison with C group was also meaningful (p<0.05). While the increase amount of creatinine in E2 group in comparison with C group was also meaningful (p<0.05).

Table 1. U	Table 1. Urea and Creatinine average table								
Р	E2	E2 E1 Control							
P=0.036	41.68±3.60	11.68±3.60 45.42±4.99 38.64±5.52 Urea							
P=0.001	=0.001 0.74±0.09 0.75±0/.06 0.46±0.05 Creatinine Ave.								

in E group rather than E2 group was not meaningful (p=0.847).

#### DISCUSSION

Formaldehyde can affect the body organs due to creating free radicals (Yurdakul et al. 2010). Formaldehyde can also affect the kidney performance such as excretion of waste substances (Umemura et al. 2009). Antioxidant can prevent the harmful effect of formaldehyde. Vitamins are one of the most important antioxidants - especially Vitamin C - which play an effective role in protection against oxidative damage caused by free raducals (Coronel et al. 2010). On the other hand, this Vitamin can enhance the activity of antioxidant enzymes in the kidney tissue (Saleem et al. 2012). This study is similar to the Kum C study for investigating urea amount (Kum et al. 2011). Although in the Kum C study, the effect of formalin smell on rat's body was investigated and the meaningful difference was just related to the urea amount. While In our study the meaningful difference in the Creatinine and urea was observed between the group exposed to formaldehyde and the control group (p<0.05).

In the study of Sajad, et al., injecting Vitamin C causes the decrease of urea and creatinine meaningful (p<0.05). In the patients suffering from kidney damage under analysis treatment (Sajadi et al. 2008) however, according to our study, injecting Vitamin C had not a significant effect on decreasing the creatinine amount in the rat's exposed to the formaldehyde. The result of this part of the study which is the main part of it is similar to other studies related to the investigating the protection effect of this Vitamin C is effective on prevention against bad effect of some substrates like formaldehyde due to reducing the amount of free radicals. In this study, the result of investigating urea and creatinine in 3 groups had a meaningful difference (p<0.05) in which the amount of them in the rats exposed to formaldehyde had a significant difference with the control group. The injection of Vitamin C enhance the changes of the urea amount (p<0.05). However, there were not any meaningful changes relate to the creatinine (p>0.05). The average of creatinine in E2 group exposed to formaldehyde and treated by Vitamin C ( $0.74\pm0.09$ ) was less than E1 group ( $0.75\pm0.06$ ).

Although these changes couldn't make an effect in the meaningful difference between E2 group and control group. With regard to the above and the performed experiments, it was observed that formaldehyde known as a harmful substrate and exposing to formaldehyde can effect on excretion substrate from kidneys. In this study formaldehyde was the cause of the meaningful difference in the creatinine and Urea level in the group exposed to formaldehyde in comparison with control group.

In various studies, the effects of antioxidants as a protection agent on body organs have been approved. In this study, injecting the Vitamin C could prevent meaningful changes in the urea level of the group exposed to the formaldehyde. According to the above results, it was concluded that injecting of 200 mg/kg Vitamin C into peritoneal during 10 days can reduce the increase of urea amount due to formalin in the adult male rats.

#### **CONCLUSION**

With regard to the performed study, Vitamin C can be used as one of the most important antioxidants which have a protective relative effect against kidney poisoning by formaldehyde.

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### Investigating pseudo Jahn-Teller effect on intermolecular hydrogen bond in enolic forms of benzonium compounds and analog containing P and As atoms

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#### ABSTRACT

This study investigates the effect of Pseudo Jahn-Teller Effect (PJTE) on distortion of hydrogen bonds of high symmetry forms of 1, 3-di (pyridine-2-yl) Benzonium (1) and analog containing P (2) and As (3) atoms. The results of B3LYP/6-311++G<sup>\*\*</sup> method indicate that the forms having inter-molecular hydrogen bond in compounds (1)-(3) with C2V symmetry have the highest value of ground state electron configuration energy (ECE). Applying normal coordination, C2V high symmetry forms turn into Cs low symmetry forms. C2V high symmetry form have two virtual frequencies with b2 and b1 symmetry. In Pseudo Jahn-Teller problem, compounds (1)-(3) are in in the forms of (A1+B2)  $\otimes$  b2 and (A1+B1)  $\otimes$  b1, and the energy difference between reference combining levels ( $\Delta$ ) reduces from compound (1)-(3).

**KEY WORDS:** PSEUDO JAHN-TELLER EFFECT, HYDROGEN BOND, INTER-MOLECULAR DISTORTION, COMPUTATIONAL CHEMISTRY, GAUSSIAN SOFTWARE

#### **INTRODUCTION**

In recent years, increasing growth of quantum chemistry and emergence of high-speed computers has led to creation of a new field in chemistry, called computational chemistry, in which computers are used as an empirical device. The main objective of this newly found field in the chemistry science is just proving the results related

#### ARTICLE INFORMATION:

\*Corresponding Author: ala.jalali@gmail.com Received 29<sup>th</sup> Dec, 2016 Accepted after revision 29<sup>th</sup> March, 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 <sup>®</sup> A Society of Science and Nature Publication, 2017. All rights reserved. Online Contents Available at: http://www.bbrc.in/ to chemistry problems, and the computational methods used today are one of the most powerful tools to study the mechanism of reactions and predict the characteristics of stable molecules, namely their nature, formation, bond energy, etc. (Hamilton *et al.* 1962).

In certain chemical compounds, hydrogen bond has been the subject of many researches because of its significant importance. The significant role of hydrogen

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bond in chemical and bio-chemical phenomena, as well as the nature of this bond's structure, has scientifically made it remarkable and worthy of further scrutiny and research. Phenomena affected by hydrogen bond are extensively found in daily life. These phenomena can go under specialist assessment by empirical techniques (Pimcntel and Clellan, 1976).

Inter-molecular hydrogen bond (IMHB) exists in many organic molecules and bio-molecules such as carbohydrates, hormones, and proteins. Furthermore, this type of bond determines the configuration of many molecules, and it is because of such bond that proteins have unique configurations. An important parameter in classifying systems with hydrogen bond is its strength. Structurally, this strength is determined by parameters such as the distance between two electronegative atoms (A...B), length of hydrogen bond (H...B), length of covalent bond (A–H), and bond angle (A<sup>+</sup>H<sup>+</sup>B), as well as thermodynamic parameters such as enthalpy of formation ( $\Delta$ Hf), entropy of formation ( $\Delta$ Sf), and Gibbs free energy ( $\Delta$ Gf) (Pauling, 1960; Speakman, 1975). These empirical methods experienced cannot measure hydrogen bond strength, or at least have limited applications. Theoretical and computational methods are more efficient and comprehensive in this context, in which molecules can be optimized in any structural and electron mode in terms of energy. These methods, which seem necessary for measuring intermolecular hydrogen bond energy, have also significantly developed after emergence of ultra-modern computers with high speed and performance.

Reviewing the literature revealed that no reports have yet been published related to the objectives of this study. Given the fact that hydrogen bond is one of the effective factors in human life, its effect has been examined in 1,3-di(pyridine-2-yl)Benzonium (1) and analog containing P (2) and As (3) atoms by pseudo Jahn-Teller analysis using high level B3LYP/6-311++G\*\* theoretical method.

It is expected that the pseudo Jahn-Teller effect can describe the transformation of C2V high symmetry structures to Cs low symmetry structures in the following compounds (Figure 1):



FIGURE 1. Symmetrical transformation of C2V and 3-di(pyridine-2-yl)Benzonium, analog containing P and As atoms in Cs form (C2V  $\rightarrow$  Cs) using calculations in B3LYP/6-311++G\*\* theoretical level (X= N, P, As)

(1) 1,3-di(pyridine-2-yl)Benzonium (2) and analog containing P atoms (3) and As atoms

It was found that compounds (1)-(3) mentioned above have C2V high symmetry configuration. By Q transformations, the first three compounds with C2V high symmetry configuration turn into Cs configuration.

This study carefully investigates the important issue of ground state electron mixing in electron exited state in the direction of applying normal coordination describing leaving high symmetry and transforming into low symmetry. The major cause of deformation was the pseudo Juan-Teller effect, which was created by combining the ground state and excited states.

Since the electron ground state of these compounds is not aligned, it is obvious that all deformations observed from linear configuration with the highest symmetry is due to pseudo Juan-Teller effect (Bersuker, 2006). Generally, the pseudo Juan-Teller effect is associated with non-aligned stated of any system, Juan-Teller effect is associated with aligned stated of non-linear molecules, and Renner-Teller effect is associated with aligned stated of linear molecules (Bersuker, 2001).

All of these effects are general and unique forms, each describing symmetrical instability and many other issues briefly discussed in the following.

#### MATERIAL AND METHODS

#### COMPUTATIONAL METHODOLOGY

First, the molecular form, written based on Zmatrix, will be drawn and numbered, given the desired symmetry. Then, the optimal molecular structure and its negative frequency will be calculated using Gaussian 03 & 98 software. Then, DFT hybrid-based method (B3LYP) with  $6-311++G^{**}$  base series will be used for all desired compounds.

Computational time depends on the Density Function Theory (DFT). TD-DFT is, for sure, one of the most common tools for investigating the excited levels of molecular systems, which has been used to study the electron configuration of Enolic structures of 1,3-di(pyridine-2-yl)Benzonium and analog containing P and As atoms.

Results of B3LYP/6-311++G<sup>\*\*</sup> and TD-DFT shows that the major reason for deformation of high symmetry configurations (C2V) to low symmetry configurations (Cs) for these compounds is pseudo Juan-Teller effect, which is created by combining ground state and excited stated. The energy difference ( $\Delta$ ) and pseudo Juan-Teller stability energy between reference stated and  $\Delta$ Ee1 in these forms (C2V  $\rightarrow$  Cs) is also investigated.

#### **RESULTS AND DISCUSSION**

Quantum mechanics calculations in the B3LYP/6- $311++G^{**}$  initial level was used to examine the structural properties of molecules in compounds (1)-(3).

## 3-1. Investigating pseudo Juan-Teller effect on distortion of 1,3-di(pyridine-2-yl)Benzonium molecule (compound No. 1)

Initial quantum mechanics calculations in the B3LYP/6-311++G\*\* theoretical level showed that 1,3-di(pyridine-2-yl)Benzonium structure has C2V high symmetry, while has low symmetry in Cs point group, whose deviation with high symmetry arrangement is due to pseudo Juan-Teller effects, which is the only source of instability for



FIGURE 2. Symmetrical transformation of C2V in 1,3-di(pyridine-2-yl)Benzonium (C2V  $\rightarrow$  Cs) using calculations in B3LYP/6-311++G\*\* theoretical level

arrangements with high symmetry in aligned and nonaligned states. Deviations is created by combining the base level A1 and the excited level B2 through displacement of b2, and in another case by combining base level A1 and the excited level B2 through displacement of b1. Pseudo Juan-Teller results in (A1+B2)  $\otimes$  b2 and (A1+B1)  $\otimes$  b1 problems.

The energy difference between ground state and excited level B2 (Figure 3) and between ground state and excited level B1 (Figure4), along with combination of orbitals is 5.35 eV and 5.55 eV, respectively.

- 1. [Homo 3 (A2)  $\rightarrow$  Lumo 1(B1), Homu 2(B1)  $\rightarrow$  Lumo (A2), Homo -1 (A2)  $\rightarrow$  Lumo + 3 (B1)], [Homo - 1 (A1)  $\rightarrow$  Lumo + 5(B1)]
- 2. [Homo 7 (A1) → Lumo + 1(B1), Homo 5(B2) → Lumo (A2)]

Given the reduction of energy difference in your desired compound in B2 symmetry compared to B1, its pseudo Juan-Teller energy would be higher.  $\Delta$ Ee1 also confirms it in this case.

The electron energy of some excited levels for 1,3-di(pyridine-2-yl)Benzonium structure, calculated in B3LYP/6-311++G\*\* theoretical level (eV), is given in Table 1, which indicates that B1 excited level with



FIGURE 3. Initial energy levels calculated (ground state and excited state with B2 symmetry) in 1,3-di(pyridine-2-yl)Benzonium molecule, and their changes by pseudo Juan-Teller effect (first case)



FIGURE 4. Initial energy levels calculated (ground state and excited state with B1 symmetry) in 1,3-di(pyridine-2-yl)Benzonium molecule, and their changes by pseudo Juan-Teller effect (second case)

Table 1. Investigating the energy of excited levels (eV) of 1,3-di(pyridine-2-yl)Benzonium in symmetrical								
transformation (C2V –	→ Cs) (two c	ases).						
	D	٨	р		D	D		D

	B <sub>2</sub>	A <sub>1</sub>	B <sub>2</sub>	A <sub>1</sub>	B <sub>2</sub>	B <sub>2</sub>	A <sub>1</sub>	B <sub>1</sub>
1. $C_{16}H_{13}N_{2}(+1)$	3.84	3.96	3.98	4.29	5.22	5.35	5.42	-
2. $C_{16}H_{13}N_{2}(+1)$	3.87	3.10	4.01	4.32	5.25	-	5.45	5.55

Table 2. The thermodynamic functions calculated (enthalpy, Gibbs free energy (Hartree), and entropy (calmil-1k-1)), ground state energy, and their changes in 25°C and 1 atm for compounds ,3-di(pyridine-2-yl)Benzonium, analog containing P and As atoms using calculations in B31YP/6-311++G\*\* theoretical level

GeometriesInfarredRefar	atoms, using calculations in B3LYP/6-311++G <sup>***</sup> theoretical level.								
i-fCiGII13N2(1+) D 0.0426.61834109.24326.6702460.120580.00010.1210926.87821120.125930I-CIGIII3N2(1+) D 0.0426.733939014.56926.7333450.000.5.260.00027.0011310.0001I-CIGIII3N2(1+) D 0.0426.618410.924326.6702460.070100.0706026.87821120.076162-CIGHI3N2(1+) D 0.0426.643410.924326.6702400.070010.0700.26.9547270.076162-CIGHI3N2(1+) D 0.0426.6434541.124026.7472110.0001.00126.9547270.00012-CIGHI3N2(1+) D 0.0429.9501271.124029.950260.04570.0413.020928100.047542-CIGHI3N2(1+) D 0.0429.9501271.129.950160.0011.0011.0011.0010.0013-CIGHI3P2(1+) D 0.0429.9501071.129.950160.0011.0010.0101.0010.0013-CIGHI3P2(1+) D 0.0429.9501071.129.950160.0011.0011.0011.0010.0013-CIGHI3P2(1+) D 0.0429.9501071.129.950160.0011.0011.0011.0011.0013-CIGHI3P2(1+) D 0.0429.9501071.129.950160.0011.0011.0011.0011.0013-CIGHI3P2(1+) D 0.0429.9501071.129.950160.0011.0011.0011.0011.0013-CIGHI3P2(1+) D 0.0429.9501071.29.950161.29.950160.001	Geometries	H (Hartree)	S (cal mol <sup>1</sup> K <sup>-1</sup> )	G (Hartree)	∆Ha (Hartree)	∆S <sup>a</sup> (calmol¹K⁻¹)	∆Gª (Hartree)	Eel	ΔEel
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h-fclif13N2(h) Do.2526.78390914.5699-72.67333340.00005.216010.0001-72.70413130.0000LL </td <td></td> <td></td> <td></td> <td></td> <td>(75.66)</td> <td></td> <td>(77.25)</td> <td></td> <td>(79.02)</td>					(75.66)		(77.25)		(79.02)
Index <t< td=""><td>1- C16H13N2(1+). TD 0.5</td><td>-726.738909</td><td>114.569</td><td>-726.793345</td><td>0.0000</td><td>5.326</td><td>0.0000</td><td>-727.0041313</td><td>0.0000</td></t<>	1- C16H13N2(1+). TD 0.5	-726.738909	114.569	-726.793345	0.0000	5.326	0.0000	-727.0041313	0.0000
2.1 C1GH13N2(1+) TD.0.7.2 G6.81841109.2437.2 G6.702400.070610.070010.076967.2 G.8 R32120.07651TTC1GH13N2(1+) TD.0.7.2 G.69435411.2467.2 G.7472110.0000.0010.0007.2 G.5947280.0001TTTTT0.0010.0010.0010.0010.0010.0010.001T1.199.85012718.7061.299.950280.045670.04000.01000.01000.01010.01010.0101T1.199.85012711.8701.299.950100.0000.00000.00000.00000.00010.00110.0011T1.199.85012711.8701.299.950200.00000.00000.00000.00010.00110.0011T1.199.85012711.8701.299.950200.00000.00000.00000.00010.00110.0011T1.199.85012711.8701.299.950200.00100.01000.01011.01010.0111T1.199.85012711.8701.299.950200.00100.01000.01011.01010.0111T1.199.8501271.87001.299.950200.00100.01000.01011.01010.0111T1.199.870771.87011.299.95020.00100.01000.01011.01010.0111T1.199.870771.87051.299.95020.01010.01010.01010.01010.0111T1.199.870771.299.87071.299.8707 <td></td> <td></td> <td></td> <td></td> <td>(0.00)</td> <td></td> <td>(0.00)</td> <td></td> <td>(0.00)</td>					(0.00)		(0.00)		(0.00)
Index	2- C16H13N2(1+). TD 0.0	-726.618341	109.243	-726.670246	0.076013	0.000	0.076965	-726.8782112	0.0765166
21641312(1+) C10.0-726.69437.811.24C-726.7472.110.0002.030.10.001-72.69.872.720.000CC </td <td></td> <td></td> <td></td> <td></td> <td>(47.70)</td> <td></td> <td>(48.30)</td> <td></td> <td>(48.01)</td>					(47.70)		(48.30)		(48.01)
Index	2- C16H13N2(1+). TD 0.4	-726.694354	111.246	-726.747211	0.0000	2.003	0.000	-726.9547278	0.0000
h100000000000000000000000000000000000					(0.00)		(0.00)		(0.00)
Image stateImage stat	3- C16H13P2(1+). TD 0.0	-1299.850127	118.706	-1299.906528	0.045676	4.414	0.043578	-1300.0992816	0.0477544
AC1GH13P2(1+) TD 0.4-1299.895800114.292-1299.9501000.00000.00000.00000.100.1470300.00004-1209.85017118.706-1299.965280.023950.00000.02494-130.0992810.244914-1299.85017118.7061299.951270.00000.024040.100.992810.244914-1299.85017118.7061299.951270.00000.00000.024910.101.0929814-1299.87407120.804-1299.931470.0002.0980.001-130.1237340.00015-129.87407120.804-129.931470.0002.0980.010-130.1237340.00015-129.87407120.804-129.931470.0002.0980.010-130.1237340.00015-129.87407120.804-129.931470.0001.0810.010-130.1237340.0015-129.87407120.804120.8040.0101.0810.0100.0100.01045-129.87407120.804120.8040.01810.0180.01810.0140.0140.0145-129.87407120.814120.81410.9101.0810.0101.0141.0141.0145-129.87407120.814120.81410.9101.0141.0141.0141.0145-129.87408120.81410.8141.0141.0141.0141.0141.0145-129.87408120.81410.8141.0141.					(28.66)		(27.35)		(29.97)
Index (1)Index (1)Index (1)Index (1)Index (1)Index (1)129385017118.700-1299.905230.023950.00000.024940.00092860.024911111111111111111111111111299.91707120.804-1299.914740.0002.0980.001-1300.1237730.000111299.91477120.804-1299.914740.0002.0980.010-1300.1237730.000111299.9147410.0010.0010.0010.0010.0010.0010.00111299.914740.0000.01010.0110.0110.0110.01111299.914740.00010.0110.0110.0110.0110.01111299.914740.00010.0110.0110.0110.0110.01111299.9147410.0110.0110.0110.0110.0110.011112.0112.0112.0110.0110.0110.0110.0110.011112.0112.0112.0112.0110.0110.0110.0110.0110.011212.0112.0112.0112.0112.0112.0110.0110.0110.011212.0112.0112.0112.0112.0112.0112.0110.0110.011212.0112.0112.0112.0112.0112.0112.0112.0112.01 <td>3- C16H13P2(1+). TD 0.4</td> <td>-1299.895803</td> <td>114.292</td> <td>-1299.950106</td> <td>0.0000</td> <td>0.0000</td> <td>0.0000</td> <td>-1300.147036</td> <td>0.0000</td>	3- C16H13P2(1+). TD 0.4	-1299.895803	114.292	-1299.950106	0.0000	0.0000	0.0000	-1300.147036	0.0000
4-C16H13P2(1+) TD 0.0-1299.850127118.706-1299.9065280.023950.00000.024946-1300.0928160.024918III </td <td></td> <td></td> <td></td> <td></td> <td>(0.00)</td> <td></td> <td>(0.00)</td> <td></td> <td>(0.00)</td>					(0.00)		(0.00)		(0.00)
Image: series of the series	4- C16H13P2(1+). TD 0.0	-1299.850127	118.706	-1299.906528	0.02395	0.0000	0.024946	-1300.0992816	0.0244918
4- C16H13P2(1+) TD 0.4-1299.874077120.804-1299.9314740.00002.0980.000-1300.1237340.0000II <tdi< td="">IIII<tdi< td=""><td></td><td></td><td></td><td></td><td>(15.03)</td><td></td><td>(15.65)</td><td></td><td>(15.37)</td></tdi<></tdi<>					(15.03)		(15.65)		(15.37)
Index	4- C16H13P2(1+). TD 0.4	-1299.874077	120.804	-1299.931474	0.0000	2.098	0.000	-1300.1237734	0.0000
S- C16H13As2(1+) TO 0.0-5088.839500120.345-5088.8966800.031851.0680.031342-5089.08542070.034649II </td <td></td> <td></td> <td></td> <td></td> <td>(0.00)</td> <td></td> <td>(0.00)</td> <td></td> <td>(0.00)</td>					(0.00)		(0.00)		(0.00)
Image: series of the	5- C16H13As2(1+). TD 0.0	-5088.839500	120.345	-5088.896680	0.03185	1.068	0.031342	-5089.0854207	0.0346449
5- C16H13As2(1+). TD 0.4 -5088.871350 119.277 -5088.928022 0.0000 0.0000 -5089.1200656 0.0000   6- C16H13As2(1+). TD 0.0 -5088.839500 120.345 -5088.896680 0.017477 0.0000 0.021056 -5089.0854207 0.0189186   6- C16H13As2(1+). TD 0.5 -5088.856977 127.877 -5088.917736 0.0000 13.210 (10.97) (13.21) (10.97) (10.97)   6- C16H13As2(1+). TD 0.5 -5088.856977 127.877 -5088.917736 0.0000 7.532 0.0000 -5089.1043393 0.0000   7- C16H13As2(1+). TD 0.0 -5088.839500 120.345 -5088.896680 0.000686 0.0000 0.002027 -5089.0854207 0.001695   7- C16H13As2(1+). TD 0.4 -5088.840186 123.167 -5088.898707 0.0000 2.822 0.0000 -5089.0871157 0.0000					(19.99)		(19.67)		(21.74)
Image: series of the	5- C16H13As2(1+). TD 0.4	-5088.871350	119.277	-5088.928022	0.0000	0.0000	0.000	-5089.1200656	0.0000
6- C16H13As2(1+). TD 0.0 -5088.839500 120.345 -5088.896680 0.017477 0.0000 0.021056 -5089.0854207 0.0189186   C C16H13As2(1+). TD 0.5 C <thc< th=""> C <thc< th=""></thc<></thc<>					(0.00)		(0.00)		(0.00)
Image: Normal Sector Image: No	6- C16H13As2(1+). TD 0.0	-5088.839500	120.345	-5088.896680	0.017477	0.0000	0.021056	-5089.0854207	0.0189186
6- C16H13As2(1+). TD 0.5 -5088.856977 127.877 -5088.917736 0.0000 7.532 0.0000 -5089.1043393 0.0000   7- C16H13As2(1+). TD 0.0 -5088.839500 120.345 -5088.896680 0.000686 0.0000 0.002027 -5089.0854207 0.001695   7- C16H13As2(1+). TD 0.4 -5088.840186 123.167 -5088.898707 0.0000 2.822 0.0000 -5089.0871157 0.0000					(10.97)		(13.21)		(11.87)
Image: Mark Series of the series of	6- C16H13As2(1+). TD 0.5	-5088.856977	127.877	-5088.917736	0.0000	7.532	0.0000	-5089.1043393	0.0000
7- C16H13As2(1+). TD 0.0 -5088.839500 120.345 -5088.896680 0.000686 0.0000 0.002027 -5089.0854207 0.001695   V					(0.00)		(0.00)		(0.00)
TD 0.4 -5088.840186 123.167 -5088.898707 0.0000 2.822 0.0000 -5089.0871157 0.0000	7- C16H13As2(1+). TD 0.0	-5088.839500	120.345	-5088.896680	0.000686	0.0000	0.002027	-5089.0854207	0.001695
7- C16H13As2(1+). -5088.840186 123.167 -5088.898707 0.0000 2.822 0.0000 -5089.0871157 0.0000					(0.43)		(1.27)		(1.06)
	7- C16H13As2(1+). TD 0.4	-5088.840186	123.167	-5088.898707	0.0000	2.822	0.0000	-5089.0871157	0.0000



an energy about 5.55 eV poorly contributes in creating pseudo Juan-Teller effect.

The value of thermodynamic parameters  $\Delta$ G,  $\Delta$ H,  $\Delta$ S, and  $\Delta$ Ee1 of the desired compound, shown in Table 2, was calculated using B3LYP/6-311++G\*\* method. The results show that the value of  $\Delta$ Ee1 for 1,3-di(pyridine-2-yl)Benzonium is 79.02 kCal/mol and 48.01 kCal/mol for B2 symmetry and B1 symmetry, respectively, which implies that the desired compound with B1 symmetry has lower pseudo Juan-Teller stability energy. Since the energy difference between the ground and excited states of B2 is lower than that of B1, its  $\Delta$ Ee1 is higher, so 1,3-di(pyridine-2-yl)Benzonium with B2 symmetry has higher pseudo Juan-Teller stability energy.

## 3-2. Investigating pseudo Juan-Teller effect on distortion of analog containing P 1,3-di(pyridine-2-yl) Benzonium atom (compound No. 2)

Structural properties of compound No. 2 was examined using B3LYP/6-311++G\*\* theoretical level. The results showed that compound No. 2 has C2V high symmetry, and has low symmetry in point group. Deviations of this arrangement with high symmetry are caused by psuedo Juan-Teller effect, which is the only source of instability for arrangements with high symmetry in aligned and non-aligned states. The deviations are formed as a result of combining the compound of ground state A1 and excited level B2 by displacement b2, and another case as a result of combining the ground state A1 and excited level B1 through displacement b1, i.e., Energy difference between ground state and excited state B2 (first case) and between ground state and excited state B1 (second case) is 5.10 and 4.46 eV, respectively.

- 1. [Homo 6 (A2) → Lumo (B1), Homo 5(B1) → Lumo+1(A2), Homo - 5 (B1) → Lumo + 2 (A2), Homo - 3 (B1) → Lumo + 1(A2), Homo - 2 (A2) → Lumo (B1), Homo - 1(B1) → Lumo + 2 (A2), Homo (A2) - Lumo + 4(B1), Homo (A2) → Lumo + 5 (B1)]
- [Homo 4 (B2) → Lumo + 1(A2), Homo 1(B1) → Lumo + 3 (A1)]

So, pseudo Juan-Teller results in (A1+B2)  $\otimes$  b2 and (A1+B1)  $\otimes$  b1 problems.

Given the reduction in the energy difference of the desired compound in B1 symmetry, it is expected that its pseudo Juan-Teller energy would be higher (regardless of other factors).

Figures 6 and 7 show the energy of ground level and excited levels, as well as the deviations of arrangements with high symmetry due to pseudo Juan-Teller effect.

The electron energy of a number of excited levels for the structure of the compound No. 2, calculated in B3LYP/6-311++G<sup>\*\*</sup> theoretical level (eV), is reported in Table 3, which shows that B2 excited level with an approximate energy of 5.10 eV (first case) and B1 excited level with an approximate energy of 4.46 eV (first case) contribute in making pseudo Juan-Teller effect.

The value of thermodynamic parameters  $\Delta$ G,  $\Delta$ H,  $\Delta$ S, and  $\Delta$ Ee1 of the desired compound, shown in Table 2, was calculated using B3LYP/6-311++G\*\* method. The results show that the value of  $\Delta$ Ee1 for compound No. 2 is 29.97 kCal/mol and 15.37 kCal/mol for B2 symmetry and B1 symmetry, respectively, which implies that the desired compound with B1 symmetry has lower pseudo Juan-Teller stability energy, however, the energy difference between reference states has decreased.



FIGURE 6. Initial energy levels calculated (ground state and excited state with B2 symmetry) in analog containing P 1,3-di(pyridine-2-yl)Benzoniumatoms, and their changes by pseudo Juan-Teller effect (first case)



Table 3. Investigating t	Table 3. Investigating the energy of excited levels (eV) of analog containing P 1,3-di(pyridine-2-yl)Benzonium									
atoms in symmetrical transformation (C2V $\rightarrow$ Cs) (two cases).										
1. C <sub>1</sub> , H <sub>1</sub> , P <sub>2</sub> (+1) 3.15 3.32 3.71 4.33 - 4.55 4.94 5.10										

4.38

3.74

#### 3-3. Investigating pseudo Juan-Teller effect on distortion of analog containing As 1,3-di(pyridine-2-yl) Benzonium atom (compound No. 3)

3.18

3.36

2.  $C_{16}H_{13}P_{2}(+1)$ 

As it was mentioned in previous structures, the structure of compound No. 3 has C2V high symmetry, and has low symmetry in point group. Deviations are the result of combining the compound of ground state A1 and excited level B2 by displacement b2, as well as the result of combining the ground state A1 and excited level B1 through displacement b1. Combination of excited level B2 with excited level B1 and combination of excited level A2 with excited level A1 is done through displacement a2. (It has to be noted that in the third case, the ground state cannot combine with excited states as it is aligned with them, so it doesn't create psuedo Juan-Teller effect, and devations with the combination of non-aligned excited levels results in creation of psuedo Juan-Teller effect.) Here, the pseudo Juan-Teller results in (A1+B2)  $\otimes$  b2, (A1+B1)  $\otimes$  b1, (B2+B1)  $\otimes$  a2, and (A2+A1)  $\otimes$  a2 problems.



Figures 9, 10, and 11 show the energy of ground level and excited levels, as well as the deviations of arrangements with high symmetry due to pseudo Juan-Teller effect. The energy difference between ground level and excited level B2 (first case), shown in Figure 9, and between ground level and excited level B1 (second case), shown in Figure 10, and between a pair of excited levels of B2 and B1 and another pair of excited levels of A2 and A1 (third case), shown in Figure 11, along with the combination of orbitals is 3.50, 3.78, and 0.03-0.25 eV, respectively.

4.76

4.58

4.46

- 1. [Homo 4 (B2)  $\rightarrow$  Lumo + 2 (A1), Homo 1(B1)  $\rightarrow$  Lumo+1(A2)]
- 2. [Homo 1 (B1)  $\rightarrow$  Lumo + 2 (A2)]
- 3. [Homo 4 (B2)  $\rightarrow$  Lumo (B1), Homo (A2) Lumo +2 (A1), Homo  $\rightarrow$  3(B1) - Lumo (B1), Homo (A2) -Lumo + 1(A2), Homo (A2) - Lumo + 3 (A2), Homo  $\rightarrow$  4 (B2) - Lumo + 2(A1), Homo  $\rightarrow$  1(B1) - Lumo + 1 (A2), Homo  $\rightarrow$  1(B1) - Lumo + 2 (A1)]

Comparison between the first and second case shows that according to the reduction in energy difference in the first case, its pseudo Juan-Teller energy is higher, and comparison between the three cases indicates that the pseudo Juan-Teller of the third case is the highest (in case just one single factor of energy difference between ground level and excited level ( $\Delta$ ) is considered).

The electron energy of a number of excited levels for the structure No. 3, calculated in B3LYP/ $6-311++G^{**}$  theoretical level (eV), is reported in Table 4. It shows that the excited level B2 with an approximate energy of 3.50 eV (first case), and the excited level B1 with an approxi-











mate energy of 3.78 eV (first case) contribute in creating pseudo Juan-Teller effect.

The value of thermodynamic parameters  $\Delta G$ ,  $\Delta H$ ,  $\Delta S$ , and  $\Delta Ee1$  of the desired compound, shown in Table 2, was calculated using B3LYP/6-311++G\*\* method.

The results show that the value of  $\Delta Ee1$  for the compound No. 3 is 21.74 kCal/mol, 11.87 kCal/mol, and 1.06 kCal/mol for the first, second, and third case, respectively, which implies that the desired compound in the third state has lower pseudo Juan-Teller stability energy.

The results of B3LYP/6-311++ $G^{**}$  calculations for the three compound 1, 2, and 3 show that the major

cause of deformation of configurations with C2V high symmetry to Cs low symmetry configurations is pseudo Juan-Teller effect. The energy difference ( $\Delta$ ) between the reference states from compound 1 to compound 3 (i.e., 5-35-5.55 eV, 4.46-5.10 3 eV, and 0.03-0.25-3.5-3.78 eV for compounds 1, 2, and 3, respectively) decreases. So, it is expected that the pseudo Juan-Teller energy for these deformations (C2V  $\rightarrow$  Cs) increases from compound (1) to (3). The results obtained bu applying this method to determine the energy of the ground state from compound (1) to (3) for B2 symmetry (79.02, 27.97, and 21.74 kcalmol-1 for compound 4, 5, and 6, respectively) and for

1,3-di(pyridine-2-yl)Benzonium atoms with symmetrical arrangement (C2V $\rightarrow$ Cs) (three cases)								
cascs).	1	1	1					
	B <sub>2</sub>	A <sub>1</sub>	B <sub>2</sub>	A <sub>2</sub>	A <sub>1</sub>	B <sub>1</sub>		
1. $C_{16}H_{13}As_2(+1)$	2.87	3.08	3.50	3.68	3.71	3.75		
2. $C_{16}H_{13}As_{2}(+1)$	2.91	3.12	3.53	3.72	3.75	3.78		
3 C H As (+1)	2 90	3 11	3 53	3 71	3 74	3 78		

B1 symmetry (48.01, 15.35, and 11.78 21.74 kcalmol-1 for compound 1, 2, and 3, respectively) decreases, which implies that the compound (1) has the highest pseudo Juan-Teller stability energy.

#### CONCLUSION

The results obtained by calculations in  $B3LYP/6-311++G^{**}$  theoretical level shows that the pseudo Juan-Teller effect explains C2V high symmetry structural deformation to Cs low symmetry structure in the following compounds:

1,3-di(pyridine-2-yl)Benzonium (compound 1)

Analog containing P 1,3-di(pyridine-2-yl)Benzonium atom (compound 2)

Analog containing As 1,3-di(pyridine-2-yl)Benzonium atom (compound 3)

It was found that the hydrogen bond of compounds (1) to (3) have C2V high symmetry configuration.

By Q transformations, the first three compounds (1 to 3) transform from C2V high symmetry base configuration to Cs low symmetry excited configuration. It is associated with decreasing the electron energy of ground state electron configurations and increasing the electron energy of excited state electron configurations. This study addressed the mixing of electron ground state with electron excited states in the direction of applying normal coordination, describing leaving high symmetry and transforming into low symmetry. Therefore, the distortion of C2V high symmetry having hydrogen bond in compounds (1)-(3) is due to pseudo Juan-Teller effect (PJTE), (A1+B2)  $\otimes$  b2, and (A1+B1)  $\otimes$  b1, which is created by combining the ground state and excited states. It has to be noted that meanwhile, the energy difference ( $\Delta$ E) between reference states from compound (1) to (3) (i.e., 5.33-5.5 eV, 4.46-5.10 eV, 0.03-0.25-3.5-3.78 eV for 1,3-di(pyridine-2-yl)Benzonium, analog containing P atom, and analog containing As atom, respectively) decreases. Furthermore, examining pseudo Juan-Teller for these deformations (C2V  $\rightarrow$  Cs) showed that the pseudo Juan-Teller stability energy decreases from compounds (1) to (3).

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### Synthesis and some properties of 3-substituted-5,5-Dimethyl-5,6-dihydrobenzo[H]quinazolin(1h,3h)2, 4-dione

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#### ABSTRACT

Ethyl 2-cyano-3,3-dimethyl-4-phenylbutanoate was cyclized into 1-amino-3,3-dimethyl-3,4-dihydronaphthalene-2-ethylcarboxyiate condensation of which with primary amines synthesized 3 – substituted-5,5-dimethyl-5,6-dihydrobenzo[h]quinazolin-(1H,3H)2,4-dions. The method is based on the interaction of carbamate (II) with primary amines, which resulted in the preparation of 1,3-disubstituted urea without isolation formate reaction medium subjected to cyclization in the presence of alkali

**KEY WORDS:** CYCLIZATION, AMINOESTER, BENZO[H]QUINAZOLINE, SUBSTITUTION

#### **INTRODUCTION**

For this, ethyl 2-cyano-3,3-dimethyl-4- phenylbutanoate(I)in  $H_2SO_4$  solution was cyclized into 1-amino-3,3-dimethyl-3,4-dihydronaphthalene-2-ethylcarboxyiate(II), which was then reacted with chlorophenylformate (III)a method for the synthesis of 3-substituted 5,5-dimethyl-5,6-dihydrobenzo[h]quina zoline(1H,3H)2,4-dione. (IV) was developed. The method is based on the interaction of carbamate (II) with primary amines, which resulted in the preparation of 1,3-disubstituted urea without isolation formate reaction medium subjected to cyclization in the presence of alkali (Graddon & Nickel, 2012; Kwatkowski & Trojanowski, 2010)

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 $XV: R=CH_2C_6H_5; XVI:R=CH_2CH_2C_6H_5.$ 

#### **EXPERIMENTAL CHEMICAL PART**

IR spectra were taken in mineral oil UR-20 and FT-IR Nexus instrument. PMR spectra, with or HMDS internal standard on a Varian Mercury-300 spectrometer (USA)

Table 1. 3-substituted-5,5-dimethyl-5,6-dihydrobenzo[h]quinazolin-(1H,3H)2,4-dions										
					Theore	t <b>ical,</b> %		experimental, %		
Compound	R	Yield, %	Mp,° C	Rf*	С	Н	N	С	С	N
22	NH <sub>2</sub>	96	228-230	0.43 (a)	65.48	5.97	16.50	65.33	5.88	16.32
23	CH <sub>3</sub>	43	>250	0.67 (a)	70.44	6.39	11.12	70.29	6.29	10.93
24	C <sub>2</sub> H <sub>5</sub>	63	230-232	0.75 (B)	71.25	6.86	10.24	71.09	6.71	10.36
25	C <sub>3</sub> H <sub>7</sub>	63	228-230	0.78 (a)	71.97	7.23	9.70	71.81	7.09	9.85
26	ISO-C <sub>3</sub> H <sub>7</sub>	56	219-220	0.76 (δ)	71.88	7.19	10.01	71.81	7.09	9.85
27	C <sub>4</sub> H <sub>9</sub>	83	180-182	0.53 (δ)	72.59	7.56	9.57	72.46	7.43	9.39
28	Cyclopentyl	70	>250	0.56 (π)	73.68	7.32	9.18	73.52	7.14	9.03
29	Cyclohexane	68	238-240	0.80 (r)	73.95	7.62	8.77	74.04	7.46	8.64
30	2-Furfuryl	68	219-220	0.71 (a)	70.86	5.77	8.50	70.79	5.63	8.69
31	C <sub>6</sub> H <sub>5</sub>	94	>250	0.69 (a)	75.64	5.56	8.63	75.45	5.70	8.80
32	CH <sub>2</sub> C <sub>6</sub> H <sub>5</sub>	78	218-220	0.58 (π)	75.95	6.22	8.58	75.88	6.06	8.43
33	CH <sub>2</sub> CH <sub>2</sub> C <sub>6</sub> H <sub>5</sub>	81	>250	0.73 (a)	76.43	6.57	7.95	76.28	6.40	8.09
34	3-ClC <sub>6</sub> H <sub>4</sub>	55	>250	0.76 (δ)	67.93	5.01	7.82	68.09	4.86	7.94
TLC using Aceta	te:Benzen (1:2)									

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.Mass spectra were obtained on an MX-1321A spectrometer (USSR) using direct sample introduction into the ion source. TLC was carried out on Silufol R plates with detection by  $I_2$  vapor (Patel & Woods, 2001).

#### 1-Amino-3,3-dimethyl-3,4-dihydronaphthalene-2ethylcarboxylate(II)

Compound I (50g,0.193mol) was placed into a 250-mL flask, stirred at 10-15°C, treated in portions with conc.  $H_2SO_4$  (100mL), stirred at the same temperature for 7 h, neutralized with aqueous  $NH_4OH$ , and extracted with Et20(500 mL). The extract was washed twice with H20 and dried over anhydrous  $Na_2SO_4$ . The solvent was distilled off. The solid was crystallized. The crystals were washed with EtOH(70%) and dried in air to afford II, 23g(46%yield), MP 58-60°c,Rf 0.67 (isooctane-ethylacetate,2:1) IR spectrum, v, cm-1: 1600 (c=c atom), 1643 (c=o), 3334, 3438(NH<sub>2</sub>). PMR spectrum (DMSO-d<sub>6</sub>),  $\delta$ , ppm:1.16 (s, 6H, 2× CH<sub>3</sub>), 1.33 (t, J 7.1 Hz, 3H, OCH<sub>2</sub>CH<sub>3</sub>), 2.60 (s, 2H, 4-CH<sub>2</sub>), 4.17 (q, J 7.1 Hz, 2H, OCH<sub>2</sub>), 7.10 (m, 3H, 5-CH, NH<sub>2</sub>), 7.20 – 7.28 (m, 2H, 6-CH, 7-CH), 7.59 (m, 1H, 8-CH) (Popp et al., 2006).

#### ETHYL-3,3-DIMETHYL-1-( (PHENOXYCARBONYL) AMINO)-3,4-DIHYDRONAPHTALIN-2-CARBOXYL (III)

A mixture of II (24.5g, 0.1 moL), chlorophenyl formate (15.6 g, 0.1 mol) and Benzen (150 mol) was refluxed for 20h. The resulting crystals were filtered off, washed with  $H_2O$ , and crystallized from EtOH and wather (3:1) to afford (III) 31.5 gr (86.2% yield), mp 122-124°c, Rf 0.76 (Ethyl Acetate – Benzen, 1:2) IR spectrum, V, cm-1 :1600 (c=c arom), 1625 (c=c ethylen), 1710 (c=o), 1750 (NH). PMR spectrum (DMSOd6) $\delta$ , ppm : 9.10 (bs, 1H, NH) (Sahai & Singh, 1998).

#### 3-Substituted 5, 5-dimethyl- 5, 6-dihydrobenzo [h] quinazolin-(1h, 3h ) 2,4-dions (v)

A mixture of carbamate (III) (3.65 gr, 0.01 mol), primary amine (0.01 mol) and ethanol (20 ml) was refluxed for 7 h, treated with KOH solution (1.1 gr 0.02 mol) in H<sub>2</sub>O (10 ml), refluxed for another 3 h, cooled, stirred, and acidified with HCL solution (18%) to PH 3.0 – 3.5. The resulting crystals were filtered off, washed with H<sub>2</sub>O and recrystallized from EtOH to afford (IV – XVI), MP >250 °C, R<sub>f</sub> 0.74 (benzoyl ethyl acetate, 2:1). IR spectrum: v, CM<sup>-1</sup>: 1605 (C=Carom.); 1646 (C=C-C=O); 1711 (C=O); 3240 (NH). <sup>1</sup>HPMR spectrum (DMSO -d<sub>6</sub>),  $\delta$ , ppm, Hz: 1.28 (6H, c, 2CH<sub>3</sub>); 2.76 (2H, c, 6-CH<sub>2</sub>); 7.14-7.51 (5H, m, arom.); 7.93 (1H,dd, J<sub>1</sub>=7.7, J<sub>2</sub>=1.2, 10-CH); 11.24 (1H, c, NH).

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# Estimating the prevalence of risky behaviors by using network scale-up method in Larestan City

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#### ABSTRACT

Risky behavior is a series of behaviors that not only seriously damages the person engaged in this behavior and important people in his life, but also causes the unintentional harm to other innocent people. This study aimed to estimate the prevalence of risky behaviors by using Network Scale-Up method in Larestan in 2016. This cross-sectional study was conducted on 800 people aged 18 to 30 in Larestan in 2014. It was used the data checklist made by the researcher to collect data. In order to assess the demographic variables in the subjects, SPSS software (version 16) was used. Also, to estimate the prevalence of risky behaviors, Stata version 11 was used.Chi- Square test was used to compare the prevalence of risky behaviors in men and women. In all analyzes, the significance level was 0.05. The findings of the study showed that the most common risky behavior in the age group of 18-30 years in Larestan in both males and females is the tobacco products consumption in the amount of 16.82 percent and 11.06 percent, respectively. In contrast, tattoo risk behavior on both males and females respectively in the amount of 1.18 percent and 0.46 percent has the lowest rate. Despite the low prevalence of risky behaviors in Larestan, paying more attention to sexually active individuals can play an important role in reducing this phenomenon in the society. Therefore, developing serious planning by the agencies that are responsible for the health, especially the health centers is essential to reduce these behaviors in the community.

**KEY WORDS:** LARESTAN, RISKY BEHAVIOR, NETWORK SCALE-UP METHOD

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#### **INTRODUCTION**

Risky behavior is a series of behaviors that not only seriously hurts the person engaged in this behavior and important people in his life, but also causes the unintentional harm to other innocent people. Nowadays, the prevalence of risky behaviors among young people is one of the main concerns of the human societies and despite the measures taken in the past three decades, the risky behaviors have the exponential growth throughout the world (Headquarters, 2015).

According to the report of UN Office on Drugs and Crime (UNODC) in 2009, about 147 to 272 million people in 15-64 year age group have used drugs at least once during the past 12 month.The most common health risky behaviors include the excessive consumption of alcohol, drug abuse, unsafe sex, reckless driving, dangerous sports, gambling and illegal acts (TW, 2006). Researches has shown that most of these behaviors occur on the campus (MT, 2005) and the risky behaviors such as excessive alcohol consumption, illicit drug use and unsafe sexual behavior can lead to high levels of morbidity and mortality among them (Wilson , 1995).

Health risky behaviors usually begin from the childhood and adolescence, are established at a young age and will continue into adulthood(Yach D, 2004). Due to the fact that half of our population is below the age of 25 years, exploring these behaviors is important to plan for the future. Also, since the group of society is very vulnerable, the awareness of risky behaviors among them is very important (Momen Nasab, 2006).Risky behaviors have causes that must be understood and we shall strive to eliminate the favorable social contexts for the people's suffering. Unfortunately, in our country, the exact statistics on the prevalence of these behaviors in different age groups is not available (Akbar, 2013).

Due to the sensitive issue of risky behaviors among sexually active population and due to legal and religious restrictions, there is not much information about this sensitive issue. Therefore, there are very few reliable local studies in the field that can be cited as a precedent and because of the limitation of direct methods to estimate the risky behaviors, the need to be done similar studies as soon as possible using indirect methods will be determined to estimate such a critical behaviors in the country (Hamdye M, 2008).Therefore, this study aimed to estimate the prevalence of risky behaviors by using Network Scale-Up method in Larestan in 2016.

#### MATERIALS AND METHODS

This is a cross-sectional study. The study population consisted of sexually active people who were exposed to health risky behaviors in 2016 in the city of Lar. The instrument used is the self-made checklist. The check list contains 2 sections. The first part of demographic information includes gender, age, occupation, place of education, place of residence and marital status, and the second part of checklist is the questions related to the risky behaviors (smoking, hookah, pipe, opium, tramadol, alcohol, ecstasy and unknown drugs, migration history, self-mutilation, drug injection as well as the prevalence of sexual behaviors outside of marriage). The self-made checklists were completed by the clients after providing the necessary explanations by the interviewer, and in the case of illiterate persons, they answered the questions with the help of a questioner.

Since the prevalence of risky behaviors in Network Scale-Up method is indirectly estimated, unlike other studies, there is no formula for determining the sample size. Thus, by classifying people across age groups, a sample with an appropriate volume is considered to make the accuracy of estimates desirable. According to the number of people who are sexually active in 2016 (28192 women and 30390 men), 800 patients were studied.

After extracting and summarizing, the data was encoded and then entered into SPSS version 16 and Microsoft excel and finally was analyzed. The results were reported as "number (percent)" for the qualitative variables. Chi- Square test was used to compare the prevalence of risky behaviors in men and women.

Moreover, Stata 11 software was used to estimate the prevalence of risky behaviors in Wald method. The significance level was 0.05 in tests.

#### RESULTS

In total, 400 men and 400 women were studied. In table 1, it is shown the frequency distribution of demographic variables in 18-30-year-old people who completed the questionnaire in Larestan in 2016. As the results show the people over 25 years old have the highest frequency (45.42 percent). Also, most of the subjects were married and high school graduates and were living in the city and (Table 1).

Table 2 shows that the total of social networks in men and women is respectively 6515 people with an average 16.29 and 5803 people with an average of 14.50 people. In this study, the social network size (C) was found 296 people. The findings of the study showed that the most common risky behaviors among the age group of 18- 30 years in both males and females in Larestan is the use of tobacco products with a frequency of 16.82 percent and 11.06 percent, respectively. In contrast, the tattoo risk behavior on both males and females respectively with a frequency of 1.48 percent and 0.46 percent has the lowest rate (Table 3). Table 1. The frequency distribution of demographic variables in 18-30-year-old people who completed the questionnaire in Larestan in 2016.

Variable	Number	Percent	
Age groups			
Under 20 years old	82	11.05	
20-25 years old	323	43.53	
25-30 years old	337	45.42	
Marital status			
Single	313	42.64	
Married	401	54.63	
Widow	20	27.0	
Address			
City	598	78.58	
Village	163	21.42	
Education			
Under diploma	205	27.82	
High school Diploma	340	46.13	
Collegiate	192	26.05	

Table 3 shows the frequency of risky behaviors differentiated by gender. The results of frequency table estimated show the prevalence of tobacco consumption among young people aged 18-30 years in Larestan. As can be seen, the prevalence of tobacco consumption among men is more than women. This difference was statistically significant (P<0.001).

Also, the prevalence of drugs in men was significantly higher than women (P<0.001). The results of table 3 show the increased prevalence of psychotropic drug use in men than in women that this difference was statistically significant (P=0.003). Also, in the prevalence of dangerous actions and the estimated frequency, there statistically was a significant difference between men and women (P<0.001).

Further, the results in Table 3 show that the prevalence of alcohol consumption is higher in men than in women, and this difference was statistically significant in alcohol consumption (P<0.001). Moreover, the prevalence of unprotected sex outside the family was different in men and women, so that the prevalence was reported in men more than in women (P<0.001). In addition, the prevalence of migration, particularly migration abroad was higher among men than women (P=0.163). Finally, the prevalence of tattooing was significantly higher among men (18-30 years) than women in Larestan (P<0.001) (Table 3).

#### DISCUSSION

The findings of the study showed that the most common risky behaviors among the age group of 18- 30 years in both males and females in Larestan is the use of tobacco products with a frequency of 16.82 percent and 11.06 percent, respectively. In contrast, the tattoo risk behavior on both males and females respectively with a frequency of 1.48 percent and 0.46 percent has the lowest rate.

The results showed that the prevalence of tobacco products (Cigarette and hookah) has the highest frequency among the other high-risk behaviors (14.05 percent). According to the results of this study, it was found that the prevalence of (cigarette) smoking is more than hookah smoking among the subjects. In addition, the use of tobacco products (Cigarette and hookah) in all subjects was more common in boys than girls. Atai et al reported the prevalence of smoking is 31.3 in Isfahan (Ataei B, 2011). While Ismail Zadeh in his study showed that the hookah smoking (59.2) is more prevalent compared with the experience of smoking (32.7) among students (Ismail-Zadeh, 1393). Also, in the study of Taremian et al conducted on 2997 students in six Tehran universities in the academic year 2005-2006, the prevalence of smoking and hookah was estimated 15.7 and 22.1 respectively, in the past year. Contrary to the results of this study, the prevalence of hookah smoking was higher that this could be due to changing patterns of tobacco use among young people and the difficulty of hookah smoking in the student dormitories as well as ease of smoking.

The results of this study showed that the prevalence of drug abuse in the 18-30 year-old young people is 2.5% in Larestan. While Ismail Zadeh reported in his study that the illicit drug abuse is 7.3%(Ismail-Zadeh, 1393). The results of another study in Kerman and Rafsanjan showed that the prevalence of injecting drug use has a frequency of 61.5 percent(Torkashvand F, 2015).

Table 2. Sample size and social network total of friends of respondents								
Variable	Sample size	Social network total of respondents' friends	Social network total of respondents' friends					
Male	400	6515	16.29					
Female	400	5803	14.50					

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Larestan									
	Male			Female					
Risky behavior	Estimated frequency	Prevalence	95% confidence interval	Estimated frequency	Prevalence	95% confidence interval			
Consumption of tobacco products	5112	16.82	-17.75 15.92	3119	11.06	10.26 -11.89			
drug use	1129	3.71	3.26 -4.20	364	1.29	1.01 -1.61			
Psychotropic drug use	708	2.33	1.98 -2.72	446	1.58	1.27 -1.94			
Dangerous Acts	2020	6.64	6.05 -7.27	1360	4.82	4.28 -5.40			
alcohol consumption	4373	14.39	-15.27 13.55	2433	8.63	7.92 -9.38			
Sex outside the family	2631	8.65	7.98 -9.36	1756	6.23	5.62 -6.89			
Emigration	1833	6.032	5.48 -6.63	1536	5.44	4.87 -6.06			
Tattoo	359	1.18	0.93 -1.47	132	0.46	0.30 -0.67			

Another study in Isfahan showed that the prevalence of drug use among prisoners is 30.1%(Ataei 2011). Garmaroudi et al hjave also reported 2.7 percent of drug use in the past month(Garmarodi, 2009). In the study of Shokoohi et al, the estimate derived from the indirect method showed that 13.1 percent of people has the experience of drug use(B. M. Shokoohi M, Haghdoost AA 2012). The Sheikh Zadeh's study findings showed that Intravenous drug use has the lowest frequency among students(Sheikhzadeh 2016). In explaining this relationship, it can be concluded that men are more exposed to the social and economic problems and work-related stress compared to women, which may put them at risk for drug use.

Also, the study results showed 11.61 percent prevalence of alcohol and alcoholic beverages in the region. Ismail Zadeh reported 16.7 percent of drinking alcohol in his study(Ismail-Zadeh, 1393).The results of a study reported an experience 17.8% in Isfahan(Ataei B, 2011). Garmaroudi et al also reported the alcohol consumption to 7.4 percent in the past month(Garmarodi GhR, 2009).

In the study of Shokoohi et al, the estimate derived from the probabilistic method was higher than the frequency in the direct method. According to the probabilistic method, 13.7% of men had used alcohol at least once a year(Shokoohi et al., 2012). In this study, similar to previous studies, the prevalence of risk behaviors is higher among boys than girls that this can be justified according to boys' more freedom in the family and society, more courage and ease of access to drugs and alcohol, psychological stress caused by unemployment on the boys and on the other hand, family's more precise control over the behavior of girls.

In addition, the study results showed that the prevalence of dangerous acts is 5.77 percent. The study of Torkashvand et al showed that men compared with women significantly had the behaviors such as selfmutilation (p = 0/001), after the diagnosis and awareness of their disease. The results of a study in Tehran showed that most patients with self-mutilation suffer from the borderline personality disorder and antisocial personality disorder. More patients had attempted self-mutilation in their upper limbs. Furthermore, most patients with self-mutilation had the previous self-mutilation symptoms, and the average number of previous self-mutilations was approximately 9 times and patients with a history of 2 self-mutilations had the highest frequency. In explaining the risky behavior prevalence, it can be mentioned the people's easy access to sharp tools to harm themselves and attract others.

Also, the Immigration prevalence as another risky behavior was estimated 5.75 percent in the whole sample. No studies have been conducted in this area. In explaining the prevalence of this risky behavior (5.75%), it can be noted that due to the city's proximity to the Persian Gulf states, most residents of Larestan city migrate to the Persian Gulf states, especially Abu Dhabi, Kuwait and Qatar.

Another high-risk behavior examined in this study was a history of sex before marriage that it was observed nearly 7.5 percent of 15-30 year-olds have experienced this behavior. The results of a study in Isfahan showed that the risky behaviors, including partner's illicit sex is 22.1%, illicit sexual relationship and a history of temporary marriage are 17.8%(Ataei B, 2011). The study results of Torkashvand et al in the city of Kerman and Rafsanjan indicated that the unprotected sexual behavior with a frequency of 40% is a risky behavior before HIV diagnosis(Torkashvand 2015)Kolahi et al showed in their study that the female sex workers (prostitutes) who have non-commercial intercourse use condom 1.8 times less than those that have commercial intercourse(Kolahi AA). Garmaroudi et al reported that the prevalence of health risk behaviors such as sexual activities is 20.2% in Tehran(Garmarodi 2009).

In the study of Shokoohi et al in the indirect method, sex outside the family was estimated 12% over the last year, while sex with female sex workers was reported 7%(Shokoohi et al., 2012). Moreover, in the study of Sheikh Zadeh et al in the indirect method, the alcohol consumption was the most common risky behavior among men and sex outside of marriage was the most common behavior in women(Sheikhzadeh 2016).The history of premarital sex among boys was more than girls that due to the cultural and religious structure of Iranian society is a significant outbreak.

The high prevalence of premarital sex can be a sign of fading interest in religion among young people, lack of suitable conditions for marriage and sometimes a sign of modernity.Although tattooing is often done with care, it is not totally risk-free, and can transmit the blood-borne infections. Limited serologic studies on people who have a history of tattooing have shown that tattooing could be a way to transfer the viral infections, particularly hepatitis B virus.

Tattoo prevalence was estimated 0.84% in the total sample. A study in 2002 showed that people who have been tattooed become infected with the Hepatitis C virus 9 times more than those who have not been tattooed. Also, among the 454 students, 50 percent of them pierced parts of the body such as the lip, ear and navel, and 25 percent had a history of tattooing. Almost 20 percent of those who had the tattoo effects on their body were suffering from the complications such as bacterial infection, bleeding and skin and tissue damage in the area of tattooing. The results of a study showed that the rate of positive HBsAg in the tattooed women was 7.9% in Zahedan(Sharifimoud and Metanat 2007). Torkashvand et al stated in their study that a third of people with HIV had a history of tattooing before the diagnosis of the disease (Torkashvand 2015).

The prevalence of psychotropic drug use was 0.84 percent in the total sample. In the study of Hamdieh et al, the prevalence of psychotropic drugs was reported 3.8% in youth and adolescents in Tehran(Hamdieh et al., 2008). In the study conducted by Ahmadi et al on the students of Shiraz city, a frequency of smoking marijuana, heroin, morphine and cocaine was 0.8, 1, 0.8 and 0.5 percent, respectively(Ghaderi, 2015). Pourasl et al stated in their study that 20 percent of high school students have the experience of psychotropic drug use in Tabriz. Perhaps, a possible justification for the increase in other studies is that people in those areas have easy access to the psychoactive drugs.

In the results of this study, social network size in males and females was estimated 16.29 and 14.5, respectively. This suggests that on average, men and women in the age group 18-30 years are familiar with 16 males and 14 females in this age group. This implies that on average, each man communicates with 1.12 people more than women. While a study in Kerman showed that the social network size in men and women is 25.8 and 29.5, respectively. On average, each man communicates with 3.8 people more than women(Sheikhzadeh 2016).

Moreover, in the study of Shokoohi et al in 2010, it was suggested that the social network size estimated in Iranian population is 303 people( Shokoohi et al., 2012). The value has been estimated much more in this study and a study done in Kerman. This difference may be due to the different definitions of social network in the studies. In a study of Kerman, it was related only to the social network of students on campus. In this study, it also covered the sexual age groups 18-30 years(Sheikhzadeh 2016).

According to the results, the following suggestions are recommended:

In addition, to reduce the prevalence of risky behaviors among young and active population of our country, the following are recommended:

- Improving the knowledge and attitude of people, especially sexually active people aged 18-30 years in conjunction with risky behaviors
- Improving the knowledge and attitude of mental health care workers and psychiatrists in relation to the risky behaviors through mandatory training sessions for all employees
- Development of life skills training as a primary prevention program of alcohol, tobacco and other drugs in the youth in order to reduce drug use among young people by Education's officials and planners
- A comprehensive review and evaluation on a large scale in the field of implementing the program by counseling center for the prevention of behavioral health and identifying the weaknesses and providing the strategies to improve the program

Evaluation of the knowledge and attitude of mental health care workers in relation to the risky behaviors
Evaluation of the knowledge and attitude of target groups in relation to the risky behaviors

Further studies on the causes and motivations of people for the tendency toward the risky behaviors

#### CONCLUSION

Despite the low prevalence of risky behaviors in Larestan, paying more attention to sexually active individuals can play a critical role in reducing this phenomenon in the community. Therefore, developing the serious planning by the agencies that are responsible for the health, especially the health centers is essential to reduce these behaviors in the community.

#### STUDY LIMITATIONS

Entry criteria for the study includes all women and men aged 18-30 years living in Larestan.

Exclusion criteria do not include other people outside the age group 18-30 years are not included.

Exclusion criteria do not include other non-native people.

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## Comparing the cost of joint replacement surgery in patients receiving social security insurance in Shahid Beheshti and Shahid Chamran hospitals in Shiraz

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#### ABSTRACT

This study examines the cost of joint replacement surgery services for the persons receiving Social Security insurance in Shahid (martyr) Beheshti hospital and compares it with Shahid Chamran hospital in Shiraz. In the study, it was intended to compare the cost of joint replacement services in two hospitals in Shiraz. In this study, the activity-based cost calculation method was used to calculate the costs. The data were analyzed by using the logistic regression model. The results showed that the costs in the Shahid Beheshti hospital affiliated with Social Security were more than the Shahid Chamran hospital in Shiraz. The cost of all the sub-items in the Shahid Beheshti hospital was more than the Shahid Chamran hospital, only in the sub-item of consumer goods cost, there was not a significant difference. The study's findings will introduce the cost factors of a hospital to the health managers and policy makers. The cost of services in many parts of the study was roughly equal to the tariff of health services in 2016. In some of the items of cost, the cost was less than the tariff, and in others was more than the announced tariff.

KEY WORDS: JOINT REPLACEMENT SURGERY, SHAHID BEHESHTI HOSPITAL, SHAHID CHAMRAN HOSPITAL, SHIRAZ

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#### **INTRODUCTION**

The joint replacement or arthroplasty is a type of surgery in which the damaged joint surfaces are replaced with an artificial surface. The main goal of joint replacement is to relieve the pain caused by erosion, arthritis, rheumatism and destruction of the articular surface. Obtaining the optimal range of motion in joint and modifying the deformations created in the joint are considered as another factors to use the artificial joint(Bachmeier et al., 2001).

"Arthroplasty is a type of reconstructive surgery that is performed to reduce the pain and increase the range of motion in the joints with limitation of motion. The most common arthroplasty performed today is the total joint replacement which is also called the joint replacement(Nunley et al., 2012). Arthroplasty is a type of surgery in which the movable articular surfaces that have severely damaged and destroyed are resected so that the joint can move with less pain. Arthroplasty is usually used in the treatment of joints that have suffered severe damage. There are three types of arthroplasty: 1) Resection arthroplasty. 2) Interposition arthroplasty. 3) Prosthetic arthroplasty which is also called joint replacement. In this type of surgery, after removing the articular surfaces, they are replaced with the metal, ceramic or plastic pieces which are called artificial joint(Healy, Iorio, Ko, Appleby, & Lemos, 2002),(Koskinen, Eskelinen, Paavolainen, Pulkkinen, & Remes, 2008).

Shahid Beheshti hospital of Shiraz is one of the hospitals under the Social Security Organization. The Social Security insured persons do not pay the fee for the services done for them in the Social Security hospitals and all expenses will be paid by the indirect health sector of the Social Security Organization. It seems that this makes the necessary sensitivity that exists in the public and private sectors to monitor and calculate the cost of various services, does not exist.

Health in Social Security is divided into two sectors: direct and indirect health. Direct health includes the medical centers belonging to the social security organization in which the health care is offered free to the insured. Indirect health is another sector of the organization that is responsible for the purchase of service from the various diagnostic and therapeutic centers (public and private) by contracting with them that the Insured receive the health care by visiting the centers after payment of franchise(Arefnezhad et al., 2016; Kazemi Karyani, Homaie Rad, Pourreza, & Shaahmadi, 2015).

The first step towards the economic management of detailed planning about the future performance of the hospital is the accurate calculation of the cost of each part(Sefiddashti, Rad, Mohamad, & Bordbar, 2016). However, the lack of cost accounting in hospitals has made the correct amount of consumer spending does not exist in every hospital, in every sector and on every patient and lead to the budget bargain method, important hospital function, etc.(Kazemi Karyani et al., 2015),(Rad, Rezaei, & Fallah, 2015).

With regard to the implementation of the health reform plan and new tariff book in country's hospitals, there has been a sharp rise in prices of medical services. In this regard, controlling the medical costs that one of the most expensive is the surgery, is a priority. Analyzing and comparing the costs of surgery in the Social Security hospital to other hospitals is important in two aspects. The first aspect is to find the right solution to optimize the surgery costs including the costs related to the physicians, staff, equipment, daybed, para clinic, etc. and the second aspect that is considerable in this study is the determination of priority whether the direct investment to perform the surgery in the Social Security hospital benefits the organization or purchasing the service from other hospitals under the contract. The importance of this issue arises from this fact that by having the data and analyzing the costs carried out in the social security hospitals and centers under the Social Security Agreement, it can be improved the long-term care policies of organization(Samadi & Homaie Rad, 2013),(Bayati, Sarikhani, Rad, Heydari, & Lankarani, 2014).

For performing more hip and knee joint replacement surgery in these two hospitals and their high cost, these surgeries were selected. The cost of hip and knee joints replacement surgery in Shahid Chamran University Hospital was compared with this cost in the Organization's Shahid Beheshti Hospital according to the implementation of the health reform plan and increased costs resulting from it and it was determined as far as possible what the differences there are between the cost of arthroplasty in the two hospitals according to the hospital bills and which of the bill rows (premium, daybed, consumer goods, etc.) has created the differences. The basis for comparing the information contained in patients' bill was from early October 2015 to late September 2016. In this study, the total prosthetic Arthroplasty includes the total Knee Arthroplasty (TKA) and total hip Arthroplasty (THA). And the question is answered that what difference is there between the total costs of Shahid Chamran hospital and all the same costs calculated in the bill of Shahid Beheshti hospital?

#### METHOD

This is a descriptive-analytic study that will be conducted in a retrospective way. The method used is to view the available documents in the archive of the Social Security Organization and accounting records of the studied hospitals. The study population will be comprised of two Shahid Beheshti and Shahid Chamran hospitals in Shiraz and the patients referred to them. In this study, all samples admitted to the two hospitals during the period April to September 2016, will be used. Thus, the sample size does not matter in this study. Sampling is done by viewing the documents in the archives of the Social Security and accounting records of the studied hospitals and the samples examined will be collected using the checklists.

The information can be retrieved and also accessed by data processing, administrative and financial units, statistics and economics of treatment, and clinical and laboratory departments of hospital. Given that the above-mentioned information is placed in the financial sector of hospital HIS system, access to the system is possible via the hospital's database. Excel software will be used to process and summarize the data. Moreover, SPSS software will be used for the report-statistical conclusion and analysis.

The variables of this study include the costs of different departments of joint replacement surgery including the cost of daybed, surgery, anesthesia, laboratory and prosthesis. Furthermore, other variables such as the number of hospital beds and staff are also collected and their impact on the cost of services is assessed. While using the paired t test and chi-square test, the costs of services in two hospitals will be compared.

#### **FINDINGS**

Table 1 shows the descriptive findings of the study on the gender of the subjects. As the above table shows, 67.8% of subjects were male with a frequency of 118 people and the rest was female. In addition, 58 men were related to the Chamran hospital and 40 were related to the Shahid Beheshti Hospital.

Table 2 shows the descriptive findings of the study on the cost of joint replacement services in the two studied hospitals as a whole. In addition to the average costs, the standard deviation and minimum and maximum values of costs are also included.

As can be seen from the above table, the average premium was equal to 71815177 IRR, average consumer goods 21757406 IRR, paraclinic average cost 13666891 IRR, average anesthesia 30248387 IRR, average cost of prosthesis 85208976 IRR and average total cost of joints replacement 222696838 IRR. The average length of stay for patients was also averaged 2.77 days. This amount was 2.95 days in the Shahid Beheshti Hospital (affiliated to Social Security) and was 2.59 days for the Chamran Hospital affiliated to Shiraz University of Medical Sciences. The maximum number of hospitalization days was equal to 7 days in the Shahid Beheshti hospital and 5 days in the Chamran hospital. The total cost of daybed for patients in two hospitals was equal to 109982800 IRR.

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Table 2. Descriptive findings of the study on the cost of joint replacement services							
Total costs	Coefficient	SD	T-statistic	P-value			
Gender-male	35600000	17000000	2.09	0.04			
Beheshti Hospital	10100000	1600000	629	0.00			
Length of stay	-1078129	5561830	-0.19	0.85			
Constant coefficient	150000000	23000000	6.53	0.00			

Table 3. Comparing the cost of joint replacement services							
Total costs	P-value	P-value T-statistic SD Coeffic					
Gender-male	35600000	17000000	2,09	0,04			
Beheshti Hospital	10100000	1600000	6,29	0,00			
Length of stay	-1078129	5561830	-0,19	0,85			
Constant coefficient	150000000	23000000	6,53	0,00			

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Table 4. Comparing the brokerage cost of joint replacement services						
	P-value	T-statistic	SD	Coefficient		
Gender-male	4653202	2961444	1,57	0,12		
Beheshti Hospital	1770000	2783949	6,35	0,00		
Length of stay	-73833	968150	-0,08	0,94		
Constant coefficient	59800000	3999951	14,95	0,00		

Table 3 shows the analytical results of the study on the cost of joint replacement services and the comparison between the two hospitals. As specified in the table, the Beheshti Hospital variable coefficient is significant and positive and indicates that the cost of services in Shahid Beheshti hospital affiliated to Social Security is more than Shahid Chamran hospital. Since the hospital type variable was imaginary and for the Shahid Beheshti hospital was 1 and for the Shahid Chamran hospital was zero, the Chamran hospital variable as a basic variable input into the model and as a result, since the variable was for the comparison between the two hospitals and recognition of differences, the variable coefficient was as a number and related to the Shahid Chamran hospital variable. The cost in men was more than women and was not associated with the length of stay for patients in the hospital. The above variable coefficient is also equal to 10100000 IRR, indicating a difference of nearly one million Toman in the services cost between the two hospitals.

Table 4 shows the analytical findings of the study on the surgery premium cost of 1770000 joint replacement services and the comparison between the two hospitals. Since the hospital type variable was imaginary and for the Shahid Beheshti hospital was 1 and for the Shahid Chamran hospital was zero, the Chamran hospital variable as a basic variable input into the model and consequently, since the variable was for the comparison between the two hospitals and recognition of differences, the variable coefficient was a number and related to the Shahid Chamran hospital variable. As specified in the table, the Beheshti Hospital variable coefficient is significant and positive and indicates that the cost of services in the Shahid Beheshti hospital affiliated to Social Security is more than the Shahid Chamran hospital. Also, this cost was not associated with the gender of the subjects. The above variable coefficient is equal to 1770000 IRR. The cost of premiums was not associated with the length of stay.

Table 5 shows the analytical findings of the study on the consumer spending of joint replacement services and its comparison between the two hospitals. Since the variable of hospital type was dummy and for the Shahid Beheshti hospital was 1 and for the Shahid Chamran hospital was zero, the Chamran hospital variable input into the model as a basic variable and consequently, since the variable was for comparing between the two hospitals and understanding the differences, the variable coefficient was a number and related to the Shahid Chamran hospital variable. As specified in the table, the Shahid Beheshti Hospital variable coefficient is not significant and indicates that the service brokerage cost in the Shahid Beheshti hospital affiliated to Social Security was similar to the Shahid Chamran hospital. Moreover, this cost was not associated with the gender of the subjects. The cost of premium was not related to the length of stay.

Table 6 shows the analytical findings of the study on the para clinic cost of joint replacement services and its comparison between the two hospitals. Since the variable of hospital type was imaginary and for the Shahid Beheshti hospital was 1 and for the Shahid Chamran hospital was zero, the Shahid Chamran hospital variable as a basic variable input into the model and as a result, since the variable was for comparing between the two hospitals and understanding the differences, the variable coefficient was a number and related to the Shahid Chamran hospital variable. As specified in the table, the Shahid Beheshti Hospital variable coefficient

Table 5. Comparing the consumer spending of joint replacement services						
	P-value	T-statistic	SD	Coefficient		
Gender-male	3898872	2620716	1,49	0,14		
Beheshti Hospital	2053253	2468421	0,83	0,41		
Length of stay	-754014	856759	-0,88	0,38		
Constant coefficient	20200000	3539737	5,69	0,00		

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Table 6. The analytical findings of the study on the para clinic cost of joint replacement services							
	P-value T-statistic SD Coefficient						
Gender-male	1459314	1539868	0,95	0,35			
Beheshti Hospital 454901 1450383 3,14 0,00							
Length of stay -137331 503411 -0,27 0,79							
Constant coefficient	10700000	2079862	5,16	0,00			

Table 7. The analytical findings of the study on the anesthesia cost of joint replacement services						
P-value T-statistic SD Coefficient						
Gender-male	4234473	3719515	1,14	0,26		
Beheshti Hospital	1230000 3503367 3,52 0,00					
Length of stay	-1422506	1215976	-1,17	0,24		
Constant coefficient	25000000	5023858	4,98	0,00		

Table 8. The analytical findings of the study on the prosthesis cost of joint replacement services							
	P-value T-statistic SD Coefficient						
Gender-male	21300000	15400000	1,38	0,17			
Beheshti Hospital	6410000 14500000 4,41 0,00						
Length of stay	1309556 5038331 0,26 0,80						
Constant coefficient	34300000	20800000	1,65	0,10			

is significant and positive and indicates that the service brokerage cost in the Shahid Beheshti hospital affiliated to Social Security is higher than the Shahid Chamran hospital. Also, this cost was not associated with the gender of the subjects. The finished consumer cost was not related to the length of stay. The difference in the above amount also was equal to 459901 IRR.

Table 7 shows the analytical findings of the study regarding the anesthesia cost of joint replacement services and its comparison between the two hospitals. Since the variable of hospital type was imaginary and for the Shahid Beheshti hospital was 1 and for the Shahid Chamran hospital was zero, the Shahid Chamran hospital variable as a basic variable input into the model and as a result, since the variable was for the comparison between the two hospitals and recognition of differences, the variable coefficient was a number and related to the Shahid Chamran hospital variable. As specified in the table, the Shahid Beheshti Hospital variable coefficient is significant and positive and indicates that the anesthesia cost in the Shahid Beheshti hospital affiliated to Social Security is higher than the Shahid Chamran hospital. Also, the cost was not associated with the gender of the subjects. The cost of anesthesia was not related to the length of stay. The difference in the above amount also was equal to 1230000 IRR.

Table 8 shows the analytical findings of the study on the prosthesis cost of joint replacement services and its comparison between the two hospitals. Since the variable of hospital type was imaginary and for the Shahid Beheshti hospital was 1 and for the Shahid Chamran hospital was zero, the Shahid Chamran hospital variable as a basic variable input into the model and as a result, since the variable was for the comparison between the two hospitals and recognition of differences, the variable coefficient was a number and related to the Shahid Chamran hospital variable. As specified in the table, the Shahid Beheshti Hospital variable coefficient is significant and positive and indicates that the prosthesis cost in the Shahid Beheshti hospital affiliated to Social Security is more than the Shahid Chamran hospital. Furthermore, the cost was not associated with the gender of the subjects. The finished cost of the prosthesis was not related to the length of stay. The difference in the above amount also was equal to 6410000 IRR.

Table 9 shows the analytical findings of the study on the joint replacement services' daybed cost and the comparison between the two hospitals. As specified in the table, the Shahid Beheshti Hospital variable coefficient is significant and positive and indicates that the cost of the daybed in the Shahid Beheshti hospital affiliated to Social Security is more than the Shahid Chamran hos-

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Table 9. The analytical findings of the study on the daybed cost of joint replacement services						
P-value T-statistic SD Coefficient						
Gender-male	16978730	12699077	1,35	0,18		
Beheshti Hospital 39736799 11897033 3,37 0,001						
Constant coefficient	77989360	11908779	6,46	0		

pital. The cost also was not associated with the gender of the subjects.

#### DISCUSSION

In this study, it was tried to compare the cost of knee replacement surgery services in two large hospitals in Shiraz. The results showed that the cost of services at the hospital affiliated to the Social Security was more than the University Hospital. Chakubz et al found that the intensive care services are the most expensive hospital services in Canada(Jacobs & Noseworthy, 1990). Dornyg et al also found that the patients with joint problems impose the highest costs to the health system (Buchmueller, Couffinhal, Grignon, & Perronnin, 2004). Many studies have demonstrated that the use of a standard costing system can be effective in calculating the cost of goods and services and cause the standardization of the costs in hospitals(Rezaei, Bazyar, Fallah, Chavehpour, & Rad, 2015). In this case, a study was done by Crowe et al in the field of activity-based costing in the pediatric radiology department of Oulu teaching hospital in Finland in 2007 that 7452 radiology procedures were studied in this study. The information in this study was collected through the radiology information system as well as personnel and accounting units of the hospital. The results showed that the overhead costs have decreased from 57 percent to 16 percent with the implementation of activity-based costing system and the unit cost change in various procedures of radiology department has changed from 42 percent to 85 percent(Crow & Willis, 2009).

The hospitals and other health care organizations are increasingly faced with a competitive and challenging environment. The strong focus on the quality of patient care, the high cost of service delivery and the fierce competition are among the factors that force these organizations to revise the methods of service delivery and the services cost(Losina et al., 2009),(Hatam, Tourani, Rad, & Bastani, 2016),(Rad, Kavosi, & Arefnezhad, 2016). In the meantime, increasing the accuracy and precision and linking the information of costs are the main challenges of hospitals for the proper spending and management decisions. The aim of any costing and cost management system is to provide the accurate and useful information for helping the organizations so that they can provide the quality products and services in a competitive environment(Homaie Rad, Ghaisi, Arefnezhad, & Bayati, 2015; Tuominen & Eriksson, 2011). Costing can be defined as the estimated cost of the final product. In recent years, there have been much progress in the costing methods that is hoped to be able to more precisely calculate the health costs.

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## Review of the factors affecting nurses entrepreneurship in selected hospitals of Golestan province

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#### ABSTRACT

Considering the importance and the role of entrepreneurship in the health sector and acceptance of entrepreneurship as a development approach in most countries, the need to examine the factors affecting the entrepreneurship of nurses is felt more than ever. This applied research was conducted in cluster sampling in four public hospitals in Golestan province and in the form of 275 questionnaires in 2016. The standard questionnaire consisting of 44 questions was developed based on the five-item Likert scale. The questionnaire's construct validity was confirmed by confirmatory factor analysis and its reliability by Cronbach's alpha. SPSS software was used to analyze the data. Results showed that the mean and the coefficient of each components of risk-taking, internal locus of control, need to be successful, clearness of thought, activism, challenging, flexibility, individual approach and bonus item is respectively 4.33 and 0.85. There is also a significant relationship between any of the components and the nurses' entrepreneurship (p< 0.01).This study showed that the factors of risk-taking, internal locus of control, need to be successful, clearness of thought, activism, challenging, flexibility, individual approach and bonus item affect the nurses' entrepreneurship. Therefore, with proper planning, the policy makers in the health sector and administrators of public hospitals in Iran can lead nurses to become entrepreneurs.

KEY WORDS: ENTREPRENEURSHIP, NURSES, HOSPITALS

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#### **INTRODUCTION**

Entrepreneurship is a phenomenon that occurs in different environments and leads to economic growth through innovations that people have created in response to economic opportunities and have created these values for both individuals and their society (A. & Ghazi, 2013).

Entrepreneurship is an important and inexhaustible source in all human societies (Cristian-Aurelian & Petronela Cristina, 2012) Entrepreneurship is a complex, multi-layered and full-side concept that has an interdisciplinary nature and creates several areas in the community affected by itself (Sergey & William S, 2009). The gap between resources and facilities on the one hand and inclusive and diverse needs of human society on the other hand require the human involvement and role-playing. In the meantime, there have been people who did not comply with the general rules of communities so some changes have been created (Remeikiene & Dumciuviene, 2013). The entrepreneurs are the cause of making the dynamics and productivity and increase the value of work and raise the spirit of trying in the community (Naebi, 2011). Entrepreneurial Studies show that the entrepreneurs have special properties (S. G., 2010). As a result, in the past few years, the researchers from all disciplines have found a fondness for entrepreneurship (Tajeddini, 2010). Using the training and development practices, it can be improved the entrepreneurial behaviors, even to the extent that they are applicable to a wide range of job opportunities (Peris Bonet, Rueda Armengot, & Martín, 2011).

Coordination at higher levels of entrepreneurial orientations and market orientations improves the business performance and entrepreneurship in the developing countries (Boso, Story, & Cadogan, 2013).

Like other entrepreneurs, the entrepreneur nurse known as the business owner offers the nursing services with the nature of direct care, education, research, administrative and consulting services. Such nurses may do an independent clinical work, be the owner of a business, such as nursing home care or pharmaceutical company or run a consulting business, such as education or research. The nurse entrepreneurs are the innovators that have the primary motivations for change, modernization of health systems and leadership display. The main characteristics of an entrepreneur are the use of creativity to develop a new idea, improvement of services or the methods of service delivery, development of new products or new ways of using the existing products. By combining these features with the advanced or specialized knowledge and skill, it can be said the entrepreneur nurses are the advanced nurses who produce the products or services and can sell them to foreign sources. Separation of a job in which you are employed, selection

of entrepreneurial path followed by the risk of entrepreneurship, tolerance of ambiguity and facing a variety of obstacles and difficulties need strong incentives. A meta-analysis of 41 articles showed that the entrepreneurial motivations are positively and significantly associated with the entrepreneurial approaches selection and people who have high entrepreneurial incentives are more willing to become entrepreneurs (Jahani & Fallahi, 2014).

Karsoroud also states that the entrepreneurial incentives not only affect the desire to entrepreneurship, but also have an impact on the entrepreneurial behaviors (Carsrud & Brännback, 2011). Perceived entrepreneurial incentives refer to the beliefs of individuals about the attractiveness of an idea for choosing an entrepreneurial career path and the level of attractiveness may be associated with the economic benefits derived from the entrepreneurial activities, the possibility of achieving independence and achieving the specific goals (Solesvik, 2013). Studies show that the need for flexible work schedule, ability to follow ideas and having more earnings are the reasons for the tendency of staff in the health professions to entrepreneurship (Jahani & Fallahi, 2014).

Eddie expressed that the creation of consent for use of personal style and creative flair to carry out a task or produce a product, free from the constraints of large organizations, is considered as an important motivation (Eddy & Stellefson, 2009). For the formation of a successful entrepreneurial activity, in addition to proper identification of opportunities, a level of updated knowledge and information as a capital are required (Rabiei & Sarabi, 2014).

So far, much research has been done on the entrepreneurship but in the field of nurses' entrepreneurship in hospitals of Golestan province, no research has taken place. The aim of this study was to investigate the factors influencing the nurses' entrepreneurship in the selected hospitals of Golestan province. In this context, the effective components in the nurses' entrepreneurship have been examined from 9 dimensions including locus of control, need to be successful, individual approach, flexibility, challenging, clearness of thought, bonus item, activism and risk-taking.

#### **METHOD**

This applied research was conducted in a cross-sectional method in 2016 in Golestan. The study population consisted of nurses in selected hospitals in Golestan province that the sample size of 275 nurses were selected in cluster sampling for 10-20 times for SEM sample in four hospitals located in four points of Golestan prov-

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Table 1. Friedman test result				
Number	275			
Chi-square	352,791			
Freedom degree	8			
The significance level	0,000			

Table 2. Ranks of each factor				
	Avg.			
Locus of Control	5.52			
Need to be successful	5.85			
Individual approach	4.02			
flexibility	3.65			
Challenging	4.52			
clearness of thought	5.59			
Bonus item	7.00			
activism	4.52			
Risk-taking	4.33			

ince. Data collection was done by the questionnaire. The questionnaire were developed based on the scale of five options in 9 dimensions of risk-taking (contains 9 questions), internal locus of control (12 questions), need to be successful (7 questions), clearness of thought (4 questions), activism (3 questions), challenging (4 questions), flexibility (3 questions), individual approach (5 questions), bonus item (3 questions). After developing the questionnaire, its validity was confirmed through the library studies, internet, obtaining the required information from specialized literature, as well as by collecting the professors, faculty members and experts' opinions.

The questionnaire's reliability was evaluated among the 30 members of the sample. Cronbach's alpha values is over 0.7 (risk-taking 0.88, locus of control 0.91, need to succeed 0.89, clearness of thought 0.90, activism 0.91, challenging 0.89, flexibility 0.90, Individual approach 0.91 and bonus item 0.88) which shows high reliability of the study tool. In addition, an acceptable validity for the questionnaire was created by interviewing with about five respondents about the possible ambiguities and applying their judgment in the final questionnaire. Then, the structural model, was confirmed by the confirmatory factor analysis test. To rank the factors affecting nurses, Friedman test was used. Single-sample t-test was used to test the hypothesis.

#### **FINDINGS**

In this study, we evaluated 275 questionnaires that were completed correctly and completely. Among the respondents to the questionnaire, 66% were female and 34% were male. In terms of work experience, 30% were less than 10 years old, 48% between 11-20 years old and 22% between 21-30 years old. In terms of education, 80 percent had a bachelor, 15 percent a master, 0.05 percent a master and above and in terms of age, 16 percent were under 30 years old, 54 percent between 31- 40 years old, 30% between 41-50 years old.

The results of Friedman test are shown in Table 5. Due to the significant level, it is indicted that the variables of control locus, need to be successful, individual approach, flexibility, challenging, clearness of thought, bonus item, activism, risk-taking have different ranks. According to Table 2, the component of bonus item with an average rating of 00.7 is in the first rank, need to be successful with an average rating of 5.85 is in the second rank, clearness of thought with an average rating of 5.59 is in the third rank, locus of control with an average rating of 5.52 is in the fourth rank, challenging and activism component with an average rating of 4.52 in the fifth rank, risk-taking with an average rating of 4.33 in the sixth rank, individual approach with an average rating of 4.02 in the seventh rank and flexibility with an average rating of 3.65 in the eighth rank.

Table 3. Descriptive statistics of factors affecting nurses' entrepreneurship						
Component	Sign	Number	Mean	SD	Mean Standard deviation	
Locus of Control	LC	275	3.4309	.86324	.05104	
Need to be successful	NS	275	3.5125	.72722	.04300	
Individual approach	IA	275	3.2056	.67805	.04009	
flexibility	F	275	3.0932	.71944	.04254	
Challenging	С	275	3.2622	.80939	.04786	
clearness of thought	СТ	275	3.4808	.69495	.04109	
Bonus item	BI	275	3.7587	.61088	.03612	
Activism	А	275	3.1830	.64973	.03842	
Risk-taking	R	275	3.1935	.85467	.05054	

Table 4. t test for factors affecting nurses' entrepreneurship								
Study level = 3								
Component	Т	Degree of	The significance	The mean differences	Approximately interval 95%	confidence		
		freedom	level		Lower limit	Upper limit		
Locus of Control	8.442	274	.000	.43094	.3305	.5314		
Need to be successful	11.918	274	.000	.51249	.4278	.5971		
Individual approach	5.128	274	.000	.20559	.1267	.2845		
flexibility	2.192	274	.000	.09324	.0095	.1770		
Challenging	5.479	274	.000	.26224	.1680	.3564		
clearness of thought	11.699	274	.000	.48077	.3999	.5617		
Bonus item	21.005	274	.000	.75874	.6876	.8298		
Activism	4.763	274	.000	.18298	.1074	.2586		
Risk-taking	3.828	274	.000	.19347	.0940	.2929		

The results related to descriptive statistics of individual factors are shown in Table 9. Mean and standard deviation of comments for the control locus component are respectively 3.43 and 0.86, for the need to be successful component respectively 3.51 and 0.72, for individual approach component respectively 3.20 and 0.67, for flexibility component respectively 3.09 and 0.71, for challenging component respectively 3.26 and 0.80, for intellectual clearness component respectively 3.48 and 0.69, for bonus item component respectively 3.18 and 0.64 and for balanced risk-taking component respectively 3.19 and 0.58.

Results of t test is given in Table 4. According to the significant level of (p < 0/05) and positive values of upper and lower limit, the status of each component of the locus of control, need to be successful, individual approach, flexibility, challenging, clearness of thought, bonus item, activism and balanced risk-taking is desirable.

In table 5, the correlation between the variables in the less than one percent shows a significant relationship.

#### DISCUSSION

One of the main objectives of this study was to determine the relationship between the component of a balanced risk-taking and nurses' entrepreneurship. The results showed that there is a significant relationship between the balanced risk-taking component and entrepreneurship (r= 0.88). The results obtained by Mohammadi et al (Mohammadi, Talkhabi Alishah, & Lashkari, 2015) showed there is a significant positive correlation between risk-taking and entrepreneurship that are consistent with the results of this study. People who have a spirit of risk-taking and accept this fact that they themselves are responsible for the result of their actions will make more efforts to become entrepreneurs. In this regard, providing some programs to invite successful entrepreneurs to present their experiences in order to familiarize nurses with the positive and negative realities in the field of entrepreneurship will be useful and valuable.

Other objective of this study was to determine the relationship between the locus of control component and nurses' entrepreneurship. The results showed that there is a significant relationship between the component of the locus of control and entrepreneurship (r= 0.87). In line with this study, the results of Arab and Aligoli Firouzjai (Arab & Aligoli Firouzjai, 2015) showed that the internal locus of control has a significant positive impact on the students' entrepreneurial intentions that are consistent with our results.

Another aim of this study was to determine the relationship between the component of need to be successful and nurses' entrepreneurship. The results showed that there is a significant relationship between the component of need to be successful and entrepreneurship (r= 0.83). The results of this hypothesis are consistent with the results obtained by Ahmadi et al (Ahmadi, Shafei, & Mafakheri Nia, 2013). The results of their studies which are consistent with the results of the present study showed that the individual factors have a significant relationship with the entrepreneurial characteristics, so that a sense of achievement and the need to succeed is more in the male students and those who have good academic standing.

Other objective of this study was to determine the relationship between the component of clearness of thought and nurses' entrepreneurship. The results showed that there is a significant relationship between

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Table	ole 5. matrix of correlation between variables									
	Locus of control		Need to be successful	Individual approach	flexibility	Challenging	clearness of thought	Bonus item	Activism	Risk- taking
ontrol	Correlation coefficient	1								
us of co	Significance level									
Loc	Number	275								
۹_	Correlation coefficient	.755**	1							
ed to b ccessful	Significance level	.000								
Ne sue	Number	275	275							
	Correlation coefficient	.470**	.476**	1						
lual Ich	Significance level	.000	.000							
Individ approa	Number	275	275	275						
	Correlation coefficient	.500**	.498**	.551**	1					
ibility	Significance level	.000	.000	.000						
flex	Number	275	275	275	275					
1g.	Correlation coefficient	.652**	.519**	.590**	.406**	1				
allengiı	Significance level	.000	.000	.000	.000					
Ĉ	Number	275	275	275	275	275				
	Correlation coefficient	.639**	.643**	.630**	.469**	.667**	1			
ness of ght	Significance level	.000	.000	.000	.000	.000				
Clear	Number	275	275	275	275	275	275			
я	Correlation coefficient	.566**	.637**	.518**	.514**	.469**	.587**	1		
nus iter	Significance level	.000	.000	.000	.000	.000	.000			
Bo	Number	275	275	275	275	275	275	275		
	Correlation coefficient	.602**	.525**	.641**	.627**	.502**	.582**	.608**	1	
tivism	Significance level	.000	.000	.000	.000	.000	.000	.000		
Ac	Number	275	275	275	275	275	275	275	275	
1g	Correlation coefficient	.739**	.621**	.633**	.533**	.630**	.562**	.533**	.704**	1
ık-takir	Significance level	.000	.000	.000	.000	.000	.000	.000	.000	.000
Ris	Number	275	275	275	275	275	275	275	275	275
	**. Correlation is sig	nificant at t	he 0.01 level (2-	tailed).						

the component of clearness of thought and entrepreneurship (r=0.88). In line with this study, Nemati (Nemati, 2014) discussed the students' entrepreneurial personality traits in Tehran state universities. The results showed that there is a significant difference among all students studied in various academic disciplines about having the clearness of thought. These results are consistent with the results of this study.

Other objective of this study was to determine the relationship between the activism component and nurses' entrepreneurship. The results showed that there is a significant relationship between the activism component and entrepreneurship (r=0.93). In line with this research, the results of Akbari Pourang and et al's studies (Akbari Bourang, pour, & Ayati, 2015) showed that there is a significant relationship between the entrepreneurial orientation and organizational performance that are consistent with the present studies and do not match the results of Parsa and Graily Sheikh (Parsa & Grayli Sheikh, 2012). Their results showed that the entrepreneurship characteristics are more relevant to the rationalist practices than performance ones. Of course, it was expected that the entrepreneurial characteristics are more relevant to the performance practices. But the result of their study showed that people's entrepreneurial characteristic is more impressed by the rationalist practice. Perhaps the result can be analyzed in a way that people with high entrepreneurial characteristics, regardless of all circumstances and rational decisions, do not invest in a field.

Other objective of this study was to determine the relationship between the challenging component and nurses' entrepreneurship. The results showed that there is a significant relationship between the challenging component and entrepreneurship (r=0.76). The results and findings of Nemati (Nemati, 2014) that are inconsistent with the results of this study showed that the challenging component was evaluated in the weak students. In fact, challenging index covers some cases of need to succeed and since the entrepreneurship is challenged, it seeks to achieve the unattainable areas and is interested in areas in which the capabilities of entrepreneurs are challenged. So the entrepreneur will enter the new tasks and will manipulate them and after a while, will dominate the work.

Other purpose of this study was to determine the relationship between the flexibility component and nurses' entrepreneurship. The results showed that there is a significant relationship between the flexibility component and entrepreneurship (0.78). The results obtained by Abbasi et al (Abbasi, Babashahi, Afkhami Ardekani, & Farahani, 2014) showed that a there is a significant relationship between the flexibility of human resources and organizational entrepreneurship. In order to achieve the functional flexibility, it is recommended the organizations to provide the utilization background of different job design techniques, such as job rotation, job development and job enrichment. Moreover, employing the empowerment strategies, human resource development and team-building help the behavioral flexibility of human resources.

Other objective of this study was to determine the relationship between the individual approach component and nurses' entrepreneurship. The results showed that there is a significant relationship between the individual approach component and Entrepreneurship (0.80). The results of this hypothesis are consistent with the studies of Mohseni et al (Mohseni, Mousavi, & Jamali, 2014) who expressed the entrepreneurship education has a significant positive impact on the entrepreneurial attitude and general self-efficacy beliefs of students.

Through the entrepreneurship educations, the values are formed on entrepreneurship and strengthen it and subsequently, they will also gain the beliefs about entrepreneurship and in this way, their entrepreneurial attitude will be strengthened. Therefore, we can say that through the entrepreneurship education, it can be influenced the self-efficacy beliefs and entrepreneurial attitudes and simultaneously with the development of selfefficacy belief, entrepreneurial and general self-efficacy beliefs, the entrepreneurial attitude will be strengthen in people.

Another aim of this study was to determine the relationship between bonus item component and nurses' entrepreneurship. The results showed that there is a significant relationship between the bonus item component and entrepreneurship (r = 0.85). In this study, bonus item component has the highest average. In the studies of Banzing and et al (Benzing, Chu, & Kara, 2009), it was found that in low-income countries, income and bonus are an important incentive for the entrepreneurs and earn money and bonus have been one of the main incentives for entrepreneurship. These results are consistent with the results of this study. Therefore, all mentioned components are considered as the incentives for nurses to become entrepreneurs and they can be encouraged in order to become entrepreneurs through meeting the financial needs and rewarding them.

Be sure the bonus system and its structure is seriously considered and investigated. Accordingly, a committee should be composed of experts from many different disciplines and for the purpose of valuation and allocation of bonuses, the ideas are collected and valued by Entrepreneurship Committee. The ideas will be scored in accordance with the standard provided and according to the scale of their influence on the organization as well as the organization's policy priorities and the bonus is allocated to them at the same amount. In this way,

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in addition to the allocation of a reasonable bonus, the ideas are organized and also implemented.

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### Examining the impact of servant leadership on human resources management in Yasouj University of Medical Sciences

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#### ABSTRACT

Servant leadership is among modern theories in the organizational leadership arena which has been posed during recent years. Servant leader, before being a leader, is a servant and he knows that whatsoever invests on development and promotion of human resources, he has secured his organization efficiency and success. As for standing of servant managers in the organizations leadership levels, the main aim of this study has been to examine the impact of servant leadership on human resources management in Yasouj University of Medical Sciences. The utilized research method is descriptive method of survey branch. The statistical population of this study was 248 persons of all managers and assistants and staff members working in Yasouj University of Medical Sciences that 150 persons were selected by random sampling method as sample. Main tool of collecting data has been questionnaire. And for testing hypotheses, Spearman test and single variable regression were used. The main hypothesis has been calculated using Spearman correlation coefficient and existence of the impact of servant leader variable on human resources management has been confirmed with correlation coefficient 0.33. Correlation coefficients of serving variables, humility, trust and humanism of +0.533, +0.408, +0.479 and + 0.520 indicates their significance with human resources management variable. The findings of research show that there is a significant and positive relation between servant leadership and human resources management. Therefore, modeling features and specifications of servant leaders will play an important role in human resources management. So, we can develop this style among the organization leaders and managers, by means of modeling traits and features.

KEY WORDS: SERVANT LEADERSHIP, HUMAN RESOURCES MANAGEMENT, LEADERSHIP STYLES

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#### **INTRODUCTION**

Today, management is interested in personnel self-actualization in attachment to the organization and determining identity with it instead of constraint the subordinates to obey. The first step in realization of this is to change managers' attitude to the organization members (Farhangi A, 2004). The concept of servant leadership is not a new concept and in phrase of Brower (2010), philosophical foundations of servant leadership has been existed from thousands years ago. But, by emergence of organizations and prevalence of primary and traditional methods in them, scholars tried to find a modern method for leadership in new organizations. Servant leadership is an alternative against traditional power and authority model which is still the most prevalent leadership model in our today organizations (Laub, 1999)also declared that servant leadership has this potential to improve the organizational performance.

Fast environmental changes threats many organizations and the world economy is forced ahead with regional economy pressures. New Medias, information technology, world consumer cultures and emersion of world standards are effective environmental changes which exist in today organizations. Therefore, the organizations ability is effective for adopting the environmental changes and as a result their survival. So, human resources management in the organizations should considered as the most important issue and it seems that this matter provides the incentives of the organization flexibility. Today, existing changes in workplace have forced the organizations to revise their management systems for their revival in the furious world and empowerment of human resources is as one of main tools relating to leadership and management performances has made possible the realization of this issue and also the organizations becoming more competitive.

Today, personnel need latitude and decision making power to perform their duties, while the organizations seek to increase their efficiency through their personnel(Quinn & Spreitzer, 1997). Traditional leadership theories have usually been based on a kind of hierarchical model(Alvani S M, 2002). Traditional leaders are those who had good ideas about guiding the group, made decisions and determined goals and utilized their control power and dominance for achieving the mentioned goals. Usually, the organization's political space is full of leaders who are to apply control on personnel instead of energizing them, while modern leaders will be those who help the group or organization to find out their potential abilities and needs, ingather and incorporate the group intuition and serve as a trigger or driver for the group. In this case, the leader is no more a manager or director since everyone could be a leader(Quinn & Spreitzer, 1997).

(Liden, Wayne, Zhao, & Henderson, 2008)states that for developing organizational effectiveness, leaders and personnel should reinforce themselves for achieving their potential capacities and this is exactly what servant leaders do through respecting people dignity, creating mutual trust and dominance in their followers.(Spreitzer, 1996), present manager of Green Life Institute, after studying and examining several records, has recounted 10 features for servant leaders which include listening, sympathy, healing, awareness, justifying, conceptualization, providence and forethoughtfulness, serving and supervision, commitment to people growth and creating group. Of course, Spires believes that these are ten features of complete and universal leadership, but some writers have added other features to them. Based on this approach, great leaders have been great servants and this has been their key to success. Dracker believes that future organizations are those who emphasize equality, parity, justice and fairness. Those organizations in which the terms head master and subordinate has little application, give personnel values like managers(Lamond & Humphreys, 2005).

Human force is considered the most valuable source of the organization for actualization of talents and continuous access to high performance. Encountering new competitive setting pressures, managers try to fully actualize their human force talents as much as possible since if the organization desires to achieve its goals completely, even when enjoying a clear prophecy and desirable guidelines and efficient organizational structures and designing an appropriate job, it will also need capable and guidable human force. Today, this has caused the issue of managing human resources in the organizations to have a special significance. for achieving a stable system and acquiring ideal missionaries and goals, social organizations managers try to organize their human force in a balanced system according to regulations and logical principles to facilitate realization of organizational goals(Alvani 2002).

No progress and improvement will be achieved unless by focusing on improvement of the organization human resources. Forehanded managers and leaders know well that the organization means a group of personnel with different spirits, interests, thoughts, knowledge and physical conditions without them the organization never finds external existence. This organizational life continuation and their glory depend on grounds like innovation, creativity and development which could lead to increasing permeation of the organization in the society(Todaro & Smith, 2009).

Realization of such condition depends on various factors and reasons that one of the most important factors is the undeniable and special role and position of human forces. Therefore, if the best managerial guidefrom other are considered among variables emphasized by servant leader which help shaping the organization culture(Patterson, 2003). Servant leadership has had a considerable impact on growth and performance of a healthy economy and successful organization and this study considers the impact of servant leadership on human resources management, at first examines Yasouj University of Medical Sciences and analyzes its results. The research is new in the field of servant leadership and no study has been before performed in the organizations like Yasouj University of

#### **METHODOLOGY**

Medical Sciences.

The present study is applied in objective respect and in respect of data collecting method is among descriptive researches (non-experimental) and in respect of the relation between variables it is casual. The used methodology is descriptive method of survey branch. The statistical population of this study is 248 persons and the sample size regarding the sample volume is 150 people of managers, assistants and staff members working in Yasouj university of Medical Sciences. In this study, first of all servant leadership training was provided for the respondents through distance learning for one week before completing the questionnaire and then the questionnaire was provided for them. The questionnaire of the present study was the research questionnaire of Moghimi & Ramazan (2013) and questions were homologized and examined. Finally, the questionnaire is the result of interviewing with some of managers and experts about general scheme of the questionnaire using Likert range and for evaluating attitude of managers, assistants and staff members working in Yasouj University of Medical Sciences about servant leadership and its impact on human resources management.

For gaining confidence about the study's tool and examining the accuracy of the questionnaire, it was distributed among 5 managers experimentally and after obviating its problems, final questionnaire was designed on this logical basis that it is required for us to put our evaluations in a more accurate format than merely a general evaluation. The servant leadership questionnaire included 50 questions that 28 questions were related to servant leadership scale and 22 questions were related to

human resources management scale. Servant leadership scale includes 4 components of serving, humility, trust and humanism, each designated 7 items of 28 items of servant leadership scale to itself. Cronbach alpha coefficient of servant leadership scale with 28 questions and human resources optimal management scale with 22 questions was 0.96. For explaining the rate of effectiveness of variables and hypotheses tests, firstly Spearman correlation test has been used using SPSS software for assessing the correlation between variables. At first, descriptive analysis of respondents specifications were performed and in the following tests of variables normality, Spearman correlation and single variable regression was used for doing test of research hypotheses and for main hypothesis of the study, single variable regression was used.

#### FINDINGS

In this study, 59.3% of respondents were women and 39.3% men. The findings obtained in the field of educations of the statistical sample shows that about 4.7, 11.3, 55.3,22 and 6% of personnel have diploma, associate diploma, bachelor, master and doctoral degrees respectively. The greatest frequency is for people with bachelor's degree with 55.3% and the least frequency is for people with diploma degree 4.7%. In examining the statistical sample based on age, it was specified about 98% respondents are between 20 to 50 years old that these statistics show that the research population of this study is middle aged. The results of the first secondary hypothesis showed that there is a relation between serving and human resources management. Correlation rate of the first secondary hypothesis was performed using Spearman correlation test and the correlation rate of 0.533 and significance level of 0.000 was obtained (table 1).

The second secondary hypothesis was that there is a relation between humility and human resources management. The correlation rate of second secondary hypothesis was performed using Spearman correlation test and the correlation 0.408 and significance level of 0.000 was obtained that the second hypothesis was also confirmed (table 2).

The results of the third secondary hypothesis are that trust is related to human resources management. The correlation rate of third secondary hypothesis was performed using Spearman correlation test and the correlation 0.479 and significance level of 0.000 was obtained (table 3).

The results of the fourth secondary hypothesis are that humanism is related to human resources management that this hypothesis was also confirmed. Finally, the correlation rate of fourth secondary hypothesis was

Table 1. Test result between serving and human						
resources management						
variable	number	correlation	significance level			
serving 150 0.533 0.000		0.000				

Table 2. T	Table 2. Test result between humility and human						
resources	resources management						
variable	number	correlation	significance level				
serving	150	0.408	0.000				

Table 3. Test result between trust and human resources<br/>managementvariablenumbercorrelationsignificance levelserving1500.4790.000

Table 4. Test result between humanity and human resources management					
variable	number	correlation	significance level		
serving 150		0.520	0.000		

performed using Spearman correlation test and the correlation 0.520 and significance level of 0.000 was obtained (table 4).

The main hypothesis has examined the impact of servant leadership on human resources management that the observed F is equal to 17.695 and the research hypothesis is confirmed in significance level of 0.000 (table 5).

#### **DISCUSSION AND CONCLUSION**

The main hypothesis of the research is effectiveness of servant leadership on human resources management. The study findings confirm this result. The results of (Kharazi K, 2014)who found out positive impacts of servant leadership style and its effectiveness on human resources are consistent with the results of the present study. The results of (Brewer, 2010)research showed that using servant leadership principles causes improvement of human resources management and consequently the organization efficiency. The results of this study are consistent with the results of the present study. Wong (2003) in a study on leadership styles concluded that servant leadership not only is a moral and human leadership style but it is predicted that it is useful since it also causes increasing spirit, job satisfaction, efficiency and the organization and personnel glory and empowerment. So, they are consistent with the results of the present study. (Yukl, 2010) believes that servant leadership could increase effectiveness of leadership and human resources.

The results of Yokel study are also consistent with this study. The results of secondary hypotheses show that there is a relation between serving, trust, humility and humanism with human resources management. On this basis(Aryan Gh, 2010) in a study under the title of explaining assessment tool of servant leadership in Iran governmental organizations find out that features of servant leadership including kindness, humility, serving and trustiness have a significant relation with human resources management which is consistent with the results of the present study.

On the other hand, the results of (Aryan Gh, 2010)show that servant leadership has a significant and positive relation with organizational trust since concerning others and fulfilling their needs create trust and sympathy. Servant leadership causes followers to perform their occupational duties with more motive and capability and try to perform them as best as possible. Also, (Fry, Vitucci, & Cedillo, 2005)in his study showed that kindness humanity has a direct relation with human resources management and human resources efficiency which is consistent with the results of the present study. (Patterson, 2003)who examined a functional theory on servant leadership in his study concluded that evolutionary leadership implicates the leader concentration on the organization but it seems insufficient for explaining human behaviors, while servant leadership focuses on follower and clearly shows such behaviors. The results of Peterson study are consistent with the results of the present study.

The results obtained from this study could be analyzed in this way that affability with personnel and also association with them in decision makings creates the atmosphere of fellowship, love and intimacy in the organization and increase the people trust towards the leader and the organization. Servant leader implements self-devotion and serving followers through prioritiz-

Table 5. Reg resources m	Table 5. Regression analysis of relation between servant leader and humanresources management							
	SS total squares	DF freedom degree	mean squares MS	observed F rate	p-value			
regression	27.415	1	27.415					
remainder	229.290	148	1.549	17.695	0.00			
total	256.705	149						

ing their needs to organizational needs in leaders. Also, humility with others and behaving them with kindness and modesty and interest in others causes excitation and finally improvement of human resources performance. Leaders should behave with others, their personnel and subordinates with more kindness and sympathy so that personnel show more interest and motivation and raise their job satisfaction and as a result their performance level and finally it leads to the organization growth and prosperity. Trust is also considered one of main elements of servant leadership.

According to(Friedman, 2006), using servant leadership in the organization is associated with increase of trust among leader and followers, followers' growth, followers' empowerment and reproduction of services by the followers and will result in increasing of individual performance. Finally, managers should know that servant leader with traits of kindness, love and humanity tends to sacrifice for his personnel (ignore his right) and for defending them tolerates various problems like weakening his position against higher authorities, therefore, the personnel in response to this sacrifice try to improve their performance. Humanity component includes some elements like forgiveness, kindness, integrity, sympathy, compassion, honesty, patience, courage, trust, loyalty and humility.

Therefore, for a people being considered a servant, we can't dictate serving to him, but modeling features and specifications of servant leaders will be very effective. So, we can develop this style among the organizations' manger and leaders by modeling traits and features. Preparing and providing training courses for development and nurturing servant leadership skills and providing special scores for managers who could successfully pass these courses is significant and could be very efficient in managers effectiveness. Servant leaders due to their special leadership style are not unique but their look to their surrounding world makes them to be distinguished from others.

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# Evaluation of inter-hospital transfers before and after health reform plan in Iran

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#### ABSTRACT

Health system reform and improving the quality of health care as one of its important results has always been important. Health reform plan is considered as one of the fundamental changes in the health system of the Islamic Republic of Iran and therefore requires the effective measures to enhance the status and improve the performance. This study aimed to investigate the inter hospital transfers before and after health reform plan in Iran in 2013-2014. This descriptive - analytic study was conducted in the second 6-month period of 2013 and 2014. The study population consisted of all transfers from the hospitals in the city of Shiraz in Fars Province to the hospitals located in Shiraz. The sample was based on the study population. Research Information were received from health care monitoring center in Shiraz University of Medical Sciences. The statistical analysis was performed using the descriptive statistics and chi-square and Wilcoxon tests and at a significance level p < 0/05 and by software SPSS (22). The results showed that the transfer cases in the second 6 months of 2013 (before transformation plan) were 427 and in the second 6 months of 2014 (after transformation plan) was 544. The results of this analysis showed that there is not a significant difference in the rate of transfers before and after health reform plan (P> / 05). The statistical analysis also showed that there's a significant difference between before and after health reform plan in relation to the causes of sending patients, in terms of the absence and lack of specialist, need for operating room, willingness to private hospitals and not discharging and not sending the patient with personal satisfaction by the hospital (p < 0.05). However, there was a significant relationship between before and after health reform plan in terms of the lack of relevant department or

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service and empty bed in the origin hospital and patients' financial distress (p > / 05). According to the study results, the number of transfers was not significantly different before and after health reform plan and the transfers rate did not diminish. With implementation of the health reform plan, it was expected that the transfers would decrease. But, as the results showed the number of transfers had increased. In general, it should be noted that other variables that were not examined in this study should not be considered off and their possible impact on increasing the inter-hospital transfer can be considered. In any case, every fledgling national plan, especially in its first steps would require the regular revisions and reforms.

KEY WORDS: HEALTH REFORM PLAN, TRANSFER, HOSPITAL

#### **INTRODUCTION**

The main mission of the health system is the promotion of health and meeting the needs of people and society. These needs influenced by the economic, social, political and environmental conditions are constantly changing. On the other hand, the disease patterns and risky factors are constantly changing. Especially in the current era that the changes occur very fast in this sector. Responding to these changes is the most important argument that based on it, the health system must be transformed and upgraded (Health, 2011). Due to the constant changes in the health system and pressure that is applied to the personnel of health staff in the health system which leads to burnout and intention to leave, the health system reform will be definitely useful and effective for both the patients and medical personnel, (NIKBAKHT, Salari, Hosseinpour, Et Yekaninejad, 2014). During the last health reforms taking place in the country to implement the comprehensive health plan, the healthcare reform program has been implemented in the country since mid-May 2014 (Health, 2014). In fact, the goal of health system reform is the promotion of health, reduction of payment from public funds, development and promotion of community health indicators(Khodadadi, Vafaie, Aahmadi, & Razavian, 2015). Studies show the gap between the objectives and ideals of the health reform plan, (Zarezadeh, 2015).

The inter-hospital transfer in the referral system is one of the most important components of a country's emergency service system, so that in most developed countries, a scientific protocol has been defined for it (Ebadifarde Azar, 2002), ("Evaluate the performance of the referral system in patients referred," 2013), (system, 2002). Transferring patients from one medical facility to another medical facility such as counseling, admission, Parr clinic services or special services that require the certain conditions including the patient preference, lack of diagnostic and therapeutic facilities, or need for medical treatment facilities in the specific cases is called the inter-hospital transfer (Bagust, Place, & Posnett, 1999).

The inter-hospital transfer is considered as part of the patient's treatment. The special laboratory tests, specialty or subspecialty care, lack of skilled manpower, lack of diagnostic and therapeutic facilities, especially the limitation of intensive care beds in distant centers can be raised as reasons for sending patients (Armagan, Al, Engindeniz, & Tokyay, 2004). One of the major challenges that have created many problems for the health system during recent decades in Iran and shows the need for further studies during the implementation of plan is the inter-hospital transfers from small towns to larger cities,(Bagheri Lankarani, 2015). Many patients in deprived areas die or suffer the irreversible lesions due to the lack of medical facilities in public hospitals or lack of timely and adequate provision of services and lack of specialists(Alidadi, Zaboli, & Sepandi, 2016).

But what is certain is that the inter-hospital transfers that occur due to the absence of specialists and other relevant factors will impose the additional costs to the health system and patients. Therefore, by doing the targeted researches in this field, the efficiency and effectiveness of the health system should be improved by providing the scientific solutions, and the efforts must be made so that people have access to health services, (Jabbari 2015).

Health reform plan aimed at improving the quality of medical and health services follows the infrastructure reforms. This plan has been operating for several years and frequent and continuous assessments can be effective in identifying the weaknesses and improving the performance. Therefore, this study was aimed to investigate the rate of inter-hospital transfers before and after health reform plan in the hospitals of Shiraz University of Medical Sciences in the second half of 2013 and 2014.

#### MATERIAL AND METHODS

This study is applied and was conducted in descriptive – analytic method at a point in time, between the second half of 2013 and 2014. It is worth noting that the health reform plan has been implemented since the second half of 2014 and the collected data related to the inter-hospital transfers in the first period of implementation of the transformation plan, the second 6 months of 2014 (after health reform plan) were compared with the previous corresponding period, the second 6 months of 2013 (before health reform plan) in this study. The study population consisted of all deployments made in all health services including surgery, obstetrics and gynecology, pediatrics, neurology, neurosurgery, orthopedics, cardiology, internal medicine, ear, nose and throat or ENT, burn and ophthalmology in the hospitals of Shiraz University of Medical Sciences. The hospitals sending patients included all hospitals located in the cities of Fars province and the hospitals receiving patients were the hospitals located in the city of Shiraz. In this study, according to the importance of sending the patients, all of the study population was studied and sampling was not performed. As a result, the sample is identical with the study population.

The scope of the study includes the hospitals of Medical Sciences and Health Services, located in the city of Shiraz in Fars province which did the inter-hospital transfers in 2013 and 2014 that among them, it can be named Ali Asghar Hospital in Bayram, Imam Khomeini in Estahban, Imam Hassan in Darab, Vali Asr in Eghlid, Imam Hussein in Sepidan, Imam Khomeini in Abade, Imam Sadeq in Saadat Shahr, Vali Asr in Boanat, and so on. The hospitals of Medical Sciences and Health Services, located in Shiraz also admitted the patients in 2013 and 2014. These hospitals included Shahid Chamran, Namazi, Ordibehesht (May), Shahid Rajai and Central Hospitals. The basic information of this study was obtained from the health care monitoring system of Shiraz University of Medical Sciences and in coordination with deputy of treatment.

#### RESULTS

The results showed that the transfer cases were 427 in the second 6 months of 2013 (before transformation plan) and was 544in the second 6 months of 2014 (after transformation plan). Moreover, 40 percent of inter-hospital transfers were female and 60 percent were male in 2013 (before transformation plan) and 43 percent of inter-hospital transfers were female and 57 percent were male in 2014 (after transformation plan). 263 cases of transfers (62%) were occurred due to the lack of a doctor in 2013 (before transformation plan). Also, 209 cases (38%) were occurred due to the lack of a doctor in 2014 (after transformation plan). 184 cases of transfers (43%) were due to the lack of specialist in 2013 (before transformation plan). The number of transfers occurred due to the absence of specialist was 267 cases (49%) in 2014 (after transformation plan). The number of transfers occurred due to the lack of related service or department was 208 case (49%) in 2013 and 273 cases (50%) in 2014. The number of transfers occurred due to the lack of available bed was 13 case (3%) in 2013 and 24 cases (13%) in 2014.

The number of transfers occurred due to the need for operating room was 66 case (15%) in 2013 and 46 cases (8%) in 2014. The number of transfers occurred due to willingness to private hospitals was 41 case (10%) in 2013 and 79 cases (14%) in 2014. The number of transfers occurred because of the private patients' financial distress was 16 case (4%) in 2013 and 11 cases (2%) in 2014. The number of transfers occurred due to the lack of patient's withdrawal from the transfer was 10 case (2%) in 2013 and 17 cases (3%) in 2014. The number of transfers occurred due to the cancellation of origin hospital was 14 case (3%) in 2013 and 6 cases (1%) in 2014. The number of transfers occurred because of DAMA (discharge against medical advice) was 34 case (8%) in 2013 and 20 cases (3%) in 2014.

For inferential analysis of the data, it is used Chisquare and Wilcoxon tests at a significance level of P </05.The results of this analysis showed that there is not a significant difference in the rate of transfers before and after health reform plan (P> / 05).

The statistical analysis also showed that there's a significant difference between before and after health

Table 1. Summary of descriptive data						
			Frequency	Percent		
The number	2013		427	-		
of transfers (dispatches)	2014		544	-		
Transfer patients'	2013	Male	258	40		
gender (Gender of			169	60		
patients sent)	2014	Female	311	43		
-			233	57		
Withdrawal of	2013		14	3		
origin Hospital	2014		6	1		
DAMA	2013		34	8		
	2014		20	3		
Lack of specialist	2013		263	62		
	2014		209	38		
Absence of	2013		184	42		
specialist	2014		267	48		
Lack of ward	2013		208	49		
	2014		273	51		
Lack of empty	2013		13	3		
bed	2014		24	24		
The need for	2013		66	15		
operating room	2014		46	8		
Willingness to	2013		41	10		
private hospital	2014		79	14		
Patients' financial	2013		16	4		
problems	2014		11	2		

reform plan in relation to the causes of sending patients, in terms of the absence and lack of specialist, need for operating room, willingness to private hospital and not discharging and not sending the patient with personal satisfaction by the hospital (p </05). However, there was a significant relationship between before and after health reform plan in terms of the lack of relevant department or service and empty bed in the origin hospital and also patients' financial problems (p > /05).

#### DISCUSSION

As the results showed there is not a significant difference in the rate of transfers before and after health reform plan. It seems that the health reform plan could not change the rate of transfers with its eight-fold packages and this is while the rate of transfers had been significantly reduced due to the lack of specialists before and after health reform plan which indicates that the reform plan has been partly successful in its resident and retention package and this is while the absence of a specialist after health reform plan has been higher than before, which indicates that despite the existence of various specialists in the cities, their physical presence has been reduced in the city for various reasons that requires more monitoring units surveillance to assess the presence of specialists. The lack of specialists in the hospitals located in cities of Fars province was one of the concerns that was evaluated in this study after health reform plan. The researches that had been discussed the absence of specialist in the hospitals before the health reform plan reported a great dissatisfaction, (Moradi 2014 and Mahdavi 2014 ).

In the previous researches, it was reported the reluctance and lack of motivation to attend specialist in the cities, especially the more deprived areas (Armagan et al., 2004). The studies have shown that increasing the use of skilled manpower cannot only be effective in reducing transfer but also the proper planning to provide the needed experts, fitting the number of doctors, hospital equipment and other specialized facilities with the needs of a region, making culture of changing patient attitudes, increasing the physical space and improving the environment of health centers can affect the patient's morale and reduce the patients' negative opinions about the inability of medical centers in providing the quality services and also prevent the waste of organizations' human-economic resources, imposing the heavy costs and the problems caused by the patient transfer(Alidadi et al., 2016).

Comparing the hospitals in the cities in terms of the inter-hospital transfer due to the lack of related service or department was another variable examined. The number of transfers occurred due to the lack of related service or department has increased after transformation plan. However, the transfer percent has not decreased compared with before the transformation plan due to an increase in the number of transfers. But it was expected that the transfer of patients reduced due to the lack of related service or department after transformation plan and that no significant difference was found in the transfer of patients before and after transformation plan. In other words, the reform plan has not been effective on the inter-hospital transfer due to the lack of relevant department or service.

Accordingly, it can be examined the relationship between "the presence of specialist and lack of related service or department despite decreasing the lack of specialist" in future researches and based on these results, the practical strategies are offered more decisively in this regard. In addition, as a possibility, a lack of related service or department can be one of the reasons for the absence of specialist in the hospital. As a result, a comparative study can be used to examine the relationship between these two factors. Several studies show that the main reason for the transfers is the shortage of specialists and super-specialists, diagnostic services and lack of clinical departments(Watts, Fountain, Reith, & Schep, 2004).

Another variable examined was the transfer due to the lack of available bed that had not a significant difference before and after health reform plan. In Hashemian and Moeini Pour's study, it was found that enhancing the operation of public hospital beds in deprived areas was not considerable. Instead, the public hospitals in the provincial capital has seen a significant increase in bed performance index(Hashemian M, 2014). Since this study was done in the early months of health development plan and the creation of hospital beds is time-consuming, judging the impact of the health reform plan on increasing the hospital beds seems a bit hasty.

Another reason for sending the patients was a need for operating room that there was a significant difference between before and after the health reform plan. The 15% of transfers were occurred because of the need for operating room before health reform plan. This rate has significantly decreased after the health reform plan since the rate has increased to 8 percent after the health reform plan.Of course, this depends on the existence of operating room or presence of the equipment in it and also the presence of relevant specialists.

In assessing the health reform plan, one of the things that can determine the desirability of improving the indicators is the patients' financial problems. A significant difference was seen in the transfers due to the patients' financial problems before and after health reform plan. This can be considered by the relevant authorities. In this study, the patient's withdrawal from the transfer was compared between before and after the transformation plan. It is necessary to mention that this case may be occurred for reasons such as not being able to attend the patient's family in the provincial capital or the reasons such as these. In these circumstances, if the necessity of sending patient is confirmed by the medical staff, he will stay away from treatment.

In this study, there was not a significant difference between before and after transformation plan based on the patient's withdrawal from the transfer. In other words, the transformation plan has not decreased the patients' withdrawal from the transfer.Hospital cancellation of sending the patient was one of the factors that leaded to cancel the process of sending patients. When a hospital gets the admission in one of the hospitals in the provincial capital for reasons including the lack of available bed and so on and then does not send the patient, it seems that the problem (for example, the empty bed) is solved.

The willingness of patients to private hospitals has increased after the health reform plan. In other words, the number and percentage dispatched to a private hospital after the health reform plan has increased. There are significant differences in the rate of transfer based on the desire to a private hospital before and after the health reform plan in this study. Sending patients to the private hospitals can reduce the proliferation of patients in the hospitals, particularly teaching. On the other hand, the patients will incur heavier expenses. Designing the programs can be considered to improve or enhance the hospital environment and necessary resource for medical team in teaching and non-private hospitals and also to balance the costs in the private hospitals.

This issue is interesting from another perspective. If the private hospitals place less financial burden on the patient and the measures are taken by the relevant organizations in this regard, the volume of patients admitted to the hospitals so-called state will be reduced and the quality of services provided in these hospitals also will be more effective.

In this study, two steps before and after transformation plan were compared based on the DAMA or discharging the patients with personal satisfaction that had a significant difference and rose slightly. In other words, the transformation plan has failed to reduce the rate of DAMA. The patients who were not transferred due to DAMA were among those whose transfer necessity had been identified, but the patients or their families refused further treatment with personal satisfaction before being admitted to hospital in Shiraz. The patient whose transfer necessity has been identified more likely has not a stable and non-traumatic situation however refuses further treatment and such cases can be followed by the officials since some of these DAMA may be occurred because of the marginal problems arisen in the origin hospital.

In the study of Razavian et al, entitled "Comparing the rate and reasons for discharge with personal preferences before and after health reform plan", it was found that the DAMA after health reform plan has decreased. These results are inconsistent with the results of our study(Rezvanian 2015). DAMA may occur in some patients whose families feel that their patients can be discharged, but the medical teams are looking for more stable condition or more evaluation of patient to prepare him for discharge. In such cases, the patient discharge may cause risks for him. However, the hospital will not be responsible for possible problems, but in some cases, the clinical supervisor can give instructions to the patient's family and prevent the DAMA and potential problems somewhat.

#### CONCLUSION

The results showed that the number of transfers are not significantly different before and after health reform plan and the rate of transfers has not diminished. With regard to the implementation of the health reform plan, it is expected that the transfers would decrease. But as the results showed the number of transfers has increased. In general, it should be noted that other variables that were not examined in this study should not be considered off and their possible impact on increasing the transfer of the hospital can also be considered. In any case, all fledgling national plans, especially in its first steps require the regular revisions and reforms. This is well reflected in this study.

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### Structure of solid waste management in hospitals of Bandar Abbas city

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#### ABSTRACT

One of the major sources of waste in each city is the hospital centers, which produce a wide range of waste. These wastes should not be mixed with municipal wastes, because the spread of chemical and biological materials containing the dangerous pathogens causes the specific environmental and health hazards. Lack of control and lack of attention to proper management of hospital wastes on how to collect, store, transport and dispose of such waste, will lead to the prevalence of regional and urban epidemics and diseases and waste of money that this is a serious threat to the public health and environment. The aim of this study is to evaluate trends in waste management in hospitals of Bandar Abbas and adapt this process with the national standards. This is an applied study conducted in a descriptive-analytic method. In this study, one sample t method was used. The sample consisted of 107 waste production sites in 8 hospitals in Bandar Abbas that the census method was used. To evaluate the variables, it was used the Health Ministry's standard checklist for hospital waste review. The data was analyzed by SPSS software and using the descriptive and inferential statistics. There is no significant difference between the average total per capita solid waste per bed in hospitals in Bandar Abbas and the average total per capita solid waste per bed set by the Ministry of Health (t = 1.922). It means the average per capita waste generation in hospitals in Bandar Abbas is consistent with the regulations of the Ministry of Health. There is a match between the average per capita ordinary solid waste generation with the average ordinary solid waste generation set by the Ministry of Health (t = 1.631). It means the average ordinary waste in hospitals of Bandar Abbas is consistent with the regulations of the Ministry of Health. The average duration of waste storage in hospitals of Bandar Abbas is consistent with the average waste storage in accordance with regulations of the Ministry of Health related to similar areas (hot and humid conditions (t = 22.12). This means that the average duration of waste storage in hospitals of Bandar Abbas corresponds to the

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time determined by the Ministry of Health for the hot and humid weather conditions. Using the above results, it can be concluded that the establishment of environmental health experts at hospitals, daily tracking and proper training for personnel involved in the production, and collection and disposal of hospital wastes could play an effective role in preventing the risks of hospital wastes.

Correct management training and disposal of hospital wastes should be one of the operational objectives of hospital managers and this important issue should be included in planning courses for staff of all hospitals.

**KEY WORDS:** SOLID WASTE – MANAGEMENT – HOSPITAL –BANDAR ABBAS

#### **INTRODUCTION**

Today, increasing waste and environmental pollution and health hazards resulting from it has been raised as one of the most important problems in human societies today, (Chartier, 2014). The whole extent of this waste is so high in which we can find the ordinary household waste to the dangerous chemical and biological contaminants. One of the major sources of waste generation in each city is the hospitals which produce a wide range of waste (Zarei, Taghdisi, Keshavarz Mohamadi, & Tehrani, 2013).

The great thing about the medical wastes is that these wastes should not be mixed with municipal wastes, because the spread of chemical and biological materials containing the dangerous pathogens causes the specific environmental and health hazards. Classification and composition of medical waste with particular attention to the collection and disposal of it include a wide range of different materials, such as ordinary or householdlike, infectious, chemical, and pharmaceutical wastes (Chartier, 2014), (Zarei et al., 2013). The household-like wastes includes materials such as paper, cardboard, carton, plastic materials, remnants of food and fruit that if not mixed with the hazardous and infectious materials are safe and they can be collected and disposed of as the household waste (Kumar, Samrongthong, & Shaikh, 2013). The potentially infectious wastes exist in various forms as the contaminated disposable supplies and sharp instruments products containing blood, and laboratory culture media, (Nie, Qiao, & Wu, 2014 and Ndejjo et al., 2015).

Based on WHO, the infectious wastes include the wastes that contain the pathogens to the extent that can cause the disease in the susceptible hosts, (WHO, 2004). There are different opinions in the classification and definition of infectious wastes. The sharp wastes include the needles, syringes, broken glasses and scalpels. Since these components can create the injury and lead the pathogens such as hepatitis and AIDS to enter the human body, therefore it is necessary to separate them from other infectious wastes (Rastegar & Gholami, 2014). The chemical and pharmaceutical wastes includes the drugs, pharmaceutical products and various chemi-

cals that are produced by the specific health activities in these centers. The drugs and chemicals returned or discarded and expired are also part of this category.

Therefore, the particular attention to the separate collection and disposal of them is very important. This is while sometimes seen in Bandar Abbas that for reasons of high cost of solid waste disposal, the illegal and hygienic ways are used to dispose of the wastes. Since the lack of control and lack of attention to proper management of hospital wastes on how to collect, preserve, transport and dispose of such waste will lead to the prevalence of regional and urban epidemics and diseases and waste of money, this is considered as a serious threat to the public health and environment.

This study aimed to assess the waste management process in hospitals of Bandar Abbas and adapt this process with the national standards. So, at first, the aim of this study is to evaluate the waste management process in hospitals of Bandar Abbas and adapt this process with the national standards and secondly, to find the standard deviation and provide the administrative approaches to standardize the structure.

#### MATERIAL AND METHODS

In this descriptive-analytic study, the research environment was the hospitals of Bandar Abbas, including the university hospitals (Shahid Mohammadi- chilrens'), private hospitals (Om-e-Leila and Imam Reza), hospitals affiliated with the police and armed forces (Saheb-al-Zaman, Seyed-al-Shohada and Khatam-ol-anbia) and Persian Gulf hospital affiliated to social security. The study population consisted of 107 waste production sites in the 8 hospitals of Bandar Abbas. (N=107)

The standard waste management checklist of Ministry of Health related to the collection of waste management data in country's hospitals was used by the researcher to collect the data. The standard checklist Ministry of Health has been 105 years that after soliciting the opinion of experts of environmental health department of the Health Center in Hormozgan province and professors of environmental health department at the School of Health in Bandar Abbas, it was summarized to the 42 questions to collect better data. So, the checklist used to collect the research data had 42 questions that was applied for the different stages of hospital waste management, including how to produce waste, status of collection, transportation, weighing, disinfecting and final disposal of hospitals' solid wastes in Bandar Abbas.

The checklist includes six scales that are the per capita waste, disinfecting procedures, management components in waste disposal, waste separation, storage, transportation and methods of final disposal of waste. Questions of subscales are as follows: Per capita waste, questions 7, 8, 9, 10, 11, 12, 13, 14, 15 and 16; that how to measure on these questions is as kg per day. Disinfecting methods, questions 17, 18, 19 and 20; which the method of measurement is based on standard or nonstandard methods.

Management components in waste disposal, questions 21, 22, 23, 24 and 25; that the method of measuring them is as yes / no, complete / incomplete. Waste separation, questions 25, 26, 27 and 28, that the method of measuring them is as yes / no, complete / incomplete. Storage and transportation, questions 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43 and 44, that the measurement method is as yes / no, complete / incomplete. Methods for final disposal of wastes, questions 45, 46, 47 and 48, that the measurement method is as yes / no, complete / incomplete. In this questionnaire, obtaining less points means more consistent with the standards of the Ministry of Health.

In this review, after completing the paperwork and obtaining the necessary permits, in collaboration with the Deputy Treatment and Deputy Health of medical university and hospital managers in Bandar Abbas, the research data in hospitals of Bandar Abbas was collected in 4 steps as follows.

#### FIRST STAGE

The research environments were visited in a field method (waste production sites, including wards, outpatient departments, clinics, diagnostic departments, operating rooms, drug stores, administration and support departments, kitchens and cafeterias) and the solid waste collection sites, people involved in the production process, collection, transportation, storage and final disposal of wastes were identified.

#### SECOND STAGE

At this stage, it was justified the people involved in the production process to the final disposal of wastes in hospitals on the goal of the study, for this purpose, in coordination with the hospital manager and health experts based in hospitals, the people gathered in the auditorium of the hospital and the functional objectives and implementation phases of the study were described for them. As the number of people involved in the Shahid Mohammadi hospital was great, 3 briefings were held in this hospital and 2 briefings were held in the children's' hospital and Persian Gulf hospital. In other hospitals, a meeting was held to justify the people involved.

#### THIRD STAGE

At this stage, the designated sites were daily visited and then the process of collecting, transporting, storing, weighing and disposing of the wastes generated was observed and recorded for each site and finally, the completed information related to the various stages of producing solid waste in each hospital was recorded in the standard checklist of Ministry of Health (checklist of visiting the management of the collection, storage, transportation and disposal of wastes in the country's hospitals). It should be noted that the standard checklist Ministry of Health related to the different stages of solid waste disposal in country hospitals has been 105 years that after soliciting the opinion of experts of environmental health department of the Health Center in Hormozgan province and professors of environmental health department at the School of Health in Bandar Abbas, it was summarized to the 42 questions by the researcher to collect better data.

#### FOURTH STAGE

At this stage, after collecting the data required in all hospitals, the data collected was entered into SPSS 16 software and then using the descriptive and analytic statistics and statistical tests, the per capita production, duration of waste storage and waste management method in the hospitals of Bandar Abbas were compared with the regulations of the Ministry of Health.

In this study, the SPSS 16 software and descriptive statistics including frequency, mean and standard deviation; and inferential statistics including one sample t-test (at the significance level 0.05) were used to analyze the data.

#### RESULTS

According to the results of this study, the amount and percentage of the waste generated is shown in Table 1. Accordingly, the amount of waste produced daily in hospitals was 1987.45 kg that the waste generation in the university hospitals was 921.45 kg, in the private hospitals 383 kg, in the military and police hospitals 296 kg, and in the social security hospital 387 kg per day.

As seen in Table 1, the highest average total production of waste is in Social Security hospitals in the

Table 1. The quantitative components of the waste by the type of surveyed hospitals								
Parameter	Production (Kg / d)	Average (Kg / d)	Standard deviation (Kg / d)	Minimum (Kg / d)	Maximum (Kg / d)	% of ordinary waste production to the total ordinary waste produced	% Of total Production	
The total amount of waste produced in university hospitals	921.45	26.32	30.17	5	160	3.387	4.366	
The total amount of waste produced in private hospitals	383	14.18	11.23	3	45	2.933	1.279	
The total amount of waste produced in military and police hospitals	296	8.96	10.87	4	30	1.199	1.894	
The total amount of waste produced at the Social Security Hospital	387	32.25	24.51	7	140	19.5	1.479	

amount of 32.25 kg per waste production site and then in the university hospitals with an average 26.33 kg of waste per site. The lowest total waste production is in the military and police hospitals with an average 8.96 kg per waste generation site. It is observed 37.38% of ordinary wastes are created in the university hospitals that this seems natural considering that most active beds are related to the university hospitals and on the other hand, these hospitals are teaching and more staff and university students are working in them. The lowest percentage of ordinary waste production (Alam, Sujauddin, Iqbal, & Huda, 2008) is also related to the military and police hospitals in Bandar Abbas.

According to the study results, the number of active beds and per capita total waste generation in the university hospitals with 325 beds is 2.83 Kg / d, in the private hospitals with 169 active beds is 2.26 Kg / d, in the military and police hospitals with 163 beds is 1.81 Kg / d and in the social security hospital with 107 active beds is 3.61 Kg / d per active bed.

Another important indicator of waste management is the waste storage time in the temporary storage site of waste. The information in this section is presented in Figure 1. According to the figure, in 62.6% of the hospitals surveyed, the waste storage time in temporary sites was 24 hours and in 25 percent of hospitals, the time was between 24 to 48 hours and in 12.5%, the time was between 48 and 72 hours.

According to the results of this study, most waste storage time in temporary sites is respectively in the police and military hospitals with an average of 56 hours, in Social Security hospitals with an average of 28 hours, in private hospitals with an average of 23 hours and less time keeping waste is in the university hospitals with an average of 21 hours.

- 1. Lack of disinfection of waste containers
- 2. Disinfection of waste containers
- 3. Non-coding and labeling waste separated
- 4. Coding and labeling the waste
- 5. The absence of valid contracts with authorized centers for transport and disposal of chemical and pharmaceutical waste
- Valid contracts with authorized centers for transport and disposal of chemical and pharmaceutical waste

As seen in Figure 2, disinfection and labeling of waste are done in 100 percent of hospitals, but only in 50 per-

Table 2. Per capita waste generation in different hospitals studied						
Hospitals	Number of active beds	Ordinary waste per capita per active bed(Kg/d)	total waste per capita per bed(Kg/d)			
University hospitals	325	1.34	2.83			
Private hospitals	169	1.6	2.26			
Military and police hospitals	163	1.33	1.81			
Social Security hospital	107	1.85	3.61			
All hospitals	758	1.52	2.62			

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Table 3. The average duration of waste storage by the type of surveyed hospitals						
Row	Hospitals by the type of ownership	The average duration of waste storage per hour				
1	University Hospitals	21				
2	Private Hospitals	23				
3	Police Military Hospitals	56				
4	Social Security Hospital	28				
Total average		32				

cent of hospitals, it has been signed with authorized centers to transport and dispose of chemical and pharmaceutical waste.

1. The absence of Safety Box to collect the sharp waste

- 2. The existence of Safety Box to collect the sharp waste
- 3. The lack of organs and limbs cut and dead fetus
- 4. Failure to collect the organs and limbs cut and dead fetuses in accordance with regulations
- 5. Collecting the organs and limbs cut and dead fetuses in accordance with the regulations
- 6. Collection along with other wastes
- 7. Separately storage method of chemical and pharmaceutical wastes

As seen in Figure 3, the chemical, pharmaceutical and biological wastes are separately kept in 75% of hospitals studied. Also, in all the hospitals that have the pathological wastes (organs and limbs cut and dead fetus, etc), these wastes are collected according to regulations of the Ministry of Health. This graph also shows that in the majority of hospitals studied (87.5%), there is the safety box for collecting the sharp wastes.





Table 4. Comparing the total production of solid waste (infectious and non-infectious) in the hospitals of Bandar Abbas with the regulations approved by the Ministry of Health and Medical Education					
	Variables	Average	t	Significance *	
Statistical indicators					
Average per capita production of so bed in hospitals in Bandar Abbas	2.62	1.022	0.00		
Average per capita production of so bed set by the Ministry of Health	olid waste per active	2.7	1.922 0.09		

The above table shows that there is no significant difference between the average total per capita solid waste per bed in hospitals in Bandar Abbas and the average total per capita solid waste per bed set by the Ministry of Health (p=<0.01 , t=1.922). The average total per capita solid waste generation in hospitals in Bandar Abbas corresponds to the average total per capita solid waste determined by the Ministry of Health.

#### DISCUSSION

Per capita waste production in hospitals studied in Bandar Abbas was obtained 2.62 kg/b.d. In this study, except ordinary wastes (1.5 per active bed per day, i.e. 57.25% of the total waste production), other wastes was considered infectious that the amount of these wastes is 1.12 kg/b.d, i.e. 42.74% of total wastes generated. In a same study, entitled the hospital waste management in hospitals in West Azerbaijan in 2007, the amount of waste generated per bed per day had been equivalent to 0.95 kg/b.d that the amount increased to 3 kg/b.d in 2012 that is consistent with the amount of waste generated in this study (2.62 kg/b.d) (2). In the study of Dehghani et al that was done in hospitals of Arak University of Medical Sciences, entitled the review of medical waste management status, the results showed that the rate of waste production is 4.42 kg/b.d, which is consistent with this study(Dehghani, Azam, Changani, & Dehghani Fard, 2008). The results also show that per capita waste generation was higher in our study compared to the study of Al-Khatib et al with 0.59 to 0.93 kg/b.d medical waste production(Al-Khatib, Al-Qaroot, & Ali-Shtayeh, 2009), study of A.B.Wahab et al with 0.37 to 1.25 kg/b.d infectious waste in public hospitals and 0.12 and 0.28 kg/b.d in private hospitals (Wahab & Adesanya, 2011) and the study of Cheng.Y.W et al with 0.19 to 0.88 kg/b/d infectious waste production.

On the other hand, according to the results obtained in this study, 57.25% of the ordinary wastes and 42.47% of infectious wastes constitute the total wastes generated in the hospitals. The infectious waste generated in this study compared to the Taghipoor's study in Tabriz were higher (29.4 percent)(Taghipour & Mosaferi, 2009). The study of Farzad Kia et al in which the infectious waste was 10 to 15 percent in Tehran educational hospitals (Farzadkia, Moradi, Mohammadi, & Jorfi, 2009) is not consistent with this study. In a study of Davoodi conducted in the hospitals of Mashhad, it was 34.90% (Davoodi et al., 2014) and in the study of Alam MM et al, it has been reported that the infectious waste (at a rate of 37%) is more than the present study (Alam et al., 2008).

Furthermore, in the study of Nemathaga F conducted in South Africa and in Limpopo Province, the average percentage of the components of medical wastes was 60.47% ordinary wastes and 30.32 % infectious wastes that these results are almost consistent with the results of this study(Nemathaga, Maringa, & Chimuka, 2008). According to this study (Table 2), per capita waste production in university hospitals is 2.38 kg/d, in private hospitals is 2.26 kg/d, in police and military hospitals is 1.81 kg /d and in social security hospitals is 3.61 kg/d/b. It seems that high per capita waste generation can be due to the hospital inappropriate management structure, early replacement of hospital administrators and inexperience of environmental health expert based in the hospital.

According to the results of Figure 1, most waste storage time in temporary sites is respectively in the police and military hospitals with an average of 56 hours, in Social Security hospitals with an average of 28 hours, in private hospitals with an average of 23 hours and less waste storage time is in the university hospitals with an average of 21 hours. It seems that one of the reasons for long-term accumulation of waste in public hospitals is associated with the traffic problem of vehicles to collect and transport waste in military areas as well as the lower volume of daily waste than the volume of trucks carrying the waste. According to Figure 4, in 62.5% of hospitals, the pharmaceutical and chemical waste final disposal method is the sanitary landfill. In 25 percent of these hospitals, the methods of container making and piling up are used for final disposal of the wastes and in 12.5 percent of the hospitals studied, it is used other methods. The sanitary landfill and incineration methods are not used in any of the hospitals.

#### CONCLUSION

Lack of control and lack of attention to proper management of hospital wastes on how to collect, store, transport and dispose of such waste will lead to the prevalence of regional and urban epidemics and diseases and waste of money that this is considered a serious threat to the public health and environment. On the other hand, due to urban sprawl and population growth, the pace of creation of institutions and medical centers such as the hospitals and paying attention to the management of hospital wastes are necessary. Therefore, the present study was conducted in this regard that the results of this study showed total per capita waste generation in hospitals of Bandar Abbas is 2.62 kg/b.d that 1.5 kg is related to the household-like wastes (ordinary) and 1.12 kg belong to the infectious wastes including the sharp waste, pharmaceutical waste, chemical and hazardous wastes, pathological wastes and genotoxic waste.

According to the World Health Organization (2014), which is approved by the Ministry of Health, 85% of waste generated in hospitals are without risk or ordinary and only 15 to 25% of them constitute the hazardous waste. While in the hospitals studied, 42.74 percent of hospital wastes are infectious and hazardous that is more than the amount recommended by the World Health Organization and the Ministry of Health. It seems that this is often due to neglect and lack of awareness of the environmental hazards and pollution and economic losses caused by mixing the ordinary and infectious wastes in all stages of production, transportation and storage of waste in hospitals.

Based on the results of this study, we can conclude that the per capita production of solid waste per bed as well as the average duration of waste storage in the temporary site of waste at hospitals of Bandar Abbas is almost accordance with the standards recommended by the World Health Organization and the Ministry of Health. But there is no consistency in the waste composition, the infectious waste ratio to the total waste generated and the proportion of infectious and hazardous waste in hospitals of Bandar Abbas is about 2 times the amount recommended by the World Health Organization and the Ministry of Health that it should be prevented the mixing of infectious and ordinary waste, especially in production by implementing more effective training programs and making a commitment and responsibility in all employees involved in the infectious waste production and performing ongoing monitoring by managers and health experts in hospitals as well as the university students in different fields in hospitals. Moreover, it is necessary to force the hospital officials and administrators in implementing the waste management rules.

#### OFFERS

With respect to the implementation of effective training programs for managers and personnel involved in the production, transportation and disposal of hospital waste, it is recommended at first the training needs of different groups involved in the production of hospital wastes are determined based on scientific principles and then the required training programs are developed and implemented based on these results.

In the educational needs of different groups based on scientific principles involved in the production of hospital wastes were determined and then based on the results required training programs developed and implemented.

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## Effect of planting date choice on the vulnerability of winter wheat to climate change: Case study of cool temperate, northwestern provinces of Iran

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#### ABSTRACT

In this study, vulnerability to trend in length of 4 phonological stages (Initial, Anthesis, Maturity and Harvest) and total length of crop season (LCS) as a measure of climate change has been studied in 27 stations situated in 6 cool temperate provinces of north western Iran. Time series data for 25 years period between 1989-90 to 2014-15 based on 8 scenarios for planting (sowing) date are studied to assess the effect of climate change on each station. The results show that late planting causes less vulnerability (except in Nahavand and Zarrineh stations) but also shorter crop season which is unfavorable. The Anthesis and Initial stages are most affected but Maturity and Harvest stages seem to be indifferent to climate change. Correct management training and disposal of hospital wastes should be one of the operational objectives of hospital managers and this important issue should be included in planning courses for staff of all hospitals.

KEY WORDS: IRAN, WINTER WHEAT, GROWING DEGREE DAYS, PHENOLOGY, CLIMATE CHANGE, PLANTING DAT5E

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#### INTRODUCTION

Winter Wheat is one of the strategic agricultural products of Iran. This variety of wheat has the best yield and quality in north-western provinces of country, including West and East Azerbaijan, Ardabil, Zanjan, Kordestan and Hamedan. Despite the fact that the mentioned region has the area of 17578000 acres or nearly 16.3% of the country area, the area under cultivation of winter wheat in these provinces consist about 40% of total wheat cultivating farms in the country or about 2411000 acres. This implies that the region is prone of cultivating wheat (and also other agricultural products) about 2.3 times more than other parts of country.

Another fact that verifies this is fraction of area under cultivation of wheat per total province area. Among 31 Iranian provinces, ranking of this statistic shows that all the provinces in selected area rank below 10, including first rank in country, Hamedan Province with 21.2% of its area under cultivation of wheat, Second rank Ardabil Province with 20.0%, rank 4 Kordestanprovince with 18.4%, rank 6 Zanjan provinces with 14.1% and finally, rank 9 and 10 East and West Azerbaijan provinces with 9.7% and 9.6% respectively.

Although the most important source of impact on yield of wheat, especially in dry farming, is adequate and timely precipitation, the climate change and global warming plays an undeniable role on long-term trends and attitudes toward choice of new places for building farms to answer the consistently increasing demand for this strategic product.

Choice of planting date is also a key factor and is studied to assess its impact on yield of many crops, specially wheat and maize. (Gomez-Macpherson and Richards,1995; Radmehr et al., 2003; Turner, 2004). For example Epplin et al. (2000) showed that a 3-week change in planting date of winter wheat, from 1 to 21 September is associated with an expected 44% increase in grain yield but the foliage yield drops 68%.

Tsimba et al. (2013) studied the effect of planting date on maize phonological stages in cool temperate sites across New Zealand. They showed that emergenceanthesis duration was longest for the earliest plantings, averaging 890°Cd vs. 830°Cd for the latest plantedcrops. Conversely, grain filling duration was shortest for the earliest or latest plantings (1220°Cd) vs. 1270°Cd for optimum plantingdates.

Roshan et al. (2013) studied present and future climate projections over the region ofwheat production over Iran. Observedclimate (temperature and degree day) changes during theperiod (1951–2009) is discussed andprojected futurechanges up to 2100 based on the MAGICC/SCENGEN 5.3compound model was utilized. It was concluded that the wheat growthperiod will be negatively affected due to the increase of the temperature. The growth period is expected to be shorterby 21.3, 22.3, 23.9, 26.7, and 32.3 days for the northern,western, central, southern, and eastern regions by the year 2050.

Andarzian et al. (2014) studied 4 stations in Khuzestan province, Iran to determine optimum sowing date using Cropping System Model (CSM)-CERES-Wheat model. Themodel was run for 8 sowing dates starting on 25 October and repeated every 10 days until 5 January. They assessed the performance of model based on different statistics anthesis date, maturity date, grain yield and biomass compared to observed data.

Waha et al. (2012) studied management measures for adaption to impacts of climate change in Sub-Saharan Africa, including dual cropping system of maizegroundnut and choice of optimal planting date. They suggested that even though cropping system modification can reduce negative impacts of climate change, but it requires knowledge, labor, enough time for soil preparation and market and also adds up the risk of facing non rainy seasons. Instead, farmers can adapt sowing date to the start of the mainrainy season, which has showed good results in Northern provinces of South Africa nad Cameron.

Dobor et al. (2016) strived to develop a mechanism to optimal choice of planting date. PD data from 294 agricultural enterprises in Hungary during the period from 2001 to2010 were used to validate the PD methods. Effect of climate change on the timing of PD was evaluatedusing an ensemble of 10 climate change projections. Their analysis predicts a shift to earlier PDs for maize (approx. 12 days) and laterPD for winter wheat (approx. 17 days) for the 2071–2100 period. The results indicated that maize PDsshould be changed according to the earlier start of the growing season in spring. In contrast, currentlyused PDs should be preserved for winter wheat to avoid climate change related yield loss. Proposed PD estimation methods performed better than other eight tested methods.

In a Mediterranean type environment the correct choice of sowing date and cultivar are critical determinants of yield (Connoret al., 1992). Sowing date may normally occur within a 'sowingwindow' starting with the first significant rainfall after summerand closing when a sowing date would be too late to achieve areasonable yield. It is general practice in most Mediterraneanenvironments to sow at the beginning of the rainfall season inautumn if the frost risk for anthesis is low with such an earlysowing date. The advantages of this practice have been widelyshown through field experiments and crop simulation models(Stapper and Harris, 1989; Shackley and Anderson, 1995; Henget al., 2007; Asseng et al., 2008).
Early sowing dates increase theinterception of solar radiance of a crop, allowing it to accumulatemore dry matter (Stapper and Harris, 1989), and avoid terminaldrought at the end of the growing season. This practice isconsidered less feasible where frost risk during later winter/earlyspring is too high (Connor et al., 1992; Anderson et al., 1995), but ifappropriate cultivars are available, the risk of frost damage can beminimized (Stapper and Fischer, 1990).

In this article, adaptable planting date strategy is studied over cool temperate region of north-western Iran, affected by Mediterranean weather systems, using 8 scenarios beginning from 26 September, each with 7 days lag. The trend in four phenological stages beside total Length of Crop Season (LCS) as a measure of intensity of the effect of climate is calculated in 27 stations in the region.

#### MATERIALS ANDMETHODS

The field statistics shows us that almost 90% of farms in north-western Iran are planted in the first two months of autumn from 22 September to 20 November. As the meteorological conditions vary with yearly date, correct choice of planting date is a key factor to avoid threats in different growing stages of the plants and reach best quality and quantity of product. In this article, 27



synoptic stations with complete data series available for 25 years from agricultural year 1989-90 to 2014-15 are studied. To show the effect of choice of planting date, 8 scenarios, each one with 7days additional lag, are designed for planting date, beginning from 26 September every year. Four reference phenological stages are selected based on GDD received in each stage in each year and the length of stage is calculated. A trends analysis is performed on each stage for each scenario. The absolute shift of trend in each stage and total trend existing in sum of length of stages as Length of Crop Season (LCS) is described as statistics showing vulnerability to climate change and summarized to show its behavior spatially and temporally.

The duration of the length of crop season (LCS) and of the crop development phases was simulated using the concept of growing degree days (GDD,°C day–1) adopting the approach described inRaes et al. (2012):

$$GDD = \begin{cases} \frac{T_{max} + T_{min}}{2} - T_{base} ; if \frac{T_{max} + T_{min}}{2} > 0\\ 0 ; otherwise \end{cases}$$
(1)

Where and are maximum and minimum air temperature, respectively, and  $T_{base}$  refers to the base temperature, considered equal to zero for winter wheat. The GDD required for achieving initial stage of growing of wheat is considered 400°C, for Anthesis stage equal to 1250°C, for Maturity stage 1900°C and finally the Harvest stage 2150°C, summing up from the planting date.

Calculating lengths of different stages for 27 selected stations in 25 years of studying period considering 8 different scenarios for planting date,results in 17024 figures. After that, statistics including mean, standard deviation, coefficient of variation of lengths of each period and trend (°C/year) and Pearson product moment are calculated for 648 states in 4 different stages of 8 mentioned scenarios.The Length of Crop Season is the sum of lengths of 4 stages of growth mentioned.

$$LCS = L_{initial} + L_{Anthesis} + L_{Maturity} + L_{Harvest}$$
(2)

So the total trend observed in LCS is also equal to sum of trends observed in each growing stage. Dependency of Lengths of each period besides the total LCS is studied. Whether the trend of the length of each period is related to selection of planting date is determined as the measure of effect of date of planting scenario choice on vulnerability to climate change.

### **RESULTS AND DISCUSSION**

Assuming choice of a specific scenario and averaging resulted LCSs for each station, we observe a possible.

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rends classification

Scenario 6









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changed scenario of planting date in 27 selected stations



Whether or not the trend is meaningful can be tested statistically but is beyond the scope of this article. Here we classify trends below -2days/year as classified as "Large negative trend" implying rapid (and even obvious) shrinking of LCS period. Other trends below -1 are classified as Medium Negative, below 0 as "Small negative', below +0.7 as "small positive" and below 1.6 as "Medium positive". The more negative the trend, the more shrinking of LCS which inherently results in











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less available sun hours and less quality and yield. This can be avoided by better choice of planting date if this selection results in smaller absolute observed trend and therefore, more stable conditions climatically.

The obvious shortening of LCS with adding lag to planting date scenario which is aunfavorable result, despite the other obvious finding that the trends are damped when adding to planting date lag scenario which seems to be a favorable one.



As the chart 1 shows, all stations face positive change in trend of LCS when adding to scenario date. Ardebil station is least affected and Sahand station the most. Nahavand station has positive trend and reaches the maximum value. Also Zarrineh station showed a shift from negative to positive trend on scenario4 (planting on 17October). Almost all other stations move toward zero trend when choosing scenario 5 to 8. Also the mean observed LCS is lowered between 15 days in Parsabad station to 35 days in Zarrineh station when postponing the planting date.

This result is the sum of effect on phonological growing stages. Similar analysis on stages is performed and results are depicted on charts.

Initial stage of growth shows completely different results for different stations. Nahavand station shows a constant increase with adding to lag scenario. It moves from -0.5 negative trend to +1.5 days/year. For Sarab, Khalkhal and Zarrineh stations, trend becomes large negative in first scenarios and diminishes in scenarios 5 to 8. Sardasht, Ardebil and Piranshahr stations show a constant move toward large negative trends. The other stations, begin from zero trend, reach a maximum positive trend on scenario4 (17 October) and continue to medium negative trends on scenarios 5 to 8.

Also the mean observed Length of initial stage is added between 50 (in Parsabad station) to 110 days (in Zarrineh station) when postponing the planting date.

Trend existing in the length of Anthesis stage also shows different behavior in different stations. Some of stations, very cold in climate, show a peak in first planting scenarios like Zarrineh, Khalkhal, Sarab. They reach near zero trend in this stage for last scenarios of planting. Some other stations like Sardasht, Ardebil, Piranshahr and Maragheh reach their peak in last scenarios showing a maximum positive trend there, meaning sharp elongation of length of anthesis stage if planting is postponed a lot. Others show a minimum trend on scenario 4 and reach near zero trend on last stages. Among these, Sahand station shows maximum descent, obviously more than other stations. Totally, adding to trend for all stations when selecting late planting scenario can be confirmed visually. Also the mean observed Length of Anthesis stage lowered between 40 days in Parsabad station to 120 days in Zarrineh, Bijarand Takabstation when postponing the planting date.

The mean observed Length of Maturity stage lowers between 30 days in Parsabad station to 5 days in Zarrineh station when postponing the planting date. Sahand station shows a peak on scenario 3 but returns to normal situation on last scenarios. It can be said that except Ardebil station that remains indifferent to selection of planting scenario, all stations converge to about 32 days in late scenarios and totally, less vulnerability is observed to planting date selection. The same condition is obvious in trends chart with maximum descent of trend in Parsabad and Sardasht stations and near zero trend in late scenarios.

The mean observed Length of Harvest stage lowers between 4 days in Parsabad station to 5 days in Zarrineh and Takab stations when postponing the planting date. Sahand station shows a different sharply descending behavior but returns to normal situation on last scenarios. It can be said that except Ardebil station that remains indifferent to selection of planting scenario, all stations converge to about 11 days in late scenarios and totally, less vulnerability is observed to planting date selection. The same condition is obvious in trends chart with maximum descent of trend in Parsabad and Ascent in Maragheh and Zarrineh stations and near zero trend in late scenarios.

#### CONCLUSION

In this article, 27 stations in 6 north-western provinces of Iran, which are prone of cultivating winter wheat, are studied. The magnitude of observed trend in 4 phenological stages (Initial, Anthesis, Maturity and Harvest) are calculated based on required Growing Degree Days on 25 years period from Crop Season of year 1989-90 to 2014-15 according to 8 planting date scenarios beginning from 26 September with 7 days lag between scenarios.

The results show that Anthesis stage is most vulnerable to climate change. Initial stage is in second rank and the last stages of maturity and harvest seems to be indifferent to planting date choice. The trend in total Length of Crop Serason (LCS) becomes more positive when postponing planting date. This implies diminishing of negative trend in case of planting on 26 September, except of Nahavand station that faces a positive trend in late planting scenarios and Zarrineh station that shift sign of trend on scenario 4. Even though this finding shows more stable conditions if late planting is chosen, obvious decrease in total crop length season for all stations, which is negative in the sense that it means shorter photoperiod, less quality/quantity product and also adding the risk of facing frost in Anthesis stage, planting in October is suggested to be better.

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# Analysis of post-processing method for dynamic models output using network data for the drought in North West of Iran

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# ABSTRACT

Since long time ago, prediction of precipitation status and investigation of drought hazards in catchment areas of North West of Iran, due to the critical importance of discharge rate of related catchments for Lake Uromia, has been one of the most important challenging issues in efficient management of water resources; management of vast capital of water resources and energy production of the country is highly affected by the aforesaid factors. Therefore, application of dynamic methods may play significant role in adjustment of such conditions concerning the frequencies of climate parameters and occurrence of imbalance behaviors in precipitation pattern of the country. Regarding improper distribution of observed data, this research firstly completes postprocessing operation using precipitation data of Aphrodite network, and Model Output Statistics(MOS) post-processing methods on the output of dynamic prediction model MRI-CGCM3 in a 28-year period(1980-2007), the precipitation grid of post-processed model and upon weighting output climate variables of dynamic model for each cell of data network and also, determining statistical model coefficients of multivariable correlation; output systematic error of the model highly reduced to be used in small scale applications. Then, post-processed prediction data of dynamic model were applied for computing Standardized Precipitation Index (SPI) provided in order to predict drought. Capabilities of selected post-processing method were assessed using evaluation criteria. Findings showed that application of statistical post-processing on direct output of dynamic model results in developing the monthly prediction of precipitation up to 29% in selected post-processing method. Accuracy of Standardized Precipitation Index (SPI) predicting may increase up to 22.3% than no post-processing mode, in a way that this value reaches to 79.5% after the implementation of post-processing operation.

KEY WORDS: POST-PROCESSING, DROUGHT, DYNAMIC MODELS, SEASONAL PREDICTION

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#### **INTRODUCTION**

Drought has been regarded as a basic parameter in sustainable development issues; it is considered as one of the most prominent climatic hazards, both in the short and long-term scale. Concerning that drought is a prominent natural hazard in Iran, and that in the last few years, various parts of the country have been affected by this hazard; therefore, it is of particular importance to perform its assessment, monitoring and prognosis. One of the methods used for quantifying drought hazards deals with using drought indices which may be applied for determining intensity and extension of drought on a periodical style. So far, these indices have been used for monitoring drought; but, we may use output of seasonal predictions to predict such profiles. Seasonal predictions provide some information about long-term averages. Land surface properties, especially calm variability of ocean surface temperature can affect the Earth's weather. These effects are not observable in diurnal scale, but they are observable on a larger time scale of months and the seasonal averages.

A wide range of studies have been conducted within and outside the country; but, most studies applied hydro-climate observed data or climatic indices such as El Niño-Southern Oscillation (ENSO) and the North Atlantic Oscillation (NAO) and establishing interrelation of rainfall and large-scale climate signals and they rarely have used dynamic methods in the prediction of precipitation. Concerning climatic variations of the recent years and the occurrence of unusual behaviors in precipitation pattern of the most parts of the country, application of dynamic methods bear advantages than the statistical methods which are solely based on the behaviors of statistical periods. Nowadays, the most common method used in international centers for predicting rainfall on hourly to seasonal time scales is the application of the numerical dynamic models. The output of the aforesaid models can be used as input for other applied models. The main objective for predicting climatic conditions in dynamic method is predicting the future of the status of climatic variables according to their current conditions and information and the application of numerical approximations for dynamic equations. In the dynamic method, we firstly provide prediction using a general circulation model; then, dynamic downscaling will be done on the desired area using a regional model. General Circulation Models (GCM) simulate the climate system with more complexities. Dynamic part includes numerical schemes which compute large scale atmospheric transmissions. These transmissions are calculated in a physical space or a spectrum space.

Nowadays, the outputs of these models are presented to users by international seasonal predicting centers. Concerning the relatively large scale output of these models, ranged from about 0.1 \* 0.1 geographical degrees to 2.5 \* 2.5 geographical degrees which results in lower resolution and more errors in the direct use of the output of such models. Therefore, their output has errors especially for the near ground surface variables including precipitation which requires correction and post-processing analysis. There are a wide range of methods used for post-processing analysis of the output of numerical Prediction models of which we may name Model Output Statistics (MOS). Application of techniques and special conditions is required for determining correlation coefficient and effect of each parameter of output model with the regional climate conditions. Another problem in using post-processing methods is lack of spatial and temporal distribution of observed data to be used in the post-processing analysis of the output of dynamic model, (Azadi et al., 2011).

In this regard, application of Aphrodite data can greatly reduce calculation errors and considers proper distribution of time and place in the category of postprocessing framework (Yatagai, et al., 2012). A wide range of methods have been used in the post-processing analysis of the output of dynamic methods; for example. Babaeian et al. applied linear multivariable regression method for post-processing the precipitation output of MRI-CGCM3 model, (Babaeian et al., 2013).

In another study, (Kim et al 2012) performed seasonal prediction of winter in the Northern Hemisphere using seasonal predicting systems which were recently updated using ECMWF and NCEP; through the revision of predicting period (1982-2010), the paper evaluated coupled seasonal climate prediction systems of oceanatmosphere and using ECMWF System 4 (Sys4) and the National Center for Environmental Prediction (NCEP) for model (CFSv2); they evaluated analysis with the use of both data sets (Kim et al., 2012a). Also in another research, Wilkes (2008) presented seasonal prediction of temperature parameter in network form on North America using developed statistical methods based on the surface temperature data of the water bodies of the North Pacific. Two time-series including long-term data (from 1880 to 2007) and short term data (from 1950 to 2007) were tested the surface temperature of water bodies in terms of Extended Reconstructed Sea Surface Temperature version 2 (ERSST v.2) grid data with a horizontal resolution of  $2 \times 2$  degrees in statistical models of Canonical Correlation Analysis (CCA) and Maximum Covariance Analysis (MCA) and it showed that application of long-term data, despite low accuracy of some of them, may result in major promotion in accuracy of seasonal predictions for winter temperature (Wilks 2008).

Also, Kim et al (2012) applied multivariable linear regression method to provide seasonal predicts in South

Korea using teleconnection indices. The present study applied a maximum of five predictive variables used for the multivariable correlation models. The results of Kim et al showed that monthly correlation coefficients of temperature varied from 0.42 to 0.65 and for precipitation changes from 0.37 to 0.63. Correction coefficients for temperature vary from 18% to 42% and for precipitation changes from 14% to 39% (Kim et al., 2012b). In a research, Lim et al (2009) performed downscaling of predicted seasonal precipitation (NCEP/CFS) with a resolution of 2.5° to spatial scale of 20km on the South-East United States, including Florida, Georgia and Alabama using CSEOF model which is based on statistical downscaling (Lim et al., 2009). Jeffery and colleagues (2005) demonstrated that the use of MOS technique (application of statistical methods on the output of dynamic models) results in development of two-week predictions. They applied this method on global models of NCEP and ECMWF. Application of MOS technique on two models results in development of prediction results higher than application of MOS technique on one model (Jeffrey, et al., 2005). Krishnamurti and colleagues (2000) performed a research in connection with the seasonal and climatic predictions with the use of research based corrective multi-model predicts.

Finally, statistical weight of each model was determined using linear multivariable regression. They concluded that the predictions of multiple models have better performance than single models. The findings showed that the use of statistical methods in postprocessing multi-model predicts can improve multiple predict system of distinct models (Krishnamurti, T. K., et al., 2000). Some of the statistical post-processing methods do not require long-term data of the model including neural network method (Fathi et al. 2010, Hasanzadeh et al. 2012) and Genetic Algorithm method (Kishtawal 2003) or Kalman filtering method (Rastgu et al. 2010,) and the moving average method (Azadi, et al. 2011, McCollor 2008, Johnson and Swinbank. 2010).

Gene and Renwick (2003) performed Seasonal Predicting of New Zealand temperature by using linear multivariable correlation method and the parameters of temperature, rainfall and water bodies' surface temperature for Pacific Ocean. (Zheng, Renwick 2003).Quito et al. (2011) conducted a research on precipitation climate data of the Middle East using Aphrodite data and comparing them with the output of MRI-CGCM3 Model. They found that application of Aphrodite data may highly increase spatial accuracy of the research; especially, application of network data instead of stationbased observed data in areas with mountainous conditions may increase efficiency of the downscaling of climate models (Kitoh et al., 2011). In another study conducted by Kasanicky and Kobayashi (2003) evaluated the efficiency of prediction probabilities and the seasonal predictability of atmosphere using Atmospheric General Circulation Model (AGCM) at Japan Meteorological Agency (JMA), which is a global spectral model with T63 resolution. The results showed that the probable prediction contrary to definite prediction related to some seasonal and regional similarities, such as higher relative ability in winters of the Northern hemisphere, East Asia and North America (Kusunoki Kobayashi, 2003).

Meanwhile in another research, Rasa et al (2012) developed Aphrodite data by the Research Institute for Humanity and Nature (RIHN) and the Meteorological Research Institute |Japan Meteorological Agency (MRI/ JMA) for wet areas and wet adjacent areas of Pakistan with a Resolution of 0.05 degrees in decade form (Rasu et al., 2012). Yasutomi et al. (2011) studied the development of long-term networked temperatures data series and its application in the separation of rain / snow at daily precipitations (Yasutomi et al., 2011)

Therefore, application of post-processing technique may develop outputs of dynamic models to be used in subscales and the outputs of these models may be implemented in macro-environment management with a more comprehensive approach. Main objective of the present research consisted of developing the accuracy of seasonal predictions of precipitation of North-west of the country using dynamic model output post-processing method used toward managing the drought hazard.

#### MATERIAL AND METHODS

In this study, we used three data series; the first series is observed data of monthly precipitation obtained from Meteorological Stations in the North-West of Iran, including West Azerbaijan and East Azerbaijan and Ardabil provinces (Figure 1). Selection of stations with regard to the availability of long-term observed data of precipitation (1980 - 2007) was according to predict data and Aphrodite data.

Table 1 shows existing observation stations of the studied region along with precipitation data of the observation stations, respectively presented for all seasons of the year Second Series of Data are Aphrodite Data.

Aphrodite Project was developed in 2006 with the aim of creating diurnal precipitation data in high resolution networks across Asia (Yatagai, et al. 2012). In the same year, a project named APHRODITE was developed by the Research Institute for Humanity and Nature (RIHN) and the Meteorological Research Institute |Japan Meteorological Agency (MRI/JMA)in order to establish networked diurnal precipitation databases across Asia with high spatial resolution and as per the observations



made by rain gauge. APHRODITE consisted of an international cooperation plan for collection and analysis of rain gauging observed data collected from thousands of stations across Asia plus the reports provided by World Meteorological Organization (WMO) which resulted in providing diurnal precipitation data for 57 years. This database was provided by ADW interpolation method. Aphrodite Data consists of integrated observed data of precipitation in Asia with high-resolution which are used for evaluating water resources in form of three separate collections consist of the monsoon regions of Asia, the Middle East and Russia with the spatial resolution of 0.25  $\times$  0.25 and 0.5  $\times$  0.5 and with diurnal timescale.

The initial step in using such data is to perform their verification and contrast with the observed data obtained from meteorological stations which are equipped with rain gauge stations. Toward this, observed data in the

Table 1. Climate statistics of observation stations in the studied region														
		Precipitation (mm)		Total	Total Precipitation (mm)			Preci	ipitation (º	n Percei ⁄₀)	ntage			
Province	Station	Average	Max	Min	Spring	Summer	Autumn	Winter	Spring	Summer	Autumn	Winter	Variation Range	Variance
	Uremia	312.3	51	2.2	114.2	14.1	91.7	92.3	%37	%5	%29	%30	48.8	307.23
	Piranshahr	662.9	106.5	1.6	170.7	7.1	196.8	288.3	%26	%1	%30	%43	104.9	1927
_	Takab	337.5	60	3.1	125.3	13.3	93	105.9	%37	%4	%28	%31	56.9	395
aijaı	Khoy	263.2	52.6	6.2	114.9	29.2	64.7	54.4	%44	%11	%25	%21	46.4	163.55
zerb	Sardasht	833.5	135.9	1.3	214.4	4.9	253	361.2	%26	%1	%30	%43	134.6	3248.13
st A	Mako	305.1	60.1	12.6	142.2	48.9	62.4	51.6	%47	%16	%20	%17	47.5	214.78
We	Mahabad	397	63.1	1.2	115.9	6.6	124	150.5	%29	%2	%31	%38	61.9	598.42
an	Ahar	287.6	55.4	6.4	123.8	25.5	75.5	62.8	%43	%9	%26	%22	49	190.77
baija	Tabriz	247.2	46.8	3.4	102.3	13.7	65.6	65.6	%41	%6	%27	%27	33.4	180.56
zer	Sarab	244.4	51	7	107.7	29.1	59.6	48	%44	%12	%24	%20	44	158.97
East	Mianeh	278.4	48.4	3.1	101.6	14.3	75.7	86.8	%36	%5	%27	%31	45.3	218.64
	Ardebil	275.3	34.6	5.1	99.8	22.7	80.5	72.3	%36	%8	%29	%26	38.7	137.74
debil	Pars Abad	274.2	62.2	6.2	91.1	32.6	92.7	57.8	%33	%12	%34	%21	28.4	94.42
Arc	Khalkhal	372.8		6.1	144.2	25.7	101.8	101.1	%39	%7	%27	%27	56.1	336.23



same period were compared with Aphrodite data on the synoptic station and rain gauge stations of North West region of Iran including Ardabil and East Azerbaijan and West Azerbaijan provinces. Figure 2 shows configuration of considered region in terms of using Aphrodite data. The target area has 59 grids with 0.5x0.5 degrees; where, corresponding Aphrodite data were extracted through programming and changing format.

The third series of data is retrospective predicts of rainfall and some meteorological variables affecting it, such as geo-potential height, thickness of different layers, ground level pressure and other meteorological variables of model outputs. Generally, each seasonal prediction model should be performed during each model development for a 30-year period in order to compare its results with the observed data. Comparing the predictions of the last 30-year period with observed values, accuracy of seasonal prediction model will be evaluated and in terms of verifying the aforesaid model and it will be used for the issuance of seasonal prediction.

In this research, we applied re-prediction data of MRI-CGCM model output including 14 variables and general index of the model output and 6 retrospective predictive variables related to the network of the studied stations. MRI-CGCM3 Model (Yukimoto et al., 2012) consists of two components including atmospheric general circulation model (MRI-AGCM3) and oceanic general circulation model (MRI-COM) where its atmospheric component is coupled with aerosol model of MASINGAR km<sup>-2</sup>. Coupling intervals or data exchange between atmospheric and oceanic models is one hour and the same interval for Aerosol is 0.5 hour. In the atmospheric model of MRI-AGCM3, atmospheric component of the model is in spectral form in which the hydrostatic equations are used as predictors.

The horizontal resolution of Tl159 model (about 120 km) is with 48 vertical layers in ETA coordinate system. The structure of this model consists of three major components, namely: (a) the initial field input data of the model, obtained through the analysis of meteorological variables, ocean and land surface variables, (b) an integrated prediction system of the atmosphere, oceans and land and (c) the map products and error analysis and assessment system. Applied variables and indices with their explanations are given in Table 2.

Total of the first 14 parameters of the output of MRI-CGCM3 model have been used on a monthly basis at Tokyo Climate Centre (TCC) for post-processing. They have been chosen in a way to be appropriate for the climate of South-East Asia; but, a significant number of them are suitable for our climate, too. In addition to the aforesaid 14 indices, 6 other variables including H500, SLP, T2M, T850 and Model-Pr will be extracted from the model output files.

Table 2. Outp	ut Parameters of MRI-CGCM3 I	Model			
Parameter	Variable	Parameter	Variable	Parameter	Variable
Z2030	Geopotential height of 500 millibar	NINOSST	Water surface temperature	H500	Geopotential height of 500 millibar
Z3040	Average Geopotential height of 500 millibar	NINOWESTSST	Water surface temperature	SLP	Mean sea level pressure
Z4050	Geopotential height of 500 millibar	DLRAIN	Precipitation	SST	Water surface temperature
Z5060	Geopotential height of 500 millibar	WIORAIN	Precipitation	T2M	Temperature in 2m
THMD	Thickness between 300 and 850 millibar	SAMOIRAIN	Precipitation	T850	Temperature in 850milibar
THEX	Thickness between 300 and 850 millibar	WNPRAIN	Precipitation	Model-Pr	Precipitation in Network
WIOSST	Water surface temperature	MCRAIN	Precipitation		

# POST-PROCESSING OF PRECIPITATION DATA AND VERIFYING RESULTS

The method applied in statistical post-processing is linear multivariable regression method on precipitation data. Multivariable regression methods may modify both types of random and systematic errors in model outputs. The predictability of random error is much more difficult than systematic errors. In this method, prediction and observed data are divided into two courses "statistical post-processing model" and "examination". Multivariable regression method is a method of making model equation from past data series (Shimizukawa et al. 2009).

This method is one of the most powerful ways to explain the inter-relationship of observed and modeled variables. The general form of multivariable regression equation is as follows:

$$Y_t = \alpha + \beta_1 X_{1t} + \beta_2 X_{2t} + \beta_3 X_{3t} + \dots + \beta_k X_{kt} + \varepsilon_t$$
(1)

Where,  $Y_t$  is dependent variable or predictant and  $X_{kt}$  is independent variable or predictor. Since, total of 20 seasonal prediction variables are applied for the development of multivariable correlation model and some of which have no significant relation with observed precipitation of the region; therefore, all predictors (independent variables) were inserted in model toward omission of non-effective variables; then, the variable with least correlation became omitted.

In selection of the final variables for adjustment coefficient of R<sup>2</sup>, balanced adjustment coefficient of R<sup>2</sup>-Adjust and F and t statistics are also effective. R<sup>2</sup> presents the percentage of variable changes of the predictant using predictors. R<sup>2</sup>-Adjust or balanced R<sup>2</sup> will be used when the number of independent variables increased. Negative values of balanced adjustment coefficient are not accepted.

Advantage of linear multivariable correlation method is that despite the non-intervention of atmosphere physical processes, a significant relationship may be established between predictants of the region and predictors of large-scale atmospheric circulation model output and then applied its results for downscaling local parameters including precipitation (Lee, J., Y., 2003).

In this study, the 28-year period of seasonal Prediction model can be divided into two periods of 22-years and 6-years. Data of the 22years period are used for the extraction of the precipitation behavior of MRI-CGCM3 Model on the studied network points. This has been performed through determining the variable of prediction indices with highest correlation with point precipitation of the network and determining statistical model coefficients of multivariable correlation. Then, the statistical model obtained from 22 years output of MRI-CGCM3 model and precipitation network data were applied for a 6 years period to predict monthly rainfall. Jump (JMP4) software was used in this research for the determination of partial correlation between 20 variable output indices of MRI-CGCM3 Model with observed precipitation of the station. Investigations showed that if number of input variables in multivariable model exceeds from 3, postprocessing errors increase the same and prediction of the precipitation points of the network increases with the same trend; therefore, multivariable model was designed based on 3 input variables.

Also, four evaluation indices of Mean Square Skill Score (MSSS), Relative Operating Characteristics (ROC), Mean Bias Error (MBE) and Relative Error (RE) were applied for investigating capabilities of selected postprocessing method in predicting point precipitation of studied regional stations network.

Mean Square Skill Score (MSSS) index predicts the relative accuracy of post-processed model compared with the actual values of observed data; whereas:

$$MSSS = 1 - \frac{RMSE_f}{RMSE_c} \tag{2}$$

It is necessary to calculate the Mean Square Error (MSE) of observed data (MSE<sub>c</sub>) and prediction (MSE<sub>c</sub>).

$$MSE_f = \frac{1}{n} \sum_{i=1}^{n} (f_i - x_i)^2$$
(3)

$$MSE_c = \frac{1}{n} \sum_{i=1}^{n} (x_i)^2$$
 (4)

Where fi and xi respectively are the ith predicted value and ith observed value of n data.  $\text{RMSE}_{f}$  and  $\text{RMSE}_{c}$ values are obtained respectively for square root of the mean square error prediction and observed values. In an accurate prediction, square root of the mean square error prediction equals 1 (MSSS=1) and in a full incorrect prediction, it equals 0 (MSSS=0). It shows that application of post-processed model output is more successful in comparison with climate means (Gheti, 2007).

In addition to the two aforementioned indices, mean bias error (MBE) and the mean relative error were also applied in examining the capabilities of post-processing method which are calculated according to the following formula.

$$MBE = \frac{1}{n} \left( \sum_{i=1}^{n} M_i - \sum_{i=1}^{n} O_i \right)$$
(5)

Where Mi and Oi are respectively predicted and observed values. Relative errors (RE) of predictions are calculated as follows:

$$RE = \frac{\frac{1}{n}(\sum_{i=1}^{n} M_i - \sum_{i=0}^{n} O_i)}{\sum_{i=0}^{n} O_i}$$
(6)

Table 3. Classification of SPI index as per McKee et al							
Classification of SPI drought index as per McKee et al (Ensafi moghaddam, 2007)							
Status SPI Index Status SPI Index							
Sever wet	≤2	Relatively Dry	-1 to -1.49				
Very wet	1.5 to 1.99	Very dry	-1.5 to -1.99				
Relatively wet	1 to 1.49	Sever dry	≥-2				
Near normal	-0.99 to +0.99						

On one hand, we may calculate ROC curve and also correct Hit Rate (HR) prediction indices and False Alarm Rate (FAR) incorrect prediction indices for each class of predictions in which the ROC sub-curve area shows evaluation of the prediction; where, much more closing to 1 shows higher capability of the model (WMO, 2006).

#### **DROUGHT PREDICTION INDEX (SPI)**

Concerning the importance of being aware of drought status for the future months in planning for agriculture, water resources and environments, we may use predicted precipitations to compute Drought Prediction Index (SPI) in monthly and seasonal (3 months) scales for studied network cells. The reason for this index deals with the monthly data of Aphrodite network and consequently, in having monthly post-processing data. Since, SPI index may be calculated only if having monthly precipitation data; therefore, this index is suggested for predicting drought. SPI index was presented by McKee and colleagues to quantify the precipitation and drought observation. Wide range of applications enables SPI index to observe drought in short-term scales including soil moisture and long-term scales including surface waters and ground waters (Fattahi et al., 2007). Based on SPI method, drought period occurs when the SPI is continuously negative and reaches a value of -1 or less; and it ends when the SPI is positive, and the cumulative values of SPI show the magnitude and severity of drought period and wet periods. The classifications of SPI values are shown in Table 3 (Moghaddam 2007).

#### **RESULTS AND DISCUSSION**

This research regarded the selected course of study from 1980 to 2007; 70% of which i.e. 1980-2001 was considered as the test course and providing monthly post-processing regression equations and 30% of which i.e. 2002-2007 was considered as verification period. Aphrodite data networked in 59 network cells of 0.5x0.5 degrees were extracted for the studied region and validated with the observed data of regional stations; whereas, results showed proper accuracy of Aphrodite data which finally resulted in their application instead of sparse data of stations (Figures 3 - 7). It is to be noted that networked Aphrodite data absolutely increased accuracy of the study with regard to topographic conditions of the studied region and dispersion of stations.

In the first step and corresponding to the test period, precipitation prediction was calibrated during the period of 1980-2001; variables with highest correlation with



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monthly precipitations were extracted for each network cell and their monthly post-processed equations were designed. In next step, gross output of MRICGCM3 Model was amended for each of the network cells using monthly post-processed equations for each network cell in the studied area; and prediction of cell precipitation was extracted for the test period of 2002-2007. Finally for the accuracy of the performance of results and equations in future predictions, results of validation period were validated using actual data. Applying the results of the precipitation predicted in SPI index, we may study zoning of drought prediction in the studied region. Due to the high volume of maps and charts, which were carried out separately for each cell, 505 cell analysis with 45.25 degrees in longitude and 37.75 degrees in latitude were presented as samples in this research which can be generalized to other cells, as well.

Table 4 shows the input parameters for different months of the year in regarded network cells which were obtained through multivariable regression equations and they were determined for the post-processed model and they were given toward post-processed precipitation model; they are mentioned along with the accuracy of the classified prediction of monthly precipitation

during the s	tatistical period	of 1980-2007					
Ν	/IRE	М	BE	Accuracy of			
After Post Process	Before Post Process	After Post Process	Before Post Process	classified prediction %	MSSS	Model Index	Month
0.28	1.15	-6.53	26.45	72.22	0.74	Sst, h2,IOBW Rain	Jan
-0.17	0.59	5.33	18.41	88.89	0.88	MC Rain, IOBW SST, Z4050	Feb
0.06	0.39	2.49	14.94	50.00	0.61	SST, h2, THEX	Mar
-0.33	0.25	-21.52	16.34	38.89	0.78	WIO SST, Z3040, DL Rain	Apr
0.34	1.40	14.17	58.63	38.89	0.57	H2, SST NNOWEST SST, NNO3	May
0.56	11.51	-3.57	73.45	83.33	0.16	Z2030, h2, Z4050	Jun
-0.86	11.94	-6.44	89.78	66.67	0.13	SST, Z2030, THTR	Jul
-0.86	68.39	0.99	78.65	83.33	0.19	DL Rain, IOBW Rain, MC,Rain	Aug
3.30	81.98	0.44	108.13	66.67	-12.22	P850, WNP Rain, TPR	Sep
0.26	1.94	6.84	50.62	75.22	0.40	MC Rain, WIO SST, DL Rain	Oct
0.33	1.35	-12.79	52.29	72.22	0.68	Z3040, Z4050, NNO WEST	Nov
0.74	12.63	4.77	81.69	100.00	0.30	ELO SST, WIO Rain, ELO Rain	Dec
0.11	76.77	6.67	55.78	67.59		Average	

Table 4. Prediction model of the parameters of MRI-CGCM3 model toward post-processing network cell rainfall No. 505

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and bias before and after post-processing procedure. According to the above table, the least square error (MSSS) index, the best capability of post-processing model was observed in February with a value of 0.88 and the least value was observed in July as 0.13. Therefore, monthly prediction accuracy average over the year is 67.59%. Applying statistical bias post-processing and relative error respectively reduced from 55.78 to 6.76mm and 76.87 to -0.11.

Figure 8 shows rainfall graphs predicted by the MRI-CGCM3 model for February (a), May (b), August (c) and November (d) which include data of the model before



FIGURE 9. ROC curve of post-processed precipitation data using multivariable regression method for the training period (right) and prediction period (left) in an annual scale



post-processing (MRICGCM) and after post-processing (Train), Aphrodite network rainfall (Observation) and modeling test period precipitation (Post-processing) brought for 505 cells as a sample.

Figure 9 shows post-processing precipitation data of ROC curve obtained in multivariable regression method for network of 505 during the two periods of training and prediction periods in annual scale. In this graph, vertical vector indicates true prediction index and horizontal vector indicates false prediction index. Results show that highest efficiency of the model deals with the time in which precipitation is predicted in normal or a higher range. It has less accuracy in low precipitation months.

Figure 10 shows precipitation data average of Aphrodite network, raw model data and post-processed data in multivariable regression method for the network of 505 over the prediction period (years 2002-2007). The results indicated that there is a significant difference between raw predicted output and post-processed out of the model; in a way that post-processed model prediction has proper consistency with network Aphrodite data and this appropriation and consistency have better results in high precipitation months.





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Figures 11 to 14 show zoning of SPI drought index modified using Aphrodite network rainfall and the rainfall predicted by MRI-CGCM3 model subject to post-processing process. In the aforesaid figures, SPI index can be seen for the three months periods leading to March (winter), June (spring), September (summer) and December (autumn).

Table 5 indicates the rate of increase in prediction accuracy of SPI index by the MRI-CGCM3 model after performing statistical post-processing process in Aphrodite network cell of 505 for the studied region. In the second and third columns of the table, the prediction accuracy rate of seasonal drought index is given as per modified classification of Maki et al.; and in two last columns, the correlation value of drought indices before and after performing post-processing process was inserted on model output.

The above table shows the accuracy of the drought index prediction in the period 2001 to 2007 for the cells

Table 5. The capability of MRI-CGCM3 model in predicting seasonal SPI indices in the network of 505 during the period of 2001 to 2007							
Network	Accuracy of classif	fied prediction %	Correlation of SPI model prediction with the Observed				
THE	Before Post-processing	After Post-processing	Before Post-processing	After Post-processing			
505	60.9	78.4	0.068	0.46			
Networks Average	61.7	79.5	0.061	0.49			

of network 505 as well as the mean of 59 existing Aphrodite networks available in the studied region; in other words, there are 12 predictions for SPI index of each year. According to this table, the inter-correlation of SPI values calculated from not post-processed precipitation of MRI-CGCM3 model to network 505 was 0.068 that after post-processing, it reached to 0.46; for networks average, the amount improved from 0.061 to 0.49. Also, prediction accuracy of this index according to the classification presented in Table 5 for not post-processed SPI index for the network of 505 samples was 60.9% and for post-processed SPI was 78.4%; this amount for the studied networks improved from 61.7% to 79.5% indicating the promotion of prediction accuracy of this index valued at 22.3% after performing statistical postprocessing process.

#### CONCLUSION

Concerning the importance having access to seasonal predictions and also the prediction of annual conditions for future months in North West of Iran and especially for three provinces of West Azerbaijan, East Azerbaijan, and Ardebil; they mostly cover catchment areas of the Lake Uremia bearing special importance in this regard. Also, management of energy and water resources in the said region is highly affected by climate conditions; this research tends to apply multivariable regression method for post-processing the output of the seasonal prediction of MRI-CGCM3 model on the aforesaid region toward promoting accuracy of monthly predictions and also, drought index. Toward realization of this, multivariable regression method was networked on 20 model indices and applying Aphrodite data which has less temporal and spatial errors than observed data of stations. Number of Aphrodite network points in the aforesaid region is 59 points with spatial distance of 0.5 geographical degrees, having highest accuracy after the validating station based data; therefore, their application for the studied region with its special topographical conditions may increase post-processing accuracy.

The applied statistical period of this research is a 28-year period (covering from 1980 to 2007) which is even in both Aphrodite and model data series. The above-mentioned period can be divided into two periods of 22-years used for determining multivariable regression equations for each point of the network and for different months of the year and also a 6-years period for presenting prediction and validating predictions with actual data. Then, results of the prediction of SPI drought index were applied. The obtained results were validated using statistical indices and findings showed that application of multivariable regression method in postprocessing model output excluding spatial range, has higher accuracy in cold and high precipitation seasons and less accuracy in low precipitation seasons. Also, the monthly bias value of the precipitation decreased from the 67mm for before post-processing to 9mm for after post-processing. This indicates positive effect of applying post-processing method on model output.

Finally, correlation value of post-processed and not post-processed output indices were validated using results in SPI index which increased from 0.061 to 0.45 for mean network points and the accuracy of classified predictions improved from 61.7% to 79.5% indicating 22.5% promotion from post-processing method in model output. Findings of the present research indicated that application of post-processing method on model outputs may improve accuracy of results for smaller spatial scales; also, application of Aphrodite network data instead of station based sparse data may lead to more improved results. Application of post-processed results in SPI index may lead to codification of a comprehensive model in using drought index in drought prediction context and it provides seasonal predictions for drought hazard. This may develop future macro-management in the field of climate and drought.

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# Determination of total aflatoxin in rice consumption in Yasuj, Iran

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## ABSTRACT

Aflatoxins are the secondary metabolites of *Aspergillus flavus* and *Aspergillus parasiticus* which are often produced by molds. The consumption of food contaminated with aflatoxin poison, which is associated with many humans and Aflatoxicosis, in some cases can lead to death.Nowadays, rice is the foodstuff for half of theworld'spopulation. Rice is exposed to fungal and aflatoxin contaminations like other cereal crops. This study aimed toinvestigate and compare the amount of aflatoxin and the level of toxin in rice samples in Yasuj. In this study, 45rice samples collected from Yasuj supermarketsand the amount of aflatoxin contamination were tested by Elisa. The results showed that total aflatoxincontamination in all samples was lower than the national standard in Iran. The average amount of total aflatoxin in types such as Gerdeh, Champa, Shamim and Fajr, is6.53- 6.14- 4.54and 6.12 ng /g, respectively. Comparing the results of this study and other studies, it can be concluded that rice examined in this study is more desirable.

KEY WORDS: TOTAL AFLATOXIN, RICE, ELISA

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#### **INTRODUCTION**

Rice is one of the most important crops. Grain dark is the staple food for half of the world's population (Payan, 2011). Rice cultivation has existed in Iran since the Achaemenid (Khodabande, 2010). It is cultivated widely in certain areas of the world such as China, India, Japan, Uruguay and parts of South Africa (Payan, 2011). Many agricultural products from the cultivation to consumption are prone to contaminate with fungi. If the fungipollution-causing strains of toxin,it may produce mycotoxin in some stage of its growth as a secondary metabolite. (Reza, Tahereh, Alireza, & bahar, 2011) Liu *et al*, 2015).

Despite numerous studies during the first half of the last century, only in the 1960s, itwas found that metabolites of fungi are responsible for the illness and death of livestock. Currently, it is well established that toxic mold metabolites are responsible for many epidemics in human and animal population (Reza, Tahereh, Alireza, & bahar, 2011). Mycotoxins are a natural group of toxic compounds produced by several species of fungi. These compounds have different chemical structuresandlow molecular weight that are found in a large number of agricultural products and food. In general, many types of grains, oilseeds, nuts and dried fruit are prone to fungal pollution(Majid, *et al.*, 2008). The most important mycotoxins involve aflatoxins, patulin, ochratoxin A and zearalenone (Abdel-Wahhab & Kholif, 2010).

Aflatoxins are mycotoxins produced by the Aspergillus species and some species of Penicillium and Aspergillus flavus (Fink-Grernmels, 1999). Different types of aflatoxin are: AFP1, AFG2, AFG1, AFM2, AFM1, AFB2, AFB1 and AFQ1 that aflatoxin B1, biologically is the most active type between theknown aflatoxins (Kazemi, Mohtadinia, Mahdavi, Akbari, & Salehpour, 2008). The most important factors in aflatoxin production include temperature, humidity, oxygen concentration, substrate, PH nutrients, microbial interactions, the presence or absence of inhibitors such as organic acids as well as mechanical damage (Amanlou, Rezaei Khkha, Ramazani, & Meyer, 2014, Liu *et al*, 2015).

Kohgiluyeh and Boyer-Ahmad is one of the provinces, which has water resources and favorable climatic conditions for rice cultivation (Nader, Kobra, & Mohammad Javad, 2008). Six common varieties of rice in this province are Champa, Gerdeh, Tropical Champa, Shamim, Lenjan and Tarom (Cassel, Campbell, Draper, & Epperson, Aflatoxins: Hazards in grain/aflatoxicosis and livestock, 2001), (Arafa, Bloomer, Wilson, Simpson, & Harms, 1981). Since the review of total aflatoxin has not been conducted in this province and according to the importance of total aflatoxin monitoring in rice, thisresearch evaluates the total aflatoxin in the rice produced in Kohgiluyeh and Boyer-Ahmad.

#### MATERIALS AND METHODS

In this study, the rice sample was randomly collected from Yasuj shops, accordingto the sampling method of crops.

#### TOTAL AFLATOXIN ANALYSIS BY ELISA

In recent years ELISA method is used for the determination of mycotoxins. The ELISA method as a general technique for the early diagnosis and detection of mycotoxins with advantages such as sensitivity, sample preparation and easy operation, safety, high accuracy and time saving can be noted. This chemical method used antigen-antibody technique. This method is sensitive, fast and relatively inexpensive(Institute of Standards and Industrial Research of Iran, 2001)-(Khosravi, 1998).Total Aflatoxin competitive immunoassay kit EuroProxima B.V of the Netherlands was used to determine how much of the toxin existed in their food. Extraction and test methods for mycotoxins in the samples were performed according to the manufacturer's instructions.

#### SAMPLE PREPARATION

10 g of he rice powder sample was homogenized with 50ml of acetonitril in room temperature for 30 minutes was completely shaken. The extract was filtered by No. 42 Whatman paper and then 50 ml of the filtrate was diluted with 150 ml of buffer solution.100 ml of diluted extract was used per sink in the test. The rest was homogenized for 10 min at roomtemperature and then the resultant deposit was centrifuged. An aliqout (100 µl) of the supernatant was diluted with600 µl of phosphate buffer at pH = 7.2. An aliquot of thissolution (50 µl) or standard solution (50 µl), 50 µl of theaflatoxinperoxidase conjugate and 50 µl of the mouseantibody solution against alfatoxin were added to eachsink of the used plate. The determination was replicated three times. The samples were incubated for 30 min at room temperature in the darkness. The free and peroxidase-combined aflatoxins compete for the combining site with antibodies to mouse antibodies immobilized on theplate. Next, the plate was emptied and washed five times with phosphate buffer at pH = 7.2. Then, 50 µl of tetramethyl benzidineAnd 50 µl of urea peroxide were added and incubated again for 30 min in darkness. The reactionwas terminated by adding 100 µl of the stop reagent. Theabsorbance of the solution was measured at a wavelength of450 nm, using an ELISA reading apparatus. The content of aflatoxins was calculated using the previously preparedstandard curve.

Table 1. Analysis of total aflatoxin in the samples of rice in the city of Yasooj.							
Mim	Max	Samples					
6.42	6.63	0.09	6.53	7	Gerdeh		
5.24	6.42	0.21	6.14	17	Champa		
0.06	6.48	2.02	4.54	11	Shamim		
5.09	6.9	0.58	6.12	9	Fajr		

#### **RESULTS AND DISCUSSION**

The results are shown in Table 1. The findings of this study show that of the 45 samples all samples had total aflatoxin contamination, but it was lower than the standard limit. The limit of the toxin in different countries varies from 30 µg / kg to50 µg food. For example, in Iran it is 30 µg / kg of food material (Food corporation of India, 2011)-(Jonathan, et al., 2004). The maximum amount of aflatoxin 6.9 and the lowest amount of poison was 0.06 .The average amount of poison in the tested samples was measured 5.83 µg / kg. Average total aflatoxin concentration of toxin in the samples of rice Gerdeh, Champa, Shamim and Fajr, 6.53,6.14,4.54 and 6.12 µg / kg, respectively. The maximum data of The Gerdeh, Champa, Shamim and Fajr, sample, 6.62,6.42,6.68 and 6.9 µg / kg respectivelyand minimum amount of them 6.42,5.24,0.06 and 5.09 respectively (Table 1). Figure 1 shows Average total aflatoxin in the rice samples.

Rice is among the food items in the basket of Iranians. Due to the high consumption of rice by the Iranians

considering quality and health, it can have an important role in maintaining and promoting overall health. However, due to the high volume of product, product diversity, different cultures, different weather conditions and other causes of contamination and harmful substances, a variety of factors exist. Among the most important and common infections, fungal infections and contaminated mold can be noted. Aflatoxins and Ochratoxin by a group of the secondary metabolites of fungi that are particularly Aspergillus arise Azqarch. Studies have shown that post-harvest processing as well as applying proper drying and storage to reduce pollution and prevent its spread areis is required (Rustom, 1997)-(Samarajeewa, Sen, & Cohen, 1990). In a study by Kazemi et al on rice East Azerbaijan, 23% of the samples were infected. (Department of Planning & Economic Information and Communication Technology Center, 2013-2014). In another study by Rezai on imported rice in Zabol, 6.27% of thesamples hadfungal infection (Center for Statistics and Information Technology Ministry of Agriculture, 2013-2014).

A recent study by (Liu *et al*, 2015) on the 370 rice schema from six provinces in China was conducted to determine aflatoxin and Ochratoxin A 5/63 percent and 9.4 percent, The results showed that the samples contained Ochratoxin a 4.1% of samples were aflatoxin and aflatoxin and 3.0% of samples above the limit Ochratoxin a Europe Union (Farsiani, Marziye, Mahsa, Mohamad reza, & Mahmoud, 2014).Figure 1 shows the present study.Most of that total aflatoxin investigate the prevalence of less than 30 ng per mg, based on Table 1,



the average total aflatoxin in samples examined 83/5 on the ng/mg. In a study by Elena Suárez-Bonnet *et al* (2013), based on the total aflatoxin contamination (B1, G1, B2, and G2) in rice from Mexico and Aspanya, the results showed that the average total aflatoxin of Spanish rice was 37 / 3 micrograms per kg, in the range of 6.1 to 1383 mg/ kg (Suárez-Bonnet, *et al.*, 2013).

#### CONCLUSION

Comparing the results of this study and studies in the country and other countries it can be concluded that the rice examined in this study is more desirable. However, the potential pollution. to the fungus and toxins resulting from it and universal standards in the harvest of all itemsshould beapplied to the provide perfect conditions for transportation and time- consuming maintenance. Another important point is that the cultivation and harvest time or until you quit at the end of bran or less is consumed, the possibility of less contamination is more. The role of temperature in mold growth and toxin production after harvesting isproven and it must be maintained at the right temperature as much as the mold growth is prevented.

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# Effects of high intensity interval training on plasma levels of growth hormone and insulin like growth factor-1 in healthy males

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## ABSTRACT

It is well-recognized that exercise has a significant impact on the growth hormone / insulin-like growth factor GH/ IGF system but less is known about the effects of high intensity training (HIT) on this axis. Aim of the present study was to evaluate the effect of ten weeks of HIT on plasma levels of GH and IGF-I in healthy men. Twenty young men (age 23.34 $\pm$ 2.56 weight 72.47 $\pm$ 12.01 height 174.10  $\pm$  5.75) recruited and randomly assigned into Control (n=10) and HIT (n=12) groups. HIT protocol was started with 4 cycles. Then, every two weeks one cycle was added to the previous ones. Finally it was to 8 cycles/session in tenth weeks that lasted 16 minutes. Blood samples were collected prior to and after HIT program for all subjects and IGF-I and GH levels were measured. HIT subjects showed a significant increase in IGF-I (P=0.002, F=12.38). However no significant change was shown in GH levels (P=0.716, F=0.62).Our findings indicate that the HIT caused increase in circulating levels of IGF-I independently from GH levels. Both hormones may contribute to positive effects of anabolic conditions.

KEY WORDS: IGF-I/GH AXIS, HIT, ADAPTATION

#### **INTRODUCTION**

Growth hormone (GH) is the principal regulator of the hepatic synthesis of insulin-like growth factor I (IGF-1). IGF-1 itself is the primary downstream mediator of GH actions, and circulating IGF-1 plays an important role in the feedback regulation of GH secretion. However IGF-1, produced in skeletal muscle during exercise, is

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\*Corresponding Author: Sm.hejazi37@gmail.com Received 27<sup>th</sup> Dec, 2016 Accepted after revision 2<sup>nd</sup> March, 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 <sup>®</sup> A Society of Science and Nature Publication, 2017. All rights reserved. Online Contents Available at: http://www.bbrc.in/ also released into the circulation which might explain an increase in Circulating IGF-1 levels as well Frystyk (2010) and Nindl (2010). IGF-1 has widespread anabolic and insulin-sensitizing effects, and plays a critical role in formation, maintenance, and regeneration of skeletal muscles. IGF-1 also plays a direct role in whole body glucose homeostasis primarily by stimulating skeletal muscle glucose uptake (Berg and Bang 2004). Nindl et al. (2010) stated that IGF-1 is an important metabolic biomarker associated with a variety of health and exercise-related outcomes. It is well-recognized that exercise has a significant impact on the GH/IGF system, number of factors have led to interest in the effect of exercise on the growth hormone/insulin-like growth factor-I (GH/IGF-I) axis, including its possible role in maintenance of lean mass in a variety of physiological actions like protein synthesis, cellular proliferation and glucose metabolism, (Brill et al., 2002 and Weltman et al 2003).

Although most modes of exercise stimulate an increased GH secretory response that is linear with exercise intensity evidence suggests IGF-I responses are independent of GH. Insulin-like growth factor I (IGF-1) is a polypeptide of 70 amino acids (7650 daltons), and is one of a number of related insulin-like growth factors present in the circulation. The molecule has a number of biological activities similar to insulin. IGF-1 concentrations change with age, nutritional status, body composition and physical activity, m(Roy et al 1985, Hornum et al 1985, Stitt et al.2004).Whether previous studies have reported exercise-induced alterations of IGF-I seems to depend on several factors, including exercise model. Both low- and high-intensity cycling have been shown to increase IGF-I concentrations. However, neither lowvolume nor high-volume resistance exercise has been shown to change total IGF-I concentrations, (Cappon et al., 1994 and Nindl et al., 2001).

Moreover, no change in IGF-I concentrations has been found following a marathon, a 20 km run, and treadmill exercise at 60% of Vo max. The ability of IGF-I to promote muscle hypertrophy is unchallenged; however, several lines of evidence have demonstrated that load-induced hypertrophy can occur independently of IGF-I and/or activation of the IGF-I receptor. Conversely, evidence in support of IGF-I as a "regulator or amplifier" of muscle remodeling cascades also exists, (Hagberg et al., 1988, Banfi et al., 1994, Spangenburg et al., 2008 and Flueck and Goldspink 2011).

HIT exercises are high intensity and interval that can be done in a short time, although has the benefits of long-term endurance exercise. Even though the recent studies have shown endurance training can induce an increase of GH, IGF-1, levels in the circulation, but less is known about the effects of different training intensities (e. g. high-intensity training (HIT) on circulating levels of these growth factors. Only a few studies have addressed this issue in a strictly experimental way. The purpose of the present study was to evaluate the effect of ten weeks of HIT on plasma levels of GH and IGF-I in healthy men. The present study differs from previous studies, the protocol was more rigorous and exercise responses were compared with a non-exercise control trial, (Schwarz et al 1996 and Laursens and Jenkins 2002).

#### **METHODS**

#### **STUDY DESIGN /PARTICIPANTS**

Trial design was semi-experimental with control group. Twenty two young men (age  $23.34\pm2.56$  weight  $72.47\pm12.01$  height  $174.10\pm5.75$ ) recruited via a recall in Ferdowsi university of Mashhad campuses and those approved participation were randomized into either a training group (HIT) or a control group (CON). Informed consent was obtained from each patient included in the study and the study protocol conforms to the ethical guidelines of the 1975 Declaration of Helsinki.Exclusion criteria include professional athletics history as well as the current regular exercise, smoking, cardiovascular and metabolic disease or any complication that disrupt the implementation of exercise.

HIT group after became acquainted with the correct training performances, carried out the exercises, every other day, three sessions a week, for 10 weeks. Exercises included warm up, HIT training, cool down. Subjects warmed up by stretching and easy walking for 5 minutes. The HIT interventions consisted of four 30 s maximal effort ("all-out") shuttle run bouts (from cone-1 to cone-2,20 meter sweep) separated by 1.5 min passive rest each (Fig. 1).

HIT protocol began with 4 cycles and every two weeks added one cycle. Finally it was 8 cycles in tenth week that lasted 16 minutes. Cooling Down also included 5



min of walking and stretching. During the HIT interventions all subjects were vocally encouraged to maintain Maximal effort. Quality of training was controlled by a physical education expert and subject's heartbeat was constantly checked by polar device. Control group asked to be sedentary in this period.

Twenty four hours before starting the exercise program, while all the subjects were fasten; 5 cc of blood was taken from their brachial vein. Also sampling repeated after 48 hours of last session in same condition. Blood samples were frozen in -20 for future analysis. LDN (Germany) ELISA assay Kit was used to measure IGF-I concentrations which Sensitivity was 1.292 ng / mL and monobind (USA) ELISA assay Kit was used to measure GH concentrations which Sensitivity was 0.072 ng /mL.

Data normality was tested using Shapiro-wilk and the homogeneity of the variances was tested using levene. After making sure of the normality and equality of the groups, variance analysis with repeated measuring was used to study the differences between groups. Statistical analysis was done by the SPSS Software.

#### **RESULTS AND DISCUSSION**

After ten weeks HIT subjects showed a significant increase in IGF-I (P=0.002, F=12.38). However no significant change was shown in GH levels (P=0.716, F=0.62). (Table 1).

Previous studies have been reported that exercise has a significant impact on the levels of several hormones, and can increase resistance and performance, as well as muscle mass. Hormone levels can change according to several parameters, including the type and length of exercise, the duration of time following exercise, the age and gender of the athletes, among others, Kraemer et al (2006). Based on the findings from the present research, plasma levels of IGF-I had been significantly increased due to HIT protocol. To our knowledge, no previous research has directly investigated the impacts of HIT on IGF-I/GH axis. However, other types of training have been published. Most of the training time during the HIT intervention was spent in recovery between short, intense bursts of all-out shuttle running. This is in accordance with previously published studies, (Wahl et al 2010).

Several studies have indicated that anabolic hormones, such as insulin, GH, testosterone and IGF-1, stimulate neural tissue and muscle development during resistance exercise, (Crewther et al 2006). The serum concentration of anabolic hormones is elevated during and following resistance exercise compared to the level at rest, which leads to hypertrophy and remodeling of muscle (Widdowson et al., 2009). Circadian rhythm has specific effects on the release of IGF-1 in the body, where the hormone levels are higher in the morning and lower in the afternoon, (Hayes et al., 2010).

In the present study GH concentrations did not significantly changed as a result of relative long term HIT. That regard should be considered that due to our study limitation, GH only measured at one point in time. Also regarding Circadian rhythm and the pulsatile manner of GH it will probably cause different results when compared with multi-time point, whereas long-term exercise training approximately doubles integrated GH concentrations when measured on non-exercising days. Linnamo et al. reports that GH levels are increased in response to submaximal and maximal heavy resistance exercise. However, the prominent increase was detected just after the exercise session was completed, and the response returned to normal level two hours post exercise, (Weltman et al., 1992 and Linnamo et al., 2005).

Different training intensities, such as high-intensity training and high volume, low-intensity training may have a different impact on hormone levels. Although pH is generally well regulated, a more increase in the acidity of the circulating blood and the skeletal muscle occurs when performing HIT. One can speculate that these systemic and local changes in the extracellular environment might influence the release, the affinity, and association/ dissociation of GH, IGF-1. The extracellular pH has been recognized to regulate the IGF-1 interactions with different cells, components of the extracellular, (Gordon et al 1994 and Gibala et al 2006).

Table 1. Study va	Table 1. Study variables before (pre) and after (post) 10 weeks of study protocol							
Variable	Control		HIT	ANOVA (Demosted				
	Pre test	Post test	Pre test	Post test	(Repeated Measurement)			
IGF-I (ng /mL)	193.10 <u>±</u> 33.54	190.60 ± 32.32	199.27 ± 28.69	222.27 ± 32.90	F=12.38 P=0.002			
GH (ng /mL )	3.053±0.73	3.004±0.53	3.241±0.41	3.158±0.61	F=0.62 P=0.716			
Data are mean ± SD	-							

In summary, we undertook a randomized trial of the impact of 10 weeks of HIT on IGF-I/GH axis in previously untrained subjects. The major finding was HIT caused increase in circulating levels of IGF-I independently from GH levels. Both hormones may contribute to the positive effects of anabolic conditions as it has been shown by previous studies.

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# The comparative of role of attachment styles and parents' quality of life and academic achievement of high school children

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# ABSTRACT

This study aimed to investigate the relationship between attachment styles and quality of life of Parent with academic achievement of high school. The study sample consists of all parents of high school students in Zahedan from 94 to 95 and it consisted of 100 couples which includes 200 participants. The parents of high school students in Zahedan were selected by multistage randomized cluster sampling. To assess the hypotheses, Revised Adult Attachment Scale (RASS) and SF-12 Quality-of-Life Questionnaire were used. Also, the average of marks in first semester was used as an indicator of academic achievement. Then, data were examined by descriptive statistical methods such as mean, standard deviation and also inferential statistics such as Pearson correlation and multivariate regression analysis. The results showed that the mean of secure attachment is higher than avoidant insecure and anxiety insecure attachment styles. The parent's attachment styles were significantly correlated to children's academic achievements (P<0/01). There is a significant relationship between the quality of life of parents and children's academic achievements (P<0/01). As the secure attachment and quality of life of parents increase, children's academic achievement will also increase. And parent's ambivalent insecure attachment styles were significantly correlated to children's academic achievement will also increase. Of the subscales of attachment styles, secure attachment is good predictor for academic achievement.

KEY WORDS: ATTACHMENT STYLES, QUALITY OF LIFE, ACADEMIC ACHIEVEMENT

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#### **INTRODUCTION**

Family is considered as the most important human system and it is introduced institutions or social institution which is the result of a marriage between man and woman; in which family members, including spouses and children, and sometimes grandparents and grandchildren are living based on peaceful coexistence, peace, intimacy, familiarity, mutual understanding and cooperation. Families are usually small unit consisting of at least two or three people but it is one of the most important social institutions and the first source of raising and training generations and the greatest and richest source of happiness and emotion. The relationship between the members of family helps the health of the family. Understanding among the family leads to satisfaction in Marital Life; otherwise families will face difficulty (Bani Asadi, 1996). The interpersonal relationship is the foundation of the human identity and it is its primary relationship with others. The effective relationship flourishes creativity and improves the quality of the relationship between people. While ineffective relationship will ban human creativity and destroy the relationship. Relationship covers all human life; people are survived, grown and evolved by relationships and one's happiness largely depends on how the relationship is with others (Soodani, Dehghani and Dehghan Zadeh, 2012).

Bowlby (1973) claimed that primary attachment experiences of adults play an important role in the quality and quantity of their close relationships in the future. According to Bowlby's attachment theory (1969, 1973 and 1980), people tend to seek a close relationship and with support, like the relationship with primary attachment figures. Bowlby believed that management strategies in controlling the excitement and enthusiasm for using intimacy in close relationships as a "secure base" make it possible to understand the attachment theory in the context of relations between spouses. (Sadeghi, Mazaheri, Mootabi, 2011) and Hazen and Shaver (1987) also indicated that the type of children's attachment style affect adulthood's love style. The basis of parents' behavior determines type and style of attachment in children. Models of attachment styles include secure attachment, avoidant attachment and ambivalent attachment. Without any fundamental changes, attachment styles affect individual and social life, professional relationships and stress management, mental and physiological health and individual cognitive development. More than 20 year-research has confirmed the stability of attachment styles over time. (Doinita, 2015)

Among the aspects of human social life, one can mention to healthy and productive interaction between human beings and establishing love and kindness to other people and expressing intimacy and sympathy with each other; Human is a multi-dimensional being whose the important part of his complex nature is his desire for social life and living with his fellow human beings. Thus, marriage has been described as the most important and fundamental human relationship because it provides the basic structure for building family relationship and training the next generation. The relationship between husband and wife is regarded as the longest relationship. (Soodani, Dehghani and Dehghan Zadeh, 2013)

The relationship between husband and wife is an important factor in quality of life. Maintaining life as usual is not considered desirable, but improving the quality of life in multiple contexts is considered as the main effort of societies. Quality of life include some major concepts which leads to overall satisfaction with life. These concepts include health, suitable housing, employment, personal and family security. According to the World Health Organization, quality of life is defined as people's perception of their position in life in terms of culture, value system in which they live, goals, expectations, standards and priorities; therefore, it is an individual issue and is not visible by others and it depends on people's perception of different aspects of life. (Bonomi, Patrick, Bushnell, Martin, 2000).

Flanagan (1987) defined quality of life in five primary factors and 15 secondary factors; these factors include: (a) material and physical well-being (1. economic security, 2. Personal and health security) (b) relationships with others (3 marriage 4. having and raising children 5. the relationship with other members of family 6. The relationship with close friends) (c) citizenship, participatory and social activities (7. help and encourage others, 8-participation in local and governmental activities) (d) individual success and progress (9. growth of intelligence, 10. self-awareness and achieving personal goals 11. Interest in and usefulness of job 12. personal creativity) and leisure (13. interaction with others 14. Being passive and monitoring recreational activities and 15. Active and participating in recreational activities). (Rezai, Ahadi, Pashaei Sharifi, Karimi, 2007)

On the other hand the relationship between couples can be satisfactory or unsatisfactory. Marital satisfaction will create a healthy emotional environment for the growth and development of children and, as the result, this satisfaction can be effective on the interaction between children and parents. In other words, family and parent's quality of life is one of the most important factors affecting children's behavioral problems and lack of agreement between parents is considered as the most important causes of children's behavioral problems, so the family plays a very important role in children's training (Razavi, Mahmoodi, Rahimi, 2008).

Along with the development of communities and assigning the task of education to the institution of

education, academic failure is considered as one of the most important issues in the field of cognition and education. This phenomenon has attracted the attention of today's world and the minds of many researchers and experts because its personal, familial and social consequences are remarkable regarding material and spiritual costs. A person who faces academic failure in addition to causing material damage to the educational system will waste his life that can never be remedied.

Also, the studies on social pathologies have consistently shown that a large percentage of the social perverts had lower education. So conducting such studies which examine the consequences related to academic performance, is very important. A considerable amount of studies has been devoted to topics that have examined the factors affecting academic achievement. One can mention the studies on the relationship between emotional intelligence, goal orientation, personality traits many other variables and academic achievement (Mahbod, Foolad Chang, 2012). The main purpose of this study was to compare the role of attachment styles or parents' quality of life with their children's academic achievement. According to the above mentioned statements, the question is whether there is a relationship between parents' attachment style and quality of life with their children's academic achievement?

The main purpose of this study was to compare the role of attachment styles or parents' quality of life with their children's academic achievement. To obtain the above purposes, the following questions were examined precisely.

- 1. Were parent's secure attachment styles significantly correlated to children's academic achievements?
- 2. Were parent's avoidance attachment styles significantly correlated to children's academic achievements?
- 3. Were parent's ambivalent attachment styles significantly correlated to children's academic achievements?
- 4. Was parent's quality of life significantly related to children's academic achievements?

## METHODOLOGY

This research is a descriptive and correlational study. The study population included all male and female high school students' parents in Zahedan. The sample consists of 100 couples which includes 200 participants in Zahedan. This study used a randomized cluster sampling. Of all high schools in Zahedan, parents of students in public high schools were selected, then two schools were selected randomly and three classes were selected from each school. At the end, the samples were parents of these students. To

collect the data, Revised Adult Attachment Scale (RASS) and SF-12 Quality-of-Life Questionnaire and the average of marks in first semester were used.

#### **RESULTS AND DISCUSSIOIN**

First hypothesis: Parent's secure attachment styles were significantly correlated to high school children's academic achievements.

Table 1. Pearson correlation between secure attachment           and academic achievement					
Variable	Statistical methods	Academic Achievement			
Secure Attachment	r	*0/360			
	p-value	0/0001			
	Number	100			

The results of Table 1 showed that Pearson correlation coefficient of secure attachment is 0/360 and since the amount of p-value is 0/0001 and it is smaller than 0/05 there is a significant positive relationship between secure attachment and academic achievement.

Second hypothesis: Parent's avoidance attachment styles were significantly correlated to children's academic achievements.

Table 2. Pearson con attachment and aca	rrelation betw demic achiev	veen avoidance vement
Variable	Statistical methods	Academic Achievement
Insecure Attachment	R	0/112
	p-value	0/269
	Number	100

The results of Table 2 showed that Pearson correlation coefficient of avoidance attachment is 0/112 and since the amount of p-value is 0/269 and it is smaller than 0/05, there is a significant positive relationship between avoidance attachment and academic achievement.

Third hypothesis: Parent's ambivalent attachment styles were significantly correlated to children's academic achievements.

Table 3. Pearson correlation between ambivalent attachment and academic achievement					
Variable	Statistical methods	Academic Achievement			
Ambivalent Attachment	r	*0/-247			
	p-value	0/013			
	Number	100			

The results of Table 3 showed that Pearson correlation coefficient of ambivalent attachment is 0/-247 and since the amount of p-value is 0/013 and it is smaller than 0/05, there is a significant negative relationship between ambivalent attachment and academic achievement.

Fourth hypothesis: Parent's quality of life was significantly related to children's academic achievements.

Table 4. Pearson correlation between quality of life and academic achievement					
Variable	Statistical methods	Academic Achievement			
Quality of life	r	**0/368			
	p-value	0/0001			
	Number	100			

The results of Table 4 showed that Pearson correlation coefficient of quality of life is 0/368 and since the amount of p-value is 0/0001 and it is smaller than 0/05 there is a significant positive relationship between quality of life and academic achievement.

To answer this question that which of the following sub-scales of attachment styles and quality of life can predict student's academic achievement, stepwise regression analysis was used. In fact, the sub-scales of attachment styles is considered as predictors and academic achievement is known as criterion variable and the results of them are shown in Table 5.

#### Criterion variable: Academic Achievement

Based on the results listed in Table 5, it can be concluded that in explaining and predicting academic achievement, one can say that secure attachment style with the amount of 13 percent could explain the variance in academic achievement.

Secure attachment style (0/01 > p, 3/60 = Beta) has a significant positive correlation with academic achievement and is a positive unique predictor for variable.

Based on the results listed in Table 6, it can be concluded that in explaining and predicting academic achievement, one can say that the quality of life in amount of 13/5 percent, could explain the variance in academic achievement. Quality of life (0/01 > p3/68 = Beta) has a significant positive correlation with academic achievement and is a positive unique predictor for variable.

Examination of correlation coefficients between the variables of the three hypotheses indicated that the correlation coefficients between secure attachment style and academic achievement (0/360), between insecure attachment style scores and academic achievement (0/112) are positive relationships but between ambivalent attachment style and academic achievement (0/247) are negative and significant relationships. In general, it can be concluded that a significant relationship can be found between attachment styles of parents and their children's academic achievement.

The investigation of the role of attachment styles on academic achievement, stepwise multivariate regression analysis showed that secure attachment style is the pre-

Table 5. The stepwise regression of attachment styles for predicting academic achievement of the first three hypotheses								
style	Non- standardized coefficient (B)	standard error	Beta (Standardized coefficient)	T score	The correlation coefficient	The coefficient of determination	Variation of determination coefficient	p-value
Attachment styles secure	0/251	2/092	0/360	3/820	0/360	0/130	0/130	0/0001
Avoidance Attachment styles	0/080	2/228	0/112	1/111	0/112	0/012	0/012	0/269
Ambivalent Attachment styles	0/-132	2/172	0/-247	2/-529	0/247	0/061	0/061	0/013

Table 6.	Table 6. The stepwise regression of quality of life for predicting academic achievement								
style	Non- standardized coefficient (B)	Standard deviation	Beta (Standardized coefficient)	T score	The correlation coefficient	The coefficient of determination	Variation of determination coefficient	p-value	
Quality of life	0/127	2/085	0/368	3/913	0/368	0/135	0/135	0/0001	

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dictor of children's academic achievement and regarding Beta coefficients and the increase in academic achievement scores, it is believed that academic achievement is so high. Secure attachment style is 0/360. The results of this study are consistent with those of Mohammad Pour (2009), Hazen and Shaver (2003), Sadeghi, Mazaheri, Mootabi (2011), Torabi (2009) and Richelle and Krisanne (2001).

Consistency of results can be explained based on two possibilities: First of all, attachment as a primary need provides necessary biological readiness in the context of behavioral attachment on both sides of the parental relationships. Second of all, while biological variables, vital values and constructive interactions are at the service of formation and strengthening of secure attachment styles, providing situations under which biological preparations disrupt on both sides of the relationships and reduce vital value of secure attachment behaviors is always difficult and rare. This situation explains about the reduction of frequency of insecure attachment styles (avoidant, and ambivalent). So, it can be concluded that secure attachment is a safe resource for dealing and coping with stress anxiety, depression, anger and other negative emotions while insecure attachment styles do not provide such a resource and leave person alone and helpless in the face of stress and even diminish person's weak coping strategies. In other words, secure attachment style is one of the richest interpersonal sources that enable individuals against stress and the adverse effects of it and lack of it makes person vulnerable in dealing with critical situations. On the other hand secure attachment style in a positive way and avoidant attachment style in a negative way are predictors of mental and physical health. Secure attachment style increased physical and mental health through positive emotional cognitive processes and because of negative emotionalcognitive processes, insecure attachment styles reduces emotional and physical health. Also, individuals with secure attachment styles have less interpersonal problems and are happier than those with avoidant and ambivalent attachment style. People with insecure attachment styles have more emotional and spiritual problems and the more unable people feel, the less their level of happiness will be.

After the fourth hypothesis, the study sought to examine the relationship between parent's quality of life with their children's academic achievement; thus, the results showed a significant relationship between them. Evaluation of the correlation between quality of life scores and academic achievement (0/368) is significant, it can be generally concluded that there is a significant positive relationship between parents' quality of life and their children's academic achievement. Therefore, as the quality of life increases, the academic achievement will increase, too. To investigate the role of quality of life on academic achievement, stepwise multivariate regression analysis showed that parent's quality of life is a good predictor of children's academic achievement and regarding Beta coefficients, the amount of it is 0/368.

The findings of this study showed that parents' the quality of life influence their children's academic achievement and this is consistent with the studies of Rezaei, Ahadi, Pasha Sharifi, Karimi (2007), Soodani, Dehghani, Dehghan zadeh (2013) and Moosavi (2014). Quality of life includes different dimensions of health, physical, emotional and social comfort and is affected by personal experiences and his understanding of life that does not change over time. Each dimension has two measurable subjective and objective aspects, but it is subjective expectations that represent the quality of real-life (Tayebi et al., 2010). The subjective concept of quality of life means that it should be explained by him or his ideas and not by anybody else.

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# Relationship between teachers' tolerance, self-concept and personality type in teachers

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#### ABSTRACT

The purpose of this research was to study the relationship between teachers' tolerance, self-concept and personality type in teachers. The population of this study included all school teachers of Khash city in 2015 – 16. The sample consisted of 316 teachers that were selected at random. To collect the data tolerance, self-concept and personality type questionnaires were used. For analyzing the data Pearson correlation coefficient and stepwise regression was used. Results demonstrated that there was a positive and direct relationship between teachers' tolerance and self-concept. There was no relationship between teachers, self-concept and personality type. There was no relationship between teachers, self-concept and tolerance. Tolerance and self-concept variables could not predict teachers' personality type.

**KEY WORDS:** TOLERANCE. SELF-CONCEPT. PERSONALITY TYPE. TEACHERS

#### INTRODUCTION

Teaching job has internal and external stressful resources. Internal stressful resources of teaching job include the nature of teacher role, readiness level, competences and ability for doing duties. Decreasing the competence level can be resulted from lack of training before doing services. School environment can create stressful conditions for teachers such as students' destructive behaviors, insufficient encouragement structure, job isolation, opposed and multiple roles (Brook, Green, Geless & Chovarzer, 1996).

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During recent 20 years, studies related to tolerance have increased significantly. Thus, it is necessary to conduct more researches in this field faster than past because of several reasons. Firstly, increasing the numbers of people who they expose problems and also the numbers of problems. Secondly, understanding the dangerous and protective factors and their performance way can be led to suitable clinical interventions. Thirdly, it seems this topic is important because it is close relationship with mental health (Vaiv, Feredrikson & Tailor, 2008).

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Tolerance is not resistance against dangerous situations or damages, but it means active and constructive cooperation in environment. Indeed, as Rechardson (2002) stated tolerance is positive growing and adjusting following a period of unbalance rather than as simple recovery from damage and disaster. According to Bonanoo (2004) tolerance is something more than living under stressful conditions it does not mean lack of vulnerable against stress. Previous theories about tolerance emphasized on related features with positive consequences in facing with life problems and disasters. They introduced external factors such as efficient school, communication with protective adults as improving factors for tolerance. While, contemporary theories introduce tolerance as multiple subject composed of natural variables such as physical constitution and personality associated with special skills like problem solving. It allows people resist against life stressful events, suitably (Shafi Zadeh, 2012). Tolerance has recognized as effective subject in discussions about teaching process. Tolerance level affects on teachers ability for managing answers and reactions which it is complex and difficult process. It is considered as effective factor on improving quality and job standards (Goo & Di, 2007).

On the other hand, today most of scientists and psychologists believe that self- concept determines the individual's behavior. When a person is faced with a situation and stimulant that it is inconsistent with her/his behavior and values, he/she shows strong resistant against it, but if it be consistent with his/her behavior and values, he/she accepts it. Charlz Werth (1995) believes that self - concept is composed of three parts: 1. Body image that shows individual's view about his/her physical condition and it includes his/ her physical reactions. 2. Self - social includes self- racial, cultural and religious. 3. Self - cognition that states individuals' view about his/her mental talents. Damoon & Hart (2001) in their research related to self- concept found out that individuals' positive and negative self- evaluations affect on their social relations. Whatever it is important that individuals behave in way to imagine themselves as they like. They may behave in different social situations in a way that others like them. While, those who think they are not lovely may behave in a way that others do not like (Homan & Deh Abadi, 2013). Also, personality types determine mental talents and describe human behavior in different life situations. These personality types must be considered in job and educational consultations, whatever is often forgotten. Holland as one of famous theorists in field of work psychology, his theory has been successful more than other theories in this field. Holland states his theory based on two main principals:

1. Job selecting depends on type of individuals' personality. 2. There is direct relationship between job selecting and individuals' view and attitude.

Hypotheses of Hollands' theory on job selecting and evolution has been stated based on 7 hypotheses:

- 1. Most people are classified in one of below 6 personality types: realist, searcher, artist, social, adventurous and normative individuals.
- 2. Holland believes that there are 6 types of work places consistent of 6 personality types. If each personality type be in its suitable environment, it can lead to most success.
- 3. Individuals search environments where allow them to show and grow their abilities, skills, roles, values and attitudes that they like.
- 4. Individuals' behavior forms by personality and environmental factors. Job events such as job satisfaction, job selecting, job success and job continuity can be predicted through consistent of personality models with environmental models.
- 5. It can be used hexagonal model to show the relationship between individual and job. For example, realist person has more consistent with jobs related to realist type and has less consistent with jobs related to social type.
- 6. Also, it can be used hexagonal model to show the adaptation level of individual with environment. For example a person (R- N-S: realist, normative and searcher) has more adaptation with this environment more than a person (R-A-N: realist, artist and normative).
- 7. Distinction level affects on adaptation between individual and environment. If a person be more similar to environment (for example, S-A-A: social, artist, adventurous) the probability of job satisfaction will be more in that environment (Montazer Gaib & Keaikha Nejad, 2012).

Regarding to mentioned materials, current research has tried to study the relationship between tolerance, selfconcept and personality type of teachers of Khash city during 2015-16.

#### **RESEARCH QUESTIONS AND OBJECTIVES**

The main aim of this research is to study the relationship between tolerance, self-concept and teachers personality type from Khash city. Below questions will be studied to achieve mentioned aim:

- 1. There is significant relationship between teacherstolerance and self-concept of Khash city.
- 2. There is significant relationship between teachers self-concept and personality type of Khash city.

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- 3. There is significant relationship between teachers tolerance and personality type of Khash city.
- 4. Tolerance and self- concept variables predict teachers personality type.

#### **METHODS**

Current research is descriptive and correlative research. Statistical population of this research includes 1760 teachers of Khash city during 2015-16. The sample consists of 316 teachers that were selected at random and from them were asked to fill the tolerance, self-concept and personality type questionnaires.

#### **RESULTS AND DISCUSSION**

First hypothesis: there is significant relationship between teachers' tolerance and self- concept of Khash city.

Table 1. Correlation coefficient ofteachers' tolerance and self-concept									
Sig.	Group								
0.01	0.217	Tolerance	Teachers						
Self-concept									

The findings of table 1 revealed that there is significant and positive correlation between teachers' tolerance and self – concept (r=0.217, p<0.01).

Second hypothesis: there is significant relationship between teachers self- concept and personality type of Khash city.

Table 2. Correlation coefficient of teachers'self-concept and personality type								
Sig. r Variables Group								
0.788	0.016	Self-concept	Teachers					

The findings of table 2 revealed that there is no significant correlation between self – concept and personality type.

Third hypothesis: there is significant relationship between teachers tolerance and personality type of Khash city.

Table 3. Correlation coefficient of teachers'								
tolerance and personality type.								
Sig.	Group							
0.09	0.095	Tolerance	Teachers					
	Personality type							

The findings of table 3 revealed that there was no significant correlation between tolerance and personality type of teachers of Khash city.

Forth hypothesis: tolerance and self-concept variables predict teachers personality type.

Table 4. Regression analysis of teachers' personalitytype based on tolerance and self-concept								
Sig. R <sup>2</sup> R Variables Step								
0.090	0.010	0.098	Tolerance	1				
0.788	788 0.000 0.016 Self-concept 2							

The results of table 4 show that tolerance and selfconcept variables could not predict teachers<sup>-</sup> personality type.

The results of first hypothesis related to study the relationship between teachers tolerance and self-concept showed that there was positive and positive relationship between teachers tolerance and self- concept. It means that increasing tolerances leads to increasing self-concept at high level. Also, high self-concept leads to increasing individuals tolerance.

The results of the second hypothesis related to study the relationship between teachers' self-concept and personality type showed that there was no significant relationship between teachers' self-concept and personality type.

The results of the third hypothesis related to study the relationship between teacher's tolerance and personality type showed that there was no significant relationship between teachers, tolerance and personality type.

The results of the forth hypothesis related to study predictor variables of teachers personality type showed that tolerance and self-concept variables could not predict teachers personality type.

Since, human resource is considered as the most important and strategic resources of each organization and regarding to importance of education system for improving society and future of citizens, it is necessary to provide suitable conditions such as agreement off teachers , duties with their interests , competences and abilities, selecting teachers according to their competences and abilities, studying and recognizing needs and expectations of human force, attempting to meet their needs, creating and increasing job importance, creating active and stimulus environment, recognizing stressful fields and their consequences, providing consulting services, creating and keeping desirable human relations, organizing management training courses, providing suitable physical conditions and creating opportunities for resting, leaving from work temporary and continually decrease teachers<sup>,</sup> mental stresses and help their mental health.

Teachers are main element of education system. If a manager can meet teachers needs, he has acted in direction to provide needed conditions and opportunities for creating spirit, job satisfaction to achieve goals of education system. Thus, communication of manager with teachers is very important especial for managing school better. When, all of responsible people in the organization try to provide suitable and efficient environment for increasing the ability of their abilities and competences and for others, this education system has achieved perfect efficiency. They try to provide suitable conditions to rely on others and communicate correctly. Thus, each member of the group can achieve job satisfaction by team working, correct communication and thinking alike each other and finally they increase the efficiency of education system.

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# Evaluation of the protective effect of vitamin C on hepatic damage caused by formaldehyde in rats

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### ABSTRACT

Formaldehyde (methanol) is a chemical substance, with nasty smelling which is normally used to fix cadavers and histological process. The main use of formaldehyde is in production of synthetic resins, wood-plastic products and fiber industry. Formaldehyde has a negative impact on performance of organ system with oxidative stress in the body .specially on the hepatic. Some studies have demonstrated that antioxidants such as vitamin C can play an important role to protect from damage caused by harmful substance. The aim of this study was to evaluate the protective effect of vitamin C on hepatic damage caused by formaldehyde in rats.This study included 24 adult male rats with weighing 250-300 gr. rats were randomly divided into 3 groups each comprising 8 rats. 1- Control group: exposed to normal saline (1cc/kg per day for 10 days) that injected intraperitoneally, 2 -groups E1: exposed to formaldehyde 10mg/kg per day for 10 days, 3 - group E2: simultaneously exposed to vitamin C (200mg/kg) per day for 10 days& formaldehyde 10 mg/kg intraperitoneally 10 days. At the end of the exposure period, the mice were placed under anesthesia and surgery. The blood samples were taken for isolation of serum and measurement of AST and ALT in.In this study, AST and ALT levels of 24 adult rats in the all groups were measured and the results were compared. The amount of AST in the all groups was significant (P <0.05). The amount of AST in group E2 compared to controls was significant (P = 0 < 0.05) and the amount of AST in group E2 compared to E1 was not significant (P = P > 0.05). Also, comparison of the results showed significant difference in serum ALT in third group. Serum ALT level in E1 compared to control group was significant (P < 0.05) and ALT in group E2 compared to control group was significant (P < 0.05). The amount of ALT in group E2 compared to E1 was not significant (P = 0.847). According to this study, intraperitoneal administration of formaldehyde at a dose of 10 mgr/kg per 10-day can increase AST and ALT and vitamin C at a dose of 200 (mg / kg) per day for 10-days can reduce amount of AST and ALT in adult rats exposed to formaldehyde

KEY WORDS: FORMALDEHYDE, AST, ALT, LIVER

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#### **INTRODUCTION**

Formaldehyde is a chemical material with a nasty smell, which is used in fixing cadavers, histological processes, synthetic resins, wooden and plastic productions and industrial fiber production. It has a negative effect on performance of body organs. It is metabolized to formic acid by dehydrogenase formaldehyde and dehydrogenase aldehyde enzymes in the liver and erythrocyte which is exorcised through urine, excretion and breathing with different macromolecules such as protein, acid nucleic or interact with the light molecules like amino acid. Formaldehyde can cause oxidative stress in the body and has a bad effect on respiratory system and blood circulation and liver (Golalipour et al., 2007 Mendis et al., 2007, Cheng et al., 2003, Collins and Lineker 2004 Kini et al., 2004). Formaldehyde was known as a harmful factor for liver cells in the different studies. Antioxidants are such components that help body to destroy free radicals oxidative stress is actually imbalance between oxidants and antioxidants. When the amount of oxidants increases, the cells are damaged. Antioxidants include Vitamin A, E, C, Zn and selenium, which play a crucial role on inhibition of free radicals and stability of cell membrane, (Kini et al., 2001, Gupta et al., 2004, Woolagrd et a; 2002).

Vitamin C (Ascorbic Acid) is a white or yellow odorless solid substrate with the molecular formulation of C6H806. Ascorbic Acid is produced in the liver of plants and animals (except some special kind and human). Vitamin C operates as antioxidants in the body and cause acceleration of Fe, Cu and also revives of folic acid and collagen making. Vitamin C as a soluble antioxidant becomes active by moving oxygen and nitrogen elements. The role of vitamin E as a protective agent on liver damage caused by formaldehyde in the previous studies was approved. The role of A,E,C Vitamins as protective antioxidants on liver hepatotoxicity was also investigated. It is possible to evaluate liver function by checking the indicators in the blood, (Kum et al., 2011, Kini et al., m 2011, Djeffal et al., 2011, Ememghorashy et al., 2012).

With regard to the formaldehyde effects in making oxidative stress, free radicals and their effect on liver performance and in accordance with the performed studies related to the formaldehyde on the liver tissue changes as glomerular vascular congestion and also minor decline holes in the pipe cells and studies about the protection effect of Vitamin C on prevention of formaldehyde damage, in this study, we decided to investigate the protection effect of Vitamin C on liver performance of rats after exposing to formaldehyde.

#### METHODOLOGY

In this study 24 adult rat of Wistar bread were selected and divided into 3 equal groups. The first group (c) received 1cc/kg of normal saline and the second group (E2) received 10 mg/kg formaldehyde and the third group (E3) received both 10mg/kg formaldehyde and 200 mg/ kg Vitamin C in 10 days by injection into peritoneal. During the study, the rats were under normal condition of shelter with 24±2 temperature and appropriate feeding. 3 weeks after finishing the injection phlebotomy, after anesthesia by sterile syringe was performed. After making flocculation by centrifuge, samples were separated with 1500 rpm during 10 minutes and they were kept in -20 c till testing for evaluation of ALT and AST. The amount of ALT and AST were measured by using Pars Azmoon kits and auto analyzer tool (BiotecticaInstrument BT 1000).

Data analysis was performed after entering the data to SPSS Ver.20program and to investigate normality of cantinas quantitative data distribution, Shapiro-wilk test was conducted. The explicit result of the groups was reported as average and deviation from standard deviation. The comparison between the investigated groups was performed by using ANOVA test. If the average differences of statistic results were meaningful the LSD test were used to compare them. The meaningful level was considered less than 0.05 (P<0.05).

#### RESULTS AND DISCUSSION

In this study, 24 adult male rats of Wistar bread were involved. Among them 8 rats (33%) considered as control group, 8 rats (33%) considered as test group 2 (E2) and another 8 rats (33.3%) as test group 2 (E2). Descriptive factors and the comparison between the weights of rats among 3 groups of control E1, E2 was shown in the table 1. In order to compare AST level in 3 groups of control (c) E1,E2. Variance analysis test (ANOVA) was conducted and in order to compare 2 group's level of ALT, the LSD test was came out. Descriptive specifications and the comparison between ALT levels of three groups include group c, E1, E2 were listed in the table 2.

According to the comparison of AST level, it was suggested that there is a significant difference in 3 groups of control, E1, E2 (p<0.05). Also, with regard to the 2 groups comparison, The difference between the AST level of group c and group E1 was meaning (p<0.05) and the difference between AST level of control (c) and test group (E1) was also meaningful (p<0.05). However, there is not a meaningful difference between AST level of study group E1 and E2 (p>0.05) (plot 1). In order to compare, ALT level in 3 study groups of control (c), E1,



E2. The one way variance analysis (ANOVA) was conducted and in order to compare ALT level between 2 groups, the LSD test was used.

Descriptive specifications and the comparison of ALT level among 3 study groups of control (c), test 1 (E1) and

test 2 (E2) was shown in the table 3. According to the comparison of three groups, the ALT level has a meaningful difference (p<0.05). It was also suggested that there is a significant difference between ALT level of control group (c) and test 1 group (E1). (p<0.05) and ALT

Table 1. Rats weight in 3 study groups of control (c), E1, E2								
	P-Value	P-Value						
Specification	Control	Test 1	Test 2					
Weight (gr) Standard deviation ± Mean Range	214,37 ± 11,01 202-235	212,12 <u>+</u> 2,79 208-217	215,5±3,96 211-222	0.62				

Table 2. AST amount of 3 study groups of control (c), Test 1 (E1), Test 2 (E2)								
specification	Group	Group Comparison among gr						
	Control	E1	E2	Statistic F	P-Value			
AST Mean±SD Range	78.5 <u>+</u> 5.75 68-86	126.5 <u>±</u> 18.08 96-145	110.75±14.81 86-136	24.78	<0.001			

Table 3. ALT among 3 study groups of control (c), Test 1 (E1), Test 2 (E2)										
specification	Group			Comparison	among groups					
	Control	E1	E2	Statistic F	P-Value					
ALT Mean±SD Range	27.25 <u>+</u> 4.3 68-86	39.87±4.01 32-44	32.62±3.96 28-38	19.14	<0.001					

level of C and E2 group (p<0.05) and also between E1,E2 groups (p<0.05).

Formaldehyde can affect the body organs due to creating free radicals. Formaldehyde can also affect the kidney performance such as excretion of waste substances. Antioxidant can prevent the harmful effect of formaldehyde . Vitamins are one of the most important antioxidants – especially Vitamin C – which play an effective role in protection against oxidative damage caused by free radicals . On the other hand, this Vitamin can enhance the activity of antioxidant enzymes in the liver tissue,( Claudia et al., 2003, HaiXia et al., 2012, Ukmali and Armutcuf 2011, Sajadi et al., 2008, Shang et al., 2014).

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According to the above description, 24 rats of Wistar bread were involved in this study with regard to the previous studies and the ability and facility of laboratory and human resource present in the research center. This study was similar to the study of Ukmali et al. (2011). Histology of liver cells was just investigated and no treatment was suggested to prevent formaldehyde effect. In the study of Ukmali some evidences were shown about inflammation in the liver cells .

On the other hand this study was similar to that of Shang et al (2014), except that in this study, Vitamin C was fed to the rats and histology of kidney and liver cells was investigated. With regard to the performed studies and the side effect of formaldehyde which was approved by them and also concerning this fact that people and doctors are always exposed to this substrate without being able to perform histology investigations on human body, the liver enzymes was measured to evaluate ALT and AST indicators. It was shown that there were a significant difference between the control groups and the groups exposed to formaldehyde which can be related to the inflammatory response of liver cells to formaldehyde injection. Standardization was performed according to the weight, gender and bread. So, the meaningful difference statistically approved the harmful effect of exposing to this substrate (p<0.0001). On the other hand, ALT and AST level in the E2 group treated by vitamin C were decreased but not to the normal level of liver enzymes which is probably because of high toxicity effect of formaldehyde. More reduction may be reached by increasing the time of treatment or Vitamin C dose.

# CONCLUSION

According to this study, intraperitoneal administration of formaldehyde at a dose of 10 mge/kg per 10-day can increase AST and ALT and vitamin C at a dose of 200 (mg / kg) per day for 10-days can reduce amount of AST and ALT in adult rats exposed to formaldehyde.

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# Relationship between personality traits and anxiety with loneliness in students

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#### ABSTRACT

The aim of study is the relationship between Personality characteristics and anxiety with loneliness in students of Islamic Azad University of Ramhormoz. The statistical population included all male and female students of Islamic Azad University of Ramhormoz in 2015-2016. The study sample included 300 students who also by simple random sampling based on Morgan table of random numbers were selected from the statistical population. Results showed that there was a significant relationship among neuroticism, extraversion, openness and agreeableness with loneliness. And there was a significant relationship between anxiety and loneliness.

**KEY WORDS:** PERSONALITY CHARACTERISTICS, ANXIETY, LONELINESS

#### INTRODUCTION

Loneliness and experiences, usually in the lives of all people, from childhood to middle age it happens and attention to past experience is important. Past experiences often feel an ongoing basis we are alone. Loneliness in adolescence may be because one of the factors such as the parents' dispute, sexual abuse and feelings of failure at anything happen (Homferi, 2007). Family studies have important insights to the understanding alone in children and adolescents that can know the roots of

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interpersonal relationships and Experience alone. Alone, a complex set of subjective experiences and painful feelings and the gap between the existing social relations and social needs and not realized expectations reflects (Makgero, 2008). Investigation of Factors Affecting on loneliness in various social groups has always been the focus of many studies.

Salarvandian (2014) studied on personality traits as one of the factors influencing the feelings of loneliness in students. One of the factors influencing the feelings of loneliness is Personality characteristics. Personality

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characteristics as an organized collection unit consists of relatively stable components, the people on both, distinguishes one person from another person, can affect the feelings of loneliness (Shamloo, 2003). In other words, the features of the character set of psychological characteristics, cognitive, emotional and volitional, which determines the behavior and thinking of each person's life is centered. (Rogers et al., 2006). However, one of the most common views on the theory of personality characteristics is including neuroticism, extraversion, openness, agreeableness and conscientiousness.

Research results of Jafari Siavoshani et al (2014) Prediction the role of Personality characteristics of loneliness in high school adolescent girls showed that extraversion, consistent and conscientious is reduced level of loneliness. Another variable is associated with loneliness in students is anxiety and as pervasive and problematic phenomenon among students can have negative effect on academic achievement and performance optimization (Mahmoud Elmi, 1999). Reduce or create of anxiety, several factors such as personality characteristics can be effective. (Sedrpoushan, 2005). The results research of Maria and Niva, (2009), showed that anxiety has a significant impact on feelings of loneliness. In fact, anxiety especially social anxiety and anxiety related to interpersonal relationships particularly meaningful relationship with loneliness in adolescents girls. Lack of anxiety, especially social anxiety, increase group acceptance and by shaping interpersonal relationships is to reduce loneliness in students.

Considering the importance of loneliness in students and the impact of individual and social variables, this research aims to examine the relationship between Personality characteristics and anxiety with loneliness in students. The main research question is to answer the question whether is there relationship between Personality characteristics and anxiety with loneliness among students?

#### **METHODS**

The present study, survey and research are descriptive. The statistical population included all male and female students of Islamic Azad University of Ramhormoz in 2015-2016. The study sample included 300 students who were also by simple random sampling based on Morgan table of random numbers were selected from the statistical population.

#### **RESEARCH INSTRUMENTS**

**1.** Personality characteristics Questionnaire: In this study to evaluate the personality characteristics of the Big Five Personality Inventory short form McCrae and Costa (1985) was used. The test measures five Personality

characteristics that puts people, these features include: neuroticism, extraversion, openness to experience, agreeableness and conscientiousness. McCrae and Costa (2004) conducted a study on 208 students that reliability for five personality characteristics include neuroticism, extraversion, openness to experience, agreeableness and conscientiousness, respectively, 0.83, 0.75, 0.80, 0.79 and 0.79 were reported. Also McCrae and Costa (2004) convergent validity of the test by linking with NEO Test 240 questions for the five personality characteristics (factors) by 0.83, 0.83, 0.91, 0.76 and 0.86 reported. In this study, Cronbach's alpha reliability is this questionnaire to extraversion, 0.76, openness 0.65, agreeableness 0.67, neuroticism 0.72 and conscientiousness 0.76, respectively.

2. Anxiety Inventory: to evaluate anxiety in this study used the inventory of Najarian et al. (2005) that Cronbach's alpha coefficient for the total subject (male and female) reported 0.90. Research of Dabiri Nejad (2008), the validity of questionnaires through correlation test score of anxiety and aggression reported 0.64. The significance level was in 0.001 which the validity is acceptable. In this study, Cronbach's alpha reliability was 0.87.

3. Loneliness questionnaire: Russell and Katrona (1980) questionnaires to assess loneliness was used. In research of Shokrkon Mirdrikvand (2008), with Cronbach's alpha and split-half reliability was calculated 0.77 and 0.72 respectively. The correlation scale new and original scale was reported that 91% showed high validity of the new scale in this study, the reliability of the questionnaire was obtained by Cronbach's 0.79.

#### **RESULTS AND DISCUSSION**

Descriptive findings included the number, minimum, maximum, average, and standard deviation of the variables are presented in Table 1.

Table 1. Descriptive findings of anxiety, Personality characteristics and feelings of loneliness in students									
Index		Mean	SD						
	variable								
Anxiety		65.05	5.45						
S	Neurosis	23.58	5.22						
steristic	Extraversion	18.87	6.86						
chara	Openness	26.81	8.80						
nality	Agreeableness	25.47	7.97						
Personality characteristics	Conscientiousness	23.53	7.63						
	feelings loneliness	50.46	5.1						

Table 2. Results of Kolmogorov-Smirnov test on normal distribution of scores of research									
Inde	x Variable	Statistics	DF	Р	Distribution normal/ abnormal				
Anxi	ety	1.30	299	0.065	normal				
S	Neurosis	1.17	299	0.127	normal				
cteristic	Extraversion	1.68	299	0.07	normal				
chara	Openness	1.07	299	0.198	normal				
onality	Agreeableness	1.11	299	0.168	normal				
Perso	Conscientiousness	1.31	299	0.064	normal				
	Loneliness	0.90	299	0.38	normal				

Before examining the research hypotheses normal distribution of variables using the Kolmogorov-Smirnov test at a confidence level of 95% ( $\alpha = 0.05$ ) were examined and the results are listed in Table 2.

Results Table 2 shows the distribution of scores for all variables, including Personality characteristics, anxiety and loneliness are normal (p < 0.05). Due to the fact that Personality characteristics, anxiety and loneliness are normally distributed, so Pearson correlation coefficient was used to examine the relationship between them is that its results are as follows.

This study examined the relationship between Personality characteristics and anxiety with loneliness in students of Islamic Azad University of Ramhormoz. Results showed that there was a significant relationship among neuroticism, extraversion, openness and agreeableness with loneliness. In other words, the results showed that the people extraversion, openness and agreeableness higher and neuroticism lower, feel less alone. People who have features are good neurosis due to negative motions do not have the convenient ability to adapt to the environment and the expression, their emotions have refused so they tend to loneliness and isolation (Ferraro et al., 2007).

While extroverts in the community and guests, decisive, active, and are talking. And discussion and social-

Table 3. Correlation coefficients between Personality characteristics and anxiety with loneliness									
dependent variable Neurosis Extraversion Openness Agreeableness Conscientiousness Anxiety									
loneliness	r = 0.17 sig= 0.002	r =- 0.27 sig = 0.001	r =-0.56 sig = 0.001	r = - 0.60 sig = 0.031	r = - 0.09 sig = 0.099	r = 0.20 sig =0.001			

Table 4.	Table 4. Regression analysis to predict the simultaneous arrival of loneliness										
Index				Predictor va	Predictor variables						
Criterion variable	MR	$R^2$	F P	Personality	Personality characteristics Anxiety						
				Neurosis	Extraversion	Openness	Agreeableness	Conscientiousness		51.89	
loneliness	0.79	0.63	F=85.83 P=0.001	$\beta$ =0.21 b=0.24 t=4.49 P=0.001	$\beta$ =-0.16 b=-0.12 t=2.95 P=0.003	$\beta$ =-0.47 b=-0.27 t=-9.77 P=0.0001	$\beta$ =-0.54 b = -0.35 t= -10.84 P=0.0001	β=-0.24 b=-0.16 t= - 4.28 P=0.0001	$\beta$ =-0.05 b= -0.05 t =1.63 P=0.103	-	

izing and prefer to be alone (Nenimz, 2005) so obviously they feel less lonely. The results also showed that there was a significant relationship between anxiety and loneliness. The results showed that students who have higher anxiety, they feel more alone. To explain these findings, it can be stated that debilitating anxiety, apprehension and encourage intense that the individual or family, or enhance it in person. Anxieties through the involvement of some of the physiological, cognitive and emotional cause reduce the ability and willingness of individuals to start or continue the interpersonal relationships. So does the person feel alone? Given that this research has been conducted on the students so in generalizing the results to other people is limited. Based on the results, it is suggested their families special attention to parenting style according to their impact on Personality characteristics and is followed by feelings of loneliness.

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# Forecasting the efficiency of staff based on Information Technology

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# ABSTRACT

The present study has been conducted with the aim of the relationship between efficiency and IT. The statistical population included all the principals, teachers, and administrative staff of Ministry of Education in Districts 3, 5, 9 and 18 in Tehran as more than 1800 people. Among these, 160 were selected as the sample. The assessment tool in this study is the researcher-made questionnaire in which 26 multiple chose-items are used for the assessment of IT and 27 multiple choice-items for the efficiency. The findings indicate that the level of information technology and efficiency, in their overall sense, are at a high level in the community. Social networks and electronic communication components are respectively in the first and last ranks. In addition, Career Mastery and efficiency are respectively in the first and last ranks. Generally, Information Technology has no significant relationship with any of personal traits. Moreover, the overall efficiency is related to gender, place of work, age and service experience. Fundamental correlation was used with the aim of explaining the set of efficiency variables based on IT variables and personal characteristics (age, service experience). Therefore, in this study a model is introduced based on the optimized model of efficiency of the fourfold contingency model based on the information technology factors.

**KEY WORDS:** INFORMATION TECHNOLOGY, EFFICIENCY, EDUCATION, IT FACTOR ANALYSIS, EFFICIENCY FACTOR ANALYSIS

### **INTRODUCTION**

Efficiency is a fundamental and important measure in Economy and is accepted as a criterion for determining the wealth of a country. And it is an important determining factor for living standard. In addition, the efficiency of countries is as an indicator for their devel-

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paradigm brings with itself new theory, economics, lifestyle and especial technology.

Obviously, we must follow new theories and architecture in the organizational areas. Peter Drucker pointed out that in the twentieth century, conscious activity in the field of increasing staff efficiency could increase efficiency by fifty times. He believes the same task in the twenty-first century should be based on knowledge chores and educated staff (worker knowledge). Educated employees are those who work with technology and in particular the information technology. In recent years, organizations have done the most investment on IT so that according to some estimates, over 30% of total new investments have been on information technology from 1987 to 2015.

In 2004, 484 billion dollars, equivalent to 40% of the total investments of enterprises in America, was dedicated to information processing equipment and software. Methods of information technology have changed in line with heavy investments in organizations. Personal computers do things much faster than the old Maine frames. These computers are programmed in organizations and allow their users to share thoughts, programs, files and electronic messages. Internet and doing things have provided an environment that the remote change of information in organizations goes beyond organizations and geographical boundaries.

Providing a clear picture of the relationship between efficiency and the searching ways to maximize the efficiency as the one of the priorities of organization investments on IT is been organized in developing countries. According to a recent survey conducted by McKinsey at the international level, 71 percent of senior executives believe that technological innovation has a positive impact on firms' profitability. As one of the aspects of the organization, they argue that the development of information technology can improve individual and organizational performance, especially in information processing.

According to Faramarzi (2015, p. 3), information technology directly affects on the time barrier and spread of information meaning that it leaves more time for development by reducing the time required to perform normal processes, and avoids duplication by providing a platform for information spread.In recent years, the rapid growth of information and communication technologies has had an important influence on human life and the performance of organizations and institutions in different countries.

According to experts, Lorin and Erick (as cited in Sohrabi et al., 2016), as the invention of the steam engine and the Industrial Revolution caused a shift in work and personal life of people, communications revolution has similarly caused changes in life of man. According to Chang and Cheung (as cited in Rezai, 2009), acceptance is a multidimensional phenomenon which includes a wide range of key variables some of them including perceptions, beliefs, attitudes, characteristics and extent of engagement with the IT. According to Dillon and Morris (1996), quoted by Farahbod et al. (2013), user acceptance is defined as a "demonstrable willingness among a group to use information and communication technology to perform functions that these technologies are designed to support".

According to Cheung Kong (2008), studying the literature with the development texts of the information technology curriculum in recent decades in Hong Kong indicates that the objective of curriculum in Hong Kong is the change from computer studies to create and develop the knowledge related to the information processing approaches. According to Sun and Zhang (2006), information and communication technologies have been introduced as the dominant technology in the new millennium. These technologies are as means to increase efficiency and growth in all areas of human activity with the increase of information communication process and reduction of transaction costs. In the past two decades, different theories and models are proposed, tested, modified and extended in the field of technology acceptance and the source of most of these models is from information, psychology and sociology systems. These models contribute to our understanding of the factors influencing the acceptance of technology by users and the relationships between them. Then, these models are examined in detail.

According to Lee and Kim (2009), Technology Acceptance Mode by Davis et al can be noted as one of the most widely used models in the field among different models that information technology researchers have used to explain or predict motivational factors used in technology acceptance by users. The model is based on the idea that the perception of individuals of technology affects their attitudes toward technology. This model suggests that the use of ICT is determined by the desire to behavior (desire to use) and this behavioral intention is determined by two beliefs:

- 1. The mental perception of usefulness: the extent to which a person believes that using a particular technology will improve his performance.
- 2. The mental perception of the ease of use: the extent to which a person believes that using technology will be easy for him (Yi, Jackson, Park and Probst (2006, p. 357), Walter and López (2008, p. 207)).

The use of ICT by the user in the model is the result of the function a four-step process that includes:

- Exogenous variables will affect users' ideas for using information and communication technologies.

- Users' opinions will affect their attitude in using information and communication technology.
- Users' attitude will affect their willingness to use ICT.
- The willingness of users determines their level of use of ICT (Burton-Jones and Hubona, 2006).

According to Hong, Thong and Tam (2006), technology acceptance model is based on the willingness to take that technology is a good predictor. Also, it can be used to predict user behavior before using information and communication technologies. Kuo and Yen (2009) states that willingness to accept is as mental probability of a person of doing a particular behavior which is an important factor in its actual behavior.

According to Oliveira (2002), during the 1970s, factory efficiency went up to 90-85 percents, while the performance of office work only increased 4 percent. Therefore, there was a need for systems to increase both the efficiency of factories and offices. Hence, office automation systems came into existence after the evolution of data processing systems, management information systems and supportive decision-making systems. These systems support administration offices through IT and increase their efficacy. The increased efficiency caused by the completion of information transfer and the speed and accuracy of information are between and within offices and can ultimately benefit the manager by presenting better information for decision making. The presence of information technology in organizations has improved efficiency and decision-making. Today, 50% of the capital budget costs in manufacturing organizations are spent on information technology and nearly 40 percent of the costs of re-engineering of the organizations in 1977 have been spent on information systems. Although we assume the investment on information technology coordinates organizational changes to enhance communication, the researches showing the role of information technology in such a role meticulously are few.

According to Matthew (2001), according to the necessity of the use of information technology and its development, it seems that there is a need to increase professional staff and the automation of tasks. Therefore, it is necessary for organizations to attract and retain expert staff to survive in the competition and benefit massive human resources systems in this regard. Organizations need consulting services about the financial justification of the use of information technology to prove that their rivals have gained more than the average percentage of income using ICT.

Fletcher (2013), in a study entitled as the "Staff Management in Business, Human Capital Management axis" states that if the role supportive human resources of the workforce and the management is based on business needs, using information technology will lead to improve staff efficiency.Sanjra and Gonjalez (2010) studied the role of information and communications technology in the improvement of the efficiency of teachers in primary and secondary schools and indicated that the expansion of information technology in education is beneficial for the teaching/learning process and the portion of IT is high in the betterment of teaching/learning process in schools and technology is considered as innovation. There is a need not only for the modernization of the teaching models as well as the role of teacher to reach the highest level of information technology at a school.

In a study conducted by Darvish khezri and Rouhanifard (2014) in the Islamic Azad University of Gorgan as "the relationship between the use of information technology by staff and their efficiency in Islamic Azad University of Gorgan and its affiliated centers" they found that the efficiency of human resource on each eight components (motivation of human resources, innovation and creativity, spirit of competitiveness, cost reduction of activities, improving quality, reducing time work, job satisfaction and morale of the workforce) is different due to the use of technologies. In other words, there is a significant relationship between the use of information technology and human resource efficiency.

In a study conducted by Esfandiari Bayat (2013) in the city of Shiraz as "the relationship between the use of information technology by staff and organizational commitment with organizational efficiency", he concluded as follows: there is a relationship between the organizational commitment and the use of information technology by staff with efficiency and this relationship is positive and meaningful. In explaining, it can be said that the staff would have more job satisfaction in case of organizational commitment and the more the individual have commitment to the organization, the more they will be loyal to the objectives and values of the organization (emotional commitment) and there is a tendency to more trying and endeavor for beyond responsibilities.

A study conducted by Hosseinpour and Karimi Jaafar (2012) in the Markazi province entitled as "The Effect of Information and Communication Technology (ICT) on labor force efficiency in manufacturing industries of Markazi province". The aim of carrying out of this study was to investigate the effect of ICT indexes on labor force efficiency in industry of Markazi Province. Results show that ICT studies are of factors affecting labor force efficiency in the economy. Generally, by considering theoretical foundations regarding production and efficiency, the industries with a four-digit code of efficiency model are estimated using panel data method and the coefficients of the used variables in the work force efficiency model confirm the used model. In this study, four models are estimated among which the third model was selected as the proper model of this study that follows the index of industrial enterprises that use the Internet as an indicator of ICT. The results show that information and communications technology has a positive effect on the efficiency of work force. On the other hand, human resource including the important, effective and complementary changes is for accepting the role of information technology on the efficiency of work force in Markazi province. Because whatever the workforce is more educated, they have higher ability in the implementation and acceptance of new technologies. Capital stock per capita has also a positive and significant effect on the efficiency of labor force.

In a study conducted by Sharifi, Mohammad Davoodi and Islamiyah (2012) in Tehran entitled as "The relationship between the use of information and communication technologies with the performance of teachers in the teaching-learning process", the relationship between the use of information and communications technologies with the performance of teachers in the teaching-learning process was studied. The results indicated that there is a significant relationship between the use of information and communications technologies by teachers and with their performance in the teaching-learning process and 60.6 percent of the changes of the dependant variable of the research (performance of teachers) are defined by the use of practical software, the use of databases and then the use of internet.

Also, there is no significant difference observed between the comments of participants in both components of the study (using information and communication technology and performance) in terms of teaching experience.

Accordingly, the main objective of the research is to study the effect of the use of ICT by the staff, principals and teachers of the smart schools on their efficiency.

#### **RESEARCH METHODOLOGY**

The research method in this study is descriptive and correlation-based due to the subject and the data collection method and it is applied research since the objective is to predict the criterion variables based on the predicting variables. The hypothesis presentation has not been done in this research. Then, we have only provided research questions:

**First question:** To what extent there is IT and each of its components in the studied population? **Second question:** To what extent is the efficiency of each of its components in the studied population?

Third question: What is the ranking of IT components?

- Fourth question: What is the ranking of efficiency components?
- Fifth question: Is there a relationship between IT and each of its components with personal characteristics of managers?
- Sixth question: do efficiency and its components have a relationship with personal characteristics of managers?
- **Seventh question:** does IT have a relationship with efficiency?

The statistical population of the present study included all principals, teachers and administrative staff in secondary smart schools for girls in Tehran in 2015 and 2016 academic years. The statistical population is estimated as 1800 people. The sample size using Cochran formula was determined as 160 people who were selected by cluster multistage random sampling including principals, teachers and administrative staff.

#### **RESULTS AND DISCUSSION**

Cronbach's alpha coefficient has been used in this study to determine the reliability of the test. The alpha coefficient has been 0.8844 in the efficiency questionnaire and 0.8630 in IT questionnaire. Moreover, the primary output indicates that correlation matrix determinant of information technology is equal to 0.0000061 and opposite to zero and KMO in the efficiency questionnaire is equal to 0.759 showing the adequacy of sampling this study. In the study, the statistical value of Bartlett's spheral test is equal to 1780.0523 and its significance level is equal to 0.000 and the implementation of factor analysis and factor analysis is justifiable and a set of 5 factors of information technology explain 62.2 percent of the total variance of the information technology. In the next step, it is determined that the especial values for 5 factors are bigger than 1 and therefore, the questionnaire has 7 factors.

The primary output indicates that correlation matrix determinant of efficiency is equal to 0.000434 and it should be opposite to zero in order to find the invert correlation matrix and do the calculations. KMO in the efficiency questionnaire is equal to 0.755 showing the adequacy of sampling this study. Bartlett's spheral test is used in order to investigate whether the correlation matrix of the data is not zero. The purpose of this test is to reject the null hypothesis (HO). Bartlett test examines the hypothesis that the observed correlation matrix is associated to a population with uncorrelated variables. It is necessary for variables to be correlated with each

(n= 160)	(n= 160)										
Variable	Symbol	Mean	Std. deviation	Std. error	skewness	T skewness	kurtosis	T kurtosis	Min	Max	damane
Electronic empowerment	F1	3.086	0.562	0.044	-0.528	-2.73	-0.042	-0.110	1.57	4	2.43
Electronic communication	F2	2.048	0.668	0.052	0.617	3.187	-0.296	0.766	1	3.8	2.6
Electronic learning	F3	2.928	0.661	0.052	-0.200	-1.033	-0.264	0.684	1	4	3
Social network	F4	0.151	0.686	0.054	-0.729	-3.768	-0.058	-0.150	1	4	3
Electronic job	F5	2.15	0.549	0.043	0.475	2.454	0.272	0.703	1	3.8	2.8
Information technology	Ftot	2.686	0.438	0.034	-0.206	-1.066	0.968	2.500	1.21	3.73	2.52
Monitoring and reaction	B1	2.996	0.740	0.058	-0.907	-4.684	1.084	2.799	1	4	3
Organizational support	B2	2.889	0.645	0.051	-1.032	-5.331	2.170	5.603	1	4	3
Cooperation and implementation	B3	2.922	0.661	0.052	-0.924	-4.772	1.561	4.031	1	4	3
Competitiveness	B4	3.007	0.700	0.055	-0.773	-3.994	1.221	3.153	1	4	3
Practicality	B5	2.973	0.570	0.045	-0.987	-5.101	3.383	8.736	1	4	3
Performance	B6	2.797	0.739	0.058	-0.344	-1.779	0.134	0.347	1	4	3
Career Mastery	B7	3.287	0.567	0.044	-1.668	-8.615	6.031	15.572	1	4	3
Efficiency	Btot	2.983	0.483	0.038	-1.642	-8.479	7.826	20.207	1.41	3.81	2.4

Table 1. Central and dispersion characteristics of information technology and efficiency variables in the study sample

Table 2. The results of one-sample t model to determine the level of information technology and efficiency in the studied population

cincicity in ur	e studied pe	pulation				
Variable	Symbol	Mean	Std. deviation	T value	Но	The variables level in population
Electronic empowerment	F1	3.086	0.562	13.1	rejected	Very high
Electronic communication	F2	2.048	0.668	-8.5	rejected	Very low
Electronic learning	F3	2.928	0.661	8.1	rejected	High
Social network	F4	0.151	0.686	12.01	rejected	Very high
Electronic job	F5	2.15	0.549	-8.05	rejected	Very low
Information technology	Ftot	2.686	0.438	5.3	rejected	High
Monitoring and reaction	B1	2.996	0.740	8.47	rejected	High
Organizational support	B2	2.889	0.645	7.6	rejected	High
Cooperation and implementation	B3	2.922	0.661	8.06	rejected	High
Competitiveness	B4	3.007	0.700	9.12	rejected	Very high
Practicality	B5	2.973	0.570	10.5	rejected	Very high
Performance	B6	2.797	0.739	5.09	rejected	High
Career Mastery	B7	3.287	0.567	17.5	rejected	Very high
Efficiency	Btot	2.983	0.483	12.6	rejected	Very high

Table 3. Ranking of IT	Table 3. Ranking of IT (F) and efficiency (B) variables in the studied population							
Variable	Sym.	Mean rank	Rank	Variable	Sym.	Mean rank	Rank	
Electronic empowerment	F1	3.86	2	Social network	F4	3.97	1	
Electronic communication	F2	1.64	5	Electronic job	F5	2.01	4	
Electronic learning	F3	3.52	3					
Significance 0.0000		d.f. 4		Chi-square 306.9438		Cases 160		
Variable	Sym.	Mean rank	Rank	Variable	Sym.	Mean rank	Rank	
Monitoring and reaction	B1	4.12	3	Practicality	B5	3.79	4	
Organizational support	B2	3.53	6	Performance	B6	3.37	7	
Cooperation and B3 3.77 implementation		3.77	5	Career Mastery	B7	5.28	1	
Competitiveness	B4	4.13	2					
Significance 0.0000		d.f. 6		Chi-square 81.4500		Cases 160		

other; otherwise, there is no reason to explain the factor model. In this study, the statistical value of Bartlett's spheral test is equal to 1501.6582 and its significance level is less than 0.000.

Therefore, the implementation of factor analysis and factor analysis is justifiable in addition to the adequacy of sampling and a set of 5 factors of efficiency explain 52.8 percent of the total variance of the efficiency. The construct validity shows that the efficiency is able to determine 52.8 percent of the total variance of the efficiency. In the next step, it is determined that the especial values for 7 factors are bigger than 1 and therefore, the questionnaire has 7 factors.

Central and dispersion characteristics of IT and efficiency variables are determined and shown in Table 1. In response to the first and second question of the research,

Table 4. Results implementing consistent chi-square model to determine the relationship between information technology and individual characteristics of employees							ormation
Variable	Sym.	Gender	Education	Rank	Service area	Age	Experience
Electronic empowerment	F1	$X^2 = 0.96$ $\alpha = 0.8$ no relationship	X <sup>2</sup> = 10.44 α=0.01 It has a relationship	$X^2 = 0.19$ $\alpha = 0.97$ no relationship	$X^2 = 19.21$ $\alpha = 0.02$ It has a relationship	$X^2 = 14.48$ $\alpha = 0.10$ no relationship	$X^2 = 13.57$ $\alpha = 0.13$ no relationship
Electronic communication	F2	$X^2 = 2.12$ $\alpha = 0.54$ no relationship	$X^2 = 1.28$ $\alpha = 0.73$ no relationship	$X^2 = 2.88$ $\alpha = 0.41$ no relationship	$X^2 = 6.33$ $\alpha$ =0.70 no relationship	$X^2 = 10.8$ $\alpha = 0.28$ no relationship	$X^2 = 1.50$ $\alpha = 0.99$ no relationship
Electronic learning	F3	$X^2 = 0.75$ $\alpha = 0.86$ no relationship	$X^2 = 5.22$ $\alpha = 0.15$ no relationship	$X^2 = 2.53$ $\alpha = 0.46$ no relationship	$X^2 = 9.54$ $\alpha = 0.38$ no relationship	$X^2 = 14.82$ $\alpha$ =0.09 no relationship	$X^2 = 14.7$ $\alpha$ =0.09 no relationship
Social network	F4	$X^2 = 3.57$ $\alpha = 0.31$ no relationship	$X^2 = 1.12$ $\alpha$ =0.77 no relationship	$X^2 = 4.48$ $\alpha$ =0.21 no relationship	$X^2 = 6.62$ $\alpha = 0.67$ no relationship	$X^2 = 14.64$ $\alpha$ =0.10 no relationship	$X^2 = 5.76$ $\alpha = 0.76$ no relationship
Electronic job	F5	$X^2 = 2.42$ $\alpha = 0.48$ no relationship	$X^2 = 5.43$ $\alpha = 0.14$ no relationship	$X^2 = 13.41$ $\alpha$ =0.003 It has a relationship	$X^2 = 22.77$ $\alpha = 0.006$ It has a relationship	$X^2 = 25.04$ $\alpha = 0.002$ It has a relationship	$X^2 = 18.68$ $\alpha$ =0.02 It has a relationship
Information technology	Ftot	$X^2 = 0.94$ $\alpha = 0.81$ no relationship	$X^2 = 4.57$ $\alpha = 0.20$ no relationship	$X^2 = 1.82$ $\alpha = 0.61$ no relationship	$X^2 = 9.39$ $\alpha = 0.40$ no relationship	$X^2 = 9.36$ $\alpha = 0.40$ no relationship	$X^2 = 7.35$ $\alpha = 0.60$ no relationship

Table 5. The results of the implementation of the chi-square consistent model to determine the relationship between efficiency and personal characteristics of employees

ciliciticy and perso	Jilai Cilai	acteristics of cit	ipioyees				
Variable	Sym.	Gender	Education	Rank	Service area	Age	Experience
Monitoring and reaction	B1	$X^2 = 3.39$ $\alpha = 0.33$ no relationship	$X^2 = 1.45$ $\alpha = 0.69$ no relationship	$X^2 = 0.46$ $\alpha = 0.92$ no relationship	$X^2 = 19.95$ $\alpha = 0.01$ It has a relationship	$X^2 = 22.58$ $\alpha = 0.007$ It has a relationship	$X^2 = 20.03$ $\alpha = 0.01$ It has a relationship
Organizational support	B2	$X^2 = 4.91$ $\alpha = 0.17$ no relationship	$X^2 = 2.65$ $\alpha = 0.44$ no relationship	$X^2 = 3.50$ $\alpha = 0.32$ no relationship	$X^2 = 13.82$ $\alpha = 0.12$ no relationship	$X^2 = 23.69$ $\alpha = 0.004$ It has a relationship	$X^2 = 8.01$ $\alpha = 0.53$ no relationship
Cooperation and implementation	B3	$X^2 = 2.86$ $\alpha = 0.41$ no relationship	$X^2 = 4.96$ $\alpha = 0.17$ no relationship	$X^2 = 3.02$ $\alpha = 0.38$ no relationship	$X^2 = 8.20$ $\alpha = 0.51$ no relationship	$X^2 = 22.84$ $\alpha = 0.006$ It has a relationship	$X^2 = 33.42$ $\alpha$ =0.0001 It has a relationship
Competitiveness	B4	$X^2 = 2.45$ $\alpha = 0.48$ no relationship	$X^2 = 4.65$ $\alpha = 0.19$ no relationship	$X^2 = 6.44$ $\alpha = 0.09$ no relationship	$X^2 = 23.87$ $\alpha = 0.004$ It has a relationship	$X^2 = 32.60$ $\alpha = 0.0001$ It has a relationship	$X^2 = 36.44$ $\alpha = 0.0003$ It has a relationship
Practicality	B5	$X^2 = 2.56$ $\alpha = 0.46$ no relationship	$X^2 = 29.36$ $\alpha = 0.0001$ It has a relationship	$X^2 = 1.14$ $\alpha = 0.76$ no relationship	$X^2 = 14.24$ $\alpha = 0.11$ no relationship	$X^2 = 9.94$ $\alpha = 0.35$ no relationship	$X^2 = 6.68$ $\alpha = 0.66$ no relationship
Performance	B6	$X^2 = 6.53$ $\alpha = 0.08$ no relationship	$X^2 = 3.74$ $\alpha = 0.29$ no relationship	$X^2 = 3.72$ $\alpha = 0.29$ no relationship	$X^2 = 18.37$ $\alpha = 0.03$ It has a relationship	$X^2 = 30.49$ $\alpha = 0.0003$ It has a relationship	$X^2 = 27.02$ $\alpha$ =0.001 It has a relationship
Career Mastery	B7	$X^2 = 3.89$ $\alpha = 0.27$ no relationship	$X^2 = 3.37$ $\alpha = 0.33$ no relationship	$X^2 = 9.54$ $\alpha = 0.02$ It has a relationship	$X^2 = 17.05$ $\alpha = 0.04$ It has a relationship	$X^2 = 7.25$ $\alpha = 0.61$ no relationship	$X^2 = 9.22$ $\alpha = 0.41$ no relationship
Efficiency	Btot	$X^2 = 8.25$ $\alpha = 0.04$ It has a relationship	$X^2 = 2.76$ $\alpha = 0.42$ no relationship	$X^2 = 3.15$ $\alpha = 0.36$ no relationship	$X^2 = 22.63$ $\alpha = 0.007$ It has a relationship	$X^2 = 26.63$ $\alpha = 0.001$ It has a relationship	$X^2 = 20.09$ $\alpha = 0.01$ It has a relationship

the one-sample t model is been used and as table 2 shows, the efficiency components are higher than medium in the population in which the sample is extracted.

To answer the third and the fourth questions of study, Friedman's model is used and the results are shown in Table 3. As it is determined in table 3, in the studied population from the variables of information technology, social network (F4) is placed in the first rank, electronic empowerment (F1) in the second rank, electronic learning (F3) in the third rank, electronic job (F5) in the fourth rank and electronic communication (F4) in the last rank. Among efficiency variables, Career Mastery is placed at the first rank (b7), Competitiveness (B4) in the second rank, monitoring and reaction (B1) in the third rank, practicality (B5) in the fourth rank and cooperation and implementation (B3) in the fifth rank, organizational support (B2) in the sixth rank and Performance (B6) in the last rank.

According to Tables 4 and 5, a non-parametric model is used to answer fifth and sixth research questions.

Table 4 shows the results of the implementation of Chi square consistent model to determine the relationship between information technologies with personal characteristics of employees.

The results in Table 4 show that electronic empowerment variable has a relationship with education at  $\alpha$ =0.01 lower than the Pearson (0.05) level. Moreover, electronic empowerment variable has also a relationship with service area at  $\alpha$ =0.02 lower than the Pearson (0.05) level. In the studied population, electronic job variable has a relationship with rank at  $\alpha$ =0.003 lower than the Pearson (0.05) level. Also, electronic job variable has a relationship with service area at  $\alpha$ =0.006 lower than the Pearson (0.05) level as well as age at  $\alpha$ =0.002 lower than the Pearson (0.05) level and with experience at  $\alpha$ =0.02 lower than the Pearson (0.05) level.

In Table 5, the results of the implementation of Chi square consistent model are presented to determine the relationship between efficiency and personal characteristics of employees.

1	Fable 6	5. Consecutiv	ve Ratings signific	ance test			
I	Row	$\lambda$ special value	fundamental correlation coefficient R <sub>c</sub>	fundamental correlation square R <sub>c</sub> <sup>2</sup>	F value	df	Sig.
1	1	0.7870	0.663625	0.440399	5.35	49	<0.0001
2	2	0.5162	0.583468	0.340435	4.35	36	<0.0001
3	3	0.3626	0.515861	0.266112	3.40	25	< 0.0001
4	4	0.2012	0.409249	0.167484	2.16	16	0.0057
5	5	0.0251	0.156482	0.024487	0.68	9	0.7292
6	5	0.0154	0.123181	0.015173	0.59	4	0.6715
7	7	0.0002	0.015094	0.000228	0.03	1	0.8526

Results of Table 5: Monitoring and reaction variable has a relationship with service area at  $\alpha$ =0.01 lower than the Pearson (0.05) level. Monitoring and reaction variable has a relationship with age at  $\alpha$ =0.007 lower than the Pearson (0.05) level and experience at  $\alpha$ =0.01 lower than the Pearson (0.05) level. Organizational support variable has a relationship with age at  $\alpha$ =0.004 lower than the Pearson (0.05) level. Cooperation and implementation variable has a relationship with age at  $\alpha$ =0.006 lower than the Pearson (0.05) level and with experience at  $\alpha$ =0.0001 lower than the Pearson (0.05) level. Competitiveness variable has a relationship with service area at  $\alpha$ =0.004 lower than the Pearson (0.05) level, with age at  $\alpha$ =0.0001 lower than the Pearson (0.05) level and with experience at  $\alpha$ =0.0003 lower than the Pearson (0.05) level. Practicality variable has a relationship with education at  $\alpha$ =0.0001 lower than the Pearson (0.05) level. Performance variable has a relationship with service area at  $\alpha$ =0.03 lower than the Pearson (0.05) level and with age at  $\alpha$ =0.003 lower than the Pearson (0.05) level and with experience at  $\alpha$ =0.001 lower than the Pearson (0.05) level.

Career Mastery variable has a relationship with rank at  $\alpha$ =0.02 lower than the Pearson (0.05) level and with service area at  $\alpha$ =0.04 lower than the Pearson (0.05) level. It has a relationship with gender variable at  $\alpha$ =0.04 lower than the Pearson (0.05) level and with service area at  $\alpha$ =0.007 lower than the Pearson (0.05) level and with age at  $\alpha$ =0.001 lower than the Pearson (0.05) level and with experience at  $\alpha$ =0.01 lower than the Pearson (0.05) level.

Fundamental correlation model is used to answer the last question (does IT have a relationship with efficiency?). A summary of the fundamental correlation analysis is shown in Table 4-11.

As it can be seen in table 6, the corresponding F value with  $\lambda 1= 0.7870$  is equal to 5.35 which is significant for the 7\*7=49 of degree of freedom at a lower level than 0.0001. F value with  $\lambda 2= 0.5162$  is equal to 4.35 which is significant for the (7-1) (7-1) =36 of degree of freedom

at a lower level than 0.0001. The corresponding F value with  $\lambda 3$ = 0.3626 is equal to 3.40 which is significant for the (6-1) (6-1) = 25 of degree of freedom at a lower level than 0.0001. The F value with  $\lambda 4$ = 0.2012 is equal to 2.16 which is statistically significant for the (5-1) (5-1) = 16 of degree of freedom at  $\alpha$  = 0.0057 but the corresponding F value is not significant for  $\lambda 5$ ,  $\lambda 6$  and  $\lambda 7$ .

Based on the summary of this table, tow matrixes of the standardized coefficients are obtained of the fundamental variables (for each of the two sets that could be analyzed there is only one matrix). These values give exact information about the combination of corresponding couples with fundamental variables of table six and present them in table 7.

As Table 7 shows, the coefficients are the portion of the main variables in the combination of fundamental variables and they are usually only calculated for the fundamental correlations couples statistically significant.

 $R_{c12}$  means 0.440399 that indicates the variance ratio of ZY1 that is explained or justified by the ZX1, which means that about 44% of the ZY1 variance is explained by ZX1.  $R_{c22}$  means 0.340435 that is explained by ZX3 and  $R_{c32}$  means 0.266112 indicates the variance ratio of ZY3 that is explained by the ZX3, and  $R_{c42}$  means 0.167484 indicates the variance ratio of ZY4 that is explained by the ZX4. The relevant size of weights indicates the importance of each variable in a collection in comparison with the variables in another collection. The relevant size of this weight is the base for the definition of fundamental variables and explaining it in addition to being as its sign and each of them measures something. Structural vectors of the first to fourth factors along with the Wight are shown in table 8.

The left four columns of Table 8 figures show that four appropriate models are extracted based on four fundamental variables. Before introducing each model, it is necessary to be reminded that the age variable has a trivial and neutral effect on all four models. As experience (work) variable in the first three models, electronic

Table 7. Standard dependent (with)	lized fund variables	lamental w	reighting c	oefficients t	oetween ir	idepender	it (var) and	
Independent variable	Sym.	V1	V2	V3	V4	V5	V6	V7
Age	Age	0.4549	-0.2359	-0.4503	0.2980	-0.7287	1.4326	-0.1690
Experience	work	-0.2178	-0.3222	0.4356	-1.0912	0.8896	-1.0063	-0.1802
Software/ hardware	F1	0.5030	-0.9339	0.5786	0.2066	-0.1443	-0.1559	-0.0651
Electronic communication	F2	0.0069	-0.0798	-0.5486	0.6534	0.8906	0.0652	0.0133
Electronic learning	F3	0.6079	0.4364	-0.5407	-0.5495	-0.4148	-0.4690	-0.5325
Social networks	F4	0.1164	0.6521	0.4125	0.0180	0.2103	0.5093	0.8665
Electronic Job	F5	-0.2304	0.2635	0.7129	-0.0743	0.0080	0.2441	-0.7383
Dependent variable	Sym.	W1	W2	W3	W4	W5	W6	W7
Monitoring and reaction	B1	-0.1405	-0.7090	0.1499	0.2291	0.9668	-0.1166	-0.5388
Organizational support	B2	0.6339	0.2558	0.7322	-0.4638	-0.0237	-0.5446	-0.5108
Cooperation and implementation	B3	0.0738	0.1796	-0.3438	0.9159	0.7325	-0.2865	-0.1894
Competitiveness	B4	-0.3374	0.5449	0.5223	0.4021	0.0609	0.5961	-0.6032
Practicality	B5	0.0757	0.6333	-0.7280	-0.0851	0.5992	-0.1802	0.1727
Performance	B6	0.2579	-0.0772	-0.4441	-0.4162	-0.3022	0.9903	-0.3120
Career Mastery	B7	0.4855	-0.5265	0.1273	0.1247	-0.1171	0.0348	0.8914

communication (F2) in the first model, and social networks (F4) in the fourth model have a trivial or neutral effect in the production or prediction of efficiency.

The efficiency of staff in an environment in which using software/hardware (F1) is high (with the coefficient of 8), the amount of electronic learning/teaching (F3) is also very high (with the coefficient of 9), the relationship with social networks (F4) is very low (with the coefficient of 1) and in the opposite, electronic Job (F5) is relatively high (with the coefficient of -4) is stated as follows: the lack of monitoring and reaction (B1) is low (with the coefficient of -1), each of the variables of organizational support (B2), Cooperation and implementation (B3), and Practicality (B5) id very low(with the coefficient of 1), and in the opposite, Competitiveness (B4) is high(with the coefficient of -5), Performance (B6) is relatively low(with the coefficient of 3) and in the last, Career Mastery (B7) is very high (with the coefficient of 9).

In the second model, if staff insist on not using software/hardware (F1) (with the coefficient of 16), the lack of electronic communication (F2) is low (with the coefficient of -1), Electronic learning (F3) is high (with the coefficient of 6), the use of social networks (F4) is very high (with the coefficient of 9), and electronic Job (F5) is relatively high (with the coefficient of 4), the efficiency of employees in these conditions will be as such: Lack of monitoring and reaction (B1) is low (with the coefficient of -1), lack of monitoring and reaction (B1) as well as inefficiency (B6) is low (with the coefficient of -1), organizational support (B2) is relatively high (with the coefficient of 4), cooperation and implementation (B3) is relatively Low (with the coefficient of 2), competitiveness (B4) and efficiency (B5), with 8 and 12 coefficients respectively are very high, and in last lack of career mastery (B7) is very large (with the coefficient of -10) are anticipated.

The third model, if staff using software/hardware (F1), the use of social networks (F4), and electronic Job (F5) are very high with the coefficients of 10, 6, and 12 respectively, and on the other hand, the lack of electronic communication (F2) and lack of electronic learning (F3) are very high (each with the coefficient of -8), the efficiency of staff is evaluated as such: monitoring and reaction (B1) and career mastery (B7) is relatively low (each with the coefficient of 2), competitiveness (B4) and organizational support (B2) and performance (B6) are very high with coefficients of 2, 12, 7 and 6 respectively, lack of cooperation and implementation (B3) is relatively low (with the coefficient of -5), and lack of practicality (B5) is very high (with the coefficient of -13).

		Fundar	nental st	ructure		Fundamental	weights			Weig	ht rati	05	
Independent variable S	ym.	V1	V2	V3	V4	V1	V2	V3	V4	V1	V2	V3	V4
Age A	.) (0	0.122	-0.333	-0.237	-0.5282	0.06813665	-0.035333655	-0.067455611	0.044634381	0	0	0	0
Experience	k (	0.027	-0.320	-0.071	-0.7618	-0.032951	-0.048738691	0.0659021116	-0.165071606	0	0	0	-1
Software/hardware F1	1	0.758	-0.284	0.4508	0.3175	0.89340266	-1.658788126	1.0276806454	0.3669959192	8	-16	10	e
Electronic F2	2	0.433	0.0097	-0.182	0.3810	0.01024246	-0.119227962	-0.82008774	0.9767728632	0	-1-	8-	6
communication													
Electronic learning F3	3	0.827	0.0428	-0.092	-0.0506	0.91953512	0.6601950525	-0.817876621	-0.831276451	6	6	-8	-8
Social networks F4	4 (	0.625	0.4235	0.3567	-0.1102	0.16951815	0.9501000821	0.6009807608	0.026235686	1	6	6	0
Electronic Job F5	2	0.044	0.3698	0.5139	0.1928	-0.419306	0.4795124326	1.297469579	-0.135199189	-4	4	12	
Dependent variable Sy	ym.	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4
Monitoring and reaction B1	1 (	0.325	-0.245	0.1042	0.5403	-0.19988637	-0.008955643	0.2133758739	0.325996724	-1	-1	2	e
Organizational support B2	2 (	0.783	0.3418	0.4141	0.0678	1.048485066	0.4230755139	1.211132173	-0.76719553	1	4	12	-7
Cooperation and B3 implementation	е е	0.465	0.1364	-0.132	0.7984	0.118847150	0.2893474616	-0.553908318	1.475802677	1	2	-5	14
Competitiveness B4	4 (	0.134	0.4512	0.4659	0.4684	-0.51155043	0.8261035512	0.7918446722	0.609570296	-5	8	7	6
Practicality B5	5	0.506	0.4821	-0.443	0.1353	0.145517143	0.2170621732	-1.39901473	-0.16362494	1	12	-13	-1
Performance	6 (	0.588	0.0257	-0.159	0.0670	0.365309816	-0.10931526	-0.62901808	-0.58953443	3	-1	6	-5
Career Mastery B7	2	0.761	-0.313	-0.012	0.2154	0.955296870	-1.35979597	0.2504985474	0.250751441	6	- 10	2	2

In the fourth model, efficiency based IT variables is formed as follows: If staff are with very few experience (work) (with the coefficient of -1) in an environment with very low Electronic Job (F5) (with the coefficient of -1), using relatively high software/hardware (F1) (with the coefficient of 3), very large electronic communication (F2) (with the coefficient of 9), and lack of very high electronic learning (F3) (with the coefficient of -8), the efficiency is explained and justified as relatively high monitoring and reaction (B1) (with the coefficient of 3), very high lack of organizational support (B2) (with the coefficient of -7), very high cooperation and implementation (B3) (with the coefficient of 14), relatively high competitiveness (B4) (with the coefficient of 6), very low practicality (B5) (with the coefficient of -1), lack of good performance (B6) (with the coefficient of -5), and low career mastery (B7) (with the coefficient of 2).

In general, findings show that if the use of software/ hardware and electronic learning is at very high level, the career mastery of staff will be also high. On the one hand, the heavy use of social networks is followed by the high efficiency of staff and on the other hand, the very much use of software/hardware and high electronic job are followed by high organizational support and high competitiveness. But they cause a great inefficiency and at last, high electronic communication has caused a huge increase in cooperation and implementation and in turn, the reduction of organizational support and efficiency. Thus, in this study, efficiency is introduced as an optimal model of a contingency model (four) influenced by information technology.

#### DISCUSSION AND CONCLUSION

Any society needs different organizations to realize its own objectives, also the correction and betterment of any organization is in line with the attention to the individuals in that society that is effective in efficiency and betterment of using organizational IT. In this regard, this study seeks to study the relationship between efficiency and IT.

In the present study, the existence of relationship between IT and efficiency was confirmed and other researches in line with this research such as: Darvish Khezri and Rouhani Fard (2014) that in their study there was a significant relationship between efficiency of work force and information technology. In the study of Esfandiari and Biat (2013), there is a relationship between organizational commitment and the amount of use of staff of the information technology with efficiency and this is a positive significant relationship. The results of Hosseinpur and Karimi Jaafari (2012) showed that ICT has a positive relationship with labor efficiency. Bozorgi (2012) has concluded that ICT and human resource efficiency are related to each other. Imani, Sharifi and Vafamanesh (2011) concluded that there is a significant relationship between using IT and the efficiency of human resource. The following researches are in line with the research results of the present study: Afsheh, Kianfar and Ali Shaeidi (2011), Faryany and Tajvidi (2011), Sanjera and Gonjalez (2010) and Kim (2009). In the present study, the convenience sample is being used, so it is necessary to generalize the results with caution.

## RECOMMENDATIONS

- ✓ It is suggest conducting such studies in other areas so that the population includes a greater number of managers with a variety of individual characteristics and compared with existing research.
- ✓ The study only benefits questionnaire to gather data of the population. It is better to use other data gathering tools for the information technology and efficiency such as observation, interview and standard questionnaires as well to strengthen the research results due to the process of the research.
- ✓ It is suggested comparing the relationship between IT and efficiency in different organizations in order to strengthen efficiency theory.
- ✓ It is suggested suing the available findings based on the findings Seventh question (last) in order to strengthen the efficiency factors in the population.

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# Students' marriage age increase, affecting factors and priorities

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# ABSTRACT

The purpose of research is to identify and prioritize the factors influencing the increase in age of marriage among students of Islamic Azad University of Islamshahr. Methods: This study was descriptive survey and the statistical population was Islamshahr Islamic Azad University students at the second semester of 2015-16 academic years among whom 350 students were selected based on the sample size estimation table of the Morgan and Kerejcy populations as stratified random sampling. The information gathering tool was the self-made questionnaire including 31 components according to the 5-points Likert scale with 0.89 reliability based on Cronbach's alpha. Descriptive inferential statistics and single-group Z inferential test were used to analyze the data. Results: The results showed: First, all Z score agents are more than critical Z score in confidence level of 0.99 and  $\alpha / 2$  (2.58) = 0.01 and the second, The existence of the phenomenon of unemployment, the society approach to increase the level of education, the fear of the spread of aristocracy culture, extreme emphasis on the nobility of the two parties, changing the criteria for an easy marriage, fear of supplying suitable supplies for life, and the difficulty of families' deal as a result of complex social relations are as the most important factors in increasing the marriage age of students more than cultural phenomena and social values.

KEY WORDS: STUDENTS, ISLAMIC AZAD UNIVERSITY, MARRIAGE AGE INCREASE, PRIORITIZATION, AFFECTING FACTORS

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#### INTRODUCTION

Islam is a religion of culture and in the Islamic culture, the pivot of reforms is the culture. Culture is the extract of social life and it is y culture that the person is linked and coordinated to the people around at various dimensions and is identified and determined of the other societies. Certainly, the existence and survival of human beings and societies is related to the culture (Fazl Ellahi Ghomeshi, 2013). Universities and students are of the most important cultural elements of the society that play a major role in the structure of society by creating knowledge and the promulgation of culture and ways of life. Marriage and families are of the symbols of Islamic culture as an inevitable necessity not only for psychological and physical comfort of the people, but also to strengthen values and family institution, social health and a fortunate for excellence, purity and pure life. Therefore, the timely marriage of students not only emphasizes the adherence to culture and values but also, the sanctity of the pure and scientific environment of the university is also specification. Marriage (Ezdevaj) is made up of the word "Zoj" meaning as couple and pair. In fact, a person who has been alone and single tries to form the smallest unit of the society as the family and marriage can be known as a social contract based on compromise and compromise between the man and the woman and the stability of the society (Biabangard, 2002).

In the Qur'an's view, marriage is the source of peace of the human spirit and is a great sign of God's mercy and grandeur (Rome Sura: 21). Marriage is an intimate relationship between man and woman for a long time and this relationship is not to satisfy the immediate desires but the future life and the happiness of men and women and their children are formed based on this relationship. There is a need for constant compromise and high level of sacrifice in the marriage but if the man and the woman have more compromise before the marriage, there is a possibility for higher compromise after the marriage (Ahmadi Monfared, 2008).

Marriage is a process of interaction between man and woman held under Sharia and customary legal ceremonies the loyalty to which is accepted by Sharia and social laws and organizations (Ibid: 20). Marriage is an action that causes the interaction between the two sexes based on the constant sexual relationships; therefore, the relationship between two people of the same sex is not considered as marriage whether contemporary or permanent and o the other hand, in the marriage definition, the mere physical relationship between the opposite sexes does not seem sufficient since marriage requires a social agreement that causes the legality of the physical relationships (Sarookhani, 1991). Karlsson shows marriage as a process of mutual action between two people, a man and a woman, that realizes some legal conditions and holds a ceremony for their marriage and generally, their activity is accepted by the law as the marriage (Karlsson, 1963).

Marriage and marital issues has been one of the most important issues of human life during history. Therefore, this issue has been considered by different scientific fields as sociology, law, economics, psychology, philosophy in addition to religions. Thus, any change and transformation in society will cause changes in the family institution by considering the importance of the family as one of the major institutions of society.Increased marriage age for girls and the phenomenon of certain spinster among them is among the cultural and social changes that are resulted in large changes occurred in the society. Increased marriage age phenomenon is not only observed in Iran but also in postindustrial developed countries like the United States of America, so that on the basis of existing studies, the age of marriage in this country has outstandingly increased since the mid-1960s among its population (Loughran and Zissimopoulos, 2004).

Marriage time and family formation is influenced by several factors. The development and modernization in the new world has caused the change in the time of marriage and its delay with the rapid and considerable change of the individual's economic and social conditions. The collapse of wide family systems, the replacement of industrial and business trading instead of traditional agricultural economy, the complexity of social labor division, the expansion of public education and more involvement of women in economic and social activities outside the house are factors that contribute to delayed marriage (Mahmoudian , 2004).

The increase of the population growth rate is among the factors that has catalyzed the increase of marriage age and the occurrence of certain spinster phenomenon. On the other hand, it should not be neglected that the increase of marriage age and the certain spinster phenomena cause disorder in the natural function of the family institution and consequently, we will naturally face the destroy and the threatening of mental health, the creation of inhibiting dams and barriers in the way of mental growth and sublimation, the occurrence of mental and social diseases and disorders such as depression, anxiety, addiction and social crimes, wasting the massive energy of people that prevents social growth and sublimation, the increase of the age differences between children and parents and interest and perspective gaps between the two generations within the family (Soltanpoor, 2000).

According to this important factor and the emphases of the Islam humanitarian school on timely marriage of

youths constantly as the cause of the mental peace and physical comfort; "And of His signs is that He created for you from yourselves mates that you may find tranquility in them; and He placed between you affection and mercy. Indeed in that are signs for a people who give thought" (Rome Sura: 21). According to the necessity of creating a healthy and pure environment for thinking and producing knowledge and the promulgation of the culture and societal values at universities as the center of thinking and knowledge production the most important factor of which is students and their physical and intellectual health is considered as the environment creation and learning experiences for the knowledge production. The students' marriage at proper ages will cause the succulence at universities and the focus of exactness on scientific objectives. Therefore, the researchers are after providing the possibility of cultural and managerial curriculum for having developed and Islamic valued-based universities by identifying and prioritizing the affecting factors of the students' marriage age increase.

### INHIBITING FACTORS OF MARRIAGE

Any factor that causes the lack of the formation of marriage of girls and boys or delays the marriage is called the inhibiting factor of the marriage (Dezhakam, 2004: 108). These factors include: economic problems and false customs and formalities, false freedoms and escaping responsibility, military service of boys, the problem of housing, fastidious and possessiveness in mate selection, poverty (Biabangard, 2002: 94), disrupting the balance of boys and girls ready to get married because of migration from the villages for the purpose of university education (Sadeghian, 2001: 5), sexual deviation and adultery, male impotence and female undersexed, intense love relationships as falling in love, the lack of coordination of social and economic status of the two parties' families, time lapse and aged boys or girls, relative incent, high intellectual difference between the boy and the girl, ideological and religious differences and so on (Dezhakam, 2004). Sometimes these factors can be overcome and are not majorly important and such as poverty, education time and so on and sometimes, these factors cannot be overcome and there is no possibility for marriage such as love relationships, the intense educational and economic differences and the lack of the complete compromise of the both parties' families (Dezhakam, 2004). The age of marriage is one of the important indicators to evaluate the physical and mental health of a community (Murayama, 2001). In our country that religious norms enjoy a favorable popularity among people, it carries the domain of the effect of the marriage age to new generation behavioral and cultural identity fields. A significant increase in marriage age after centuries of early marriage experience is considered as important phenomenon in social changes (Hajnal, 1965: 48).

Marriage and family formation is one of the issues discussed by various religions, philosophers, sociologists, psychologists, scholars, educators, poets, writers and artists. In marriage and family formation, goals and motivations such as the human desire for the continuity of generations, spiritual and economic needs and requirements are involved that have been varied in different periods of human history (Caldwell, 1981). But what nowadays is the main challenge of Iranian society among young people is the increase of the age of marriage; young people, who do not find the opportunity to marry, young people who are isolated due to wrong social traditions and also young people who like to be single for a long time of their lives. These and other factors have changed the marriage age phenomenon as a problem. It worth mentioning that the consequences of this phenomenon (marriage age) can cause the increase in anxieties and stresses and the prevalence of depression and behavioral disorders and sexual vulnerability. By the lapse of the exciting period of life, it decreases the motivation for marriage and discourages the aged girls to form families (Azad Armaki, 2007).

Besides that, the marriage age increase and certain spinster sends out the marriage of the legal and normal circulation and threatens the security of the family which is in line with other damages as the increase of divorce due to illegitimate relationships (Gidenze, 2007). On the other hand, specific problems such as huge dowries, huge amounts of jewelry payment, various gifts and costumes and glamorous wedding celebrations, renting, mortgage or house purchase, pregnancy and parenting and dozens of other family, economic, social and cultural problems face young people (Eskandari Cherati, 2008). Simultaneous with economic and social changes such as urbanization, education, creation of new jobs and the emergence of various classes, the family system and the governing norms can be seen in the changes in marriage age (Kana'ani, 2006).

Considering the importance of the issue, the increased marriage age seems to be more important from different cultural, political, economic, social and even security for people when it is related to the open minded students of universities. Students are the thoughtful and cultural capitals and future leaders and managers of the societies who have the mission of knowledge production, culture development and cultural services to people and certainly, thinking method and their interpretation can have various effects on the society. Student marriage phenomenon will be the provider of physical and mental happiness and the background provider of the health and the purity of the sacred environment of the university to produce knowledge and endeavor to reach individual and social sublimation peaks; an objective that the Supreme Leader of Iran institution tries to realize in order to realize the pure life at universities by providing the cultural background and giving financial services and loans in the recent years.

Despite all these efforts and in the way of the God's satisfaction, the student marriage age also needs more investigation according to realities in order to have effective planning to reach the goals with proper reasoning. The review of literature and websites and credited information services of the country show that descriptive researches based on the data analysis are very few although the researches in the related domain are not few some of which are mentioned below.

Karimlu et al (1999) compared the change trend of the age of the first marriage of women in Tehran province with all the country based on the information of the National Health and disease project in Iran and analyzed it based on Bras 8 method.

The results show that marriage ratio in all age groups, and especially in 15-19 years age group, has completely decreased and generally, marriage age has increased across the country as well as Tehran province. In a study entitled as "the age of marriage is rising: the study of supporting factors", Mahmoudian (2004) found that recent marriages happen at higher ages and education, urbanization, the cooperation of women as labor force, freer marriages, sexual equality and the relative relationship of the couples have direct effects on the marriage age. In a study entitled as "the evolution of women's marriage age in Iran and the population factors affecting it based on attributive study and descriptive-analytical research method", Kazemipoor (2004) concluded that there is a relationship between marriage age, literacy, education, ethnicity, urban and rural residential areas and generally the socio-economic status of people. Moreover, the age structure of population (the disproportion between unmarried men and women) are among the influencing factors on the variations of the age of marriage in Iran.

In a study, Nikmanesh and Kazemi (2006) studied the effective factors on the marriage age increase among the youth and the influencing solutions to come over this problem and showed that marriage opportunities have been more available for girls with delay in marriage than boys and girls have known the main reason for their failure to getting married as not finding a loved one and continuing education. Boys have introduced economic problems and unemployment as barriers to marriage. Hope for marriage in the future is higher in boys than girls. Also, they showed that boys and girls know reducing expectations of their parents as a solution to marriage problems. In the second priority, boys and girls have introduced the overcome of economic problems and unemployment as the solution. In a study entitled as "the study of the reasons and effects of the marriage age increase among rural girls in Ashtian", Majduddin (2007) concluded that family is of great importance in terms of effectiveness on its members and on different levels of society and the cause of the family is marriage. So, the health of the society and family is related to a healthy and permanent marriage.

Also, social factors and problems caused by this such as poverty and unemployment will cause to the migration, marriage and the permanent residence of the rural boys in cities and the lack of sexual balance in the village, so that it causes the increase in the number of the single girls in the village and the delay in their marriage age followed by the increase of the damages and social deviations. In a study entitled as "Marriage Age; increase factors and the strategies to decrease", Rajabi (2007) has introduced the increase of the marriage age as one of the important issues of the human society because by the increase of the marriage age, the youths are deprived of the normal sexual instinct satisfaction way and its consequences and benefits.

In past societies, boys and girls got married at puberty or shortly thereafter and staying single was considered a social shortage. But with more complexity of societies and the creation of false desires and motivations, the social tastes changed and as a result of this taste changing, the natural and instinctive need for marriage was repressed and this process has gone so far that today in some Western societies, young people have totally refused marriage and regarded it as a barrier to their freedom. They will turn to marriage only in time that they lose their youthful vitality and require a caregiver. Unfortunately, this wrong culture has also affected Islamic societies, including our Islamic community, so that the increasing age of marriage has caused many problems in the country. Problems such as depression and loss of vitality among the youth, obsession in choosing spouse, the problematic and unmarried elderly children at home, increased anxiety especially in girls, uncertainty, loss of freshness and beauty, hopelessness and deciding to not to marry for reducing the desire for marriage, carelessness in selecting a spouse, the risk of diversion, and dozens of such problems that challenges many of our youth.

In a study entitled as "the criteria for choosing the education level of spouses and comparing it among male and female students", Forodastan et al (2008) concluded that the education level of spouse is very important in the view point of students and is one of the spouse selection criteria. Moreover, there is a significant difference between male and female students in the education level of spouse. The girls showed the highest the tendency towards the higher education level of spouses and boys showed the lowest tendency towards the higher education level of spouses. According to the results of this research, there is this formal attitude in the society that the education level of men should be higher than his wife. Moreover, statistics show the increase in the number of the girl students at universities compared to boys.

This trend can cause the increase in marriage age of youths and especially in the number of single educated girls in the societies. Some strategies are recommended in the way of reforming the current attitudes. In a study entitled as "the assessment of the youth attitude towards marriage and the recognition of its consequences and effects", Kazemipoor (2009) concluded that in Iranian society, the family institution and the interactions among its members has not developed as long as the growth and the development of industrialization and urbanization. In this regard, divorce has been higher among the people with lower social status. Finally, according to the interaction view, most youth have pay attention to rational selection for spouse selection and the attitude towards marriage has changed to a rational selection among young people.

In a study entitled as "the study of the effect of cultural factors on marriage model in Shiraz", Kazemi and Niazi (2010) concluded that the marriage model is more modernized by the increase of the developmental idealism of individuals. Moreover, gender, age, value priorities, income, education levels and the level of using mass media tools have had a meaningful relationship with marriage model. Based on the multi-variate regression results among all the independent variables, gender variables, developmental idealism, the level of using mass media tools, age, value priorities and income explain 73 percent of the changes of dependent variable. The gender variable has the highest effect on the marriage model. In a study entitled as "the study of the effecting factors on the marriage age of women in Iran; an economic approach", Zarabi and Mostafavi (2011) stated that marriage is a social, demographic and economic phenomenon and the marriage age is a good indicator to study it. The research results prove the positive effect of education level on the marriage age of women. Moreover, the urbanization variable shows negative effect in general compared to being rural. The difference of marriage age is also seen among different ethnic groups. Also, the results show that marriage age is lower among families of higher economic classes and finally, marriage age faces an increasing trend among recent age groups compared to the past.

In a study entitled as "Effect of socializing with the opposite sex before marriage on marriage age and willing to marry among students of Tehran University", Farahani Khalajabadi et al (2011) concluded that the experience of advanced sociability before marriage is one of the determinants of late marriage among students after controlling for sex and economic status and family culture so that the experience of advanced sociability with the opposite sex before marriage delays the marriage about 2 years. Also, this sociability has a more significant relationship with marriage among girls and less significant relationship with marriage among boys. In a study entitled as "the reasons of girls' marriage age increase among single girls and married women from 25 to 44 in urban centers of the country", Habibpoorgetabi and Ghaffari (2011) concluded that girls who marry later have higher education, have supernal attitude towards marriage and believe that the costs of the lost opportunities with marriage is higher than marriage opportunity.

On the other hand, if the society condition, whether economically or socio-culturally, is not ready to accept such changes, its negative consequences would be more than its positive ones. In a study entitled as "An introduction to the statistics of young people marriage in Iran with the analysis of divorce and marriage statistics and the explanation of the major barriers to marriage", Bankipoorfard et al (2011) concluded that cultural barriers have more effects than economic barriers but they are less paid attention to. In addition, the marriage growth rate has decreased despite the population growth and divorce rate has significantly increased. In this condition, the marriage age average has increased especially among girls.

The result is that the marriage of peers, training life skills at various levels, permanent monitoring and special attention of managers to planning and a national commitment to solve this problem are of the ways out of this critical situation. In a study entitled as "the relationship between women's education with their marriage age increase and preventing strategies emphasizing Islamic approach", Mirsondosi and Mohammadi Qale Sefidi (2011) concluded that there is a significant, negative and inverse relationship between the education of the married women and the economic expectation level of Tehran girls. In other words, the higher their education level goes, the less their economic expectations are. There is a direct and positive relationship between the education of the married women and the social pressures level so that the higher their education level goes, the higher is the level of social pressures and the person is more willing to get married. In a study entitled as "the economic and social factors related to the marriage age increase in Kermanshah",

Moradi and Saffarian (2012) showed that there is significant relationship between the variables such as the people's attitudes towards gender equality, democratic parenting style, authoritative parenting style, education and enjoyment of being single, the strictness of parents and expectations. The results of the regression show that the use of media, parents' intervention, parenting style, sexual inequality, housing and self-confidence are respectively important in the explanation of the dependent variable that have entered the regression equation. Taken together, these variables have explained and predicted the marriage age from the conceptual atmosphere of the dependent variable.

The results of Hosseini and Geravand (2013) as "the assessment of the factors affecting the behavior gap and attitudes of women to the appropriate age for marriage in Koohdasht" indicate the fact that there is better explanation of gap in behavior and the attitudes of women towards appropriate marriage age from the socio-economic, demographic, and cultural and ethnic background characteristics. Fazl Elahi Ghomeshi and Maleki Tavna (2013) in "mate-selection culture among students: criteria and priorities" indicated that mental and intellectual health has the highest priority and political view is of the least important criteria among students and modesty and family and personal decency, having marital honesty, moral agreement between the spouses, security and peace in life, reliability, high sense of responsibility, physical health and cultural and educational fit between the spouses were the most important criteria for mate selection among university students respectively. The correlation between students' ranking of two universities was significant. They concluded that students pay minor attention to mundane and physical characteristics compared to spiritual factors that is in more coordination with cultural and Islamic teachings.

The realistic analysis of the previously mentioned researches show that the researches in coordination with the objectives of this research have been very few and the conduction of this research in the sacred city of Qom and via referencing students emphasize its uniqueness. However, the identification and prioritization of the effecting factors on the marriage age of students is not been previous observed with the presented trend.

#### RESEARCH METHODOLOGY

The research method is practical in terms of purpose and it is a descriptive survey in terms of data collection. The statistical population consisted of all students of Islamshar Islamic Azad University in the second semester of 2015-16 academic years as about 7,000 according to authorities. The sample included 350 people who were selected based on the sample size estimation table of the Morgan and Kerejcy populations (quoted in Hasan Zade, 2004) as stratified random sampling. The information gathering tool was the self-made questionnaire including 31 components according to the 5-points Likert scale with 0.89 reliability based on Cronbach's alpha. Descriptive inferential statistics such as mean, standard deviation and dispersion coefficient and inferential statistics such as single-group Z test were used.

#### RESULTS

The above table shows the status of the collected data about the effecting factors on the marriage age increase among students and its prioritization in their view. According to the information, all the studied criteria of Z score are higher than table Z at the confidence level of  $\alpha$  / 2 (2.58) = 0.01 and 0.99. According to the significance of the average difference with the average of the expected gained score (3) with 99% reliability, it can be concluded that 31 components of the studied components are acceptable and favorable. In accordance with the data, the highest average (4.35) was related to component 2 (the unemployment among young people) is located in the first position of the second with dispersion coefficient of 22.03 and after that, component 1 (the increase of higher levels of education among youth) is placed in the second position with the mean of 3.84 and dispersion coefficient of 22.09 and component 7 (the phenomenon of high cost of living for young people)is placed in the third position with the mean of 4.26 and dispersion coefficient of 23.71.

The lack of income for marriage among young people, the fear of the phenomenon of failure in life among youth, the expansion of multiplier culture and pride and aristocracy among youth, the excessive emphasis on the nobility of the parties, changing standards of marriage from easy to difficult, the phenomenon of rivalry to supply equipment for life and the difficulty of full agreement of the two sides families are in grades four to ten respectively.

According to the students of Islamic Azad University of Qom, military service of boys, gender equality among young people, the excessive emphasis on the age agreement of the couples, the emphasis is on having the vehicle before marriage among young people, reducing the desire for marriage, the emphasis of parents on choosing spouse among relatives and having elder single brother or sister as a barrier to marriage were known as the least important components from 25 to 31 respectively.

#### DISCUSSION AND CONCLUSION

Today, the mission of universities in knowledge production, culture, influencing the public culture and providing services is considered as vital the tools of which are behavioral patterns and information including teachers, administrators, staff and the audience. The univer-

Tab	le 1. Prioritizing the factors affecting the marriage age increase among	students						
		$\sum X$	X	n	S	Z	V	R
1	The society approach in the increase of higher education	883	3.84	230	0.88	23.1	22.9	2
2	The unemployment among youth	1001	4.35	230	0.96	29.3	22.03	1
3	The expansion of free relationships between boys and girls	808	3.54	228	1.23	12.83	34.66	21
4	The fear of providing appropriate equipments of competitive life	889	3.88	229	1.12	18.68	28.84	9
5	The parents' emphasis to choose spouse among relatives	632	2.76	229	1.1	3.58	39.85	30
6	Contractive form of dowries between families	769	3.39	227	1.13	11.85	33.32	17
7	The change of the criteria of easy marriage	820	3.66	224	1.06	16.47	28.82	8
8	The fear of the increasing costs of living	962	4.26	226	1.01	26.17	23.71	3
9	The military service of boys	785	3.46	227	1.26	11.46	36.41	24
10	The obsession in religious beliefs of both sides	689	3.06	225	1.06	7.96	34.58	20
11	Idealism and the belief to free life among youth	734	3.26	225	1.17	9.79	35.8	23
12	The emphasis on financial independence and the income of both sides	822	3.62	227	1.14	14.77	31.57	14
13	The lack of boy and girl proportion due to urbanization	711	3.13	227	1.19	8	37.99	28
14	The excessive obsession in choosing spouse	808	3.56	227	1.12	14.29	31.38	13
15	The difficulty of family agreement due to the complexity of social relationships	801	3.54	226	1.08	14.55	30.45	10
16	The lack of sufficient income of the youth	959	4.19	229	1.07	23.87	25.55	4
17	The lack of trust to the other party due to the increase of crimes and deviations	771	3.43	225	1.16	11.99	33.83	19
18	The excessive emphasis on the age agreement of the couples	740	3.29	225	1.23	9.63	37.36	26
19	The intensity of gender pride due to the increase of gender equality in the society	673	3.05	221	1.14	7.14	37.28	25
20	The lack of supportive laws and institutions for marriage	832	3.68	226	1.21	14.69	32.85	16
21	The lack of tendency to permanent marriage among youth	787	3.45	228	1.33	10.82	38.48	29
22	The cultural and value emphases of the society in the marriage of siblings in the order of birth	724	3.25	223	1.32	8.44	40.69	31
23	Attention to the occupation of the boy's or girl's parents	766	3.42	224	1.21	11.37	35.39	22
24	The decrease of trust to the opposite sex in the society	840	3.8	221	1.17	16.53	30.79	11
25	The excessive emphasis on having family nobility for the both parties	834	3.79	220	1.07	17.91	28.21	7
26	The excuses of parents for choosing spouse based on their will (not their youths)	759	3.4	223	1.14	11.81	33.56	18
27	The conflict in decision making between marriage and education	765	3.45	222	1.24	9.3	37.89	27
28	The emphasis on having house and car before the marriage	727	3.27	222	1.24	9.3	37.89	27
29	The emphasis of the society on traditional criteria for marriage	791	3.53	224	1.1	14.08	31.03	12
30	The fear of the failure in marital life	874	3.92	223	1.04	20.45	26.45	5
31	The expansion of aristocracy culture among youth	852	3.86	221	1.07	18.77	27.84	6

sities affect not only the person development but also the living methods of the people of a society through the emergence of internal efficiency (giving sufficient knowledge, insights and ability) and external efficiency (employment and quality of life) through the development of information, skills, character and development of creativity and thinking (Fazl Elahi Ghomeshi and Maleki Tavana, 2013).

They want to teach life methods to students as a soft and inflexible social system and affect the culture of the society. Attention to the marriage age increase among students is also one of socio-cultural phenomena that universities are faced with as their mission in order to have a completely scientific and pure environment and free of intervening factors for learning the thinking method or learning the learning and problem solving method and creativity in the production of science as the most important capital of the countries in the current era scientific competition and influencing the public culture. The results of the present study with the aim of the identification and prioritization of the effective factors on the marriage age increase among students of Islamshahr Islamic Azad University showed that: unemployment, the increase of the education level the increase of the living costs are of the most important and effective factors of the marriage age increase among university students respectively.

These results are partly consistent with the research results of Habibpoorgetabi and Ghaffari (2011), Zarabi and Mostafavi (2011), Kazemipour (2009), Forodastan et al (2008), Majduddin (2007), Nikmanesh and Kazemi (2006), Kazemipour (2004) and Mahmoudian (2004) in terms of economic factors and higher education and are congruent with the research results of Mirsondosi and Mohammadi Qale Sefidi (2011) and Farahani Khalajabadi et al (2011) concerning the impact of cultural factors including the pre-marital relationships between girls and boys. The major reason seems to be mostly the environmental conditions prevailing in the holy city of Qom. Also, the components of the lack of income for marriage, the phenomenon of fear of failure in life among youth, the expansion of multiplier culture and pride and aristocracy among youth, the excessive emphasis on the nobility of the parties, changing standards of marriage from easy to difficult, the phenomenon of rivalry to supply equipment for life and the difficulty of full agreement of the two sides families are in grades four to ten respectively.

The other effective factors on the marriage age increase from 10 to 20 priorities are: the decrease of trust to the opposite sex in the society, the emphasis of the society on traditional criteria for marriage, the excessive obsession in choosing spouse, the emphasis on financial independence and the income of both sides, the conflict in decision making between marriage and education, the lack of supportive laws and institutions for marriage, contractive form of dowries between families, the excuses of parents for choosing spouse based on their will (not their youths), and the lack of trust to the other party due to the increase of crimes and moral deviations.

In contrast the following components have the least importance among youth: the obsession in religious beliefs of both sides, the expansion of free relationships between boys and girls, attention to the occupation of the boy's or girl's parents, idealism and the belief to free life among youth, the military service of boys, the intensity of gender pride due to the increase of gender equality in the society, the excessive emphasis on the age agreement of the couples, the emphasis on having house and car before the marriage, the lack of boy and girl proportion due to urbanization, the lack of tendency to permanent marriage among youth, the parents' emphasis to choose spouse among relatives and the cultural and value emphases of the society in the marriage of siblings in the order of birth. This shows a kind of the priority of economic criteria compared to cultural and social and especially moral issues and social values and sometimes, some anti value issues are made more important in social discussions. The results can reveal the fact that the cultural and social values derived from dominant philosophy are more important among students despite the increasing effects of economic factors on marriage.

#### RECOMMENDATIONS

- 1. In order to have a healthy, happy and far from intellectual and cultural pollutions and the adherence to Islamic traditions and rules at universities, it is suggested to conduct a large research with precise components for planning and the prerequisites of easy marriage of students as one of the major concerns of the authorities in Supreme Leader of Iran institution.
- 2. Due to the consolidation of Islamic culture and values through planning based on basic knowledge, the values and symbols of mental, physical, intellectual and cultural health of students should be retained and the background for the production of more knowledge should be provided.

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# Comparison of cognitive performance (attention function, active memory and problem solving) between male and female students

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## ABSTRACT

The aim of this study is to compare cognitive performance (attention function, active memory and problem solving) in high school students of Ilkhechi, Iran. This study is causal-comparative research. The study population included all male and female students of Ilkhechi that its number was 376. The samling method was cluster random sampling method. Sample size was 100 subjects. To gather information used computerized questionnaire include Continuous Performance Test (CPT), a computerized test Wechsler active memory (WAMS). For analysis of results used independent t-test and analysis of variance. The results showed that There was a significant difference between the performance Attention, (right Attention, presents a false and removed answer), audio-visual active memory and problem solving in boys and girls. Those in girl correct Attention performance and removed answers are more than boys and presents false in boys better than girls.

**KEY WORDS:** COGNITIVE FUNCTION, ACTIVE MEMORY, ATTENTION

#### **INTRODUCTION**

Among the prerequisites Academic and social learning in students, are sustained attention, active memory and problem solving. These skills are excellent cognitive abilities in daily activities and assignments to help stu-

#### ARTICLE INFORMATION:

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Gender differences in cognitive functions in various spheres of psychological and neuropsychological literature are studied. Also recognizing the mental activity involved in the acquisition, processing, organizing and use of knowledge.These activities include cognitive function and its components, including selective attention, perception, active memory, logical reasoning and problem solving is a (Tende et al., 2012), (Ardila, Rosselli, Matute & Inozemtseva, 2011). (Solso, 2008, quoted by shahabi, 2012).

Cognitive function as well as a series of thought processes is lead to understanding and awareness of thoughts and ideas. It includes all aspects of perception, thinking, reasoning and remembering (James, 2014). The most important cognitive domains nerve psychological assessments, including intelligence, memory, attention, working memory, executive functions, perception, language and information processing speed (Ray, dull, Agustina, 2009. quoted by Nazari Badie, 2011). Gender differences in cognitive function are a controversial issue (Taleb and Alheme, 2012).

Attention also is very important in cognitive function, behavioral and mental. Even small attention deficit affects the learning function (Abedi and Jahanian Najaf Abadi, 2010). Attention like a gatekeeper in mind acts, this is by setting and prioritizing stimulus is processed by the central nervous system.Attention components including regulating arousal and care, selective attention, sustained attention, Attention span or divided attention, inhibitory control and behavior (Seidman, 2007). Merritt et al (2007) study found, there are different responses to selective attention tasks between men and women. Research Feng et al. (2011) also showed there is a significant difference between boys and girls in the field of vision Attention. In addition, the Talib and ALhEmEh (2012) showed no significant difference between men and women in selective visual attention.

Active memory contains information recorded in the permanent memory that has already been fully active in the situation. Active memory is one of the most important cognitive processes underlying thinking and teaching (Dan, 2008, Liza et al., 2009).The results of Johnson and Bouchard (2007) on active memory showed that women in general in terms of memory, a better performance than men. The Lamborn (2006), this study showed no significant difference between genders in Active memory capacity. Tende and colleagues (2012) showed that no significant difference between girls and boys in active memory. Harness (2008) in a study found that women were active memory in retrieval tasks better than men.

Problem solving process in which the learner to learn new ways of combining rules to be learned. Problem solving not only the rule, techniques, skills and concepts previously learned in a new situation, but a process that creates new learning (Miyake et al., 2000, Gagné, 1975). Klosia and Lausanne (2004) showed that gender differences to differences in the strategies used in problemsolving orientation leads assignments. In view of the above, this study seeks to answer the question whether is there a difference between male and female students in cognitive performance (attention function, active memory and problem solving)?

# **RESEARCH METHODOLOGY**

The study is causal-comparative studies. Where to compare three variables between the two groups were studied. The statistical population is all students, (male and female high school eighth) Ilkhchi in 2015-2016. Sample size is 376 that 191 girls and 185 boys. The sampling method is multistage random cluster in a gender and equal nomber is chosen. First, the three boy's schools, two schools and three girl's school, two schools were selected from each of four schools selected and 30 subject randomly selected. A total of 120 people, 100 subjects for the final analysis due to the lack of cooperation and the subjects remained.

### **INSTRUMENTS**

#### A. Continuous Performance Test (CPT)

This test by Razvled et al (1956) was designed. In Occupational Therapy Center of Roshd, Sina Software Persian has been prepared by the Institute of Cognitive Behavioral Sciences. The Persian version of the test, 150 units or Persian image as stimulants, and of these, 30 stimulants the target to stimulate others to be considered as inappropriate stimulants. Duration of each stimulant was 200 milliseconds and the distance between the 2 stimulants a second. Time running tests to understand more subjects including training stage before running the main stage will be 200 seconds.

Measures of the test used in this study include:

- 1. Error false declaration (commission error): the target stimulants test, is number 5, the subjects see this number should not press space. False declaration error was the number of times that subjects press number 5 with space key. This is an indication of lack of attention or impulsiveness. In this study of 50 numbers answer is considered efforts.
- 2. Omission errors: stimulants non target in this case the numbers 1 through 9 except the number 5, and subject to see these numbers should press the space bar. Omission errors are the number of times that the subject does not provide these numbers to

the key space. It can also indicate a lack of Attention in this study is considered the fifth attempt of removal response.

3. Attention correct: At this stage, the number of correct answers out of 50 efforts that has to be calculated and the reply with regard to the commission error and omission errors can be considered.

Validity coefficients (retest) different parts of the test are 20 days was carried out on 43 school male students between 0.59 - 0.93. All had significant correlations coefficients were calculated at 0.001. Test validity with criterion validity by comparing two groups normal group and hyperactivity disorder by Hadianfard and colleagues (2000) have been carried out. Statistical comparison of the two groups in different parts of the test showed a significant difference between the performance of the two groups (according to the Narimani and Ismaili, 2012).

#### B. Wechsler Active memory scale (WAMS)

This test is based on clinical scales of the Wechsler Memory Scale numbers and the software is designed. These tests measure memory capabilities of numbers forward and reverse and check short-term memory in children and adults, and runs on an individual basis. In the first step Digit Span Test (forward and reverse) that a series of numbers by computer visually presented to participants then participants should bring that to repeat the numbers and the second step a series of numbers by computer auditory presented to participants then participants should bring that to repeat the numbers.

Measures of the test used in this study include:

- 1. Visual active memory span: the numerical memory span subjects, in both forward and reverse stage for visual is submitted to him. (Total scores from 0 - 12).
- 2. Auditory active memory span: the numerical memory span subjects, in two stages for forward and reverse audio is presented to him. (Total scores from 0 to 12).
- 3. Total score of auditory and visual memory, active memory is obtained from the sum of the scores is from 0 to 24.

Test-retest reliability of this test report is 0.76 (Kamiabi et al., 2014).

#### C. Tower of London (TOL)

The test of the 3 bars (A, B and C) which is located on a base and three colored rings (red, blue and green) is formed. Methods: The subjects are told that you must move the colored beads (green, red and blue) and put them in the right place, with minimal moves are necessary to create a sample form. Scoring methods: based on what the person in an attempt to solve the problem, he is awarded an overall score (more efforts score lower and vice versa).

In this study, based on which efforts done as well as the time of effort, time and time before the start of the next test for a total score provided by the PC software program the test is from 12 to 50.The validity of this test report is accepted and 0.79 (Lezak, 2004; quoted from Mashhadi et al., 2009).

# **RESULTS AND DISCUSSION**

Descriptive indicators (mean and standard deviation) presented in Table 1.

First hypothesis: the correct attention, Presenting false and remove the answered is different in male and female students.According to the results of the study can be said to performance correct Attention, Presenting false and remove the answered between boys and girls are different. And in girls, performance Attention correct and remove answered are more than boys and presentation false in boys more than girls. These results are consistent with findings of Johnson and Bouchard (2007), Lamborn (2006), Tende and colleagues (2012), Mariette et al. (2007) and Feng et al. (2011). In its explanation we can say that In Attention correctly, according to the role and mental ability in girls than boys and their emphasis on detail has led them obtain the correct attention score higher than boys. And Also in remove answered, due to high level of anxiety in girls causes not to sign for the prompt answered This increases the removal rate is high in boys than girls are also to false declaration .It can be said that boys, with more confidence, in the position of official test and judge others try to show themselves as active (Stephen, 2000). The results of Pajars and Miller (1996), showed that boys more than girls in self-Attention and recognition of their performance and activities.

The second hypothesis: Auditory and visual active memory in male and female students differently.

The results show that there is different auditory and visual active memory between girls and boys. Based on the findings, we can say that girls score higher than boys in auditory active memory boys score higher than girls in and visual memory. And this finding is consistent with research results Laussel, Bvshkvl, Pryg and Jagy (2011), Dahlyn (2011), Pickering and chab (2005) and Pickering (2006). In its explanation we can say that Based on brain function, according to Kalat (2007) that girls are stronger than boys in terms of auditory, verbal function and speech. Given that the left lobe of brain in girl more powerful than right lobe and auditory center in left lobe so can be explained girls strong auditory memory than boys.

BIOSCIENCE BIOTECHNOLOGY RESEARCH COMMUNICATIONS
Table 1. Descriptive data on research variables								
	Variable	Sex	Mean	SD	Min	Max	Range	
Performance Attention	Remove Answers	Male	3.22	1.47	00	6	6	
		Female	4.02	1.57	00	7	7	
		Total	3.62	1.56	00	7	7	
	Presenting false	Male	4.20	1.24	2.0	7	5	
		Female	2.24	1.07	00	5	5	
		Total	3.22	1.52	00	7	7	
	Correct answer	Male	42.68	1.78	39	46	7	
		Female	43.64	1.74	39	47	8	
		Total	43.16	1.82	39	47	8	
	Auditory	Male	6.84	2.68	3	12	9	
		Female	8.56	2.04	4	12	8	
		Total	7.70	2.52	3	12	9	
Active Memory	visual	Male	8.80	2.08	3	3	9	
		Female	7.36	2.43	3	12	9	
		Total	8.08	2.37	3	12 9   12 9   12 8   12 9   3 9   12 9   12 9   12 9   12 9   12 9   12 14	9	
	Total memory	Male	15.64	3.38	10	24	14	
		Female	15.92	3.16	8	22	14	
		Total	15.78	3.26	8	24	16	
Problem solving	Problem solving	Male	35.18	7.35	19	47	28	
		Female	30.16	7.61	16	45	16	
		Total	32.67	7.86	16	47	31	

Table 2. Levine test to evaluate the homogeneity of variances study variables						
	Variable	F	DF1	DF2	Р	
Performance	correct Attention	0.004	1	98	0.949	
Attention	Presenting false	1.889	1	98	0.172	
	Remove Answers	0.480	1	98	0.490	
Active Memory	Auditory memory	3.137	1	98	0.094	
	Visual memory	2.344	1	98	0.129	

Table 3. Multivariate analysis to compare dependent variables for two groups.							
Scale		Value	F	Р			
	Pillai's trace	0.429	24.18	0.001			
Wilks' lambda		0.571	24.18	0.001			
Group	Hotelling's trace	0.751	24.18	0.001			
	Roy's largest root	0.751	24.18	0.001			
	Pillai's trace	0.189	11.31	0.001			
	Wilks' lambda	0.811	11.31	0.001			
Group	Hotelling's trace	0.233	11.31	0.001			
	Roy's largest root	0.233	11.31	0.001			

Table 4. One way ANOVA on scores variables in two groups								
Variable	Dependent variable	Dependent variable Sum square DF Mean Square F P						
	correct Attention	23.04	1	23.04	7.369	0.001		
Group 1	Presenting false	96.04	1	96.04	7.703	0.001		
	Remove Answers	16	1	16	6.890	0.001		
Group 2	Auditory memory	73.960	1	73.960	13.012	0.001		
Group 2	Visual memory	51.84	1	51.84	10.05	0.002		

Table 5. Comparison pairs, On scores variables in two groups								
Dependent variable	Group 1	Group 2	Mean difference	SD Erorr	Р			
correct Attention	Male	Female	-0.960	0.354	0.008			
Presenting false	Female	Male	0.960	0.354	0.008			
Remove Answers	Male	Female	1.960	0.233	0.001			
correct Attention	Female	Male	1.960	0.233	0.001			
Presenting false	Male	Female	-0.800	0.305	0.01			
	Female	Male	0.800	0.305	0.01			
Auditory memory	Male	Female	-1.720	0.354	0.001			
	Female	Male	1.720	0.354	0.001			
Auditory memory	Male	Female	1.44	0. 233	0.002			
	Female	Male	-1.44	0.233	0.002			

Table 6.	Descripti	ve pro	oblem so	lving s	scores
problem	Group	N	Mean	SD	Mean SD Erorr
solving	Male	50	35.18	7.35	1.039
	Female	50	30.16	7.61	1.0775

The third hypothesis: problem solving is different in male and female students. According to the results of the study can be said that girls and boys are different in problem solving and organization. And scores in boys are more than girls. And this finding is consistent with research results Klosia and Lausanne (2004), Harness (2008) and the Talib and ALhEmEh (2012). In its explanation can be said that the boys in the ability to organize and consider all aspects of work, are better than girls. And that the expectations of society and opportunities in families give the boys and the risk of childhood trying to follow the boys, but the girls will not be allowed. Lakes and Kimberly (2004) found that self-regulation and cognitive skills training is more effective in boys than in girls. Mythos and colleagues (2009) reported that girls are self-regulating more than boys. Also Genova and Latham (2010) and Walker (2011) found significant differences in the levels of self-regulation. The ability to adapt and learn social skills due to the opportunities that society gives boys that a successful sons, encouraged by the community but If this fails of girls are more to blame.

Table 7. T	Table 7. T test for problem solving scores							
Levene test for homogeneity of variances		Independent t test to compare the means						
Variable	F	Р	Mean differences	Standard Erorr	DF	t	Р	
problem solving	0.461	0.499	5.02	1.497	98	3.352	0.001	

Table 8. O	Table 8. One way ANOVA on scores variables in two groups								
Variable	dependent Variable	Sum square	DF	Mean Square	F	Р			
	correct Attention	23.04	1	23.04	7.36	0.008			
Group	Presenting false	1.96	1	1.96	0.182	0.670			
dioup	Remove Answers	630.01	1	630.01	11.238	0.001			
	correct Attention	306.40	98	3.127					
Error	Presenting false	1053.20	98	10.747					
	Remove Answers	5494.10	98	56.062					
	correct Attention	186608	100						
Totoal	Presenting false	25956	100						
	Remove Answers	112857	100						

Tabl	Table 9. Comparison pairs, on scores variables in two groups							
dep	endent Variable	Group 1	Group 2	Mean difference Groups	SD Error	Р		
corr	ect Attention	Male	Female	-0.960	0.354	0.008		
		Female	Male	0.960	0.354	0.008		
Acti	ve Memory	Male	Female	-0.280	0.656	0.670		
		Female	Male	0.280	0.656	0.670		
Prob	olem solving	Male	Female	5.02	1.497	0.001		
		Female	Male	-5.02	1.497	0.001		

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### Investigating the effectiveness of play therapy in improving cognitive-behavioral symptoms of autistic disorder

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#### ABSTRACT

This study aims to determine the effectiveness of play therapy in improving cognitive-behavioral symptoms of autism. The present research is a pretest-posttest quasi-experimental study design with two experimental and control groups. The statistical population consists of all children with autistic disorder in Mashhad in the year 2009-2010. The subjects (30 boy children with autism) were selected from Tabassom educational center for autistic children through available sampling method and were randomly assigned into two experimental and control groups, each including 15 participants. To this end, a pretest was initially administered for both groups using Childhood Autism Rating Scale (CARS) and then, play therapy was conducted for twelve 45-minute sessions with the experimental group and finally, a posttest was implemented. In analyzing the data, analysis of covariance was applied. The research findings demonstrated that at the end of play therapy sessions, the experimental group compared to the control group showed significant reduction in total scores obtained in Childhood Autism Rating Scale (P=0.05). In other words, play therapy is effective in improved cognitive-behavioral symptoms of autistic disorder.

**KEY WORDS:** PLAY THERAPY, COGNITIVE-BEHAVIORAL SYMPTOMS, AUTISTIC DISORDER

#### **INTRODUCTION**

We live in an age when children's disorders and diseases are considered by families, specialists and health systems more than any other time. A child who is born has the highest and fullest growth potential. He is created at his

#### ARTICLE INFORMATION:

\*Corresponding Author: Received 27<sup>th</sup> Dec, 2016 Accepted after revision 2<sup>nd</sup> March, 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 <sup>®</sup> A Society of Science and Nature Publication, 2017. All rights reserved. Online Contents Available at: http://www.bbrc.in/ best and has the readiness and capacity to be trained in the most appropriate way and achieve the highest perfections. Children's nervous system like adults' nervous system has not reached full development since growth continues and in other words, children are changing and evolving; thus, their behavior is always changing. Given

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that children depend heavily on parents and others and are immature in terms of physical and mental capabilities, the only thing they can do in the face of pressures and discomforts is the incidence of behavioral disorders. Indeed, the child's behavior is his expressive language. The more problems the child experiences in association with others and expression of his own feelings and needs, the greater his mental and behavioral disorders will be (Glus, 1998; translated by Jamalfar, 1998).

Among exceptional children, autistic children have a highly sensitive place. Fast and accurate detection and diagnosis and subsequently treatment of such children are of crucial importance. Man has failed to definitively treat this disorder; even in many cases, these patients are not diagnosed. For this reason, it is often thought that this disease is not highly prevalent. Parents of autistic children are willing to know why their child is not able to properly speak and communicate with peers and people or play with age-appropriate toys. The question is whether or not the incidence of these disorders is congenital. Accordingly, they seek treatment for their child's disease (Rafe'ei, 2006).

#### STATEMENT OF THE PROBLEM

Pervasive developmental disorder is a term that is currently used to refer to severe psychological problems that appear in childhood. These disorders embrace serious disturbance in cognitive, social, behavioral and emotional development of the child, which have broad consequences and effects on the growth process. In this group of diseases, social skills, language development and behavioral repertoire either have not properly developed or have been lost in early childhood (Kaplan, Sadok & Gerb, 1987; translated by Fazel & Karimi, 1996).

Autistic children show impairment in social interaction in several ways. Their nonverbal behaviors indicate emotional distance which is characterized by avoidance of making eye contact, strange facial effects and use of special gestures to control interactions. Unlike most children who like to play with other children, these children avoid establishing relationships with peers. They resist their parents' hugging and fondling in childhood. Autistic children are not able to talk or show too much delay in language acquisition (Haldgin & Witborn, 1997; translated by Seyyed Mohammadi, 2007).

Play therapy is also one of the effective methods in the treatment of children's behavioral and mental problems. Playing has a great impact on the child's growth. In fact, playing is a natural instrument for the child to express "himself" and his feelings, establish communication, describe experiences, reveal the wishes and reach self-actualization (Landreth, 1985; translated by Arian, 1995). By reviewing the theoretical background and studies conducted on the subject, it can be found that although multiple investigations have been carried out about variables of the subject and their relationship with one another, few studies have been conducted on the effect of play therapy on cognitive-behavioral symptoms of disorders including autism pervasive developmental disorder. Further, in this field, there is no research that has directly addressed the effectiveness of play therapy in improving cognitive-behavioral symptoms of autistic disorder. Therefore, with regard to the above framework, the researcher in the present study seeks to answer this fundamental question as to "whether play therapy is effective in improving cognitive-behavioral symptoms of autism".

#### **RESEARCH HYPOTHESIS**

Play therapy is effective in improving cognitive-behavioral symptoms of autistic children.

#### RESEARCH VARIABLES

**Independent variable:** In this study, play therapy is the independent variable.

- Dependent variable: Cognitive-behavioral symptoms of autistic children are considered as the dependent variable.
- **Control variable:** In this study, age and gender are regarded as the control variables. Intervening variable: In this study, mental retardation, hyperactivity and other associated disorders are considered as the intervening variables.

Definitions of terms Theoretical definitions of variables Theoretical definition of play therapy: Play therapy is a form of psychotherapy that is used for young children in response to their limited ability to express oneself verbally (Levinger, 1994).

Theoretical definition of cognitive-behavioral symptoms of autistic disorder: These symptoms comprise the inability to mutually communicate with others from early in life, having fun with objects rather than humans, compulsive behavior in the face of changes, impaired verbal communication and cliché and repetitive behaviors (Aksline, 1997; translated by Mozayyani; Nowzar Adan, 1989).

Theoretical definition of autism: It is a severe disability that occurs in the first 3 years of life and is caused by the neurological disorder that affects brain function (Rafe'ei, 2006). Operational definitions of variables Operational definition of play therapy Passive play therapy techniques which include 13 activities are used during 12 sessions of 45 minutes for the subjects of the experimental group.Operational definition of cognitivebehavioral symptoms of autistic disorder. It is the score obtained by the individual in Childhood Autism Rating Scale.

Operational definition of autism: It starts at age 3 and is characterized by having at least 6 cases of the features mentioned in DSM-IV-TR. Checklist of Autism in Toddlers (CHAT) can also be used.

**Research type:** This research is a quasi-experimental study in which attempt has been made to control the intervening variables to the extent possible.

**Research design:** This study is a pretest-posttest quasi-experimental design with two experimental and control groups.

$$RT_1 X_1 T_2$$

Statistical population and sample: The research statistical population consists of all children with autism in Mashhad in the year 2009-2010. The statistical sample comprises 30 individuals (15 subjects in the experimental group and 15 subjects in the control group) from among autistic boy children aged 5 to 13 years in Tabassom educational center for autistic children.

#### COMMUNICATION WITH PEOPLE

T<sub>4</sub>

- 1. No evidence of forms of abnormality in communication with people: The child's behavior is appropriate to his age. When he is asked to do something, he may seem a little bit shy, fastidious or upset; but it not abnormal. -1.5
- 2. Mildly abnormal communications: The child may avoid eye contact with adults. He may keep aloof from adults or become disturbed if he is forced to interact. He may be greatly shy. He does not respond normally to adults and is more attached to his parents than the children of his age. -2.5
- 3. Moderately abnormal communications: The child sometimes stays away from adults or it seems that he is unaware of what adults do. Sometimes continuous and emphatic effort is essential to attract the child's attention. -3.5
- 4. Severely abnormal communications: The child constantly avoids adults or is unaware of what adults do. In contact with adults, he is almost never the initiator. Continuous effort is needed to attract the child's attention.

#### IMITATION

1. Appropriate imitation: The child can imitate the sounds, words and movements according to his age and skill level. -1.5 2. Mildly abnormal imitation: The child imitates simple behaviors like clapping or monophonic

sounds. Sometimes he imitates after stimulation or with little delay. -2.5 3. Moderately abnormal imitation: The child only sometimes imitates and for this purpose, help and insistence of adults are needed. He mostly imitates with little delay. -3.5 4. Severely abnormal imitation: The child rarely or never imitates the sounds, words or movements unless with the stimulation and help of adults.

#### **EMOTIONAL RESPONSE**

1. Emotional responses appropriate to age and situation: Type and degree of the child's emotional responses are appropriate and are determined by changes in his facial expression, gesture and behavior. -1.5 2. Mildly abnormal emotional responses: Type and degree of the child's emotional responses are sometimes appropriate. Reactions are not usually associated with the objects or events around him. -2.5 3. Moderately abnormal emotional responses: Type and degree of the child's emotional responses are quite inappropriate. Reactions may be totally limited or very severe and without any association with the situations. The child may mimic, laugh or become inflexible while there is no object or event explicitly causing this issue. -3.5 4. Severely abnormal emotional responses: Responses are rarely appropriate to the situation. When the child has a stable temperament, it is very difficult to change it. Conversely, the child may show completely different feelings while nothing has changed.

#### **BODY MOVEMENTS**

1. Body movements appropriate to the age: The child can move as easily and quickly as the children of his own age. -1.5 2. Mildly abnormal body movements: Some strange states such as clumsiness, repetitive movements, poor coordination or rarely unusual movements may exist. -2.5 3. Moderately abnormal body movements: The child's behaviors are guite strange and unusual with regard to his age and include strange finger movements, strange finger position or body gesture, staring at the body, spontaneous aggression, wiggling, squirming, repetitive movements of the fingers and walking on toes. -3.5 4. Severely abnormal body movements: Severe or persistent movements of the above suggest very abnormal body movements. These behaviors may persist despite the efforts to prevent them or involving children in other activities.

#### **CHANGE ADAPTATION**

1. Age-appropriate response to change: If the child normally notices changes or he is reminded, he accepts with no insistence. -1.5 2. Mildly abnormal change adaptation: If adults try to change the child's tasks, he may do the same activity or apply the same thing. -2.5 3. Moderately abnormal change adaptation: The child usually resists changes and tries to do the old jobs so that it is difficult to dissuade him. If his fixed and daily routines change, he may become upset and angry. -3.5 4. Severely abnormal change adaptation: The child shows severe reactions to change. If he is forced to adapt himself to the change, he becomes furious and does not cooperate and his response is accompanied by turmoil.

#### IMPLEMENTATION METHOD

To do this research, after coordination carried out by the University with Mashhad Bureau of Exceptional Education, we were introduced to Tabassom educational center for autistic children. It should be noted that comprehensive diagnostic evaluation of autistic children was done in two stages:

First stage: Preliminary diagnosis or initial assessment

In this stage, child development screening test is performed. Parents' observations and information about child development and its history can greatly help in this step. Some of the screening tools which collect data about the child's social development and communication skills are as follows:

- 1. Checklist of Autism in Toddlers (CHAT)
- 2. Screening Tool for Autism in Two-Year-Olds (STAT)
- 3. Social Communication Questionnaire (SCQ) for children of 4 years and older
- 4. PDD assessment Scale/Screening Questionnaire (ASSQ)

If suspicious signs of a problem or disorder are observed in the diagnosis phase or initial assessment, the child is referred for comprehensive diagnostic evaluation.

Second stage: Comprehensive diagnostic evaluation: This evaluation is performed by a group of specialists including child psychiatrist, neurotourist, occupational therapist and speech therapist. In this stage, Autism Diagnostic Interview (ADI-R) which is a structured interview is completed with the help of the child's parents or caregiver. Additionally, CARS tool can be applicable.In this study, 30 children were selected as the sample through available sampling method. After randomly assigning the subjects into the experimental (n=15) and control (n=15) groups, the two groups took a pretest using Childhood Autism Rating Scale (CARS). Play therapy was passively implemented for the subjects of the experimental group during 12 sessions of 45 minutes (3 sessions per week). At the end of play therapy, a posttest was taken from both groups.

#### **INFERENCE OF DATA**

It can be observed in the above table that F coefficient to compare the mean posttest score of the first cognitivebehavioral symptom of autism (communication with people) in the experimental and control groups (after controlling the pretest scores) was calculated to be 0.96 which is not statistically significant ( $P \le 0.05$ ) and thus, the null hypothesis is accepted and it is concluded that the implementation of play therapy has no significant influence on improving the first component of Childhood Autism Rating Scale (communication with people).

Table 1: Results obtained from covariance analysis of the experimentalgroup with the control group in the first component of Childhood AutismRating Scale (communication with people)						
Analysis of covariance factors	Sum of squares	Degree of freedom	Mean Square	F value	Significance level	
Pretest	7.14	1	7.14	162.47	0.000	
Intergroup	0.04	1	0.04	0.96	0.34	
Error	1.18	27	0.043			
Total	8.46	29				

Table 2. Results obtained from covariance analysis of the experimental group with the control group in the second component of Childhood Autism Rating Scale (imitation)

Analysis of covariance factors	Sum of squares	Degree of freedom	Mean Square	F value	Significance level
Pretest	8.10	1	8.10	193.39	0.000
Intergroup	0.08	1	0.08	1.92	0.17
Error	1.31	27	0.04		
Total	9.36	29			

with the control group in the third component of Childhood Autism Rating Scale (emotional response)						
Analysis of covariance factors	Sum of squares	Degree of freedom	Mean Square	F value	Significance level	
Pretest	2.98	1	2.98	31.66	0.000	
Intergroup	0.003	1	0.003	0.003	0.95	
Error	2.54	27	0.094			
Total	5.74	29				

It can be seen in the above table that F coefficient to compare the mean posttest score of the second cognitive-behavioral symptom of autism (imitation) in the experimental and control groups (after controlling the pretest scores) was calculated to be 1.92 which is not statistically significant ( $P \le 0.05$ ) and hence, the null hypothesis is accepted and it is concluded that the implementation of play therapy has no significant impact on improving the second component of Childhood Autism Rating Scale (imitation).

It can be seen in the above table that F coefficient to compare the mean posttest score of the third cognitivebehavioral symptom of autism (emotional response) in the experimental and control groups (after controlling the pretest scores) was estimated to be 0.003 which is not statistically significant ( $P \leq 0.05$ ) and therefore, the null hypothesis is accepted and it is concluded that the implementation of play therapy has no significant impact on improving the third component of Childhood Autism Rating Scale (emotional response). It can be observed in the above table that F coefficient to compare the mean posttest score of the fourth cognitive-behavioral symptom of autism (body movements) in the experimental and control groups (after controlling the pretest scores) was calculated to be 0.000 which is not statistically significant ( $P \le 0.05$ ) and so, the null hypothesis is accepted and it is concluded that the implementation of play therapy has no significant effect on improving the fourth component of Childhood Autism Rating Scale (body movements).

It can be seen in the above table that F coefficient to compare the mean posttest score of the fifth cognitivebehavioral symptom of autism (change adaptation) in the experimental and control groups (after controlling the pretest scores) was calculated to be 3.60 which is not statistically significant ( $P \leq 0.05$ ) and thus, the null hypothesis is accepted and it is concluded that the implementation of play therapy has no significant effect on improving the fifth component of Childhood Autism Rating Scale (change adaptation).

Table 4. Results obtained from covariance analysis of the experimental group with the control group in the fourth component of Childhood Autism Rating Scale (body movements)								
Analysis of covariance factorsSum of squaresDegree of freedomMean SquareF valueSignificance level								
Pretest	5.74	1	5.74	104.24	0.000			
Intergroup	1.89	1	1.89	0.000	0.98			
Error	1.48	27	0.05					
Total	Total 7.24 29							

Table 5. Results obtained from covariance analysis of the experimental group with the control group in the fifth component of Childhood Autism Rating Scale (change adaptation)

Analysis of covariance factors	Sum of squares	Degree of freedom	Mean Square	F value	Significance level
Pretest	6.19	1	6.19	70.56	0.000
Intergroup	0.31	1	0.31	3.60	0.06
Error	2.37	27	0.08		
Total	8.57	29			

In the present study, it has been hypothesized that play therapy is effective in improving cognitive-behavioral symptoms of autistic disorder. With regard to data analysis in section 4, the research findings revealed that after implementing the techniques of play therapy, significant changes have been made in the whole cognitivebehavioral symptoms of autistic children. Evaluation of the experimental group scores after the implementation of play therapy suggested that there is significant difference between autistic children and subjects of the control group in cognitive-behavioral symptoms and this indicates that this treatment method has had a positive effect on improving cognitive-behavioral symptoms of autism.

The results obtained from this research are consistent with the findings achieved in some other studies in this regard. Thorp et al., (1995) and also McDonough et al. (1997) in a study investigated the effects of play therapy and puppet show on the treatment of autistic children. The obtained results demonstrated that this method is effective in the treatment of such children. Forest (2004) conducted a study and showed that play therapy is an effective method regarding the children who have experienced events or problems in life. Sarlak and Rasouliyan (1388) have also referred to the effectiveness of voice therapy in increasing the rate of hearing and thus auditory responses of autistic children.

Qaderi, Asghari Moqaddam and Sha'eiri (2006) and Zolmajd, Borjali and Arian (2007) also examined the impact of play therapy on children's aggression. The findings indicated a reduction in the level of aggression in these children. Salehi (2009) has studied the effect of play therapy on reduced oppositional defiant disorder. The research results revealed that play therapy significantly reduces the severity of symptoms of oppositional defiant disorder.

#### **RESEARCH SUGGESTIONS**

Application of the findings of this study in Welfare Organization, Exceptional Education and other centers that engage in counseling for children with disorder and use of play therapy as an effective method in the treatment of children's disorders. Establishment of centers and institutions having specialized and experienced personnel and all kinds of facilities for the treatment of these children with an emphasis on play therapy method. Reassessment of subjects after 3 or 6 months to examine the effectiveness and stability of results and also evaluation of the sustainability of this treatment method.

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# The relationship between personality types A and B in stress and stress-causing characteristics of mother and child

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#### ABSTRACT

The present study is intended to investigate the relationship between personality types A and B in stress and stresscausing characteristics of mother and child. The research method is descriptive-correlational. To this end, 100 individuals (63 subjects with type A and 37 subjects with type B) were selected through simple random sampling method from the intended population including mothers working as a nurse in Kashmar hospitals aged between 25 and 35 years with at least one child and completed Abidin Parenting Stress Index Questionnaire (1990), Friedman and Ulmer Personality Type Inventory (1984) and Rice Job Stress Questionnaire (1992). Further, to analyze the data, descriptive statistics method, Pearson correlation method, multivariate regression analysis and independent t test were applied. The research results demonstrated that the rate of job stress is significantly different between individuals with personality types A and B (P<0.05). Besides, the rate of maternal stress in people with personality type A and those with personality type B shows significant difference (P<0.05). As a result, personality types A and B significantly predict stress and stress-causing characteristics of mother and child.

**KEY WORDS:** PERSONALITY TYPES A AND B, STRESS AND STRESS-CAUSING CHARACTERISTICS OF MOTHER AND CHILD

#### **INTRODUCTION**

Stress is one of the most important causes of the incidence of physical and mental disorders. Some have considered stress as the non-specific response of the body to any situation that needs compatibility; whether it is a

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levels endanger the health and impair the performance (Dadsetan, 2007). Numerous and different antecedents, causes and sources can be introduced for stress so that Lazarus and Folkman (1984) believe that all events are potentially stress-causing and Holmes and Rahe (1967) observe that all changes in life, whether positive or negative, produce stress. Lazarus (1971) states that stress refers to a wide range of problems that are distinct from other problem areas. He believes that the individual's reaction depends on how the individual (consciously or unconsciously) interprets or evaluates the meaning of these traumatic, threatening or challenging events (Zahrakar, 2008). As mentioned, one of the stress-causing factors is job and conditions of the workplace, which includes any physical event or mental discomfort occurring in the working environment. These events cause disorder in the individual's performance and ultimately disorder in the organizational function in the long run (Nicole & Tymnz, 2005). A large group of these employees comprise nurses. Nursing profession creates great job stress due to the need for high skill and concentration at work, strong team coordination and 24-hour care (Vickers, 2003). Nursing staff in the workplace are faced with a large number of stressors (Koshneer, 2000). International Labor Organization has estimated the costs imposed on countries due to job stress to be 1 to 5.3 percent of the gross domestic product (Tangri, 2003). Currently, with regard to raising the awareness of employees and correcting the legal laws, percentage of the problems and costs associated with job stress is on the rise (Hole et al., 2006). It has been determined in various studies that around 30% of the labor force in developed countries suffers from job stress and this rate is even greater in developing countries.

Parental stress is a term that determines the perception of stress in the parent-child system which embraces both the child's stress-causing characteristics and parents' responses to these characteristics (Abidin, 1983). Experience of parental stress by different researchers (e.g. Miller & Sillie, 1980; Kwok & Wong, 1999; Creasey & Jarvis, 2003) showed that parenting is stressful for both parents, but mothers experience more parental stress than fathers (Wook & Wong, 1999). Development in young children demands closer attention and monitoring on the part of mothers due to the functions of the dynamics of development in early childhood (birth to seven years old). Mothers spend more time with their child while fathers spend this time outside the house. This attention and monitoring can itself be a source of stress in parents especially mothers (Shek & Tsang, 1993; Creasey & Jarvis, 2003).

Adjustment of mothers with parenting problems and the resulting pressures has encouraged the researchers to study the impact of parental stress on the mother's health. By the same token, Lahelma, Arber, Kivela and Roes (2002) consider parenting alongside spousal relationships as one of the multiple roles which have negative effects on various components of maternal health. Investigations of Gelfand, Teti and Fox (1992) revealed the influence of parental stress on increased depression and stress in parents as two major components of mental health (Rodrigous et al., 2003).

One of the most remarkable efforts made to build a relationship between personality differences and the ability to cope with stress belongs to Friedman and Rozenmen (1959). They introduced two personality types A and B. Personality types A refers to someone who is highly competitive, bored, vengeful and vibrant and speaks quickly. Personality type B is characterized by people who are less competitive, are not vengeful and difficult, have more patience and speak or move with more peace; additionally, the latter group is less prone to cardiovascular diseases (Panel, 1981). Some individuals create stress for themselves or aggravate their stress with the help of irrational beliefs. Some other create stress as a result of type A behavior (Spencer; cited in Hamzeh Ganji, 1999). Conversely, type B individuals take things easy and give more importance to the quality of life and have less stress (Spencer; cited in Hamzeh Ganji, 1999). Based on the foregoing, the present study seeks to investigate whether there is a significant relationship between personality types A and B with stress and stress-causing characteristics of mother and child.

#### **METHODS**

The present research is descriptive-correlational. The statistical population comprises mothers working as a nurse in Kashmar hospitals with the age of 25 to 35 years with at least one child. With respect to the mentioned statistical population, the sample size of this study includes 100 people who were selected through simple random sampling and were assigned into two A and B groups based on the 25-question personality test (A -%63) (B -%37).

#### **RESEARCH TOOLS**

1) Parenting Stress Index Questionnaire (PSI): To measure parental stress, Parenting Stress Index Questionnaire (Abidin, 1990) was used. Alpha reliability coefficient for each subtest, each domain and total scores was calculated by the test-maker. The rate of reliability in the population of 2633 people is 0.70 to 0.83 in the child domain and 0.70 to 0.84 in the parent domain and in the whole scale, the rate of reliability is 0.95. This rate of reliability coefficient can represent the internal consistency of evaluations (Hatami, 2009). In a study conducted interculturally, the reliability rate of the scale is similar to that of the original sample. The consistency rate of the test was obtained in four different studies through assessing reliability using test-retest method. Three weeks after the initial implementation, Spearman correlation coefficients in the child and parent domains were obtained to be respectively 0.817 and 0.706, which indicate the existence of a strong and significant correlation (P<0.01) during three weeks (Abidin, 1990). Moreover, in terms of reliability, the researcher estimated Cronbach's alpha to be 0.92 (Hatami, 2009).

2) Friedman and Ulmer Personality Type Inventory: To separate personality types from each other, Friedman and Ulmer Personality Type Inventory (1984) was used. This scale has been developed by Friedman and Ulmer (1984), Matthews et al. (1982) and Mourant et al. (1983) according to the characteristics of type A individuals. Positive responses have been prepared based on type A behavior and show type A behavior. Ganji has translated this questionnaire in 2002. In most of the studies conducted regarding the validity of this scale, coefficients above 70% have been achieved (Hasanzadeh, 2005).

3) Rice Job Stress Questionnaire: To measure job stress, Rice 57-question scale was employed. This questionnaire has been tested in relation to 275 school teachers. Three sections of this questionnaire are quite similar to other questionnaires of this type. The rate of validity is 0.921 for the whole questionnaire and 0.898, 0.883 and 0.816 for its three sections. The full validity is equal to 1. Cronbach's alpha of the questionnaire was calculated to be 0.89 (Hatami, 2009).

#### RESULTS

The average age of mothers in the experimental group is 29 years and in terms of education, 85 subjects have a bachelor's degree and 15 subjects have a master's degree.

Descriptive statistics of the research variables have been provided in Table 1.

Hypothesis 1: There is a relationship between personality type A and job stress of mothers. Hypothesis 2: There is a relationship between personality type B and job stress of mothers.

It should be initially proved that job stress of mothers is normally distributed in both personality types. For this purpose, Kolmogorov-Smirnov test was applied. The significance levels of this test for the variable of job stress of mothers in each of personality types A and B were respectively 0.954 and 0.717, which are greater than 0.05. Hence, job stress of mothers has a normal distribution in each personality type. In the following, independent t-test was used to compare the average job stress in both A and B groups.

Significance level of t test is 0.00 which is lower than 0.05. Thus, there is significant difference between personality types A and B in terms of job stress. Here, hypotheses 1 and 2 were proved, meaning that the rate of job stress is different in people with personality types A and B.

> Hypothesis 3: There is a relationship between personality type A and maternal stress (stress-causing characteristics).

> Hypothesis 4: There is a relationship between personality type B and maternal stress (stress-causing characteristics).

It should be initially proved that maternal stress is normally distributed in both personality types. To this end, like the first and second hypotheses, Kolmogorov-Smirnov test was applied. The significance levels of this test for the variable of maternal stress (stress-causing characteristics) in each of personality types A and B were respectively 0.324 and 0.218, which are greater than 0.05. Therefore, the variable of maternal stress

	able 1.							
R	lesearch		Job stress Maternal stress		Total stress			
c	components	Number	Mean	SD	Mean	SD	Mean	SD
G	roup A	63	145.62	12.608	153.38	9.37	145.62	12.608
G	roup B	37	130.68	14.756	137.76	11.696	130.68	14.756

Table 2. Ind	Table 2. Independent samples test to compare the average job stress in A and B groups							
Student's t-test for the assumption of the equality of means			Levene's test for the assumption of the equality of variances					
Degree of freedom	Significance level	Mean difference	Standard error deviation	Т	Significance level	F		
98	0.000	14.943	2.783	5.369	0.777	0.080		

Table 3. Independent samples test to compare the average maternal stress in A and B							
groups							
Student's t-test for the assumption of the equality of means			Levene's test for the assumption of the equality of variances				
Degree of freedom	Significance level	Mean difference	Standard error deviation	Т	Significance level	F	
98	0.000	15.624	2.130	7.334	0.378	0.785	

(stress-causing characteristics) has a normal distribution in each personality type. In the following, independent t-test was used to compare the average maternal stress (stress-causing characteristics) in both A and B groups.

Significance level of t test is 0.00 which is lower than 0.05. So, there is significant difference between personality types A and B in terms of maternal stress (stress-causing characteristics). Here, hypotheses 3 and 4 were proved, meaning that the rate of maternal stress is different in people with A and B personality types.

#### DISCUSSION AND CONCLUSION

The overall results of the research demonstrate that there is a significant relationship between personality types A and B with job stress of mothers and also, there is significant difference between these two personality types in terms of maternal stress and job stress of mothers. For example, it can be said that these two personality types do not show similar reactions in the face of mental pressure and job stress and based on the foregoing, the more the stressful events of life, the greater the job stress will be. Further, individuals with personality type A (high scores in the test) show less compatibility with pressure and stress and are likely to receive mental pressure and on the contrary, more compatibility with stress and mental pressure is seen in people with personality type B.

First and second hypotheses: The results suggested that the rate of job stress is different in individuals with personality types A and B. These results are consistent with the findings achieved by Aqilinezhad et al. (2007), Nasrollahi et al. (2013), Keergard (2001), Kittel (2005), Friedman and Rosenman (1974), Friedman (2006), Atashafrouz (2007) and Yarahmadi Khorasani (2013). In explaining the existing results, it can be stated that with regard to the component of personality types A and B, a significant relationship exists between the component of personality type and job stress of mothers. It should be remembered that each of personality types A and B has its own special features and accordingly, type A can be distinguished from type B. For example, type A is always on the move whereas type B has no concern about time. Type A individuals walk quickly but type B individuals are patient. Type A group eats fast while type B group eats food slowly and calmly. Type A talks rapidly but type B does not brag and speaks slowly. The tone of speech in type A individuals is harsh while type B individuals have a gentle tone. Type A people are not satisfied with their job and attempt to reach higher levels whereas type B people are happy with their job. Considering the mentioned features, it can be easily claimed that these two personality types are significantly different from each other and type A is more susceptible to exhaustion and physical and mental problems. Based on what has been said so far, it can be concluded that the closer the personality type to A group, the higher the risk of job burnout will be and vice versa. Consequently, based on the foregoing, hypotheses 1 and 2 are confirmed and it can be said that there is a significant relationship between personality types A and B with job burnout and also, a significant difference exists between these two personality types in terms of the risk of job burnout.

Third and fourth hypotheses: The results indicated that the rate of maternal stress is different among individuals with personality types A and B. Additionally, it can be mentioned that the dimensions of stress-causing characteristic of the mother such as depression and dissatisfaction, parental attachment, role limitations, sense of competence and social isolation have a significant relationship with the personality type of mothers and a significant difference was observed between these two types. Results of the present research are congruent with the studies carried out by Lawson and Shen (2002), Schaefer (1991), Chandan (2005), Stura (1990), Greenberg and Baron (2003) and Ross (2001).

In explaining these results, it can be stated that type A individuals feel threatened and stressed even under normal conditions because of their low self-esteem and thus make extra efforts to improve their condition. In this regard, Callahan (1989) came to the conclusion that mothers with low self-esteem experience higher levels of parental stress and often seek medical help, but there is a possibility that low self-esteem in mothers who constantly get sick results from low levels of parental stress and in this case, they should benefit from counseling and psychological support more than medical care. In such cases, before adopting any therapy method, health status of parents should be examined. With respect to

what has been mentioned above, it can be said that there is a significant relationship between the dimensions of stress-causing characteristics of mothers and their personality type, meaning that parents with personality type A have more problems particularly in connection with their children and show features such as low self-esteem, few friends, depression and greater anxiety compared to type B individuals. Therefore, a significant difference can be clearly seen between the two groups. Based on the foregoing, hypotheses 3 and 4 are confirmed.

This study was faced with some limitations. The first limitation of this research was related to the noncooperation of subjects since the questions were numerous and time-consuming so that it was difficult for most of mothers to complete the questionnaires because they spent most of their time in hospital. Another limitation included constant presence in the hospital environment and the mismatch between the time of presence and working shifts of nurses, which was resolved by continued presence in their workplace. Finally, since the data has been collected from a small city, caution should be exercised in generalizing the results to other areas and other healthcare environments. With regard to these limitations and given that this study has been implemented in a correlational manner, causal relationships are not clear in it. Thus, to obtained more accurate results, it is recommended that causal relationships between the research variables be determined by an educational approach in future studies using experimental and quasi-experimental methods and since the quality of the mother's relationship can have a significant impact on compatibility and cognitive features of the child, stress including job stress which is one of the most important types of stress should be under the control of individuals and organizations and steps must be taken to reduce it. In this respect, institutions and organizations are recommended to provide an environment so that the employee can work with more peace of mind. This peace of mind can include working time management, timely payment of salaries and benefits, reducing the working pressure using additional forces and also selection of individuals with respect to their personality and psychological characteristics. Besides, because the personality type of people determines their type of behavior in the face of stressors, it is suggested that the presence of individuals in the workplace be used with regard to their abilities before their assignment. For this

purpose, personality tests can be applied. Apart from these measures, it is also recommended that individuals who are under extra pressure at work should be screened and trained using cognitive and behavioral techniques. To this end, individual and group therapies can also be named.

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### Unacceptable status of oral and dental health-related knowledge among Iranian primary school students

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#### ABSTRACT

Oral health as one of the health Criteria of people plays key role in general health. For improvement of oral health, it is necessary to measure the knowledge level. This study has investigated the Oral health- related knowledge among Rafsanjan City Primary Schools' Students. The present descriptive-analytical study has been conducted on 429 primary students (second grade) in Rafsanjan, Iran. Samples are selected using random cluster sampling. Data collection method is the researchers' questionnaire containing 24 items and that validity and reliability was respectively obtained through using opinions of experts and content validity and test-retest method and extraction of Cronbach's alpha. After collecting the data, the data are analyzed using SPSS-21 software using independent t-test, one-way ANOVA and Pearson correlation at the significance level of 0.05.Mean score of knowledge of students is 10.24±3.1 of 24 and 69% of students had knowledge in average level. The most important weakness points included knowledge of students about mental, psychological and social complications of inadequate oral and dental health. Significant correlation was between knowledge and education of parents and description of oral and dental health status of students excellently and the variable of reporting regular brushing status.Making behavior needs increasing knowledge and changing attitude in people. Despite to the advancements and communicative technologies, knowledge level of students is in undesirable, low and unacceptable level. Hence, it would be better to arrange and announce required policy making to design intervention plans.

KEY WORDS: ORAL AND DENTAL HEALTH, KNOWLEDGE, STUDENTS

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#### INTRODUCTION

Oral and dental health is one of the main health criteria of the society and plays key role in general health and quality of life of people and can affect overall public health (1, 2). In most countries of the world, spread of oral and dental diseases like Oral Cancer is reported 1-10 cases per 100 thousand people and tooth decay is also the most common disease across the world and about 100% of adults suffer from it. Moreover, spread of the disease is reported to 60-90% among school children, (Daly and Batchelor 2012, WHO 2012, Nurelhuda et al 2009)

Oral and dental diseases like decay and periodontitis, similar to systemic diseases, have chronic process and similar behavioral features and multifactorial nature (4). Urbanization, industrial and mechanized life, change in nutrition style and poor eating habits, smoking, tobacco and alcohol are the main factors causing increase in tooth decay and gum disease. Other factors affecting oral and dental diseases include change in lifestyle, limited children's access to oral care services, social status, knowledge, personality and attention to their own health, poor diet such as eating too much sugar and generally, no observance of oral and dental hygiene (lack of brushing and no flossing. In general, 4 main factors creating decay include germs, sugar, teeth resistance and time, (Maltz et al., 2010, Liu et al., 2009 Antonio et al., 2007, Al Subait et al., 2016, Çolakoğlu and Has 2015 Castilho et al., 2015).

Oral and dental diseases can result in various complications including chewing food disorders, gastrointestinal problems, bad breath, major social problems, cancer and oral carcinomas and reduced life expectancy, speech problems, mental disorders, inflammation of the gums, tooth irregularity, low self-esteem, poor quality of life, impaired nutritional status, reducing the growth of children, the loss of more than 50 million hours of school curriculum (10-15).

Torabi et al., 2009, Zeidi et al., 2013, Morowatisharifabad et al., 2011, Rahimi et al., 2011) Feldens et al., 207 and Peterson et al., 2008).

The most important strategies of WHO to prevent the problems and to improve oral and dental health include reducing load of unacceptable oral and dental healthrelated disorders, promoting healthy lifestyles and reducing risk factors (environmental, economic, social and behavioral), development of health service provider systems and arrangement of policies to promote oral and dental health, WHO (2015).

The only effective and efficient strategy to solve problems related to oral and dental health is prevention and various collections of activities in individual, job and social level WHO (2015). For effective improvement of oral and dental healthrelated behaviors and planning in this field, people should have complete and comprehensive information about factors affecting decision making, assessment of nutrition status, measurement of public knowledge, evaluation of health status and information, size of tooth decays, assessing the status of self-case behaviors, brushing and flossing, (Pakpour et al 2011 Pishva and Asefzadeh 2010).

One of the most important and also initial steps in field of the process of changing behavior is assessing knowledge in this field and such knowledge can pave the way for formation of attitude and improvement of behavior. Studies have reported high level of knowledge of children in field of oral and dental health. Gao et al (2014) has reported the amount of spread of tooth decay among 12-15 years old children to 24% and has also reported knowledge of students in undesirable level and has reported no significant correlation between the two variables. The status of this index is also reported in undesirable level in Iranian children (Moeini et al., 2013). For example, Moeini et al (2013) have studied the knowledge level of primary students of Sanandaj to 8.5 of 20 and in undesirable level and have claimed that it can pave the way for formation of other attitude variables such as sensitivity and perceived intensity. But most of these studies have not analyzed the weaknesses of children's knowledge.

Children and adolescents are the large capital sources and the most valuable resources of a society and the more the society tries to save the resources, the society can be more successful and healthy in future. Therefore, according to role of knowledge in formation of behavior, this study has been conducted with the purpose of determining the knowledge level of students as one of the determinants of behavior and Analysis of strengths and weaknesses in field of oral and dental health.

#### MATERIALS AND METHODS

The descriptive-analytical study has been conducted on 429 primary students of second period (fourth, fifth and sixth grade) in Rafsanjan (6 schools; 3 for girls and 3 for boys). Sampling is done using cluster sampling and classes in each school are selected randomly. Data collection instrument is formed of 2 parts of demographic questions (9 questions) and researchers' questionnaire (using review of studies and scientific references). Validity of the questionnaire was measured based on opinion of 10 experts and adjustment of the results with Lavsheh table using test-retest approach among 57 students and the Cronbach's alpha was obtained to 0.74. Number of questions in second part on measuring knowledge

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of students includes 24 items, in which 11 questions are 3-option for (true, false and I do not know) and 13 questions are 4-option items with self-report answering method and with score range of (0-24). The true answers were scored with point 1, false and I do not know answer were scored with point 0. The inclusion criterion in this study was the consent of participants and exclusion criterion was incomplete responding to the questions. The data processing and analysis was done using SPSS-21 software and using independent t-test, one-way ANOVA and Pearson Correlation at the significance level of 0.05. In terms of ethical considerations in this study, one can refer to being ensured of secrecy and privacy of information and anonymity of questionnaires, presenting the results to the relevant parties, preservation of material and spiritual rights of research team and considering the contrast of interests of research team members.

#### RESULTS

The number of participants was 429 students (179 girls and 250 boys). Education level of about one third of parents was diploma and about 40% of fathers had free jobs and 65.7% of mothers were housekeeper. About 17% of participants reported excellent level of oral and dental health and 45% reported that they brush their teeth regularly. The highest level of knowledge was reported in student in sixth grade and the difference between classes was significant (p<0.001) (table 1). Mean score knowledge of students was  $10.24\pm3.1$  of 24 and only Less than 2% of students had desirable and acceptable knowledge level (figure 1). Mean score of knowledge level was equal to  $11\pm2.9$  for girls and to  $9.6\pm3.2$  for boys and the difference between two groups was significant (p<0.001). In this study, no significant correlation was observed between mean score of knowledge level of students with age and parent's job (P>0.05). However, there was significant correlation between higher education (academic education) of parents and description of oral and dental health status and report of regular brushing (P<0.01). Educational needs based on analysis of items in the questionnaire are reported in table 1. As it is clear, 3 preferred educational needs of students are in field of knowledge in field of beginning time of observing



Table 1. Distribution of demographic characteristics of students and its relationship with knowledge								
		Vä	ariable modes			P- Value		
Variable	Illiterate	Elementary	Guidance	Diploma	Academic			
Variable	Number (Percent)	Number (Percent)	Number (Percent)	Number (Percent)	Number (Percent)	P=0.03		
Father's education	6 (1.6)	26 (7)	67 (18.2)	155 (42)	115 (31.2)	P. 0.001		
Mother's education	2 (0.5)	41 (11)	59 (15.9)	149 (40.1)	131 (32.5)	r=0.001		
Father's job	Unemployed	Worker	Employee	Self-employed Retired				
	8 (1.9)	59 (14.1)	160 (38.5)	173 (41.6)	16 (3.8)	P=0.1		
Mother's job	Housewife		Employed					
	282 (65.9)		146 (34.1)	146 (34.1)				
Describe the state of oral	Excellent	Very good	Good	Average	Weak	P <0.001		
health	75 (17.7)	90 (21.2)	156 (36.8)	88 (20.8)	15 (3.5)	1<0.001		
Describe the brushing	Never	Rarely	Sometimes	Regularly & Al	ways			
	13 (3)	30 (7)	189 (44.1)	197 (945.9)		P=0.002		
Grade	Fourth (M±D)	Fifth (M±D)		Sixth (M±D)				
	9.5±3	10.5±3.2		11.03±3.06	P<0.001			

Table 2. check the status of responding to awareness qu	estions and e	ducation p	riorities		
questions	Correct a	inswers	Incorrect	Incorrect answers	
	Number	Percent	Number	Percent	priority
the time of beginning observance of oral and dental hygiene	26	6.1	403	93.9	1
Mental complications of tooth decay (being ashamed, etc.)	49	11.4	380	88.6	2
right time to change the brush	60	14	369	86	3
right time to appoint a dentist for examination	89	20.7	340	79.3	4
least times of using floss per day	91	21.2	338	78.8	5
minimum brushing time	99	23.1	330	76.9	6
time of using mouthwash in children	106	24.7	323	75.3	7
type of teeth and their effect on decay	112	26.1	317	73.9	8
dental sensitivity to heat and cold (a sign of decay)	113	26.3	316	73.7	9
brushing style of outer surface of upper teeth	117	27.3	312	72.7	10
toothache or bleeding while brushing (a sign of decay)	151	35.2	278	64.8	11
task of teeth in speaking	181	42.2	248	57.8	12
the amount of using toothpaste in children	185	43.1	244	56.9	13
the time that food residuals remain on tooth and its effect on decay	205	47.8	224	52.2	14
frequency of brushing behavior in day and night	222	51.7	207	48.3	15
the best way to clean the space between teeth	237	55.2	192	44.8	16
physical complications of decay (bad breath, etc.)	250	58.3	179	41.7	17
germs and their impact on decay	272	63.4	157	36.6	18
sugar and its impact on decay	281	65.5	148	34.5	19
task of teeth in protecting face beauty	286	66.7	143	33.3	20
brown and black spots on tooth (a sign of decay)	292	68.1	137	31.9	21
right times of brushing	295	68.8	134	31.2	22
task of teeth in chewing food	297	69.2	132	30.8	23
the time of beginning observance of oral and dental hygiene	377	87.9	52	12.1	24

oral and dental hygiene, mental complications of tooth decay and the right time to change the brush.

#### DISCUSSION

Undoubtedly, to arrange interventions and educational plans, comprehensive recognition of determinants of the behavior is required, so that the arranged planning and intervention could have the highest effect and result. One of the most important and initial steps in field of process of changing behavior is measurement of knowledge of individuals in field of the studied issue. In this study, mean value of total knowledge level of students is obtained to  $10.24\pm3.1$  of 24 and majority had unacceptable knowledge level. In other studies, knowledge level of students was reported in weak level (Paula et al., 2013). In a study conducted by Haleem et al (2013), mean score of knowledge level of 10-12 years old students in field of oral and dental health was reported to 2.5 from 12.

About 95% of students in this study reported that the beginning time of oral and dental health behaviors was from eruption time. It is necessary to provide required information for them and their families in field of observance of oral and dental health before eruption time. Majority of the students were aware of physical complications of lack of observing oral hygiene; although majority of them were unaware of mental and psychological complications and social complications like selfconfidence, being ashamed and losing friends. This issue is one of the most important issues to make children sensitive and pave the way for them to begin oral health behaviors, since having information about outcomes of a phenomenon can lead to formation of attitudes and encouraging children to take health behaviors. In the study of Haleem A, it was reported that children have unacceptable knowledge in field of complications of no observance of oral and dental health Haleem et al (2013). Therefore, it is suggested to planners and designers of intervention plans to consider this issue seriously, so that the sensitivity of perceived intensity is formed in

children to take healthy, rapid and sustainable behaviors. In this study, the students had acceptable knowledge level about functions of teeth; although more than half of them were unaware of tasks of teeth and their role in speaking. Their knowledge in this field can pave the way to encourage them to take preventive behaviors.

Another issue to encourage children to take preventive behaviors is having knowledge about the factors creating tooth decay. According to report of WHO, 4 factors including sugar, germs, resistance and time (the time that food remains in mouth) can affect teeth decay. The knowledge of students about effects of sugar and germs on decay was acceptable; although it was unacceptable in field of effect of type and resistance of teeth and time. Knowledge of children about the philosophy of teeth decay and role of important variable like time and the time that food remains on teeth can be one of the most effective factors in brushing behavior and these results are in consistence with findings of Gao et al. (2014) reported significantly unacceptable knowledge of 12-15 years old children in field of spread of teeth decay and reported the value about 24% for it and mentioned that this variable is one of the most effective variables in decay and dental diseases.

In this study, variables such as brown and black and white spots on teeth and dental sensitivity to heat and cold, gum bleeding and perforated teeth are investigated that are counted as signs of teeth decay in other studies (Herendon et al., 2010). The knowledge of majority of students about these signs was poor. However, awareness of signs of decay and examination of these signs by the person can be the most important factor encouraging in field of formation of beliefs and intention of behavior and pave the way for seriously formation of preventive behaviors and urgent referral to dentist to get preventive services in secondary level. In other studies, insufficient knowledge of children about signs of teeth decay is reported.

Al-Darwish (2016) has reported in a study that only 25% of 12-14 year old students in Qatar have acceptable knowledge level in field of oral and dental health. The students have poor knowledge about variables such as decay signs, regular appointment of dentist with the purpose of care and examination, role of fluoride and consumption of sweet drinks and foods and plaque. Only 3.7% of children brush their teeth regularly after eating food and this has been in direct correlation with formation of brushing behavior Al-Darwish (2016). The suggestion here is to provide required empowerments to introduce the signs of teeth decay to children, so that self-care and control behaviors are facilitated.

Another weakness in field of knowledge of children is being unaware of information of a well-designed brush, time of changing it, role and effect of toothpaste and flossing on improvement of oral and dental health, referring to dentist for regular examinations. As formation of behavior was growing and promotion of knowledge level is at the beginning of this process, it seems necessary to arrange and implement comprehensive plans by health authorities like school-oriented interventions and family-oriented intervention's in field of increasing knowledge of students.

In this study, girls had higher knowledge and awareness than boys and this was proved in the study conducted by Al-Subait et al (2015). The reasons for this issue could be more sensitivity of girls to health issues, especially oral and dental health. Moreover, significant correlation was observed between knowledge level of students and some demographic variables such as education level of parents and beliefs and wrong descriptions of oral and dental health and the result has been in consistence with findings of other studies (Anne et al., 2016).

In a study conducted by Nurdan and Ethem (2015), social-demographic variables had direct and significant effect on oral and dental health. In the study, the status of germ plaque was significantly correlated to the mother's job, family income, insurance status, family members, number of children, educational level of mother, caregiver, supervision of parents on oral health of children and regular appointment of dentist and brushing behavior in parents. In the study conducted by Alin-Rogeria et al (2013), variables such as parent's behaviors, parent's positive attitude, supervision and control of parents on health behaviors of children are reported. Hence, it is suggested to consider the family as the main and the first center for education of children.

#### LIMITATIONS OF THE STUDY

The limitations with the present study include the way of answering questions (self-report) and the strengths in this study include partial consideration of the issue of knowledge and its orientations in field of oral and dental health, which can be helpful for the interventions.

#### **CONCLUSION**

Taking behavior needs improving knowledge and information and changing attitudes of people towards each field and issue. The results obtained from this study showed that despite to advancement of modern technologies and increased amount of communications, still some issues such as oral and dental health and awareness of the causes and complications of teeth decay, decay signs and preventive behaviors are in unacceptable and undesirable level and this can be the main reason for lack of achievement to desirable indices among students. Designing, implementing and valuating the health interventions and promotion of health in field of oral and dental health is suggested to improve knowledge and improve relevant behaviors.

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#### CONFLICT OF INTEREST

There is no conflict of interest.

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### Effect of metacognitive strategies on the treatment of behavioral disorders in adolescents

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#### ABSTRACT

The aim of this study was to evaluate the effect of metacognitive strategies on the treatment of behavioral disorders in adolescents. Anxiety and aggression disorders are common behavior among young people who study the effects of metacognitive strategies we examined the two types of disorder. This is descriptive and analytic study. The study population are young people who have referred to psychotherapy and counseling centers in Tehran. The sample size consisted of 220 patients who were randomly selected. T-sample method was used for calculating variables. Also, questionnaires and interviews were used to collect data. The questionnaire consisted of 45 questions, and each of the variables were studied. SPSS software was used to analyze the data. The level of significance for both variables equals 0.01 which is less than 0.05. As a result, both hypotheses were confirmed at 95%.In this study, it was found that metacognitive strategies have a significant and positive effect on the treatment of behavioral disorders, especially anxiety and aggression in adolescents.

**KEY WORDS:** METACOGNITIVE STRATEGIES, BEHAVIORAL DISORDERS, ANXIETY, AGGRESSION, TEENAGERS

#### **INTRODUCTION**

Teenager is the period from childhood to adulthood and emotions and feelings are changed. In this period, emotional states get stronger and sensitive, so as irritability, anxiety, depression and aggression are observed more in young people (Golshani, 2015). Teens are living in a period of transformation that rapid changes in the field of biological, behavioral, cognitive and emotional

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\*Corresponding Author: Shamimmaalavi@gmail.com Received 27<sup>th</sup> Dec, 2016 Accepted after revision 2<sup>nd</sup> March, 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 <sup>®</sup> A Society of Science and Nature Publication, 2017. All rights reserved. Online Contents Available at: http://www.bbrc.in/ characteristics are obvious in this period. The unwanted developmental changes impose pressure on teenagers. Part of this pressure is due to physical changes and some other changes caused by social-cultural factors (Beshkar, 2009). One of the complex issues that is concerned by many researchers, psychologists and experts is the contributing factors in behavioral problems in children and adolescents. These problems have long been common in human societies and are widespread at the present time.

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Cognitive psychology has begun its rapid progress since the second half of the twentieth century; and it was in peak condition when the opponents like Watson had rejected it. But meta-cognitive psychology is the idea of founding a new field that dates back to 1970 (Salehi, 2001).

Metacognition is a multifaceted concept. This concept includes knowledge, processes, and strategies that recognizes, monitors, and controls the cognition (Wells, 2009 translated by Mohammad Khani, 2013). Metacognition refers to the structures, knowledge, and the psychological processes that control, modify and interpret thoughts and knowledge. Metacognition is defined as the knowledge that how a person learns, knowing how to use available data to achieve a goal, ability to judge cognitive processes in a particular task, knowledge of which strategies should be used, and evaluating the progress during and after the performance (Salarifar & Pouretemad, 2011). Metacognitive beliefs refer to the part of metacognitive knowledge that connect the person's beliefs about cognition, cognitive, and emotional experiences (Wells, 2009 translated by Mohammad Khani, 2013).

#### STATEMENT OF PROBLEM

Adolescence is a period of physical, cognitive, social, and emotional changes; it is a dynamic and excitement period for individuals. The ability to think, the onset of puberty and changes in relationships with family, friends, school and community, peers, family roles, responsibilities, efforts to acquire new emotional and social roles, management responsibilities without excessive dependence on other people and new direction for the future are formed in this period (Shaffer, 2014). The adolescents take family a special way to express their conflicts that caused by their cognitive and often they are reluctant to change their conflict styles over time (Canary & Lakey, 2010). In other words, it seems that the conflict style is dependent on in an environment where conflict occurs in it. Teenager in the family environment during a particular way to express the conflict that Interactions between family members and cognitive emotion regulation strategies that are used can affect the practices of conflict resolution (Jalali and Rafei, 2011). In recent years, tendency towards the use of cognitive and metacognitive therapy on children and adolescents has been rising. Results of researches show that this method is effective in the treatment of anxiety and aggression disorders.

#### **REVIEW OF LITERATURE**

MCT has been proposed in recent years, and it is concerned from different aspects, such as having a regular structure, a limited number of sessions, emphasis on process rather than content knowledge, and developing specific techniques such as attention training. MCT by changing maladaptive thinking styles controls the flexibility in cognitive control. MCT has been welcomed by specific models for each disorder and experimental evaluation so that despite the short time after the emergence of this approach, many researches have been conducted on evaluation of basic theory and techniques of metacognitive therapy (Wells, 2008).

This method has been the most applied treatment of social anxiety disorder (Clark & Wells, 1995; Wells & Papageorgiou, 2001), post-traumatic stress (Wells & Sembi, 2004), generalized anxiety disorders (Wells, 2008), obsessive-compulsive disorder (Fisher and Wells, 2008).Lobban et al., (2002) reported that metacognitive beliefs in patients with anxiety disorders, particularly generalized anxiety disorder, panic disorder, and obsessive-compulsive disorder are effective.

Metacognition is the one's information about his cognitive system. According to Thomson et al (2011), metacognition judgment plays an important role in making people feel good and their analytical thinking. Cognitive strategies refer to any behavior or action that the learners use, and these strategies aim to help learning, organizing and storing knowledge and skills, as well as ease of operation in future (Weinstein & Hume, 1988).Metacognitive strategies are known as ways to guide and monitor. Metacognition is also a variable that can be influenced by visual capabilities. Metacognition is high level of cognitive function that can be defined as any kind of consciousness or cognitive process to inform and or control every aspect of cognition (Vargas et al., 2012).

In fact, metacognitive knowledge refers to beliefs and knowledge stored in memory of person, duties, and selecting strategies (Rosenzweig et al., 2011). Through knowledge and metacognitive strategies, metacognition works by changing beliefs and interpretation of specific symptoms such as intrusive thoughts, emotional processing and response to injury. The main idea of this approach is that in psychological disorder, beliefs consist of meta-cognitive components that directs the thinking and coping style; these beliefs influenced by the thinking and coping style (Salarifar et al., 2011).

Social psychologists define aggressive act as the conscious behavior that is aimed to cause physical or mental pain (Aronson, 2007). In 1993, according to Berkowitz, aggression is relative constant desire to express with aggression by one's behavior in various situations (Mohseni Tabrizi & Rahmati, 2002). Aggression may arise in many different forms; its verbal and physical represents the behavioral aspect, anger represents the emotional aspect, and hostility represents the cognitive aspects of aggression (Naghdi et al., 2010). Several factors contribute to the incidence of aggression

such as environmental factors like social observations, media, and video games (Akbari, 2009). Family factors such as: how to deal with the needs of children, inappropriate patterns, and parents and teachers' encourage (Mohammad Khani, 2006). Biological factors, such as: inheritance factor (Mirza Beigi, 2011) and physiological factors (Richard, Haljyn, 2009). Anger and aggression are the most common problems in children and adolescents, and these problems are the most important reasons that people refer to counseling and psychotherapy centers (Bornmann et al., 2007; Goodwin et al., 2003). In most studies conducted on aggression boys than girls are more aggressive than girls (Spencer, 2000).

The anxiety disorder is considered as the introspective disorders (Shokouhi Yekta, 2005). This has negative feelings with a sense of concern about the danger. Anxiety symptoms are the same in children and adults but can represent differently at different ages (Butcher et al., 2009). Anxiety can be defined as a set of behavioral responses, physiological and cognitive phenomena with concerns about possible negative results or failure in a test or evaluation conditions (Sadock & Sadock, 2003; Naderi, 2010)

There are several definitions of anxiety, one of the definitions is "fear in real situations or fiction". Although anxiety and fear are similar, but they have obvious differences. Fear refers to mishaps happening or will happen soon, while anxiety refers to the unjustified fear (Atwell, 2006 translated Rahmati, 2009). The main features of anxiety is worry that is the concern about the uncertain consequences. It is harmful because it disrupts the human ability to take action to solve the problem (Huberty, 2010).

#### OBJECTIVES

Study of the metacognitive strategies effect on the treatment of behavioral disorders in adolescents1. The effect of metacognitive strategies on the treatment of anxiety disorders in adolescents2. The effect of metacognitive strategies on the treatment of aggression in adolescents Hypotheses

The first hypothesis: metacognitive strategies have a significant and positive effect on the treatment of generalized anxiety disorder in adolescents. The second hypothesis: metacognitive strategies have a significant and positive effect on the treatment of aggression in adolescents.

#### METHODOLOGY

This is a descriptive-analytic method. The study population are young people who have referred to psychotherapy and counseling centers in Tehran. The sample size consisted of 220 patients who were randomly selected. T-sample method was used for calculating variables. Also, questionnaires and interviews were used to collect data. The questionnaire consisted of 45 questions, and each of the variables were studied. SPSS software was used to analyze the data.

#### **RELIABILITY AND VALIDITY**

In this study, Cronbach test was used to test the reliability of the questionnaire. In order to calculate Cronbach's alpha coefficient, the variance of each score of the questionnaire and the total variance of the questionnaire should be calculated. Then, the alpha value is calculated by the following formula.



Then, the data of questionnaires were calculated by SPSS software, Cronbach's alpha equaled 0.735 for the questionnaire (after distribution of a sample n = 20). Since alpha is larger than 0.70, the reliability of the questionnaire is confirmed. To assess the validity, professors and experts' views were asked. According to their opinions, questionnaire is valid.

#### DATA ANALYSIS METHOD

To analyze the data, one-sample t was used for the impact of each variable.

#### INFERENTIAL STATISTICS

The first hypothesis: metacognitive strategies have a significant and positive effect on the treatment of generalized anxiety disorder in adolescents.

#### One-sample t-test

The test has ben designed to compare the mean of a variable with the constant value. The hypothesis is as follows:

$$\begin{cases} H_0: \, \mu \leq 3 \\ H_1: \, \mu > 3 \end{cases}$$

Table 1. Mean comparison test							
Confidence interval 95%		Sig.	t statistic	Mean difference	Variable		
Upper bound	Lower bound						
.667	.503	.001	14.05	.584	Anxiety disorder		

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As the significant level of this test is 0.001 which is less than 0.05, the null hypothesis is rejected at the level of 0.05. The average of the variable does not equal 3 and it is significantly different. The mean difference is 0.584. As the confidence level is at 95%, it can be concluded that the mean is greater than 3 for this variable. As a result, metacognitive strategies have a significant and positive effect on the treatment of anxiety disorder. The second hypothesis: metacognitive strategies have a significant and positive effect on the treatment of aggression in adolescents.

#### One-sample t-test

The test has been designed to compare the mean of a variable with the constant value. The hypothesis is as follows:

$$\begin{cases} H_0\colon \mu\leq 3\\ H_1\colon \mu>3 \end{cases}$$

Table 2. Mean comparison test								
Confidence interval 95%		Sig.	t statistic	Mean difference	Variable			
Upper bound	Lower bound							
2.73	1,48	.001	6.73	2,11	Aggression disorder			

As the significant level of this test is 0.001 which is less than 0.05, the null hypothesis is rejected at the level of 0.05. The average of the variable does not equal 3 and it is significantly different. The mean difference is 2.11. As the confidence level is at 95%, it can be concluded that the mean is greater than 3 for this variable. As a result, metacognitive strategies have a significant and positive effect on the treatment of aggression disorder.

#### DISCUSSION AND CONCLUSION

In the first hypothesis with a confidence level of 95%, it was found that the cognitive strategies have a significant and positive effect on the treatment of anxiety disorders. The result of this study is consistent with the previous studies. Wells and Carter (2001) studied the role of metacognitive beliefs in development and maintenance of anxiety disorder symptoms. Spada et al (2008) concluded that the metacognitive beliefs have a significant effect on reducing the anxiety disorder.

In the second hypothesis at 95% indicated that metacognitive strategies have a significant and positive effect on the treatment of aggression in adolescents. Fewer studies on the relationship between metacognition and aggression show that the defective metacognitive strategies are significantly associated with aggression and cognitive trust is a strong predictor for aggression (Sarvghad and Daneshpour, 2010). Other studies suggest that improving metacognitive can reduce anger and aggression (Steven, 1992).

Cognitive - behavioral therapy is a psychological term that is used to describe therapeutic interventions that alter cognitive processes with the aim of reducing psychological distress and maladaptive behavior. Cognitive - behavioral therapy is based on the fundamental premise that feelling and behavior are largely the products of cognition, so the cognitive and behavioral intervention can make a change in thinking. Thus, the main elements of cognitive behavioral therapy cognitive and behavioral theories involve (Stallard, 2005 translated by Alizadeh, Rouhi and Goudarzi, 2010). Cognitive psychologists deal with gathering the information of the world, way of representing the information and turning it into knowledge, storing it and use it for directing behavior. Cognitive psychology includes a range of cognitive processes such as feeling, perception, recognition of schemes, attention, learning, memory, concept formation, meditation, guided imagery, remembering, language, emotion, and behavior that help to understand the nature of the thinking mind (Rouhi, 2006).

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# The effect of *Aspergillus* fungus on the diet of broilers in Ahwaz

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#### ABSTRACT

Contamination of food and livestock feed to common poisonous fungus in the air and environment is important. Contaminated animal feed to aflatoxin producing fungus leads to the disturbance in the cycle of animal health, milk and consumers of animal products. In this study, all isolates of *Aspergillus* on food have been studied with the aim of identifying and toxin-producing. *Aspergillus* are a group of fungus that have replication power and abundant growth, and are known as a part of fungal flora of most of places, and among Aspergillus, a number of species have capability of toxin-producing and can create disease in humans and animals. In this study, 180 samples of poultry in the city of Ahvaz were prepared and after transfer to the laboratory and culture, purification was performed, then the identification of isolates using the valid keys of mycology was done and extracting toxin of species on the context of corn was also performed, also determining toxin-producing of species was done in two ways of coconut agar and TLC. The results showed in this study several species of Aspergillus, including species of flavus A. A.parasitichus, A.ochraceus, A.niger were identified. Species flavus with 52 isolates (0.028) allocated the most frequency and species A.ochraceus with 9 isolates (4.98) had the lowest frequency. Informing toxin-producing of the fungus on poultry diet and how toxin-producing of this fungus can be helpful in the management and prevention of infection by the fungus.

KEY WORDS: POULTRY, ASPERGILLUS, DIET

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#### INTRODUCTION

Fungus are present in abundant in the air, soil and our environment, so in the presence of humidity and the temperature, growth and reproduction of fungi are escalated (Ersali et al., 2008). Some of the toxins in the environment are fungal toxins that aflatoxins are considered the most important of them (Aghababaei et al., 2012). Aflatoxins are among the most important mycotoxins produced by some Aspergillus species (Aspergillus flavus, Aspergillus parasiticus) and Penicillium (Penicillium Pvbrvlvm) (Jamali Emam Ghedis and Moeini, 2010).

Aspergillus is fungal infectious disease of young poultry and chronic disease of older poultry that occurs with breathing difficulties. Fumigatus is the cause of Aspergillus fungus that remains in the nature by producing spore in nature. Fungus grows and reproduces rapidly in temperature 37 degrees and proper humidity but the increase of humidity causes the stop of growth. Considering its growth speed, it eliminates one-day chicks earlier that have lower resistance. Disease course varies depending on the age and power of poultry that in young poultry in acute form takes one week and in old poultry in chronic form takes a few weeks. The existence of some fungi in feed for livestock and poultry is natural and if they not have uncontrolled growth, they not have health risks but some fungi that are called fungus of toxin-producing have particular importance.

Mycotoxins are secondary metabolites produced by some filamentous fungi that infect agricultural products. They are toxic for humans and animals and causing a significant reduction in product returns and economic losses. There are widespread reports of outbreak of fungal damages in different countries. The metabolites are produced by different species under special conditions in terms of temperature, humidity and oxygen and are not essential for cellular activities. Consumption of foods contaminated with mycotoxins has been associated with a number of human poisoning, and even poisoning with mycotoxins can sometimes cause death (Aghababaei et al., 2012).

Peanuts, pistachios, wheat, rice, corn, almonds and figs are the main hosts of the fungus and are known as the most perfect natural environment for the growth of aflatoxin-producing fungi in the world, yet, several types of aflatoxin have been detected that among them B1, B2, G1, G have the utmost importance in the world. Among the different types of aflatoxin known, aflatoxin B1 by the International Agency for carcinogens is placed in Group A, research on cancer and in the meantime the toxicity and carcinogenicity of aflatoxin B1 is reported over other types, contamination of feed for livestock and poultry to fungus, followed by it aflatoxins, in addition to economic losses jeopardizes consumers of food with animal origin. Therefore, tracking and evaluation of aflatoxins in food and animal feed and comparison it with standard values in order to knowledge, proposals and measures to prevent Aflatoxicosis in animals and humans is necessary. Several studies are conducted on investigating the presence of aflatoxins in feed in Iran and many countries (Kan and Meijer, 2007).

Clinical signs of aflatoxin toxicity include: autopsy lesions, autopsy injuries, histopathological lesions in tissue, as well as the effects created on production indices of poultry flocks in cases of experimental and natural occurrence of Aflatoxicosis in broiler chickens in worldwide is reported (Kanungo et al., 2011). The main body attacked by the aflatoxin is liver and in human causes severe disorders of the liver occur. In animals also it causes problems in the gut, preventing immune function, reducing reproduction, increasing feed conversion efficiency, reducing the production of milk and egg, anemia, jaundice, reducing growth. Considering the importance of toxin-producing spices on food and diets of poultry in order to recognize species of toxin-producing and how their toxin-producing seems necessary.

#### MATERIALS AND METHODS

In order to identify isolates of *Aspergillus* fungus in poultry in Ahvaz during 2015-2016, the sampling was done in 4 active poultry farms in different parts of the city of Ahvaz. Samples taken were formed of various materials such as all diets used by poultry including: starter, middle-feeding and post-feeding, corn and soybeans, 150 samples were separated and placed inside plastic bags in the refrigerator at a temperature 4 ° C. Then the potato dextrose agar medium for culturing and isolation of fungi from sample was used. Samples were placed for 24 to 48 hours in incubation at 25 ° C then for purifying fungus, new colonies grown were cultivated.

#### A. Purification of fungus

In order to purify a fungal isolates, single spore method was used. So that by Anas fine needle, a small amount of Fungi spore was transferred to tube containing distilled water and then by Lam Thomas, its dilution was calculated. After preparing a suitable dilution, diameters of the suspension was transferred to medium of water agar 2% and by passing 12 to 24 hours, the colonies grown of fungus on medium (PDA) that already poured and cooled in the three spots was transferred and for 5 to 7 days at 25 ° C were reared (Lanyasunya et al., 2005).

#### B. Identification of fungus

To identify fungus, different culture media was used, including the culture of potato, dextrose, agar (PDA) is

known a public culture medium and used for the cultivation and primary isolation of isolates, as well as to identify the isolates, specific culture mediums such as CY20S (Czapek Yeast Extract Agar with20 sucrose) were used.

#### C. Preparing context of corn

Value of 100 grams of corn separately was poured in separate Erlenmeyer and the ratio of 100 to 27 was added to each of the contexts of distilled water and in temperature of 121 ° C. and 1.5 atmospheric pressure for 15 minutes was sterilized in an autoclave and 24 hours later was autoclaved again to all the external factors to be eliminated.

#### C. Inoculum of fungus to contexts of culture

After purification fungus, the fungus was developed on PDA medium and then spore suspension was formed in distilled water and 10 cc of this suspension in sterile conditions under the hood of Laminar was added to context and flasks with treatments were placed at room temperature and the conditions 24 hours of light and darkness.

#### D. Extraction of toxin

In order to extract Mycotoxins, first the contents of the flasks for 24 hours at 73 ° C were placed and then milled samples contaminated seeds acetonitrile – methanol was added and then was placed for 3 hours on a shaker. The resulting mixture was smooth with Whatman filter paper and extract was collected in clean Falcons and extract was passed from purification column containing a cationic resin and alumina-Carbon mix. For this purpose, the beginning and the end of the column with a layer of glass wool is blocked and a gram of mixture of Almunia – carbon is added on it and again a layer of glass wool blocked is placed on it and then cation resin that already for 1 hour is placed in distilled water is poured in column and then extract of samples were passed through the column. Passed extract of first column using the second purification column includes respectively glass wool and alumina-carbon and net glass wool and then extract passed through the second purification column for solvent evaporation was transferred to oven 70 °. After drying the extract, methanol-water solution is added to it and for an hour is placed at room temperature, then methanol-water and acetonitrile-methanol solution was added and in order to evaporate, the solvent again is placed in an oven at 73 ° and finally methanol-water was added to dried extract and the extracts were stored at -20 ° C (Rahimi et al., 2011).

#### E. Investigating toxin-producing by T LC

After extracting the toxins, solutions of sample and aflatoxin standard on TLC of TLC aluminum plate with silica gel in a direction were dotted, after the plate was placed in TLC tank and methanol: acetonitrile (88:12) risen and the plate is washed up. Plate is dried in the air and under the lamp UV (365 nm) will be judged and blue fluorescence intensity is compared with standard fluorescence (Rahimi et al., 2008).

#### **RESULTS AND DISCUSSION**

The results of contamination of food rations including corn, soybean, starter, middle-feeding, post-feeding and context of poultry to *Aspergillus* fungus are in Table 1. The results showed in this study several species of *Aspergillus*, including species *A. flavus A. parasitichus*, *A.ochraceus*, *A.niger* were identified. Species of *flavus* with 52 isolates (0.028) allocated the most frequency and the species *A.ochraceus* with 9 isolates (4.98) had the lowest frequency. The presence of fungi such as *A.flavus* with the most frequency among *Aspergillus* species can be important in terms of toxin-producing; this fungus can produce aflatoxin B1 that has the highest toxicity than other Aflatoxin produced by Aspergillus. As well as there are species of other toxin-producing on diet of poultry that including them can be noted to *Aspergillus* 

Table 1. The sample and the number of food rations contaminated with Aspergillus fungus								
n	umber and pe	Total	Sampla					
A. ochraceus	A. Niger.	A. Parasitichu.	A Flavus.	sample	Sample			
-	20	20	20	30	Corn			
-	7	5	12	30	Soybean			
-	-	-	8	30	Starter			
4	-	-	5	30	Middle-feeding			
-	5	-	3	30	Post-feeding			
5	10	6	4	30	Context			
9	42	31	52	30	Total			
4.98	22.25	0.018	0.028	30	Percent of contamination			

*parasiticus* fungi. The species has the ability to produce each 4 kinds of aflatoxin B1, B2, G1, G2, and in this sense can be considered a dangerous toxin-producing fungus.

Ochratoxin A is one of mycotoxins produced by the fungi *Aspergillus* and *Penicillium*. Spore of this fungus are widely dispersed in the environment and a lot of food, especially cereals are infected these fungus (Thompson and Henke. 2000) hence the toxin-producing spices in poultry as a pathogen agent could jeopardize poultry health. Since the existence of the toxin-producing spices on the dietary food for poultry and food can be dangerous, so the availability of toxin-producing agents and how toxin-producing is very important, *Aspergillus* is the cause of Aflatoxicosis in poultry as well as carcinogenic in human (Kanungo et al., 2011).

Brugfer et al (2003) in Australia on wheat and wheat flour used in animal feed of farms studied isolated and identified molds of Aspergillus, Cladosporydyom and Penicillium, the type of fungi identified in this study confirms the results of previous studies. Among the feed of livestock, corn silage and concentrate, respectively, had the highest number of fungal colonies. In a study that was done in Mazandaran, corn has the highest percentage to fungus Aspergillus flavus (Rahimi et al., 2008). This study also has identified corn silage as a feed contaminated with Aspergillus flavus that hence, confirms previous studies, but in this study, the most frequency of this type of fungus has been observed in straw and this could be due to difference in preparation and storage conditions of animal feeds in different farms and cities.

#### CONCLUSION

In our country, according to the climatic variation, kinds of toxin-producing strains of aspergillus can contaminate food and cause huge physical and financial losses. Also, due to diverse conditions of weather, there is the possibility of a wide range of fungi pruducing mycotoxins with toxins relevant in the environment, and it should be done sanitation and prevention principles as well as compliance with international standards for the maintenance and storage of goods and food rations.

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# The role of place sociability in giving identity to urban spaces: A case study of Safir Omid Boulevard of Astara

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#### ABSTRACT

With the introducing of urban spaces as a context for social interactions and livelihood activities of humans, the statement of the problem of the crisis of identity in contemporary architecture and urban planning as well as sociability as one of the manifestations of quality and stability in the built environment is essential. The identity of urban spaces as a context to improve human communication and social interactions be studied from the perspective of sociability and the impact of creating social spaces in giving identity to the urban areas be examined. Therefore, contextual question of the present research is the supremacy of Safir Omid Boulevard of Astara as compared to its similar and adjacent boulevards and spaces in authentication in neighboring urban context. The default of the present research is the sociability impact of this place in its authentication in the minds of citizens, which has been carried out with the aim of promoting collective and civil life in the contemporary urban environments and the revival of the spirit of collective life in public spaces. The identity crisis in urban spaces are the importance of the present study. The present research method in determining the dimensions and indices of sociability and its role in giving identity to the studied urban space is based on documentary studies, survey, descriptive and observational that has been conducted by using descriptive and inferential statistics analysis methods.

KEY WORDS: PLACE SOCIABILITY, PLACE IDENTITY, URBAN SPACE, SAFIR OMID BOULEVARD

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#### INTRODUCTION

Nowadays, giving an identity to urban places has been interest of urban architectures and designer by defining identity as a qualitative characteristic of built-up areas (Alexander, 1977, Alexander, 1979, Walmsley, 1990), the relationship of place identity with human personality and becoming as one of the aspects of the human personality (Proshansky, 1983 Mesch & Manor, 1998, Abel, 2000, Lynch,1 960) and its role in belonging and attachment to the place. With the establishment of the concept of place identity on three factors of body, activity and meaning (Punter, 1997, Canter, 1977, Rapaport 1981, Rapaport, 1982), attention of designers and planners to the three mentioned areas has become more important and an emphasis on human and social activities in urban areas and it identification taken into consideration (Walzer, 1986; Rafieian and Seyfani, 2009; Gehl, 2004; Carmona et al., 2012; Sennette,; 1980 Whyte, Marcus & Francis, 1998). According to John Lang (2002), the interaction is occurred in public sociability spaces and different groups use the spaces and are directly available for users and therefore those are the places where belong to collective identity.

The subject and question of the research is contextualist, consequently; Safir Omid Boulevard unlike its similar and adjacent spaces always has specific identity in the minds of citizens and is one of the symbols of identity of the city of Astara in the image. Regardless of the symbols of the identity of build-up places and the functional and structural similarity of the boulevard with the same Blvds, the question of the research is "the cause of the supremacy of Astara Safir Omid Boulevard in identification as compared to its adjacent and similar spaces and boulevards and in its neighboring urban context". Research background is "The impact of boulevard sociability in its identification as compared to similar and adjacent samples". The purpose of the research is "The improvement of collective and civic life urban environments". The enhancement of collective soul and social interactions in compliance with human objectives of the theoretical approach of the research, identity crisis in urban areas, the necessity and the research background in attention to the social dimensions of the place in identifying the spaces are the importance of the research as compared to the similar researches. The research has considered the impact of the components in identification of the case study through the study of the indexes of sociability and correlations with the components of place identity.

### THE SOCIABILITY CONCEPT OF PLACE AND ITS SHAPING PRINCIPLES AND COMPONENTS

The use of words like sociability or social loving, showing space qualities in architecture that brings people together or keep them away. Humphrey Osmond with Robert Sommer has proved the words in the study of the role of furniture in sociability of architectural spaces (Osmond, 1957). Sociable environments are aimed to encourage collective interactions and unsociable environments decrease it (Hall, 1982). The process of socialization is crucially important by establishing communication and social interaction between the users of any reachable architectural public and common spaces and the ability to participate effectively in interaction with others both in private life and in public and professional life of humans (Frgas, 2000).

According to the diagram (1), considering the studies conducted, sociability dimensions in three areas of "physical and environmental", "activity and functional", "subjective and semantic" can be investigated. In some studies, an only physical and environmental aspect of sociability has been considered. The role of space in the control of anti-citizenship behaviors (Schulz, 2005), the impact of physical space as a system in collective interaction (Pasalar, 2003), the formation of activity centers and enthusiasm to work in specific parts of space with features such as natural elements, natural landscape and natural materials (Danshgar Moghaddam et al, 2011).

The existence of physical factors such as furniture and quality of environmental elements (Ghamari and Mardomi, 2011), the impact of space in the pleasant and pluralism (Applyard, 1969), and the impact of concave and convex forms on contemplation and inspiration of the sense of place, privacy, sense of belonging and ownership (Sommer, 1967, Kaplan, 1998, Kaplan, 2002 Sommer, 1974), are the characteristics of the perspective. Accordingly, (Moleski & lang, 1986) have stated that physical place supports behaviors and behavioral events in an ideal situation in three forms in space. First, physical place provides physical elements and the required characteristics for continuity and reliability of individuals' comfort in environment. Second, the physical environment is a provider of facilities and spatial organization that consolidates systems and the particular patterns of activity in space and pales other activities. In some studies, activity and function aspect along with physical aspect are social determinant of sociability of place. Anticipating and creating social events is ground for improving sense of place while creating opportunities to participate in social activities (Lennard, 1984), the definition of the sociable spaces as a multi-purpose spaces and supplier of activities and for users' use and social harmony of them (Lenard, 1998), the definition of collective interactions in spaces' activities as capability for the space (Barker, 1968), the definition of activities as variable elements of urban spaces and guarantee for society and the continuer of public and social life (Parsi, 2002) are among the perspectives.



As an example, Ayatollahi and Mohammadi (2015) consider the factors affecting the sociability in two aspects of physical and activity. Physical factor includes dimensions such as location and accessibility, form, geometry, proportions, variety, and space organization. Activity also includes the assessment dimensions of functional spaces, the way the users apply in the space, problems and obstacles in the users' movements and social characteristics in acting. Therefore, creating inviting spaces shaped for the site's climate and capabilities and taking into account the cultural characteristics and social and economic fabric creates active and inactive public participation as well as strengthening the collective life. From this perspective, the process of sociability inside the public spaces is based on four steps: Accepting the space for people to participate, providing physical and psychological comfort, enjoying the space and continuing active social presence in it (Daneshpour and Charkhchian, 2007).

In some studies, along with physical, environmental activity and functional dimensions, aspects of mental and semantic of the place has been emphasized. The influence of emotion and mentality of people in sociability of place due to the passage of time and repetition of the place and becoming the common element linking people (Mansoori and Jahanbakhsh, 2016, 63), Emotional and impermanent dimensions of the experiences of individuals in the environment as essential components of interaction between people and the environment (Bonaiuto & Bonnes, 2000), the impact of the quality of social behaviors and interactions in space on attachment to the space (Poll, 2002), the impact of sense of place, reminiscent-ness and willingness to reappearance, the role of rituals, legends and traditions to create a lasting sense of place and a sense of belonging to it (Fried, 1963), are among the views.

For example, (Montero, 2001) considers the characteristics of general space of sociability in the security space, coherent structure, continuity, readability, territory, existence of appropriate facilities, environmental and educational comfort, complexity and mysteriousness, diversity, privacy, attachment, and social interactions (Montero, 2001). From Wheeler's perspective, place sociability is caused by people interact with place, meanings and related environmental attributes that a person is willing to stay in that place and re-referral, and is achieved by the sense of space of the place (Wheeler, 2004). Noghrekar et al (2014), are considered criteria of "physical-background", "psychological and personality (meaning)" and "behavioral and activity" to investigate the "sociability in the backyard of Iranian house". They have stated sociability indexes of the place in the society, social connection, 24-hour availability, diversity and user mixing, comfort, pleasure, long presence, in face-to-face, exchange of feelings, experiencing, human scale, people observation, talking and meeting, popularity, supervision, facilities and services, physical and visual penetrability, presence of people, protection and physical framework by enjoying the views of experts.

#### **RESEARCH METHODS**

Considering the question and default research, the research method in this study is based on documentary and survey, descriptive and observational methods. In the documentary studies by reviewing the sense of place, its identity and sociability it has been tried to extract appropriate theoretical framework. In this way, in the field of explaining analytical approach, first the concept of the sociability of the space and its relationship with the place's identity are considered. Therefore, it has been



evaluated in the sample case according to the psychological studies of the environment, the dimensions of sociability have been described and finally by extracting indexes of sociability, the survey, observational, and the use of statistical analysis. In this study, spatial characteristic of the place with identity has been considered as independent variables and sociability rate of the place was examined as dependent variable.

Confounding variables of age, gender and other factors were moderated during field studies and in the distribution of questionnaires through sampling and control method. It has been tried to consider all groups in the study by using targeted systematic cluster sampling to maximize reality coefficient and validity of the research as well as control of confounding variables to choose the statistical population appropriately and the target group according to age, occupational, social, gender, duration of residence groups, etc. For this purpose, 200 questionnaires with 20 questions were designed to provide total research aims. Therefore, 16 questions of the questionnaire were questioned (measures) in the form of three functional and activity components (Socio-economic elements), environmental (natural causes and context of the place) and semantic (social ties, attachment and sense of place) as the sociable components of the Likert scale. In connection with performance and activity indexes as well as factors such as attachment, satisfaction, comfort, accessibility, diversity of activities and the daily needs were assessed.

#### CASE STUDY

18 metric Safir Omid boulevard is located in the eastern range of Astara which leads to telluric customs of Astara port and Caspian sea coast from north and east side, respectively; also waterfront is located at southern site and Astara beach bazar, public parking, low-density residential texture and Farabi avenue are located at western side of this Boulevard. Caspian sea and Astara beach bazar are located at East side and west side of this avenue. Footbridge is located in Safir Omid avenue in which passers pass on it from Astara beach bazar to beach. Networks accessing to this Boulevard include 12 metric Farabi avenue; axis accessing to city center is 12 metric Farabi avenue and also axes accessing to Astara beach bazar and beach are 6 metrics Parian alley at northern site and 12 metric Sahel avenue. Table (2) shows specification of mentioned axis.

#### **RESEARCH FINDINGS AND ANALYSIS**

In this chapter, all the data gathered are analyzed. Analyses are presented in two parts, descriptive statistics and inferential statistic. In first part of descriptive statistics, a general description of research variables is presented and initially in second part of statistical inference, distribution of variable scores are studied. According to conducted studies, results of field study are presented in accordance with diagram (2) in order to prove research hypothesis.

Preliminary data collected from questioner, are assorted and analyzed and also their descriptive and inferential statistics were analyzed using AHP, CHOICE and EXPERT applications. In the part of data analysis, two basic actions were taken, correlation analysis and regression analysis. General description of respondent's characteristics containing frequency distribution of



respondents were conducted in terms of sex, age, education, etc. In the next stage, Likert scale 5 point was used for any question and a number was allocated for any range of division in SPSS. For presenting descriptive findings according to frequency distribution of respondents in terms of sex, percentage of men and women were 50% and 45%, respectively. According to frequency distribution of respondents in terms of age, 0.7% of respondents with minimal frequency distribution are 50 years old or so and 40% of respondents with maximal frequency distribution are between 40 and 50 years; frequency distribution of respondents in terms of education as follows: 7.5% of respondents with minimal frequency distribution have diploma or less and also 55% of respondents with maximal frequency distribution have bachelor degree and finally, according to frequency distribution of respondents in terms of work experience, 10% of respondents with minimal frequency distribution have 15 years or so and this value for maximal frequency distribution along with work experience between 6 and 10 years is 52.5%. Inferential findings (analysis of hypotheses) based on results of multivariate regression analysis among levels of place sociability and identity creation among the urban environments and also given that significance level of test error is 0.01 for confidence level of 0.99, we see that the correlation coefficient between the two variables of place identity has significant and positive impact on urban environments and this value equal 0.55.

Therefore, we can say that first hypothesis is proved. Correlation coefficient between two variables of place sociability has significant and positive impact on urban environments and this value equals 0.79. So, second hypothesis is acceptable. Natural elements and Local bed has significant and positive impact on urban environments and correlation coefficient between this two variables is 0.58. Correlation coefficient between two variables of socio-economic elements for identity creation of urban environments is 0.93. Therefore, it can be said that the third hypothesis is approved. Correlation coefficient between to variables of social ties for identity creation of urban environments is 0.95 and has significant and positive impact and thus, fourth hypothesis is approved. Correlation coefficient between to variables of place attachment has significant and positive impact for identity creation of urban environments and this value equals 0.95 and finally the fifth hypothesis is approved.

In order to determine the effects of each variables of place identity, natural elements, place context, social ties and place attachment as predictor variable and identity creation of urban environments as criterion variable, these variables are analyzed using multivariate regression analysis with Enter method; results have been showed that variables of place identity (BETA=0.79), natural elements and place context (BETA=0.58), socioeconomic elements (BETA=0.93), social attachment (BETA=0.95) and place attachment (BETA=0.95) is predicting variable and identity creation of urban environments. Although, variable of place attachment with beta value of 0.95 and variable of natural elements and place context with beta value of 0.58 have the most and least value of the dependent variable of identity creation for urban environments. After study and analysis of data, values of relative abundance, absolute frequency, and bar chart, the impact amount of each component in triple indicators for socialization of urban environments were analyzed and assorted. Socialization variables of urban environments and their impact on identity creation of Boulevard was studied in 3 general category of environmental and physical, activity and functional, mental and semantics. Based on figure (2) we can see that indexes of physical and activity, mental and semantics and environmental and physical have 40%, 35% and 25% of greatest impact in Socialization of this urban areas, respectively.

#### DISCUSSION AND CONCLUSION

Question of the present research is the supremacy of Safir Omid Boulevard of Astara as compared to its similar and adjacent boulevards and spaces in authentication in Astara urban context and hypothesis of this research is socialization of this boulevard as compared to its similar and adjacent boulevards in Astara urban context. Current study showed that not only environmental, functional and Semantic components are important in identity creation of urban environments, but also have direct connection with mentioned components. In relation to environmental components and their role in urban environments socialization of case study, it can be said that natural landscape, place context and existing perspectives in site and accessibility have an important role in socialization and identity creation for these spaces.

In relation to functional components, fulfillment of social needs, socio-economic interactions, safety and 24-hour availability of urban environments and also diversity and user mixing in urban environments lead to socialization. In relation to semantics components, several factors such as social ties, comfort and pleasant, sense of confidence due to the presence in space lead to long presence and have an important role in socialization of urban environments and from this it would have an effect in identity creation of urban environments. Not only field study results accept research hypothesis and effect of socialization components for identity creation of space of study, but also it showed that considering the social factors in urban environments is essential in terms of introduction of social quality as qualitative indexes of space and stability and also in terms of research goal for achieving collective and civic life in urban environments. According to the conducted studies for fulfilling purpose of this study, following items are presented as a guideline in terms of identity creation for urban environments and community role in place socialization of urban space:

- A need for beautification of urban environments through natural landscapes, utilization of natural elements and creating perspectives
- Anthropocentrism in urban environments and appropriate access to urban environments

- Attention to Sociability of outdoor furniture and utilization of spatial scales to creating environments for cognition and social interactions
- A need for security and safety in urban environments
- Attention to peace and comfort in urban environments
- Environments creation for presence and leisure while paying attention to age and sex groups at most of the day
- Attention to needs of different population groups to improve presence

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### Investigation on the role of workplace conflict and occupational stress in job performance among staff of Zahedan University of Medical Sciences

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#### ABSTRACT

This study aimed to explore the role of workplace conflict and occupational stress in job performance among staff of Zahedan University of Medical Sciences. The method of the current study was descriptive-correlational. The statistical population of the present study consisted of 1500 employees of Zahedan University of Medical Sciences in 2015. In this regard, 200 employees were selected as the sample through applying the convenience sampling method. To collect the data, the Paterson Job Performance Inventory, the Occupational Stress Scale (HSE), and the Workplace Conflict Questionnaire were used. To analyze the obtained data, both descriptive statistics (frequency, mean, and standard deviation) and inferential statistics (the Pearson correlation coefficient and regression analysis) were used via SPSS22. The results demonstrated that there was a significant and negative relationship between workplace conflict and job performance among the employees of Zahedan University of Medical Sciences. Additionally, occupational stress was significantly and negatively related to job performance.

**KEY WORDS:** WORKPLACE CONFLICT, OCCUPATIONAL STRESS, JOB PERFORMANCE, EMPLOYEES

#### **INTRODUCTION**

Due to their responsibilities for providing healthcare for patients, health associate professionals are under the influence of numerous stressful factors (Mehrabi &

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\*Corresponding Author: Received 27<sup>th</sup> Dec, 2016 Accepted after revision 2<sup>nd</sup> March, 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 <sup>®</sup> A Society of Science and Nature Publication, 2017. All rights reserved. Online Contents Available at: http://www.bbrc.in/ Ghazavi, 2005) and these chronic and persistent stressors lead to their job burnout which as a physical and mental syndrome brings about a number of issues, including dropouts, frequent absences, and poor job performance, to these professionals. Besides, several

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symptoms, such as dealing with headaches, sleep disorders, lack of concentration, and temper tantrums, which result from stress are prevalent among these people (Malazem et al., 2005).

In 2002, a study conducted by Noorbala et al. indicated that 7.4% of nurses refused to go to work because of job burnout or stress-related disabilities. This absence rate is 80% more than that of other jobs. Moreover, a study carried out by Kalagari et al. in 2002 aimed at determining the level of stress among operating room staff at hospitals in Gorgan revealed that the majority of subjects under study (54.4%) experienced low levels of stress and among all the environmental stressors in operating rooms, unpleasant odors was the most stressful factor (76%) and inappropriate collaboration during group work was the least stressful factor (7.29%). In another study, Malakouti and Valizadeh examined occupational stress in educational and therapeutic centers in Tabriz and reported high levels of stress and lack of job satisfaction among the nurses and midwives working in these centers. This indicates the necessity of training the method of reducing occupational stress to these people. Furthermore, a study conducted by Hingley and Marks on occupational stress confirmed high levels of stress among nurses. In the same line, in 2005, Khodaveisi et al. reported that nurses working at intensive care units and operating rooms experienced the highest level of stress and those working at psychiatric wards and nursing stations experienced the least level of stress. In another study conducted in Tailand, Aoki et al. classified 26.2% of the subjects under study as people who experienced severe occupational stress.

Human capital is a critical strategic element and a significant method to enhance efficiency and effectiveness in an organization and it results in the development and progress of the community (Woolridge, 2000). Nowadays, the importance of employees as the most important resources of an organization is quite evident. Hence, employees' behaviors can also be of significant importance. Certainly, human resources, as effective elements of economic, social, and cultural developments, play key roles in advancing a society. Even through spending a lot of money and employing good technology and facilities, organizations cannot reach their goals without productive and motivated human resources. Today, organizations need effective and efficient employees to be able to grow, develop, and achieve their goals. However, numerous factors including social and environmental conditions affect quality of working environments and their employees' performance.

Throughout life, people must constantly adapt themselves to and make peace with internal changes and changes that occur in their surrounding environments. Unfavorable social and environmental conditions are

among important factors that create mental pressure (stress) and threaten people's mental health (Abdi et al., 2001). Job satisfaction and organizational commitment are key factors in achieving career success. When people have to deal with high levels of job satisfaction, they certainly experience low levels of occupational stress. This increases their efficiency and personal satisfaction. Since occupational stress affects people's health and reduces their quality of life (Halkas, 2010) and given the fact that healthcare professionals play key roles in providing healthcare services for people, high levels of occupational stress among these people affect their efficiency and performance and have significant and destructive impacts on them. According to what was mentioned earlier and given the significance of the issue, the present study aimed at examining the role of workplace conflict and occupational stress in job performance among staff of Zahedan University of Medical Sciences.

#### **OBJECTIVES AND RESEARCH QUESTIONS**

The main objective of this study was to examine the role of workplace conflict and occupational stress in job performance among staff of Zahedan University of Medical Sciences. To this end, the present study sought to answer the following questions:

- 1. Is there a significant correlation between occupational stress and job performance?
- 2. Is there a significant correlation between occupational stress and workplace conflict?

#### **METHODS**

The method of the current study was descriptive followed by a correlational design. The statistical population of the present study consisted of 1500 employees of Zahedan University of Medical Sciences in 2015. In this regard, 200 employees of Zahedan University of Medical Sciences were selected and studied as the sample through applying the convenience sampling method. In the current study, the data collection tools were three questionnaires on job performance, occupational stress, and workplace conflict.

#### **RESULTS**

In this section, using both descriptive and inferential statistics, the research hypotheses were examined. Table 1 presents the means and standard deviations of occupational stress, job performance, and workplace conflict. As Table 1 demonstrates, the means and standard deviations of occupational stress, job performance, and work-

Table 1. The means and standard deviations of occupational stress, job performance, and workplace conflict				
Variable	Ν	Mean	SD	
Occupational stress	200	118.53	17.57	
Job performance	200	60.24	10.21	
Workplace conflict	200	65.16	18.60	

place conflict were respectively 118.53 and 17.57, 60.24 and 10.21, and 56.16 and 18.60.

The First Research Question: Is there a significant correlation between occupational stress and job performance?

To answer this question, the correlation coefficient test was used, the results of which are presented in the following table.

Table 2. The results of the correlation coefficient test between occupational stress and job performance		
Variable	Job performance	
Occupational stress	-0.339**	
N	200	
Sig	0.0005	
**P<0.01		

The results of the correlation coefficient test indicated a significant and negative correlation between occupational stress and job performance. This means that an increase in occupational stress leads to a decrease in job performance.

The Second Research Question: Is there a significant correlation between occupational stress and workplace conflict?

To answer this question, the correlation coefficient test was used, the results of which are presented in the following table.

Table 3. The results of the correlation coefficient test between occupational stress and workplace conflict		
Variable	Workplace conflict	
Occupational stress	-0.327**	
Ν	200	
Sig	0.0005	
**P<0.01		

The results of the correlation coefficient test indicated a significant and positive correlation between occupational stress and workplace conflict. This means that an increase in occupational stress leads to an increase in job performance.

#### DISCUSSION AND CONCLUSION

The results obtained from examining the relationship between workplace conflict and job performance among staff of Zahedan University of Medical Sciences indicated that workplace conflict was significantly and negatively related to job performance among staff of Zahedan University of Medical Sciences. This means that an increase in workplace conflict leads to a decrease in job performance. A decrease in job performance brings about irreparable consequences, including reducing job satisfaction, organizational citizenship behavior, efficiency and effectiveness, and organizational efficiency, to an organization and its staff. Through employing appropriate solutions, managers must be able to properly apply workplace conflict and guide it in a constructive and creative way. They can use it as a positive driving force for promoting performance, effectiveness, and innovation and for creating positive changes. Workplace conflict can be used as a means to alter the power structure and to change the pattern of relationships within groups. Conflict management must maintain the desired level of conflict among employees. Low levels of conflict in an organization lead to intellectual stagnation of employees and high levels of workplace conflict strongly involve employees and create confusion in administering organizations. These are both unfavorable for organizations and disrupt the process of performing tasks. Therefore, to resolve workplace conflicts, managers have to balance these forces and create lasting motivations in employees through applying interactional and friendly methods. On the other hand, stress or mental pressure is an acute issue with which organizations deal. Stress puts employees' physical and mental health in jeopardy and imposes additional costs to organizations. A group of experts in organizational behavior believed that work-related stress can be considered as the most prevalent disease of the 21<sup>st</sup> century. Indeed, this century can be regarded as the super stress era in which people are exposed to a lot of stressors and many issues and difficulties surround them.

The results obtained from this hypothesis are in line with the results of Khazaee, Khazaee, and Sharifzadeh (2006) and Mehrabi and Ghazavi (2005). In a study conducted by Khazaee, Khazaee, and Sharifzadeh, the results determined that 35.5% of the people under study experienced mild levels of emotional exhaustion, 54.2% of them experienced severe levels of depersonalization, and 37.5% of them experienced severe levels of lack of personal accomplishment. They mentioned that job burnout depended on a number of factors including workplace environment, work experience, high workloads, mental pressures, job satisfaction, and difficult working conditions and they suggested that identifying

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these factors may aid us in preventing and decreasing job burnout.

Several researchers used the results of this study in the discussion and conclusion of their studies to integrate the body of knowledge. The results of Mehrabi and Ghazavi (2005) demonstrated that considering somatization, the majority of female nurses (92.4%) were in a range from healthy to being suspected to have a disease. With regard to anxiety, 90% of them experienced moderate anxiety, 78.8% of them were healthy considering the symptoms of anxiety, and 68.8% experienced moderate social dysfunction. Moreover, in terms of general health status, 55.3% of these nurses were suspected to have disorders and only 44.7% of these people were healthy. Finally, the authors recommended that individual and organizational management strategies should be applied to promote general health among nurses.

The results obtained from investigating the relationship between occupational stress and job performance among staff of Zahedan University of Medical Sciences showed that occupational stress was significantly and negatively related to job performance among staff of Zahedan University of Medical Sciences. This means that an increase in occupational stress among employees leads to a decrease in their job performance. This decrease reduces organizational efficiency and creates difficulties in achieving organizational goals. Employees spend many hours at work; hence, job dissatisfaction which is followed by stress makes employees sick within a few years. Accordingly, experts and managers are highly recommended to pay significant attention to occupational stress. They can identify people with stress and train them to efficiently cope with it. Moreover, as a preventive action, they can eliminate stressful factors from the workplace. Would the managers prefer to have healthy and happy employees or employees full of stress with heart diseases and high blood pressures? Through employing practical methods, managers and employees of various organizations can attempt to promote tolerance and individual and organizational adaptabilities, improve their workplace environment, and develop mental health among their employees.

In this way, all the energy that they have to spend on dealing with organizational stressors can be used to improve the quantity and quality of organizations and to fulfill social responsibilities of organizations. The results obtained from this hypothesis are consistent with the results of Asai et al. (2007), Piko (2006), and Sahraeeian, Fazelzadeh, Mehdizadeh, and Toubaei (2008). The results of a study carried out by Asai et al. (2007) indicated that 22% of the respondents experienced high emotional exhaustion, 11% of them experienced high depersonalization, and 62% of the subjects under study suffered from mental illnesses. Moreover, the results indicated that the clinical oncologists experienced higher levels of mental illnesses compared to the clinical care physicians. Being sure of having enough time to communicate with patients was associated with all the subscales of occupational stress. In this study, low levels of personal accomplishment among Japanese doctors were higher than that mentioned in previously conducted studies.

In addition, Piko (2006) demonstrated that the scores of emotional exhaustion and depersonalization were greater than those mentioned in Canadian, Norwegian, and American subjects. Occupational stress, particularly emotional exhaustion, is significantly and strongly related to job dissatisfaction. Job dissatisfaction is a negative predictor of the subscales of job burnout and conflict plays a positive role as a contributing factor for emotional exhaustion and depersonalization. The results of a study conducted by Piko (2006) laid emphasis on the important role of psychosocial work environments and the relationships among occupational stress, role conflict, job satisfaction, and mental health among Hungarian healthcare staff. Although the statistical population of this study was different from that of the current study, the same measurement tools were used to examine the variables. That is why this study was mentioned.

In a study carried out by Sahraeeian et al. (2008), 22.8% of nurses obtained scores higher than 26 on emotional exhaustion, and 5% of them obtained scores higher than 9 on depersonalization, and 20.6% of them obtained scores higher than 34 on personal accomplishment. In this study, the mean score of emotional exhaustion was 25.8+0.87, the mean score of depersonalization was 5.90+0.34, and the mean score of personal accomplishment was 29.56 + 1.07. In total, 25% of the subjects under study had the criteria of job burnout. These researchers found a significant relationship between stress and various units of hospitals in which nurses worked. The scores of job burnout demonstrated that the scores of emotional exhaustion in the burn units and the scores of depersonalization in the psychiatric units were significantly high. 70% of the nurses under study experienced some symptoms of mental illnesses (using identifying scoring of greater than 4). These researchers reported that having mental illnesses was not significantly related to depersonalization and personal accomplishment.

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# The comparison of ISSR and RAPD markers with different species of *Triticum*

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#### ABSTRACT

Considering genetic variety in Iran, we applied markers to determine genetic variety and phylogenic connections in different species. On the other hand, we made an attempt to compare RADP and ISSR molecular markers on different species of wheat considering the food consumption of Iran and easy sample to wheat. In this experimental study, markers were applied to consider different species of wheat and they were experimented by RADP and ISSR starters. The effect of marker was evaluated on different species of wheat by PCR test. A comparative effect of RADP and ISSR markers via PCR method signified that different species of wheat based on applied starters with a clear distance from DNA bands showed their similarities. In conclusion, the study results indicated to the effectiveness of different species of wheat species and applying their DNA can be more effective in comparison to RADP and ISSR.

#### INTRODUCTION

Although from too many years ago human had considered drug crops of plants, the increasing production of these crops in fields and gardens turned to a new science since second half of the 20<sup>th</sup> century. Destroying and consuming growing plants of nature were placed by enjoying nature plants. Nowadays, the applying of genetic engineering methods and biotechnology allow forming DNA molecules with inheritance properties, and a significant progression has created in biological sciences. Modern biotechnology, a novel technology, is

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able to increase the function of plants through changing the genetic structure of crops and other plants.

Wheat (in science: *Triticum*) is a cereal grain. There are wild and domestic types of wheat. It is belonged to annual monocots magnoliophyta plants and Poaceae and a member of Gramineae family.

Wheat is among the oldest crop plants used by human, it is cultivated and harvested in a very great extent. Botany, it is a member of *Triticum* species divided in three different groups with determined chromosomes carrying all genetic properties of the family (3).Two diploids are more difficult than other crops, as some of them belong

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to the wheat species of genetics with four polyploidy chromosome chains, while other species got 6 chromosome chains. Diploids grow only in jungles and deserts and cropped Einkorn wheat belong to this group.Wild Tetraploids, and cultivated Emer and Durum belong to this group. Hexaploids involves bread wheat 90000 hectares of all 2.3 million hectares of water wheat are cultivated in cold regions.

#### PROPERTIES

Wheat contains all mineral salts. If you need to have different vitamins, take wheat. It is suggested to use wheat gruel with sugar and almond to stop breast bleeding. Wheat avoids gastric cancer.

#### RAPD MARKER

RADP marker starting a short oligonucleotid starter propagates in PCR reaction with low annealing temperature, a range of pieces of DNA pattern. One or more piece of polymorph productions are created as a result of changing in one open door in primer connection place ,and this polymorphism can be a genetic map (Kaiser and Polatski, 1995) RADP marker is distributed in the whole genome (Luine, Santanglo, 1994).

#### THE ADVANTAGES OF RAPD MARKER

It does not need the primary information on DNA orders to design and construct starters.

It allows a simultaneous consideration of numerous places in sample genome.

It does not need a prober, radioactive materials, etc.

#### THE DISADVANTAGES OF RAPD MARKER

The location of RAPD markers is not determined on the genetic maps.

The similarity and relationship between bands with similar movement on electrophoresis gel are not determined. The studies accomplished by Paul et al. (1996) show that RAPD markers show the genetic distances between people with little distance from each other in a less exact way in comparison to other markers. Therefore, applying markers to taxonomy studies in species should be considered. These markers have a dominant power and the disability of allele system in RAPD markers results in some limitations in the marker functions.

#### RANKING HARDSHIP

RAPD has a tendency to propagate repetitive parts of genomic DNA. As an example, too many repetitive

orders of wheat genome are propagated through RAPD reaction.

#### **ISSR TECHNIQUE**

ISSR is a PCR-based technique contained a piece of DNA in a reproducible distance between two repetitive fields of unique micro-satellites with opposite directs. Usually, this technique used micro-satellites of 16-25 bp as a primer of a mono-primary targeting poly-genomic locus to propagate the successions between micro-satellites with different measures. Bi-nucleotides, Tri-nucleotides, quadra-nucleotides, or panta-nucleotides micro-satellite repetitions can be used as primers. Although applied markers are connected to 1-4 bases, and are enlarged based on these connections, they are able to connect to each point of DNA. This technique has integrated the advantages of AFLP and micro-satellites with RAPD comprehensiveness. The applying longer primers (16-25 mers in comparison to RAPD shorter primers (10 mers) allow to apply high temperature of connection (45-60°C) increasing the primer connection to determined points of DNA with more repetitive times results in high repetition of ISSR. The studies on repetition signify that only the weakest bands are not repetitive. Nearly 92-95% of scored pieces can be counted in DNA samples, and can be repeated in distinct periods of PCR when are identified by applying polyacrilamide. 25-50 nanograms of pattern DNA in each 20 micro-liter of PCR and 10 milligram of pattern DNA can produce the same propagated productions. The connection temperature of 45-60'C depends on the applied primer.

#### MATERIALS AND METHODS

#### HERBAL MATERIALS

Nine varieties of wheat species (existed in Minister of Agricultural Jihad) were applied to consider molecules. As a whole, nine leaf samples included fresh leaves of wheat species were collected.Starters applied 14 ISSR and 10 RAPD starters to consider genetic relationships.

#### THE EXTRACTION OF GENOMIC DNA

Changed CTAB method of leaf samples was applied to extract DNA before that samples were melted. To provide 100 milliliter buffer of 2% CTAB extraction, the components of table 4-3 were solved in 20 milliliter of distilled water, pH was 8 by applying chloric acid in one mullar. Then 2 grams of hexa decyl timthyl ammonium bromide was solved in hot distilled water, and it was added to the previous solvent. Finally, the solvent was 100 milliliter. The phases of DNA extraction are as following:

Table 4-3. The composed components of DNA extraction buffer				
Buffer components	Amount	Final destination		
Tris-HCL	1.211 g	100 millimolar		
NaCl	8.19 g	4 molar		
EDTA	0.744 g	0.2% (volume-volume)		
СТАВ	2 g	0.2% (weight-volume)		
Merkapto etanol	200 microliter	0.5 molar		
рvр	2 g	0.2% (weight-volume)		

Before the experiment was started, CTAB buffer was heated in water bath of 65 °C.

100 milligram of fresh and clean leaves was pounded in liquid nitrogen in a mortar. It is suggested to keep the dish and mallet (at least in connection with leaves) cold by adding some liquid nitrogen or putting in freezer to make Nucleases inactive.

Put the powder in a corner of the dish, and when buffer was melted, add 800 micro-liter of CTAB buffer to powder and mix thoroughly. The contents of mortar (dish) should be transferred to tube of 2 milliliter, and was kept in 60°C for 30 minutes in water bath (In this 30 minutes, the tubes were circulated for some times smoothly). The sample volume (800 micro-liters) of chloroform/ isoamyl alcohol (24:1) was added in room temperature. The tubes were turned some times in a smooth way to have a unified mixture. It was centrifuged for 10 minutes and 13000 turns. The above limpid part was removed (in 500-600 micro-liters), and was poured in another tube.

2/3 (almost 350 micro-liters) of cold isopropanol volume (-20°C) was added to each tube. It was centrifuged with 13000 turns for 10 minutes in 4°C. the tube contents were removed smoothly and DNA string was left at the bottom of the tube. Vacant tubes with DNA strings were inverted on a very clean place to have dry strings. 100 micro-liters of TE buffer was added to room temperature.800 micro-liters of Aminium acetate +cold ethanol was added (2.5 molar and 1.5 liter of aminium acetate+ 3.5 milliliter ethanol), the last step was accomplished on ice, it was inverted for some times, and then tubes were transferred to freezer. They were centrifuged with 13000 turns for 15 minutes in 4°C.

The above part was discharged. The tubes were inverted to become dry. 150 milliliters of TE buffer was added to each tube. The samples were kept in room temperature, then some other actions to evaluate quantity (spectro-photometry) and quality (electrophoresis on agarose gel of 1.5% DNA) (extracted DNA) were accomplished. The samples were diluted in 100 nanograms to subsequent application. Providing method of 0.8% and 1.5% agarose to determine quantity and quality and analysis of propagated pieces X1EDTA was diluted by water in 9:1, and then X1EDTA was provided.

X1EDTA is put in the tube based on the electrophoresis tank volume by the help of cylinder, it is moved smoothly to have a good mixture. The solvent in tube is put in the microwave so that particles will be solved in a complete way and then a smooth solvent will be appeared. 0.2 micro-liter of DNA safe stain was added to gel to paint, then the gel was put in the gel dish. The solvent in the tube is poured on the electrophoresis tray. When 30 minutes was passed, agarose gel is stiff. The gel was put in the electrophoresis tank by X1EDTA.

## 9-3 sample preparation and electrophoresis of agarose gel

We add 5 milliliters of loaded buffer to each 5 milliliter of sample to have a good mixture, and then the sample is spilled into the sink. The first sink from the lift has been devoted to the measured marker. A 92-volt electric currency was connected to the tank. By passing 45 minutes, gel was removed from the tank, and then it was removed from the tray. Then a picture was taken from the gel in photography machine.

#### 10-3 The components of polymerase chain reaction

The components presented in table 5-3 were applied to carry out PCR reaction in 12 micro-liter.

Table 5-3. The applied components to carry out PCR reaction		
Component	Amount (micro liter)	
PCR kate (Master mix)	5	
Deionized water	5	
Starter	1.1	
Genomic DNA	1	
Total	12.1	

#### 11-3 Time cycle and polymerase chain reaction steps

The polymerase chain reaction was accomplished in thermocycler (Bio Rad) in 4 minutes and initial compounding in 94°C via 10 initial touching down denaturation (so that the connection temperature of starter was considered to be 5°C higher than the real connection temperature, and 0.5°C was decreased from the connection temperature to achieve the real connection temperature). This action allows to decrease similar bands of micro-satellites causing some problems in scoring the PCR typical cycles. It is suggested to apply 30 cycles containing 30 seconds of denaturation in 94°C to each starter in 45 seconds (to connect starters), and 2 minutes in 72°C to extend, and the last extension was carried out in 72°C for 7 minutes.

#### DATA ANALYSIS

The applied markers in this study are of dominated markers which are scored in interpreting gel as 1(indicating to the presence) or 0 (indicating to the lack).

#### **CLUSTERING ANALYSIS**

According to raw data obtained from ISSR and RADP molecular markers, the clustering analysis was accomplished by UPGMA method and applying the jaccard similarity coefficient to determine similarity between two individuals, Darwin 6 and Post 3 software.

#### THE ANALYSIS TO BASIC COMPONENTS

The analysis to basic components is another multi-variant method which is of high application in genetic variety analysis with clustering analysis. This method can be applied to present two-dimensional distribution of individuals in a field of plot signifying genetic similarity among them. PCA is a method to decrease data to construct relationships between two or more variants and to explain the changes of whole basic and primary data by some new independent variants called basic components.To decrease data is accomplished by linear changing of basic data to new independent variants called basic components, so that the first PC explains the maximum initial data, and the second PC explains remained changes after the first PC, etc. it should be noted that each PC explains those changes not been explained by other PCs.

As PCs are independent, each one presents different properties of basic data, and they should be interfered differently from each other. When PCA is applied to analyze molecular data, similarity matrix should be changed via the following formula to remove negative inert roots:

#### ij=Sij-Sio-Soj+SooóS

in which, Sij represents similarity coefficient between I,j individuals, Sio shows the average of similarity coefficient in n<sup>th</sup> individuals, Soj shows the average of similarity coefficients of j<sup>th</sup> individual, and Soo is the total

average of similarity coefficients. This changing causes to move similarity matrix to zero root. These similarity properties calculated by any method will be kept.

#### **RESULTS AND DISCUSSION**

A study accomplished by Aslani (2013) on the genetic variety of molecular genotype of Mirabilis jalapa by applying ISSR marker showed that ISSR does not need radioactive materials and pattern DNA sequence. Therefore, ISSR was a good marker to consider genetic variety and relationship which was coincide with our results (Aslani,2013).

A study accomplished by Heidari Nejad on the genetic variety of African Violets varieties by applying RAPD marker signified that morphologic properties are influence by various factors with no effect on DNA. These factors which are similar in DNA based on the data, are similar to or different from each other in morphologic properties. Therefore, it is expected that RAPD data may have no similarity with individual grouping in planting and morphological properties by considering the effectiveness of environmental factors on these properties.

This result has been reported by Martinz-Gumz et al. (2003) on almond. Therefore, considering individuals based on planting and morphological properties can't result in favorable results (Heidari Nejad, 2012).

Stephonova et al. (2014) accomplished a study on genetic variety of 16 species of Amaranthus of Caryophyllales family by applying molecular ISSR marker. Amaranth is a most important species existing in all around the world. In this study, ISSR method was applied to analyze variety in and among 16 species of amaranth. Eleven primaries were applied in this study. The dendrogram divided 16 varieties into 3 groups in which 2 groups belong to India and one group is belonged to Nepal. The similarity average was 0.154-1.000. This study indicated that ISSR is of high efficiency (Stephonova et al. 2014).

In a study accomplished by Ray et al. (2007) on the genetic relationships of Aramanthus which is belonged to Caryophyllales by applying molecular ISSR and RAPD markers, it was used from 18 starters and to ISSR marker and 15 starter to RAPD. The similarity coefficient of ISSR and RAPD markers were 0.45 and 0.47; respectively. Also, Cophenetic coefficient of both markers was 0.83. These coefficients refer to a good fitting between similar matrix and dendrogram, and both dendrograms showed a good similarity between species indicating that ISSR and RAPD markers are of high sufficiency to determine genetic relationships, and they are suitable tools to cluster species (Ray et al. 2007).

#### CONCLUSION

In general, the study results signified that there is a difference on the least and most distance of bands in different analyses. ISSR marker showed bands with less distance and more similarity in comparison to RAPD marker.

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## Assessing the yield and its relationship with some of the physiologic traits in bread wheat cultivars under terminal drought stress

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#### ABSTRACT

Climatic factors fluctuations are among the reasons for yield change in crops during various seasons and in different locations. Grains provide 70 percent of the food for humans and these plants are considered as the main basis for human nutrition and survival. In order to assess the yield and study its relationship with some physiologic traits in bread wheat cultivars under terminal drought stress, an experiment in the form of randomized complete block design with three replications was carried out during 2015-2016 crop year in Ardabil IAU Research Farm (5 km west of Ardabil). ANOVA results suggested that there was a significant difference among the studied bread wheat cultivars based on all traits, except for photochemical efficiency of photosystem II (FV/Fm). Results from data mean comparison indicated that the cultivar of Pishtaz had the highest yield and cultivars of Rasad, Soissons and Seri 82 had the best yield after cultivar of Pishtaz. Also, the lowest yield was related to cultivars of Soltan-95 and Kenya-2002. Additionally, results showed that in most physiologic traits, cultivar of Seri 82 had the highest values.

**KEY WORDS:** TERMINAL DROUGHT STRESS, PHYSIOLOGIC TRAITS, GRAIN YIELD, WHEAT

#### **INTRODUCTION**

Population growth phenomenon in developing countries and high variety of foodstuff and its high consumption in developed countries have led an unprecedented increase in demand for foodstuff in the world. (Akhavan, 2006) Grains provide 70 percent of the food for humans and these plants are considered as the main

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environmental changes. Decrease in growth under unsuitable environmental conditions is attributed to the disconnect between plant yields. Hence, growth specifically requires proper relationship between metabolic processes in various parts. (Brevedan and Egli, 2003) In Araus et al. (1998) study, the impact of drought stress was significant on F<sub>m</sub> and F<sub>o</sub> parameters in consecutive measurements and except for the first measurement, it led to increase in them in all parameters. However, in Paknejad and Nasri (2007) study, F<sub>m</sub> and F<sub>o</sub> parameters were not affected by the drought stress. Although in most studies, efficiency of photosystem II decreases due to the drought stress, in Havaux (1999) photosystem II was resistant against drought stress. These results are approved in other studies, too. (Živčák et al., 2008; Christen et al., 2007) According to Zivčák et al. (2008), florescence parameters are suitable for studying photosynthesis efficiency in initial stages of drought emergence and after the initial stages of drought, in which the limitation of photosynthesis emerges due to the closure of stomata, florescence parameters could not be used.

Results from Mahmudiyan et al. (2011) suggested that moisture regime has had significant impact on traits of stomatal conductance, grain yield, harvest index, grain production rate and grain weight per ear. There was a significant difference between cultivars and lines of this study based on most physiologic traits. The main objective in this research was to study the impact of physiologic traits on wheat cultivars yield under drought stress.

#### METHODOLOGY

This experiment was carried out in the form of randomized complete block design with three replications during 2015-2016 crop year in Ardabil IAU Research Farm (5 km west of Ardabil). The region climate is Semiarid and cold and the temperature during winter is usually subzero. The altitude of this location is 1350 m above sea level and its latitude and longitude are 38.15 N and 48.2 E, respectively. The experienced treatments included 6 various bread wheat cultivars (Rasad, Pishtaz, Kenya-2002, Soltan-95, Soissons and Seri 82). Tillage operation including moldboard plowing, disc, leveler, and furrow, were carried out on the fallow land. In each plot, six lines with a distance of 20 cm were formed and harvested with a length of six meters and seed density of 450 seeds per square meters. The area of each plot was 7.2 square meters and the harvested area was six meters through omitting half a meter from the beginning and the end of each plot in order to exclude the effect of margin. After the bushes grew up and reached the flowering stage, in order to apply the stress and prevent reaching rain, rain exclusion shelter was used. By the beginning of the stress, measuring the fluorescence of chlorophyll, chlorophyll content of leaves, relative water content and stomatal conductance was conducted after pollination stage. Ultimately, after reaching physiological maturity, the grain yield of 1 square meters was calculated.

#### **RESULTS AND DISCUSSION**

ANOVA results suggested that there was a significant difference between the studied wheat cultivars based on traits of leaf chlorophyll rate, water loss from separated leaf and grain yield at one percent probability level, and based on traits of leaf stomatal conductance, relative water content, harvest index and biologic yield at five percent probability level. Also, results indicated that there was no significant difference between the cultivars based on photochemical efficiency of photosystem II (FV/Fm) (Table 1).

Bakhshande et al. (2006) showed that there was a significant difference between the studied genotypes based on the traits of the harvest index and biologic yield at 5%. Amini (2003) reported a significant difference between the studied genotypes based on the traits of the number of days to heading, bush height, maturity time, number of seeds per ear, thousand kernel weight and grain yield at 1%. 'Abdoli et al. (2013) reported there was

	Table 1. Analysis of variance the traits in different cultivars of wheat									
				Mea	Mean Square					
	S.O.V DF		Leaf Chlorophyll Rate	Leaf Stomatal Conductance	photochemical efficiency of photosystem II (FV/Fm)	Relative Water Content	Water Loss from Separated Leaf	Biologic Yield	Harvest Index	Grain Yield
	Replication	2	151.01	626.69	1.58	28.49	0.08	1.55	10.80	0.16
	Treatment	5	147.85**	2692.35*	3.06 ns	121.91*	211.60**	10.27*	35.99*	0.82**
	Error	10	15.84	589.11	1.58	33.75	23.54	2.002	10.66	0.13
	C.V %		12.28	15.40	1.63	6.67	9.77	10.54	18.97	15.18
	* and ** respectively significant 5% and 1%									

Table 2. Mean comparison of genotypes for the studied traits								
	Studied traits							
Genotype	Leaf Chlorophyll Rate	Leaf Stomatal Conductance	Relative Water Content	Water Loss from Separated Leaf	Biologic Yield	Harvest Index	Grain Yield	
Rasad	22.49 с	154.47 ab	87.17 ab	57.35 ab	14.97 ab	11.11 b	2.32 ab	
Pishtaz	28.70 bc	119.53 b	89.38 ab	42.63 c	16.39 a	19.34 ab	3.25 a	
Kenya-2002	43.37 a	169.33 ab	75.09 b	49.42 abc	12.93 ab	16.22 ab	2.12 b	
Soltan-95	32.43 abc	177.44 ab	86.91 ab	41.86 c	11.75 b	16.45 ab	1.64 b	
Soissons	31.46 bc	127.25 bc	90.97 ab	44.47 bc	12.03 b	20.45 a	2.42 ab	
Seri 82	36.04 ab	197.30	93.32 a	62.16 a	12.45 ab	19.71 ab	2.25 ab	

not a significant difference between the studied cultivars based on the trait of photochemical efficiency of photosystem II. Gale et al. (2002) also observed that there was not any change in photochemical efficiency of photosystem II due to the drought stress application among various wheat cultivars.

#### LEAF CHLOROPHYLL RATE

Data mean comparison indicated among the studied wheat cultivars, the highest leaf chlorophyll rate with a mean of 43.37 CCI was related to the cultivar of Kenya -2002 and it was put in group A along with cultivars of Soltan-95 and Seri 82, and they didn't show any significant difference based on this trait. Also, the cultivar of Rasad with a mean of 22.49 CCI had the lowest leaf chlorophyll rate.(Table 2).

Gregersen and Holm (2007) expressed that the chlorophyll content decreases during water stress and cultivars with higher chlorophyll content show a higher resistance in this stress condition. Chlorophyll content not being suitable for assessing resistant towards drought was expressed by Zarei (2007).

#### LEAF STOMATAL CONDUCTANCE

Data mean comparison indicated among the studied wheat cultivars, the highest leaf stomatal conductance with a mean of 197.30 mm/cms was related to the cultivar of Seri 82 and it was put in group A along with cultivars of Rasad, Kenya-2002 and Soltan-95, and they didn't show any significant difference based on this trait. Also, the cultivar of Pishtaz with a mean of 119.53 mm/cms had the lowest leaf stomatal conductance, and it was put in group B along with the cultivar of Soissons (Table 2).

#### **RELATIVE WATER CONTENT**

The highest relative water content rate (93.32 percent) was related to the cultivar of Seri 82 and it was put in group A along with cultivars of Rasad, Pishtaz, Soltan

98, and Soissons. On the other hand, the lowest relative water content was related to the cultivar of Kenya-2002 with a mean of 75.09 percent (Table 2).

According to the results of the research conducted by 'Abdoli et al. (2013), it was determined that leaf relative water content rate decreased by 8.3 percent in drought stress. Also, they reported that there was a significant difference observed between studied cultivars based on leaf relative water content.

#### WATER LOSS FROM SEPARATED LEAF

The cultivar of Seri 82 had the highest water loss from separated leaf (with a mean of 62.16 oercent) and it was in the best group along with the cultivars of Rasad and Kenya-2002. On the other hand, the lowest water loss from separated leaf with means of 41.86 and 42.63 percent was related to the cultivars of Soltan-95 and Pishtaz (Table 2).

#### **BIOLOGIC YIELD**

Data mean comparison showed that the cultivar of Pishtaz with a mean of 16.39 tons per hectare had the highest biologic yield and it was put in the best group along with the cultivars of Rasad, Kenya-2002 and Seri 82, and they did not show any significant difference in this trait. On the other hand, the cultivars of Soltan-95 and Soissons were in the one statistical level and had the lowest biologic yield (Table 2).

In drought stress, accelerated aging of photosynthetic tissues and also decrease in current photosynthesis of the plant lead to a decrease in biomass production. Emam et al. (2007) and Pireivatlou et al. (2010) reported results related to a decrease in biologic yield due to the drought stress.

#### HARVEST INDEX

Mean comparison indicated that the highest harvest index (20.45 percent) was related to the cultivar of

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Soissons and it did not show any significant difference with the cultivars of Pishtaz, Kenya-2002, Soltan-95 and Seri 82 and they were put in one statistical level. Also, the cultivar of Rasad with a mean of 11.11 had the lowest harvest index (Table 2).

Decrease in harvest index in drought stress condition after flowering is attributed to the decrease in access to the current processed materials during grain filling period. (Emam, 2011; Emam and Niknejhad, 2011) Decrease in harvest index due to the terminal drought stress has been reported by other researchers as well. (Emam, 2011; Wang et al., 2001) In drought stress condition, decrease in photosynthetic activities ultimately leads to a decrease in the transfer of produced materials to the seeds and this leads to a decrease in harvest index. (Gooding et al., 2003).

#### **GRAIN YIELD**

Data mean comparison showed that the cultivar of Pishtaz with a mean of 3.25 tons per hectare had the highest grain yield and it was put in one group along with the cultivars of Rasad, Soissons and Seri 82, and they didn't show any significant difference based on this trait. On the other hand, the lowest grain yield was from the cultivars of Soltan-95 and Kenya-2002 which were in the same statistical level and in the last ranking (Table 2).

Abdoli and Saeidi (2012) showed that irrigation cut after pollination decreases the grain yield and thousand kernel weight to 33.9% and 26.4% respectively in various wheat cultivars.

Results from Ramezanpour and Dastfal (2004) showed that 25 and 50 percent of decrease in the water lead to 21.8 and 40.7 percent decrease in grain yield, respectively. Also, biologic yield index decreased by 16.4 and 32.2 percent, respectively.

#### CONCLUSION

Since modification of grain yield is usually difficult due to its low heritability, suitable physiologic properties should be searched for in order to maximize the relationship with formation of grain yield in various environmental conditions. It seems that by studying phonologic traits, such as relative water content, chlorophyll content, photochemical efficiency of photosystem II, stomatal conductance and water loss from separated leaf, cultivars resistive to drought stress could be easily identified. Based on retrieved results, the cultivar of Pishtaz is the most yielding cultivar in water drought condition and planting it by the farmers in Ardabil Region, in addition to leading a higher yield comparing to the other studied cultivars, could entail a lower risk in drop in production in case of drought stress emergence during grain filling stage. Accordingly, cultivars of Rasad, Soissons ans Seri 82 are in the next ranks.

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# The effect of drought stress on morphological and physiological traits and essence percentage of medicinal plant, *Nigella sativa*

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#### ABSTRACT

Various environmental stresses are of factors reducing agricultural yields. But applying these stresses on the medicinal plants effects on their active substances (constituents). In the current study, the effect of different amounts of irrigation on some qualitative and quantitative factors of Nigella Sativa was examined. The experimental design was a randomized complete block with three replications. Treatments included 3 levels of drought stress of 50 (severe stress), 70 (medium stress) and 90 (control) percent of field capacity. The required amount of water in each treatment and at any time was calculated through the measurement of soil moisture content using a hygrometer and as a result of water required to reach field capacity. During physiological investigation grain number per follicle, number of grains per plant, grain weight, biological yield, grain yield, harvest index, soluble protein, proline concentration and the essence percent were measured. The results showed that drought stress on morphological, physiological and the essence percent at 1% probability level, there was a significant difference. The results showed that with increasing stress levels, the essence percent, proline, and soluble protein increased. As well as applying moderate drought stress, the largest number of grains per plant, biological yield and grain yield was achieved, but with increasing levels of stress, these traits (characteristics) were decreased. In other traits (characteristics) increasing levels of stress, their amount was decreased.

KEY WORDS: MORPHOLOGICAL, PHYSIOLOGICAL, DROUGHT STRESS, THE ESSENCE PERCENT, NIGELLA SATIVA

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#### INTRODUCTION

Water is one of the most important environmental factors in the production of various products, so that its deficiency can severely damage the growth and development as well as the active ingredient of medicinal plants (Omidbeygi, 2005). Irregular precipitation (rainfall) patterns in arid areas expose plants to different intensities of drought stress. Often, high temperatures and poor nutritional status also makes it more complex effects of drought. Water is not only ecologically but also physiologically is important for plants, because involved in most of the internal processes of plants and almost all metabolic activities of plant cells such as manufacturing of active ingredients in medicinal plants depends on the presence of water (Letchamo et al., 1994). Therefore, one of the most important goals in plant breeding programs is the study of their tolerance facing drought (Yadav and Bhathagar, 2001). Long-term water stress effects on all metabolic processes in plants and thereby reduces plant production (plant throughput). The survival of plant in limiting conditions of drought stress requires its ability to survive in conditions of severe drought (osmotic) caused by drought. Maintenance of optimum moisture and maintaining the structure of biopolymers under stress conditions is crucial for the survival of the plant (Kuzentsov and Shevykova, 1999). Therefore, the optimization of irrigation management due to lack of water along with choice of suitable crops plant to cultivate is particularly important (Ghanbari et al., 2007).

In recent years, herbs have returned again to Iran medicine and have been cultivated in all parts of the country. Medicinal herbs (plants) due to natural essence and similar medicinal compounds together with, better adapt to the body and are usually free of side effects, especially in cases of prolonged use and for chronic diseases, therefore, are very convenient. Thus has a considerable advantages compared to chemical drugs. Also, having good therapeutic effects as well as resistance of some diseases to some medications and sensitizing in people towards some industrial medications have been the factors increased consumption of herbal medicinal products in recent decades. According to the WHO (WHO) 80 per cent of the world people to the early health care has traditionally been dependent on medicinal plants and natural products. Historically, medicinal plants have great importance in the development of communities and extensive research to find herbal medicinal products and natural materials have been done throughout history. The cultivation of these plants requires the evaluation of their capability to produce on a large scale and their resistance to adverse environmental conditions such as lack of irrigation water (Cronquist, 1981).

#### Shahattary and Mansourifar

Nigella sativa (L.) (black cumin) is an annual plant belonging to the Ranunculaceae family, with a height of 60 to 70 cm, the leaves are gray-green color with notched fiber, white to blue flowers and capsule fruit (follicles) that there are large number of fragrant black grains within. In the Nigella sativa (black cumin) grains, there is 40 percent constant oil and about 1.4 percent essence (Islam et al., 2004). Grains from these plants in medicine are used as a carminative, menstruation facilitator, laxatives, lactate stimulant, anti-constipation and sexual power amplifier in men (Riaz and Chaudhary, 1996). In addition to its automotive growth in various regions of Europe, West Asia and Iran (Esfahan and Arak) , this plant is cultivated for crops (Akbarinia et al., 2005) which meanwhile, the limiting environmental factors can reduce growth and performance of it. The conducted studies showed that appropriate moisture increased the plant height and more foliage and thus increased the number of capsules per Nigella Sativa plant and resulted in increased grain yield (Akbarinia et al., 2005).

Also, the study conducted by Mozzafari et al., (2000) on black cumin (Nigella Sativa) showed the increased drought stress increases grain oil percent but oil yield due to reduced yield in high stresses irrigation decreases. Srivastavs and Misra (2000) has reported effects of sufficient irrigation on growth and essence content of peppermint. Several reports also show an increase in extracted oil per unit area by reducing irrigation water (Mozzafari et al., 2000).

The determination of the most appropriate amount of irrigation water in order to produce the best quality and quantity of the product in the herb lack cumin (Nigella sativa) is essential. Therefore, in this study the effects of water shortage in various stages of development on the morphological factors, the amount and main components of essence and physiological traits were evaluated.

#### MATERIALS AND METHODS

To evaluate the effect of irrigation intervals on morphological, physiological and amount of essence of herb Nigella Sativa in the Deh-Shir-Khan village field of Arak city, an experiment was conducted in the 2016 crop year. The mean of average annual temperature and precipitation have been reported 13.9 ° C and 341 mm, respectively. Texture of the field soil is silt clay.

The experimental design was a randomized complete block with three replications. Treatments included 3 levels of drought stress 50 (severe stress), 70 (medium stress) and 90 (control) percent of field capacity. Grain rate was about 1.5 grams per square meter. The width of each replication was 3 meters and the distance between main plots and subplots was considered about

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40 cm. Also, the distance between each repetition 2 m for irrigation water move and walk were considered. In order to study changes in the water content of the soil profile in the various treatments of irrigation, soil moisture content was measured at depths of 15 and 30 cm using hygrometer. To determine soil water holding capacity accidentally six undisturbed samples from the farm were taken from two depths 15 and 30 cm. Sampling was conducted using auger and special capped rings. Samples were taken saturated state after the weighing. The amount of gravity water the moisture contained in the soil at field capacity and permanent wilting point using pressure plates and then drying in oven calculation of the percentage of residual moisture in the soil were determined.

Soil water holding capacity of test run at field capacity points and permanent wilting were calculated. The amount of required water in each treatment and at any time through the measurement of soil moisture content using a hygrometer and as a result of the measurement of required water to reach field capacity was calculated. Irrigation regimes following established plants and thinning were applied. Fighting against the weeds mechanically and hand weeding was done for four times.

Finally, the number of grains per follicle, number of grains per plant, grain weight, biological yield, grain yield, harvest index, soluble protein, proline concentration and essence percent were measured. To measure the percentage of essence water distillation (Clevenger, 1928) was performed using Clevenger apparatus.

For the extraction of soluble proteins in leaves, one gram of frozen leaf samples at -80 ° C using liquid nitrogen in a porcelain mortar was powdered and then adding 4 ml of extraction buffer with the composition: Tris-HCl one molar (pH = 7.5) Na2EDTA + 5% one molar 0.2% + two- Mercaptoethanol 0.4% in distilled water to sample and its homogenization, the mixture was transferred to the capped tubes followed by 13,000 rpm for 20 min was centrifuged and transparent extract was separated from solution and was kept at -20 ° C. The quantitative amount measurement of soluble proteins based on Bradford method (Bradford, 1976) using Bio-Rad reagent a spectrophotometer with wavelength at 595 nm was read and then by depicting curves derived from readings protein standards taken from bovine serum albumin (BSA) in specified concentrations on graph paper were determined.

Measurement of proline, according to Bates Method (Bates et al., 1973) was performed. To measure proline of the leaf, firstly, 0.2 g of leaf blade was cut then it was in a porcelain mortar with good liquid nitrogen was crushed. Then 10cc of Sulfosalicylic acid 3% was poured into a mortar and leaf sample was crushed good and then was passed through filter paper and cc2 of resulting solution was removed and with cc2 ready-made solution Nine dimenhydrinate (how to prepare it will be mentioned) and cc2 acetic acid was poured into the test capped tube and was placed for 1 hour in a warm bath. Then, the samples were removed from the bath and placed in the ice and to its temperature reach the temperature of room, so that if you touched it does not feel the heat. At this stage under the hood, cc4 amount of toluene was added to each sample and shaken well until completely blended. After a few moments, two phases were resulted that the low (bottom) phase was more transparent and higher (top) phase was red colored (depending on the amount of leaf proline). The toluene as a witness (control) in a spectrophotometer was used to measure the wavelength of light. Then cc4 of top phase was removed and placed into the spectrophotometer under the wavelength of 520 nm and read number rather than variable X was placed in the equation (6). The obtained Y is placed in Equation 7 to obtain the leaf proline in terms of micromoles per mg.

$$Y = 42/281X + 4/6698$$
 (1)

Proline rate 
$$=\frac{Y \times 5}{200 (\text{leaves mg})}$$
 (2)

The data were analyzed using SAS 9.1 software. Also means comparison using test LSD (at 5%) was performed.

#### **RESULTS AND DISCUSSION**

#### THE NUMBER OF GRAINS PER FOLLICLE

Analysis of variance showed that between levels of drought stress in terms of the number of grains per follicle, there was a significant difference in 1% level (Table 1). Also, the results of mean comparison showed that the control treatment (90% FC) had the highest amount of grain in the follicles (Table 2). The severe drought treatment (50% FC) has the lowest number of grains in follicles (Table 2). Effect of drought stress caused the number of grains per follicle at 70 and 50 percent of field capacity, respectively, to the 22.08 and 29.40 percent decrease compared to the control treatment. The results were in line with many studies. For example, in a study by Rezapour and colleagues (2012) Nigella sativa grain yield in irrigation treatment after 150 mm compared to treatment of 50 mm evaporation from pan surface treatment decreased 22.8 percent, so that the drought stress had a significant impact on all components of grain yield including biomass, number of capsules per plant and grains per capsules and reduced them. Koochaki and colleagues (2007) reported that

Table 1. Analysis o	Table 1. Analysis of variance Nigella sativa morphological traits under drought stress						
Mean of squares					Degrees of	Sources of	
The number of grains per follicle	number of grains per plant	1000-grain weight	biological yield	grain yield	harvest index	Freedom	changes
30.76**	127.45**	0.007**	94.34**	67.46**	69.33**	2	Block
144.43**	2593.78**	0.120**	4033.00*	3238.78**	212.34**	2	Drought stress
0.44	4.11	0.005	324.32	13.76	3.16	4	Pilot error
1.77	1.23	3.06	10.33	3.63	5.74	Coefficient of	variation

Table 2. The comparison of mean of morphological traits of Nigella sativa under drought stress							
Mean of squares						Drought stress	
The number of grains per follicle	number of grains per plant	1000-grain weight	biological yield	grain yield	harvest index	(Field Capacity)	
45.33a	172.66b	2.55a	188.65a	116.33b	32.33b	90 percent	
35.32b	190.00a	2.23b	201.61a	125.66a	38.66a	70 percent	
32.00c	132.66c	2.15c	132.60b	64.66 c	22.00 c	50 percent	

water stress (drought) by failing to provide photosynthetic inputs reduced yield components of the fennel. It seems that these factors have been effective in reducing some yield components of Nigella sativa (black cumin). yield and harvest index were significant and increasing irrigation intervals, the studied features decreased. The result of this study was consistent with Rezvani and colleagues' one (2012).

#### THE 1000 GRAIN WEIGHT

#### THE NUMBER OF GRAINS PER PLANT

Analysis of variance showed that the effect of drought stress on grain number per plant, there was a significant difference at 1% level (Table 1). The results of comparison of mean showed that mild stress had the highest number of grains per plant and severe stress (50% FC) had the lowest number of grains per plant (Table 2). In general, the number of grains per plant in mild drought stress (70% FC) increased 10.04 percent, while applying severe stress the number of grains per plant decreased at 23.16.

Increased number of grains in the less drought stress could be relevant to the more numbers of follicles, bigger and better plant growth. Considering the fact that the number of grains per follicle in fact determines the storage capacity, therefore, the greater the number of grains, plants with larger and more storage has been produced to receive photosynthetic material and increased this trait will improve the yield. In many crop plants, water stress, especially during flowering reduces the number of fertilized flowers, abortion and subsequent reduction of grain and therefore is greatly reduced performance (yield) (Rezaei, 2012). Shabanzadeh and Golvi (2012) showed that the effects of irrigation interval on height, number of branches, number of capsules per plant, grains per flowers and plant, grain (grain) weight, biological Analysis of variance showed that the effect of drought on the w1000 grain weight, there was a significant difference in the 1% level (Table 1). The results of mean comparison showed that the control treatment (90% FC) had the highest amount of 1000 grain weight (Table 2). Also severe stress treatment (50% FC) had the lowest 1000 grain weight (Table 2). In general, drought stress decreased one thousand grains weight at 8.62 and 15.68 percent in the mild and severe drought stress. The results are consistent research conducted by Shabanzadeh and Golvi (2012). The 1000 grain weight indicates the status and reproductive period of any plant and since by beginning of flowering and determination of the number of grains per plant, grains begin to receive and store values of their photosynthesis, there should be a difference between the 1000-grain weight and normal modes when the plant placed under moisture stress. But the 1000 grain weight is among the factors that most is influenced by genetic control and has a high heritability and less affected by environmental factors.

#### **BIOLOGICAL YIELD (FUNCTION)**

Analysis of variance showed that the effect of drought on the on biological yield trait, there was a significant

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difference in the 5% level (Table 1). The results of mean comparison showed that the mild stress level had the highest amount of biological yield and sever stress (50 percent FC) had the lowest biological yield (Table 2). It should be noted that moderate stress level and control had no significant difference. In general biological yield in mild drought stress (70% FC) increased 6.90 percent, while applying severe stress the number of grains per plant was decreased as 29.71 percent.

Plant growth is influenced by a series of biochemical and physiological processes such as photosynthesis, respiration, material transfer, ion absorption and metabolism of food which are also involved in plant dry weight of plant (Kafi et al, 2010). These processes have a direct relationship with the amount of available water and its continuity. With increasing irrigation intervals, these processes are disrupted, and the plant can't produce their maximum potential dry matter (Imam and Zavareh, 2008). On the other hand, the drought stress reduces the uptake of water and nutrients, crop growth rate, growth period, the plant photosynthesis, plant height, growth rate and root development and all of these factors ultimately lead to a reduction in dry matter production (Pessarkli, 1999). According to the Ahmadian and colleagues (2010) increased intensity of water deficiency leads to a reduction in biomass of chamomile in a way that at the 90% treatment of field capacity the most and at 50% treatment of field capacity the least plant biomass was produced, respectively. Rezapour and colleagues (2012) in a study on the Nigella sativa reported that decreased production yield by increase in the drought is related to reduction in plant height, leaf area reduction and enhanced allocation of photoassimilates to the root rather than shoot (aerial part) of plant.

#### THE GRAIN YIELD (PERFORMANCE)

Analysis of variance showed that the effect of drought stress on the on grain yield trait, there was a significant difference in the 1% level (Table 1). The results of mean comparison showed that the mild stress level had the highest amount of grain yield and sever stress (50 percent FC) had the lowest grain yield (Table 2). In general grain yield in mild drought stress (70% FC) increased 8.02 percent, while applying severe stress the number of grains per plant was decreased as 44.41 percent. Goldani and Rezvani Moghadam (2006) argue that the available accessible soil moisture increases the plant canopy development, thereby absorb more radiation energy plant leading increase yield and its components in the plant. On the other hand, the reduction of photosynthetic area of leaves and shortening the duration of grain filling and prematurity of treatments under drought can be effective in reducing grain yield. Aghayee and Ehsanzadeh (2012) found that drought stress by reducing leaf area, chlorophyll content, openings conductance and ultimately reduce the rate of photosynthesis decreased the function of paper grains pumpkin.

#### THE HARVEST INDEX (HI)

Analysis of variance showed that the effect of drought on the on harvest index trait, there was a significant difference in the 5% level (Table 1). The results of mean comparison showed that the mild stress level had the highest amount of harvest index and sever stress (50 percent FC) had the lowest harvest index (Table 2). It should be noted that moderate drought stress level and control had no significant difference. In general, harvest index in mild drought stress (70% FC) increased 19.57 percent, while applying severe stress, harvest index was decreased as 31.95 percent. The effect of irrigation interval on plant height, number of branches, the number of capsules per plant, number of grains per plant, 1000grain weight, biological yield and harvest index was significant and with increasing irrigation interval, the studied features were decreased. Most grain yield grain was obtained in irrigation interval of seven days (average irrigation) (Shabanzadeh and Golvi, 2012).

#### THE PERCENTAGE OF ESSENCE

Analysis of variance showed that between levels of drought stress in terms of the percentage of the essence, there was a significant difference at 1% level (Table 3). Also, the results of mean comparison showed that the control treatment (90% FC) had the lowest percentage of essence (Table 4). The severe drought treatment (50% FC) had the most percentage of essence (Table 4). Effect of drought stress resulted in levels of 70 percent of field capacity, respectively, to the 8.33 and 11.11 percent increased compared to the control.

The plants depending on the plant species and genotypes are different in reactions to drought stress. So water setting and management in medicinal and aromatic plants are important in terms of essence production. Rabiee and colleagues (50) in the study of the effect of drought stress (no stress, moderate stress and severe stress) on cumin showed that the plants under moderate stress compared to the two treatments of no stress (control) and severe stress had higher essence. Rezai Chaîne (2012) in the study of effect of different irrigation treatments on the accumulation of essence, its composition and some eco-physiological traits in fennel found that drought stress increases the fennel essence, but it reduces the essence yield and increased fennel essence due to drought stress has been reported as a result of the higher concentration of essence glands due to reduced

Table 3. Analysis of variance of essence percentage, soluble protein and proline traits of Nigella sativa under drought stress conditions					
Mean of squares Degrees of					
Essence percentage	soluble protein	proline	Freedom		
0.00001**	144.10**	2.95**	2	Block	
.00001**	6330.08**	9.99*	2	Drought stress	
.0000002**	129.64	0.76	4	Pilot error	
1.35	15.14	4.93	Coefficient of variation		

Table 4. The mean comparison of percentage of essence, soluble protein and proline of Nigella sativa under drought stress						
Traits			Drought Stross (Field Canadity)			
Essence percentage	soluble protein	proline	Drought Stress (Field Capacity)			
0.036b	0.37b	15.95b	90 percent			
0.039a	3.40b	17.76ab	70 percent			
0.040a	81.40a	19.60a	50 percent			

leaf area caused by stress and more accumulation of essence. It seems that drought stress increases secondary metabolites (essence) that have protective effect against stress such as drought stress in plants. The results of other studies on the effect of irrigation intervals on the production of secondary metabolites and the essence percentage of savory and rosemary attest (confirm) the results of this trial, so that with increasing irrigation intervals and reduced field capacity, the essence percentage of these plant has also been added (Baher et al., 2002). Rezainejad and colleagues (2002) reported that irrigation interval had a significant effect on the essence percentage of Cumin. Javanshir and colleagues (2002) also examining the effects of irrigation on the amount of essence of anise observed that irrigation treatment had significant effect on the essence percentage.

#### SOLUBLE PROTEIN

Analysis of variance showed that the effect of drought stress on soluble protein trait, there was a significant difference at the level of 5 percent (Table 3). The results of mean comparison showed that the control treatment had the lowest levels of soluble protein and severe stress (50% FC) had the highest amount of soluble protein (Table 4).

Also, Ghorbani Javid and colleagues (2007) reported that concentrations of soluble proteins at different levels of drought stress in the tolerant genotypes of alfalfa is almost constant that seemingly has been favorable maintaining the structure of the plant and plant activities, while in sensitive genotype with increasing stress, the concentration of soluble proteins decreased that can be caused by decreased the frequency of precursors producing protein (Substrates) and a decrease in gene expression or manifestation of their origin.

#### THE PROLINE (AN AMINO ACID)

Analysis of variance showed that between levels of stress in terms of proline, trait there was a significant difference at 1% level (Table 3). Also, the results mean comparison showed that the control treatment (90% FC) had the lowest proline, (Table 4). The severe drought treatment (50% FC) had the most proline (Table 4). The effect of drought stress caused proline at 70 and 50 percent of field capacity, respectively, to the 11.34 and 22.88 percent increase compared to the control.

The study was carried out on eggplant it was shown that applying water shortage stress leads to increased concentration of leaf proline were by re-watering the proline decreased (Taghavi Razavizadeh, 2004). Zeifnejad and colleagues (1997) in their study on sorghum and Griffin and colleagues (2004) in their study on Judas tree and Mehrabi (2009) on sesame reported praline increased under drought stress. Akhondi and colleagues (2007) and Kydamby and colleagues 1990) in their experiments on the alfalfa reported the effect of drought stress on proline. Pagter and colleagues (2005) in their study on the straw plant reported that just under severe stress water, proline increase slightly and thus until the critical level, has little significance. Safarnejad (2004) examining the effects of drought stress on alfalfa genotypes reported that with increasing drought stress, proline concentration increases on leaves. Thus, it can be concluded that genotypes which have produced more proline in the

effect of drought stress, this increased proline prevents further decline and loss and show less reduction of yield (performance).

#### **TOTAL CONCLUSION**

Totally, the results of this study showed that drought stress reduced number of grain per follicle, 1000-grain weight and grain yield. On the other hand, increased drought stress increased the soluble protein and proline content. For other traits moderate stresses drought increased the traits compared to control.

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## Histological study on the stages of pollination and fertilization in the cultivars of red seedless and ghezel-ozum grapes

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#### ABSTRACT

The Vitaceae is one of the most important plant families, which it includes the *Vitis* genus with all its economic characteristics. In the meantime, the European seedless grapes for their high-quality fruitshave popularity. However, in the breeding works, the progenies from the seedless cultivars have a low frequency. In Sultana cultivar (known as Thompson seedless in the United States) which is the most important seedless cultivar, abortion of the embryo after pollination and fertilization has been mentioned as a reason for being seedless. Investigating the structure of the seed and determining the time of abortion can be important in terms of tissue culture, embryo rescue and biology. In this research, the comparative study of the seed development of the red seedless grape with Ghezel-Ozum seeded cultivars considered using the histological techniques. Samples were harvested from pre-pollination till seed maturation every five days from the Research Station of Kahriz, Urmia and fixed in the FAA fixator. The fixed samples were immersed in the paraffin and then were cut with a microtome. After staining with PAS-Hematoxilen, samples were studied with the light microscope and photography. Observations showed that the growth and development of zygote and endosperm were delayed and eventually stopped in the red seedless cultivar after the double fertilization.

KEY WORDS: ABORTION; DOUBLE FERTILIZATION; ENDOSPERM; POLLINATION; SEEDLESS GRAPES; SEEDED GRAPES

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#### INTRODUCTION

The Vitaceae is one of the most important plant families, which it includes the *Vitis* genus with all its economic characteristics. Furthermore, this family has about 15 genera with 900 species (Zhang *et al.* 2015). The *Vitis* genus has a special importance in horticulture. Itis divided into two sub-genera of Euvitis and Muscadine. The commercial cultivars are related to the first sub-genus. Their flowers have 5 sepals, 5 petals, 5 stamens linked to the petals and alternating with the disc-shaped edges and the pistil with di-carpel ovary, in which each ovary there are the two standing ovules (Ghahraman 1993; Ghanadha *et al.* 2004).

The different species of the sub-genus Euvitis (2n=38) have very little differences in terms of the chromosomal structure, and their intercourse with each other is possible. Therefore, only the geographical boundaries and ecological barriers have separated them from each other and created the European, American and Asian varieties (Ghahraman 1993; Ghanadha *et al.* 2004).

The European grapes due to having high-quality fruit as the commercial varieties are popular, and it has been found that polyphenolic compounds existing in those which include the flavonoid compounds are useful in preventing the heart diseases and cancer in human (Kalt 2001; Lepiniec *et al.* 2006). The American grapes are also used as the stock due to resisting pests and diseases. The varieties that are resistant to cold and frost can also be found in the Asian grapes (Ghahraman 1993; Ghanadha *et al.* 2004).

The origin of the European grapes is the area between the Caspian Sea to the Black Sea and from there to the Mediterranean area and Europe has expanded (Wen 2007). Although, grapevines are the dioecious plants, but following selective breeding done by man that has continued for many years, the male stocks have been removed from the European grapes and now the female stocks and self-pollinated hermaphrodite are cultivated. Since being seedless is desirable characteristic in many fruits for table utilizations, in the grape has also paid special attention to this feature. However, the seedless varieties and their progenies have a low frequency. Perhaps the most main factor is difficulties in making hybrid and producing seed in these varieties (Bharathy et al. 2005; Liu et al. 2003; Ramming et al. 1991; Sharma et al. 1996; Yang et al. 2007).

In Sultana cultivar which is the most important seedless cultivar, being seedless is the result of digesting the embryo after pollination and fertilization. Ebadi *et al.* (2010) demonstrated that the high frequency of abnormal ovules and single fertilization can be considered as two other reasons of seedlessness. The remainders of undeveloped ovule inside fruitcan be seen until its har-

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vest stage. However, due to the small size of these immature seeds, it does not feel when eating fruit. Although this feature is very favorable in terms of production, but in terms of eugenic objectivesand obtaining the reproductive progenies would be problematic (Bharathy *et al.* 2005; Farsi & Bagheri 2004; Farsi & ZolAli 2006; Liu *et al.* 2003; Wakana *et al.* 2002; Yang *et al.* 2007).

Knowing how to digest the ovule and its morphological disorders and the appearance time of this phenomenon is very important and necessary. Perhaps only by this way, the separating of embryo and timely rescue it can be performed (Bharathy *et al.* 2005; Liu *et al.* 2003; Yang *et al.* 2007).

Therefore, the comparative study of the development of the ovule, the formation of embryo sac and seed in the seedless and seeded cultivars of grapes not only explain the structural and morphological differences between them, but it can also use to identify and utilize the appropriate methods to prevent the hollowness appearance of the seed (in breeding purposes) (Pratt 1971).

More processes of the development of ovule and the appearance of embryo occur at the microscopic level thereforethe use of appropriate histological methods for the structural studying of seedless in the grapes will be inevitable. However, preparing the microscopic samples of the perennial trees has specific problems which the hardness of tissuesas well as tannins and other phenolic compounds in them can be noted, and their combination with chemical materials used in the fixator prevents the optimal fixation of the tissues. Therefore, cellular and histological studies on tree species much less than herbaceous plants, and vines are not also an exception. In the annual and biennial plants such problems are less common (Ruzin 1999).

The purpose of this study was a documentation of histological information in *vitis* geneus with a comparative study of the seed development of the red seedless grape with Ghezel-Ozum seeded cultivar to exact determine the time of embryo abortion. This study can be useful in studies and practices of tissue culture and embryo rescue. Because, to know an appropriate time of exiting seeds can be more successful in tissue culture and embryo rescue.

#### MATERIALS AND METHODS

#### PLANT MATERIAL AND SAMPLING

Samples (flower buds, flowers and fruits during sampling) were collected from Seed and Plant Improvement Research Institute, Kahriz, Urmia, Iranin Jun to August 2007. Samples were collected from 10 days before and 40 days after the loss of cap (with a 7-day intervals) (one inflorescence per branch, and 10 branches per plant and 20 plants in the total of the experiment for each

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variety), and immediately fixed in the FAA fixator (formaldehyde- acetic acid-alcohol) and transferred to the laboratory. The local varieties that were used for experiments, including the red seedless cultivar (containing stenospermocarp seed) and Ghezel-Ozum seeded cultivar (containing the actual seed) were selected for comparison with each other.

Samples were harvested from the clusters that were in the similar phonological stage, and were marked for next sampling. Samples were harvested in the early morning to avoid shrinking and losing the water. The 8-year plants were used and cultivated by using the method of Top Wire Cordon ( $2 \times 4$  Meter).

Samples were kept in the refrigerator during the experiment period. Then, based on the length (in mm) of pistil (or ovarian), and fruit were divided in the early and later stages, respectively. These divisions in the early stages with the graph paper, and at later stages with the caliper under the simple (loop) microscope were done In the maturity stages, seeds were separated from the fruits and their length were also measured.

Separating under the loop was done using forceps and sharp-pointed needles, and cap and stamens were precisely separated, and immediately placed in the fixator materials. Seeds were also separated from the fruit in the same method. At this stage, it has paid attention to the time of separating not to damage the samples. Furthermore, in the mature seed, the embryo was removed from the seed and examined under a microscope. Sampling of the Ghezel-Ozum and red seedless cultivars were performed in accordance with Tables 1 and 2.

## PREPARING THE SAMPLES AND HISTOLOGICAL ASSAY

The samples were immersed in the FAA fixator (formaldehyde 37%, 5 ml; ethanol 50%, 90 ml; and 5 ml of glacial acetic acid) for 12-24 hrs. After sufficient washing with running water and dehydrating with increasing levels of ethanol, the samples were clarified with xylene and saturated with paraffin. The samples after molding in paraffin, with the rotary handle microtome (R Jung Heidelberg) were cut at the thickness of 8 to 10 µm. The slices after removing paraffin and water were stained with Hematoxylin and PAS-Hematoxylin (Jenson 1962). The staining of Light Green, and Sudan Black and Red were used for studying proteins and lipids, respectively (Gahan 1984). The microscopic investigatingand photographing of samples were done with the light microscope (Nickon, E200-LED, USA).

Table 1. The dat	Table 1. The dates of sampling of the Ghezel-Ozum cultivar					
Date	Developmentstage	Features				
2008/05/28	The stage of pollination	The peak stage of anthesis The length of ovule: 1-1.5 mm				
2008/06/02	5 days after pollination	The length of ovule: 2-3 mm The length of fruit: 4-6 mm				
2008/06/07	10 days after pollination	The length of seed: 2-4 mm The length of fruit: 8-10 mm				
2008/06/12	15 days after pollination	The length of seed: 5-6 mm The length of fruit: 10-14 mm				
2008/06/17	20 days after pollination	The length of seed: 6-7 mm The length of fruit: 14-16 mm				
2008/06/24	27 days after pollination	The length of seed: 6-8 mm The length of fruit: 14-18 mm				
2008/06/27	30 days after pollination	The length of seed: 6-8 mm The length of fruit: 18-20 mm				
2008/07/03	36 days after pollination	The length of seed: 6-8 mm The length of fruit: 18-20 mm				
2008/07/07	40 days after pollination	The length of seed: 6-8 mm The length of fruit: 18-20 mm				
2008/07/13	46 days after pollination	The length of seed: 6-8 mm The length of fruit: 18-20 mm				
2008/07/18	51 days after pollination	The length of seed: 6-8 mm The length of fruit: 18-20 mm				
2008/10/30	5 months after pollination	The length of seed: 6-8 mm The length of fruit: 18-22 mm The stage offull maturity of embryo and a ripe fruit				

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Table 2. The dates of sampling of the red seedless cultivar		
Date	Developmentstage	Features
2008/06/13		Flower bud
2008/06/14		The beginning of anthesis
2008/06/16		30 to 50 percent anthesis
2008/06/18	The time of pollination	The peak stage of anthesis (80 percent flowers in anthesis) The length of ovule: 1-1.2mm
2008/06/21	5 days after pollination	The length of seed: 1.2-1.5 mm The length of fruit: 2-4 mm
2008/06/27	10 days after pollination	The length of seed: 1.5-2 mm The length of fruit: 4-6 mm
2008/07/03	15 days after pollination	The length of seed: 2-2.5 mm The length of fruit: 6-10 mm
2008/07/08	20 days after pollination	The length of seed: 2.5-3 mm The length of fruit: 10-10 mm
2008/07/15	30 days after pollination	The length of seed: 2.5 mm The length of fruit: 12-14 mm
2008/07/28	40 days after pollination	The length of seed: 2-2.3 mm The length of fruit: 12-14 mm

#### RESULTS

## THE CHANGES OF PRE- AND POST-POLLINATION STAGES IN THE RED SEEDLESS CULTIVAR

In the flowers of Red Seedless cultivar in the anthesis (stage 4; stages 1-3 are not shown here) based on sampling date and the morphological studies with the light microscopy, the pollen shad germinated and pollination had occurred. It should be noted that the flowers in grapes are on the clustered inflorescences and at one inflorescence, flowers can be in several different phonological stages, and in examinations should be considered this issue.

Three days after pollination (stage 5), the fertilization occurred in all the flowers, and micropyle was been closed, which was due to growing upand becoming massivethe internal walls.At this stage, the presence of pollen tube into the embryo sac was significant (Fig. 1).

The microscopic sections prepared from flowers pollinated at the stages of 10 and 15 days after pollination showed that the double fertilization in this cultivar was successfully occurred; so that the first division of the zygote was observed in 15 days after pollination. The apical and basal cells were formed in high and low densities, respectively and the basal cells were observed in its first division (Fig.2).

In the stage of 8 (20 days after pollination), a number of the free nuclei within the embryo sac were observed which have been resulted from the division of synergids (Fig.2). Whereas at this stage the growth of the zygote had been stopped and the cell had been degenerating. The formation of the brown sediments around the cell that was degenerating was significant (Fig.3). The significant point at this stage was distinctively the thickening of the transverse walls of calot cells which had likely been started from the previous stage (the tangential walls). Furthermore, sometimes the wall thickening was observed in the radial walls (Fig.3).

In addition, other notable phenomenon was the separation of the inner integumentfrom the outer integument which was started from this stage and at the following stages, this space was increased (Fig.4).

In the stage of 9 (30 days after pollination) in the red seedless cultivar, the nucellus were strongly pressed and the inner integument completely kept away from the outer integumentand an empty space was created between them (Fig. 4b).

In the stage of 10 (40 days after pollination) in the red seedless cultivar, the shrinkage of nucellus was continued and nucellus in the form of crumpled on one side of the seed was observed. The stages of degeneration were along with the shrinkage and becoming small of the seed. Thickening in the transverse walls of the calot cells were also continued at this stage. In the outer integument, the needle-shaped crystals of calcium oxalate were observed which large groups of them were formed within the idioblast (Fig. 5).

## THE CHANGES OF PRE- AND POST- POLLINATION STAGES IN THE GHEZEL-OZUM CULTIVAR

Five days after pollination in the Ghezel-Ozum cultivar, zygoteand synergids were observed in the embryo sac (Fig.6).

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Hematoxilen method, a) Ovule-synergids and polar nuclei within the embryo sac were distinguished. b) Fig.¬a with further magnification, the entering of the pollen tube to synergids was distinguished. c: calot, es: embryo sac, nu: nucellus, pt: pollen tube.

Ten days after pollination, a number of the free nuclei were observed within the embryo sac. The free nuclei, after the double fertilization, were resulted from the divisions of the synergids which would form the endosperm. The zygote as well as the synergids was observed in the form of the shrunk mass by the side of that (Fig.7). In the outer epidermis of the inner integument, the tangential divisions were seen with the increasing of the lengthin the radial direction. In the inner epidermis of the outer integument were also added on the reddish brown compounds.

In Ghezel-Ozum cultivar, the formation of the globular embryo was observed in simultaneous with the stage of 8 (20 days after pollination) (Fig.8). In addition, in the Ghezel-Ozum cultivar, endosperm was formed with cell wall and also both internal and external integuments grew.

In the final stages, the entire seed with the mature embryo and the cell endosperm was observed. The



has fertilized and its first division has done. b) Endosperm nuclei within the embryo sac are identified. en: endosperm nuclei, es: embryo sac

embryo in this cultivar had thoroughly evolved and consisted of an axial section, which the apical meristems of the root and stem formed at the two ends of that, and storages-accumulated cotyledons were on the both sides of the apical meristem of stem (Fig.9).

In the mature stage of the Ghezel-Ozumseed, the protein compounds within the endosperm tissue were thoroughly observed which were stained with Light Green (Fig. 10). Furthermore, the needle-shaped crystals of calcium oxalate in the form of the groups of idioblast were also observed in the final stages in this cultivar.

#### DISCUSSION

One of the important cultivars of grapes is red Sultana or red seedless which is one variety of stenospermocarps and consumed freshly and for producing sultana. So far, few studies, histologically, was performed on this cultivar. Stott (1936) was the first to report stenospermocarpy and he applied this word for the immature seeds. He



less cultivar in 20 days after pollination, stained with the method of Hematoxilen .a) The degenerated pre-embryonic cells were shown at the micropylar pole. B) Fig.a. With further magnification. Brown sediments are observed around the purple mass. c: calot, de: degenerated embryos, mi: micropyle

stated that the growth of embryo in Thompson Seedless varieties continues to globular embryo stage (according to the Pommer *et al.* 1995).Thereafter, it has been more considered the breeding aspects of grapevines, which the most important subjectswere embryo rescue with the aim of disease resistance, improving fruit quality and enhancing the performance in the stenospermocarp cultivars. In these studies, genotype, culture medium, sample age and harvest time have been introduced as important factors for successin embryo rescue, however, any exact research has not been performed on the subject of ovule and immature seeds of stenospermocarp (Sharma 1996; Yang *et al.* 2007).

Studies showed that pollination at the stenospermocarp cultivars is just a factor to develop fruit, and following growth and development of endosperm and the embryo have difficult (Hanania *et al.* 2007; Pratt 1971). Pratt (1971) noted that the outer integument of ovule at the stenospermocarp cultivars is without sclerenchyma cells and ovules or aborted seeds remain just as a small object into cubes. The development of ovule may be normal, such as seeded cultivars that have nucellus, one or two integuments and the cord, and or is nearly normal. Pratt (1971) noted that pollen is usually fertile and





self-pollination occurs in these cultivars. It was found that the being seedless characteristic is heritable (Bouquet and Danglot 1996; Pratt 1971). Liu *et al.* (2003) demonstrated that the main reason of stenospermocarp in Sultana seedless grapeis unknownup to now.

#### **GERMINATION OF POLLEN**

It was found that pollen affects the growth and size of seed, because, the half of the embryo genes and one third of endosperm genes are sourced from paternal parent (Ebadi & Dehghani 2002). Pratt (1971) said that stenospermocarpc ultivars have usually alive pollen. In our surveys on the red seedless grape, viability and germination of pollen on the stigma surface were confirmed by fluorescence microscope, however, because of style tissue thickness, the observation of its penetration from stigma surface to style was impossible. In sectioning to view in bright field light microscope, the pollen tube and its transition place in the micropylar region and calot were observed which shows the pollen tube penetrates into the ovule and then embryo sac.

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#### FERTILIZATION AND ZYGOTE FORMATION

In studies, it has been found that the pollen tube reaches the micropyle within 12 hrs and fertilization take place 24 hrs after pollination (Pratt, 1971). However, some literatures demonstrated that it occurs 2 to 3 days after pollination (Batigiana 2006). In an effort to breed seedless varieties by Sahijram and Kanamadi (2003), oocytes were histologically investigated 24 hrs after pollination, and the formation of zygotes were observed in 4 days after pollination at all studied crosses. Endosperm mother cell was also formed in all of them, and it means that double fertilization was successful (Sahijram & Kanamadi 2003). These findings correspond with our observations. The studying sample appeared that fertilization occurred in 3 to 5 days after pollination (due to a clustering of inflorescence and intervals for sampling). In the studied microscopy sections at this stage, the presence of pollen tubes inside the synergids confirms this. Also, fertilization at Ghezel-Ozum cultivar took place in 3 to 5 days after pollination.

#### POST-FERTILIZATION

#### Endosperm formation

In our surveys, after fertilization, free nuclei were formed from divisions of the synergids nucellus in the embryo sac. However, 30 to 40 days after pollination,



es: embryo sac, pn: polar nuclei, mi: micropyle

it was found that the endosperm cells were gradually degenerated at this stage; a type of shrinkage was also created in nuclei.

In some literatures were noted that the growth of embryo can be stopped and aborted at the immature stage which are mentioned different reasons for this. For example, it can refer to the lack of proper nutrition of embryo by the endosperm (Bharathy et al., 2005; Liu et al., 2003; Ramming et al., 1991; Sharma et al., 1996; Yang et al., 2007). It was also distinguished that the death of the embryo can be due to toxin production by endosperm and incompatibility of embryo and endosperm (Bharathy *et al.* 2005; Yang *et al.* 2007). In red seedless cultivar, it seems that one of the reasons for stopping growth and development of zygote is the stopping the growth and development of the endosperm; however also the delay in the growth and development can be another



cause. Pachno *et al.* (2014) suggested that, in apomictic dandelions, the persistent synergids may play a role in the nutrition of the developing embryo.

In Ghezel-Ozum seeded cultivar, endosperm tissue is formed and fully developed after double fertilization. Ten days after pollination, the release endosperm nuclei were observed in large numbers, which their growth has continued in the following stages in 15 to 20 days after pollination and eventually was fully shaped into cell. In our investigations, proteins, polysaccharides, oil compounds and star-shaped crystals of calcium oxalate were observed in the mature endosperm.

Endosperm in the seeded cultivars of grape has irregular shape and is mainly composed of thick-wall cells (Pratt 1971). It was found that the endosperm can continue to grow even without fertilization (Chaudhury *et al.* 1998; Raghavan 2006). Endosperm effect on embryo morphogenesis is probably due to physical pressures and in the production of somatic embryos can be observed abnormal mode due to imbalances in pressure (Farsi &Bagheri 2004; Farsi&ZolAli2006).

## GROWTH OF INTEGUMENT AND CLOSING THE MICROPYLE

Batigiana (2006) demonstrated that a series of severe divisions after fertilization occurs in the funicle, navel, chalaza and integuments. Also, in the seedless cultivar, after fertilization, the growth of cells of inner integument was observed and therefore micropyle was closed. Then any division was not observed at the integument cells, while in Ghezel-Ozum seeded cultivar, the growth of outer integument was impressive. Carraro et al. (1979) reported when micropyle remains open it is due to the disruption of pollination, and increases the embryo abortion and stenospermic in grapes. In our observations, micropyle opened before fertilization, and after fertilization due to the growth of inner integument cells had been closed. Haughnand Chaudhury (2005) reportedthat there is a relationship between the growth of endosperm and integument which is related to genetic control. It means that with growth and development of the endosperm, integument growth continues. Striem et al. (1992) showed that seed integument and endosperm formation and development in the stenospermocarp grapes are independent of each other, and therefore, seed integument will be emerging without endosperm and embryo. In our study, independent of the integument formation from endosperm and embryo was rejected; because in this sample, growing integument of embryo, i.e. the seed, was stopped from 20 days after pollination and even earlier when also stops growth of endosperm.

In our studies, it was found that the outer integument at micropylar pole was formed from two to three cell layers and in chalazal pole was added to the number of layers and it is 6-7 cell layers. In the red seedless cultivar, this integument has color compounds that are likely polyphenols or anthocyanins. Vessels at the chalazal pole of outer integument were completely visible. The Color of outer integument was different with inner integument and has transparent cells that contain clearcontents. The inner integument by two to three layers has the compressed, stretched and flattened cells astangential. The inner integument surface was covered by the cuticle layer which was determined after staining with black Sudan. These observations correspond with the findings of Pratt (1971).

In the following stages of the red seedless cultivar, we saw the separation of the inner integument from the outer integument. The beginning of this phenomenon was observed 20 days after pollination. Furthermore, nuclei were gradually suffering from degeneration and



FIGURE 8. Axial sections of the seed of Ghezel-Ozum cultivar in 20 days after pollination (stage 8), stained with method of Hematoxilen. Photographed with dark and bright field microscope.a) Globular embryo is shown at the micropylar pole. Photographed with a bright field microscope.b) Globular embryo is shown at the micropylar pole. Photographed with a dark field microscope. c) Fig. a is shown with further magnification. d) Fig.b. Is shown with further magnification. ge: globular embryo, ic: inner integument (coat), mi: micropyle.



FIGURE 9. Longitudinal sections of mature embryo of the Ghezel-Ozum cultivar, stained with the method of Hematoxilen. a) Longitudinal section from isolated embryo, meristem of roots, shoots and cotyledons has been specified. b) Longitudinal section from embryo inside the seed, meristem of shoots and cotyledons has been specified. c) Root meristem. d) Shoot meristem. c: cotyledons, rm: root meristem, sm: shoot meristem.



shrinkage. These findings are corresponded with studies of Vallania *et al.* (1987) in terms of shrinkage of nucleolus and separating integument.

#### FINAL STAGES

With further investigations it was found that the zygote divided 7 or 15 days after pollination. In fact, the zygote has done fist division and then stopped. The maximum size of seed is created at the end of the first stage and then its growth stops and just continuing the growth and development of the embryo, endosperm and berries would be observed. In our observations and investigations, also seed size was completed 20 days after pollination, but then, growth of embryo had stopped.

In the red seedless cultivar, following the investigations, on 20 to 30 days after pollination, brown sediments around the zygote which is dividing, were observed that seems be the compressed polyphenols and tannins and may be effective in the death of embryo. This compact tannin role as an agent for dormancy and preventing earlier germination of the seed was documented which are in the seed coat (Debeaujon et al. 2000). Furthermore, nucleolus had been suffering from shrinkage in this stage. At the final stages, needle-shaped crystals of calcium oxalate were observed at the outer wall that large groups of them formed within idioblast, which their roles are for regulation of calcium, plant protection, detoxification of heavy metals, ion balance, firmness and so on (Vincent et al. 2005). Also, Rosianski et al. (2016) reported that the pollinated fruit of fig had a larger diameter and weight and improved firmness compared to the parthenocarpic fruit. These groups of calcium oxalate were also observed in the seeded cultivar.

The calcium oxalate crystals were also observed within the seedin the final stages. Pratt (1971) noted that this case can be observed in samples with abnormal ovules that oxalate crystals are replaced by nucellar cells. These abnormal ovules consist inovules with nucleolus and embryo sac with defection at growth and development, abnormal curvature of ovule in the ovary, necrosis of part of chalaza and so on.

#### CONCLUSION

The findings showed that growth and development of zygote and endosperm were delayed and finally stopped in red seedless cultivar after double fertilization. It means that first zygote was divided in 15-20 days after pollination when apical and basal cells had been formed, but after ward their divisions were ceased. Also in 20 days after pollination the series of brown sediments were observed around the zygote. Mean while, in Ghezel-Ozum cultivar, the formation of globular embryo and endosperm were observed in 20 days after pollination. In red seedless cultivar, endosperm cell was divided as nuclear that release nuclei were observed in the embryo sac and then divisions were stopped. Moreover, in the transverse walls of calot cells, thickening was seen quite clear. At the nuclei in the final stages, shrinkage and degeneration were observed. Also, internal integument was separated from outer integument.

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# The use of competitive intelligence for selection of municipality's contractors

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#### ABSTRACT

Nowadays, growth and development as well as more complex industrial projects in line with the progress of science and technology has led to the problem and contractor selection process as key factor in the success of industrial designs and researchers and industrialists as more specialized approach to adopt in relation to this issue, selection of competent and qualified contractor, a multi-criteria decision problem is the first step towards the implementation of a development project in terms of cost, time and quality, and competitive intelligence factor in the selection of contractors is the important development projects. In the present study attempts to influence of competitive intelligence in choosing the most qualified contractors to examine projects Municipal Development in South Khorasan province. In this regard, after an extensive study of the history of the issue, the proposed criteria and indicators were identified.Finally, it was found that factors of price, technology plays a big part in choosing a contractor for Municipal Development in South Khorasan province have played.

KEY WORDS: CONTRACTOR SELECTION, COMPETITIVE INTELLIGENCE, MUNICIPALITY OF SOUTH KHORASAN PROVINCE

#### **INTRODUCTION**

Choosing a contractor on construction projects is one of the crucial and strategic decisions that must be made regarding how to manage projects. It is necessary to select a contractor to contractor status of various aspects based on multiple criteria and factors detailed review.

#### ARTICLE INFORMATION:

\*Corresponding Author: Omrani.asadieye@Yahoo.com Received 27<sup>th</sup> Dec, 2016 Accepted after revision 2<sup>nd</sup> March, 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 <sup>®</sup> A Society of Science and Nature Publication, 2017. All rights reserved. Online Contents Available at: http://www.bbrc.in/ The absence or lack of information and accurate data, opaque and incomplete information leads to errors in the selection of contractors and ultimately will lead to irreparable losses. On the other hand, sometimes conflict due to a variety of qualitative and quantitative criteria decision making requires much more complex is the right choice. In recent years, due to incorrect selection

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of contractors in the construction industry saw a loss of financial resources in Iran (including related projects with municipalities). Selecting the right contractor, through certified contractors can be one of the solutions available to solve such problems (Marzouk, 2006 and Chules, 2013).

These decisions are usually complex and in this connection can be used to assess many qualitative and quantitative factors. Failure to do so would be to implement the project in terms of longer, lower quality and higher costs (due to depreciation expense and capital lodging or damage arising from the lack of complete and timely delivery of projects carried out( and thus destroy economic feasibility of projects (Thomas, 2001). Contractors and are important as an integral part of the project are in process. In fact, major supplier of equipment and services required for the project. In the context of different projects, there are potentially number of contractors, qualifications and abilities required to perform the treaty, but the problem here is that any contractor should be selected Indeed, process of selection of contractors for outsourced systems, multi-criteria problem that including both qualitative and quantitative criteria (Skitmore, 1999). Dixon is one of the first people who worked on the selection of contractors and more than 23 criteria that managers use them to determine the selection of contractors. Later, many researchers regarding the selection of contractors to research methods and techniques in this field were presented (Palaneeswaran et al., 2001).

The most important of these techniques include: TOP-SIS Fuzzy, AHP, CBR, DEA, SMART, VIKOR, ANP, etc. One of the new procedures for selecting contractors as independent model and its results can be used as input for other models and techniques to be used is model of competitive intelligence (CI). In fact, CI models need to check the size and location of project schedule, financial constraints, philosophy, ownership, management team dynamics and overall strategy and, ultimately, the choice of 5 main contractor cost, schedule, operational services and engineering rank, experience and stability consider the contractor's financial stability. One of these steps is selection of contractors for execution of the project (Russell et al., 1988). Due to the diversity and multiplicity of potential contractors, qualifications and abilities required to perform the treaty and the project, it is important that any contractor should be selected. So inevitably, you must first assess contractors, ratings and afterwards, selected to implement the project can best be guaranteed. In other words, the main goal contractor selection process reduces project risk, maximize quality of work and maintain relationships between different units of project (Shrestha et al., 2004).

Therefore, it is necessary to evaluate the optimal models and frameworks of contractors. In general, there

are two main methods of fee-based contractor selection process and competency based approach, of course, many employers in the selection of contractors and their primary concern was to cost it considers the most immediate evaluation index. Cost alone should not be a suitable criterion for assessing the contractor. On the other hand research that has been done in this regard that multivariate process should be used in the selection of contractors (Thomas, 2001). This is important in countries like Iran, whose economy is much more dependent on the state (Wong, 2004).

Because a detailed set of criteria and scores are selected and optimized with the addition of some economic corruption and contractors to prevent unfair contracts prevents waste and construction budgets as well as the duration of projects. Therefore, the aim of present study is that with help of CI model parameters, correct criteria and municipal construction projects have been identified factors in the selection of contractors and finally ranking pattern suitable for the evaluation and selection of optimal and ultimately be presented in such contractor.

#### **METHODS**

This research is applied - descriptive based on its goal.

#### POPULATION, SAMPLING METHOD

The study population included all experts and authorities are tender and transfer of development projects of which there are 23 municipalities in South Khorasan province that population is not due to limited sampling and all individuals are selected for the sample. When necessary, information will be collected through interviews.

#### PROCEDURE

Since the evaluation indices each system, depending on the intention is to provide and important tasks expected of it and the type of system and the factors influencing cost of treatment will be different therefore, to identify indicators of competitive intelligence contractors in construction projects following step will be removed. By collecting questionnaires, all indicators affecting the choice of contractor determined, ultimately, by collecting the opinions of experts qualified contractor will be selected on the basis of competitive intelligence theory. By referring to the background of a number of studies in this area are identified index and to ensure the effectiveness of the measures identified in the process of selecting a contractor questionnaire was prepared and distributed among experts. In this research in order to answer the research questions and one-sample t test was used to conclude it.

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#### RESULTS

\* Variable of "comprehensive system of planning and control of the project

		<b>One-Sample Statistics</b>							
	N Mean		n Std. Do	eviation	Std. Erro	Std. Error Mean			
q1	23	2.65	.83168	.83168		.17342			
			One-Sai	One-Sample Test					
			Test	Test Value = 2					
t		df	Sig. (2-tailed)	Mean Differenc	95% Confide Interva Differen	ence l of the nce			
					Lower	Upper			
q1	3.761	22	.001	.65217	.2925	1.0118			

The mean of the test ( $\mu$ ) was considered more than 2 to examine status of the studied variables so following hypothesis is tested:

H0: having comprehensive system of planning and control of projects compared to other contractors as one of competitive intelligence parameters in the selection of the contractor is not in desirable status;

#### $H0 = \mu \le 2$

H1: having comprehensive system of planning and control of projects compared to other contractors as one of competitive intelligence parameters in the selection of the contractor is in desirable status;

#### $H1 = \mu \ge 2$

As seen in Table 05. The level of significance is smaller than, 0.05 so the null hypothesis is rejected and the means which studied population in terms of having comprehensive system of planning and control of projects compared to other contractors as one of competitive intelligence parameters in the selection of the contractor is in desirable status.

Variable of "Observance of standards and technical specifications on previous projects"

		One-Sample Statistics							
	N	Mean	L	Std. Deviation			Std. Error Mean		
q2	23	2.9565		1.06508		.2	.22208		
			C	One-Sample Test					
		Test Value = 2							
	t	df	Sig.		Mean		95%		
			(2-t	ailed)	Differen	ce	Confide	ence	
							Interva	l of the	
							Differe	nce	
							Lower	Upper	
q2	4.307	22	.000		.95652		.4959	1.4171	

The mean of the test  $(\mu)$  was considered more than 2 to examine status of the studied variables so following hypothesis is tested:

H0: Observance of standards and technical specifications on previous projects compared to other contractors as one of competitive intelligence parameters in the selection of contractor is not in desirable status;

#### $H0 = \mu \le 2$

H1: Observance of standards and technical specifications on previous projects compared to other contractors as one of competitive intelligence parameters in the selection of the contractor is in desirable status;

 $H1 = \mu \ge 2$ 

As seen in Table 05. The level of significance is smaller than, 0.05 so the null hypothesis is rejected and the means which studied population in terms of Observance of standards and technical specifications on previous projects compared to other contractors as one of competitive intelligence parameters in the selection of the contractor is in desirable status.

\* Variable of "implementation of previous projects in terms of anticipated quality, cost and schedule"

		One-Sample Statistics						
	N		Mean	Std. Deviation		St M	td. Error Iean	
q3	23		2.7391	.91539		.1	9087	
			On	One-Sample Test				
			Test Value = 2					
	t	df	Sig. (2-tai	iled)	Mean Differenc	e	95% Confide	nce
							Interval Differer	of the
							Lower	Upper
q3	3.872	22	.001		.73913		.3433	1.1350

The mean of the test  $(\mu)$  was considered more than 2 to examine status of the studied variables so following hypothesis is tested:

H0: implementation of previous projects in terms of anticipated quality, cost and schedule compared to other contractors as one of competitive intelligence parameters in selection of contractor is not in desirable status;

#### $H0 = \mu \le 2$

H1: implementation of previous projects in terms of anticipated quality, cost and schedule compared to other contractors as one of competitive intelligence parameters in selection of the contractor is in desirable status;

#### $H1 = \mu \ge 2$

As seen in Table 05. The level of significance is smaller than, 0.05 so the null hypothesis is rejected and the

means which studied population in terms of anticipated quality, cost and schedule as one of competitive intelligence parameters in the selection of the contractor is in desirable status.

		One-Sample Statistics							
	Ν	Mea	n Std. De	viation	St	Std. Error Mean			
q4	23	3.043	5 .82453		.17	.17193			
		One-Sample Test							
		Test Value = 2							
	t	df	Sig.	Mean		95%			
			(2-tailed)	Difference	ce	Confide	nce		
						Interva	l of the		
						Differen	ıce		
						Lower	Upper		
q4	6.069	22	.000	1.04348		.6869	1.4000		

\* Variable "Creativity and Innovation in previous projects"

The mean of the test  $(\mu)$  was considered more than 2 to examine status of the studied variables so following hypothesis is tested:

H0: Creativity and Innovation in previous projects compared to other contractors as one of competitive intelligence parameters in the selection of the contractor is not in desirable status;

$$H0 = \mu \le 2$$

H1: Creativity and Innovation in previous projects compared to other contractors as one of competitive intelligence parameters in the selection of the contractor is in desirable status;

#### $H1 = \mu \ge 2$

As seen in Table 05. The level of significance is smaller than, 0.05 so the null hypothesis is rejected and the means which studied population in terms of creativity and Innovation in previous projects as one of competitive intelligence parameters in the selection of the contractor is in desirable status.

4 I	/ariable	"use	of	new	techno	logies'	
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		One-Sample Statistics						
	N	Mear	1 Std. Dev	Std. Deviation		Std. Error Mean		
q5	23	3.173	9 .83406	.83406		.17391		
			One-Sa	One-Sample Test				
			Test	Test Value = 2				
	t	df	Sig.	Mean		95%		
			(2-tailed)	Differe	nce	Confide	ence	
						Interva	l of the	
						Differe	ice	
						Lower	Upper	
q5	6.750	22	.000	1.17391		.8132	1.5346	

The mean of the test  $(\mu)$  was considered more than 2 to examine status of the studied variables so following hypothesis is tested:

H0: use of new technologies compared to other contractors as one of competitive intelligence parameters in the selection of the contractor is not in desirable status;

#### $H0 = \mu \le 2$

H1: use of new technologies compared to other contractors as one of competitive intelligence parameters in the selection of the contractor is in desirable status;

 $H1 = \mu \ge 2$ 

As seen in Table 05. The level of significance is smaller than, 0.05 so the null hypothesis is rejected and the means which studied population in terms of use of new technologies as one of competitive intelligence parameters in the selection of the contractor is in desirable status.

✤ Variable of "level of education, discipline, and experience of executive staff and key elements"

		<b>One-Sample Statistics</b>								
	Ν	Mea	an	Std. Deviation		S	Std. Error Mean			
q6	23	2.9130		.79275		.1	.16530			
			Or	1e-Sa	mple Test					
		Test Value = 2								
	t	df	Sig.		Mean		95%			
			(2-ta	iled)	Differenc	e	Confide	ence		
							Interva	l of the		
							Differen	1ce		
							Lower	Upper		
q6	5.524	22	.000		.91304		.5702	1.2559		

The mean of the test  $(\mu)$  was considered more than 2 to examine status of the studied variables so following hypothesis is tested:

H0: level of education, discipline, and experience of executive staff and key elements as one of competitive intelligence parameters in the selection of the contractor is not in desirable status;

#### $H0 = \mu \le 2$

H1: level of education, discipline, and experience of executive staff and key elements as one of competitive intelligence parameters in the selection of the contractor is in desirable status;

 $H1 = \mu \ge 2$ 

As seen in Table 05. The level of significance is smaller than, 0.05 so the null hypothesis is rejected and the means which studied population in terms of level of education, discipline, and experience of executive

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staff and key elements as one of competitive intelligence parameters in the selection of the contractor is in desirable status.

✤ Variable of "status and the ability to use the new equipment and machines"

		One-Sample Statistics							
	N	Me	Mean		ation	Std. Erro	r Mean		
q7	23	3.3	043	.63495		.13240			
	1	I	Or	1e-Sa	mple Test				
		Test Value = 2							
	t	df	Sig.		Mean	95%			
			(2-tai	led)	Difference	Confide	ence		
						Differen	nce		
						Lower	Upper		
q7	9.852	22	.000		1.30435	1.0298	1.5789		

The mean of the test  $(\mu)$  was considered more than 2 to examine status of the studied variables so following hypothesis is tested:

H0: status and the ability to use the new equipment and machines as one of competitive intelligence parameters in the selection of the contractor is not in desirable status;

#### $H0 = \mu \le 2$

H1: status and the ability to use the new equipment and machines as one of competitive intelligence parameters in selection of contractor is in desirable status;

#### $H1 = \mu \ge 2$

As seen in Table 05. The level of significance is smaller than, 0.05 so the null hypothesis is rejected and the means which studied population in terms of status and the ability to use the new equipment and machines as one of competitive intelligence parameters in the selection of the contractor is in desirable status.

#### \* Variable "Continued training of employees"

		<b>One-Sample Statistics</b>					
	N	M	lean S	Std.	Deviation	Std. Erro	or Mean
<b>q</b> 8	23	2.	4348 1	.036	587	.21620	
			One-	-Sa	mple Test		
			Т	ſest	Value = 2		
	t	df	Sig. (2-tailed	d)	Mean Difference	95% Confide Interva Differen	ence l of the nce
						Lower	Upper
<b>q8</b>	2.011	22	.057		.43478	0136	.8832

The mean of the test  $(\mu)$  was considered more than 2 to examine status of studied variables so following hypothesis is tested:

H0: Continued training of employees as one of competitive intelligence parameters in the selection of the contractor is not in desirable status;

#### $H0 = \mu \le 2$

H1: Continued training of employees as one of competitive intelligence parameters in the selection of the contractor is in desirable status;

 $H1 = \mu \ge 2$ 

As seen in Table 05. The level of significance is smaller than, 0.05 so the null hypothesis is rejected and the means which studied population in terms of Continued training of employees as one of competitive intelligence parameters in the selection of the contractor is in desirable status.

As seen in Table significance level is greater than 05. Therefore, the null hypothesis is not rejected and this means that the study population in terms of status and use of equipment and machinery to get better compared with other competitive intelligence contractors as one of the parameters in the selection of the contractor is not desirable statue.

#### \* Variable of suitable suggested price

		One-Sample Statistics							
Ν		N	Μ	Mean S		. Deviation	Std. En Mean	ror	
q9		15	3.8000		.41404		.10690		
		(			Dne-Sample Test				
		Test Value = 2							
	t		df	Sig.		Mean	95%		
				(2-tail	ed)	Difference	Confide	ence	
							Interva	l of the	
						Differen	ıce		
							Lower	Upper	
q9	16.8	337	14	.000		1.80000	1.5707	2.0293	

The mean of the test  $(\mu)$  was considered more than 2 to examine status of the studied variables so following hypothesis is tested:

H0: Suitable suggested price compared to other competitive intelligence contractors as one of the parameters in the selection of the contractor is not in good condition;

$$H0 = \mu \le 2$$

H1: proposed price of better fit compared with other competitive intelligence contractors as one of the parameters in selection of contractor desirable;

 $H1 = \mu \ge 2$ 

As seen in Table 05. The level of significance is smaller so null hypothesis is rejected and the means which fit studied better in terms of suggested price compared with other competitive intelligence contractors as one of the parameters in the selection of the contractor are in desirable status.

#### DISCUSSION AND CONCLUSION

Several factors are involved in the selection of contractors in the meantime, according to research topic parameters related to competitive intelligence derived from the questionnaires about them in choosing contractor for Municipal Development in South Khorasan province is evaluated.

comprehensive system of planning and project control
How to standards and technical specifications on previous projects
Implementation of previous projects in terms of quality, cost and schedule anticipated
Creativity and innovation in the previous project
The use of new technologies
Education, discipline, and experience of executive staff and key elements
Machine-to-date status and usability
Continued training of employees
Suitable suggested price

The above factors, which are subset of competitive intelligence, significant relationship in choosing contractor for Municipal Development in South Khorasan province on the outcome contractors presented themselves in areas that are superior in terms of municipal experts; upgrade can obtain better results in municipal tenders.

Table ranking of competitive intelligence factors in choosing contractor for construction in municipality of South Khorasan province

Based on the above factors, the proposed price, innovation and machines have an important role in the selection of construction contractors in South Khorasan Province while other factors are in the middle range and the continuous training of employees with the lowest degree of importance from the point of view of experts and professionals. So, using the results of the study are presented in the following suggestions in elderly:

It is suggested to increase the efficiency of algorithm research, software algorithms to be designed for mechanization in specific time periods, if there was a similar project could be implemented.

It is suggested in the specified time period, contractor selection criteria be revised in case we need new index was added or index improved old markers that have applied to be removed. According to the results of this study, the following is proposed for future research:

It is suggested that similar research data envelopment analysis (DEA), VIKOR (VIKOR), LINMAP, etc. are used for this work. This technique could be used in a fuzzy environment or logical.

Indicators of this research, according to research territory in accordance with the municipality of Birjand city in South Khorasan Province was established so it's recommended by examining other similar organizations and companies in this project is a comprehensive model that overtake all indicators of involved organizations.



BIOSCIENCE BIOTECHNOLOGY RESEARCH COMMUNICATIONS THE USE OF COMPETITIVE INTELLIGENCE FOR SELECTION OF MUNICIPALITY'S CONTRACTORS

#### Jani Darmian and Ragh Abadi

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### **Evaluation of contractors of health – Medical projects by AHP method in Iran's southeast region**

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#### ABSTRACT

Performance of construction activities in the development process of countries is an indicator of sustainable development. Given that the vast majority of projects will be assigned to the operation, implementation of any project requires suitable contractor; Of course, contracting the abilities necessary to carry out the project in terms of time and resources is anticipated and desired quality. The current method of selecting a contractor for construction projects based on the lowest bid, but the qualitative and quantitative indicators and with different degrees of importance of the fittest is a contractor. So this study was aimed to investigate evaluation of contractors of health -medical projects by AHP method in Iran's Southeast region and to determine the relationship between criteria and indicators and quantitative analysis to evaluate and select the proper rating schematic end model optimized to be presented in such projects. Therefore, after reviewing the literature and interviews with experts and managers to identify criteria, criteria that are within competence of contractors are often effective projects were extracted. The criteria were categorized in seven groups. The results of economic and financial criteria first place in the qualification and selection criteria for the contractor. Among the sub-indices as well as cost analysis, financial strength, bid qualification, respectively ranked first and fourth, respectively.

KEY WORDS: CONTRACTOR SELECTION, AHP, HEALTH PROJECTS, THE SOUTH EAST REGION

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#### **INTRODUCTION**

Construction activities and construction are considered basic indices of development countries and large part of investments in the public and private sectors will be spent on construction and infrastructure. Therefore, careful planning and efficient is felt to avoid waste of resources due to financial constraints in addition to increased efficiency in use of available resources, investment will also be optimized and in meantime, implementation of projects under planning can be critical to the success of projects.General criteria for success of development projects in the implementation process are based on three main elements. These three elements are: timely implementation (time), implementation according to budget approval (cost) and implementation in accordance with the requirements (quality), that these three are the most common factors in assessing the success of development projects (Alzahrani & Emsley, 2013).

Since the vast majority of projects will be spent on operating costs; so implementation of each project needs to the contractor with capabilities to suit the project to prevent the rise of operating costs and the project would be accomplish in terms of anticipated time and resources. In other words, the ultimate success of the project has also raised the role of contractors (Wu, 2016).

On the other hand, several studies have been done on the subject indicates that multivariate process should be used in the selection of contractors (Marzouk, 2013).

This process makes the cost element devoted to the neglect of important factors, characteristics and competence contractors and risk of project failure rises (Sandquist, 2012).

In fact, as an integral part of contractors and project implementation process are very important. In fact, a bountiful supply of services and equipment needed for the project (Zare et al., 2010).

Many companies and institutions use contractors to transfer their projects and the contractor have a lot of options to choose from them. So processes and tools should be used for selection according to standards to choose the best option. In conducted investigation, many causes of failures of projects directly and indirectly are concerned to the host contract. This issue shows necessity of carefully evaluation of contractors (Saaty, 2000).

Nowadays an efficient way and based on principles of modern management is not used for contractor's selection and in the choice of contractor according to the methods and techniques is not the right decision. While many researchers and experts defined management and decision-making equivalent that have same meaning and management is considered decisions and believe that decisions form the main focus of management and perform tasks such as planning, organization or control, in fact, nothing but the decision about how and how not perform these activities (Saadati, 2002).

Hence majority of project construction problems have some problems such as increased cost, run-time prolongation or decrease in quality due to the lack of appropriate and qualified contractor selected for the project. Some contractors to win tenders are resorting to every trick. Including discounts too high and unreasonable to suggest that the employer assessment usually due to the weakness of existing laws and regulations to determine the winner of the tender and selection of the contractor, the tender winner and multiple problems in the process of implementing the project. On the other hand, numbers of contractors believe that the method of selecting the contractor in many cases does not lead to the actual selection of the fittest contractor.

This leads to reduce motivation of many qualified and competent contractors who among them is also significant number of contractors to participate in tenders for construction projects. Based on foregoing and considering the fact that management evaluate and select the contractor for transfer of development projects, an essential part of construction process, it is also necessary to carry out applied research to solve various problems of development projects, including problems in project management, dimensions and factors affecting contractor selection and use of scientific methods of decisionmaking in the field of contractor selection of the fittest, and ultimately avoid wasting national resources country of particular importance.

Evaluation of contractors for the projects, both in terms of time and cost of the project and the resulting quality of the project, it is important decisions (Javani, 2002). Due to number of indices and that many of criteria are qualitative selection of tools and appropriate indicators to assess necessity contractors (Asgharizadeh, 2010).

The method is based on the lowest bid is selected as the contractor for construction projects, it is clear that qualitative and quantitative indicators with different degrees of importance in determining the eligibility of a proposed contract and should be considered in decisionmaking.So far, several methods and models for evaluating, ranking and selection of contractors in construction projects are presented. One of the most common and widely used methods is AHP method. Analytic Hierarchy Process or AHP, which was developed in 1980 by the hour how to determine the relative importance of a multi-criteria decision, shows activity in the issues. This method is based on three principles: structure of the model - comparing of criteria and alternatives - synthesis of priorities. By using PROMETHEE method in evaluating and ranking projects contractors six main criteria: good reputation, power supplies, power management and skilled manpower, economic and financial capabilities, experience and technical capabilities (Asgharizadeh, 2010; Nasrollahi, 2012).

Sahraei et al. (2013) used PROMETHEE method for ranking contractors in fuzzy environment and showed a strong theoretical basis of this method, accuracy and ease of contractors is required in assessing and ranking. (Manesh et al (2014). Assessment of the relationship between technical ability and quality contractors carrying out research projects using fuzzy neural models examined. In this study, by using fuzzy neural model, the relationship between the qualities of the project management contractor technical evaluation factors can be analyzed and evaluated. According to local linear neuro-fuzzy approach not only on average, but in each of the iterations are able to more accurately estimate the linear regression. Another result was that the collected data indicated a significant association between the quality of project implementation and three groups of four groups of indicators used indicator to assess the technical ability contractors.

Rohbakhsh and colleagues (2015) in ranking of supplier selection criteria by Quality Function Development Approach and AHP Fuzzy seven criteria and eighteen sub criteria to collect, evaluate and rank.Najafi et al (2016) have identified and ranked by Analytic Hierarchy Process(AHP) multi-attribute, implementation appropriate system for freeway projects.

Researches showed that criteria for selecting contractors have varied and sometimes contradictory due to a variety of qualitative and quantitative criteria decision requires much more complex is the right choice. In fact, the selection process, a multi-criteria problem which includes both qualitative and quantitative criteria. Since there are numerous methods and criteria so conducted the research to determine the appropriate methods and models in the evaluation and selection of contractors' optimal health projects in the field of research priorities is the Civil Administration.

As research's literature and according to studies on concerning this issue shows that there is no exact study about contractor selection criteria for projects in the field of health-medical projects. However there is few studies in the field of road projects and Municipality which can be achieved partly guidance in this ways.So this study was aimed to investigate evaluation of contractors of health -medical projects by AHP method in Iran's Southeast region and to determine the relationship between criteria and indicators and quantitative analysis to evaluate and select the proper rating schematic end model optimized to be presented in such projects.

#### METHODS

This research is an applied research in term of purpose and survey in terms of descriptive data and analysis methods.

Since responses to questions on questionnaire is important in relation with effective competence of contractors and the importance of each of them so their choice is important, because the lack of experts and technicians would reduce efficiency. The study population included all experts and authorities tender and assignment of development health - medical projects in Sistan and Baluchestan that number is 10 people and all of them have been selected as the sample using census method.

The AHP questionnaire was used for data collection. Questionnaire to determine the weight (importance) the main criteria the selection of contractors health - medical projects with AHP method in the South East of the country on the basis of paired comparisons between criteria based on fuzzy AHP method was used. The questionnaire consists of six main criteria that were mutually compared and ranked.

To ensure the validity, qualitative methods were used namely different experts' ideas and modifications to them after the discussion on the questionnaire has been applied. Since each question is based on research literature, it can be said that the questionnaire has validity. Cronbach's alpha coefficient was used to assess reliability. Cronbach's alpha coefficient for the questionnaire 39 items (0.85) was obtained that show high validity.

As explained earlier AHP method is used in the present study to analyze the data. In this case, in order to increase the accuracy and speed calculation software, Expert choice for weighting and ranking factors were used.

AHP is one of the most popular multi-criteria decision making techniques by Thomas L. clock was invented in the 1970s. This action decisions when faced with few options and decision criteria can be useful. Indicators can be quantitative or qualitative. The method relies on paired comparisons lies. The process of ranking and prioritizing options in AHP method includes the steps are as follows; *Criteria,Sub-criteria,Making hierarchy* 

At this point the problem is defined. The aim of the decision is drawn in form of hierarchy of factors and components of decision-. Analytic Hierarchy Process needs to break the decision by several indicators to a hierarchy of levels. For this purpose, a decision tree that used to consist of four levels:

The first level includes general purpose of decisionmaking.

On the second level are the general criteria that take decisions based on them. They include: 1. technical,

Table 1. Binary	Table 1. Binary comparison quantitative indicators								
Score	Definition	Explanation							
1	Equal importance	In achieving this objective, two indexes are of equal importance.							
3	Slightly more important	Experience shows that to achieve this goal, the importance i has little more than j.							
5	more important	Experience shows that to achieve this goal, the importance of i has greater than j.							
7	Much more important	Experience shows that to achieve this goal, the importance i has much more than j.							
9	The absolute importance	Much more important i to j conclusively proven.							
2, 4, 6 and 8		Intermediate preferences when there are intermediate.							

2.experimental, 3. The economic and financial, 4. The management and staff, 5. Machinery, 6. good reputation and 7. The past performance.

#### In the third level sub-criteria placed

And in the last level of decision options here are contractors and health projects, are discussed.

Figure 1 shows the hierarchical structure prioritizes contractor is selected criteria.

#### PAIRED COMPARISON

At this stage of Experts comparisons between criteria and sub-criteria decision-making and points those towards each other set. This comparison is done based on the quantity table (Table 3).

A preferred option compared to operating his or equal to one, therefore, reverse the principle of an agent to others and preference for agent or option than his two main properties of Pair wise comparison matrix in standard or option, the AHP process.These two charac-



teristics make to compare the n decision-maker only to  $\underline{n(n-1)}$  answer the questions

2

In this section, contractor selection criteria and subcriteria according to literature and theoretical frameworks in the field of paper were identified by experts and then final contractor selection criteria were selected by using experts' opinion.

#### RESULTS

#### MEASURES OF CONTRACTOR SELECTION CRITERIA

To determine measures, internal and external papers in this area were reviewed and after consultation with experts, the criteria and sub-criteria were selected for choosing of contractor. To prioritize the main criteria affecting the qualification and selection of contractors after each weight calculated paired comparisons of criteria and have been assessed based on the final weight.

The main criteria affecting the pairwise comparison chart above shows the qualification and selection of contractors. It can be seen that the biggest difference is the economic criterion compared with experimental measure and the least difference empirical criterion compared with standard management.

The above graph shows the relative importance of the main criteria affecting the qualification and selection of the contractor in experts' opinion. It can be seen that economic and financial criteria has the greatest weight to the final weight (0.218), so the first rank in the criteria for eligibility and selection of the contractor is economic and financial criteria. After it, good reputation with the ultimate weight standard (0.176) is ranked second. Criteria and standards for management and staff with final weight (0.142) are ranked in third and fourth. Then past performance with final weight (0.117) is ranked in the fifth and technical criterion with final weight (0.115) is ranked in sixth place. The final ranking is empirically with final weight (0.092). Comparison of rates paired incompatibility was 0.012 that indicates acceptable accuracy of these criteria is this comparison test.





### Calculation of relative weights of sub-indices of the target

Weighting and determine the importance of the project contractor selection criteria and indicators, should be based on methods that are based on scientific principles as well as the stated factors of subjective judgment functionality to best meet the decision makers in small amounts. The calculated weights for contractor selection criteria in this study have been calculated by using fuzzy AHP therefore are acceptable accuracy and precision.

After sub-indices are calculated paired comparisons of final weight and final weight, based on these indicators have been assessed. To prioritize all factors affecting qualification and selection of contractors, first of all sub-indices were paired comparison then final weight of the sub-indices obtained in relation to the target.

Table 3. Final weight and Prioritization of sub-indices of target						
Index	Final weight	Priority	Index	Final weight	Priority	
Cost Analysis	0.066	1	ability to use machinery	0.023	21	
Affordability	0.063	2	Observance of the standards	0.021	22	
Proposed price	0.062	3	Equipment and personnel insurance	0.021	23	
Qualification	0.053	4	Increased costs	0.019	24	
Management system	0.043	5	Staff training	0.018	25	
Having Machines	0.043	6	Reputation	0.018	26	
Good reputation	0.039	7	Safety & Protection	0.017	27	
lack of previous success	0.036	8	Equipping the ingot workshop	0.017	28	
Implementation of previous projects	0.035	9	Awards and honors	0.017	29	
Education and experience staff	0.034	10	Communication and coordination with the employer	0.016	30	
Time delays	0.031	11	Board Stability	0.013	31	
Comprehensive system	0.27	12	Indigenous	0.011	32	
Experience in implementing similar projects	0.027	13	Claim of damages	0.011	33	
relationship with previous employer	0.026	14	Methods and executive agencies	0.010	34	
Record executive	0.025	15	creativity and innovation	0.009	35	
Banking and financial records	0.025	16	Environmental laws and social security	0.007	36	
Competent managers	0.025	17	Documentation	0.006	37	
Previous safety performance	0.025	18	presented papers in conferences 0.005 and journals		38	
proportion machines	0.024	19	Publications and scientific research	0.005	39	
Payment of wages	0.023	20				

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The above table shows final weight and priorities of sub-indices affecting on qualification and selection of contractors. It can be observed that Cost Analysis has the most weight-final (0.066), so this index has the first rank in the sub-indices. After that, final weight of index affordability (0.063) is ranked in the second place and final weight of proposed price index (0.062) is ranked the third. Indices of Qualification with final weight (0.053), management system with final weight (0.043), Having Machines with final weight 0.043), Good Reputation with the final weight (0.039), Lack of Previous Success with the final weight (0.036), Implementation of Previous Projects with total weight (0.035), education and experience staff with final weight (0.034) are ranked as third to tenth. As well as indicators of Time delays with final weight (0.031), Comprehensive system with final weight (0.27), experience of similar projects with a total weight (0.027), relationship with previous employer with final weight (0.026), Record executive with a final weight (0.025), Banking and financial records with a final weight (0.025), competent managers with a final weight (0.025), Previous safety performance with final weight (0.025), the proportion of machinery with final weight (0.024) and Payment of wages with final weight (0.023) are ranked in eleventh to twentieth.

As well as Stability Board with final weight (0.013), Indigenous with final weight (0.011), Claim of damages with final weight (0.011), Methods and executive agencies with final weight (0.010), creativity and innovation with the final weight (0.009), Environmental laws and social security with final weight (0.007), Documentation with final weight (0.006) and presented papers in conferences and journals with the final weight (0.005) are ranked thirty-first to thirty-eighth and at the end publications and scientific research with the final weight (0.005) is ranked in the last place.

#### Technical criteria

To prioritize contractors based on technical criteria, after paired comparisons, the final weight calculated contractors were ranked based on the total weight.

Table 4. Final weight and Prioritization of contractors based on technical criteria				
Contractors Final Weight Priority				
Contractor 1	0.415	1		
Contactor 2	0.222	2		
Contractor 3	0.112	4		
Contactor 4	0.104	5		
Contractor 5	0.147	3		

Above table shows contractors based on the final weight and priority technical benchmark indices.

It is observed that contractor 1 has the most weight of with final weight (0.415) and based on the technical standard indicators contractor 1 is the first rank. After that, contractor 2 with final weight (0.222) is ranked the second. Contractor 5 with final weight (0.147) and contractor 3 with final weight (0.112) are ranked in third and fourth. Contactor 4 with final weight (0.104) is in last place.



#### **Experimental Standard**

To prioritize contractors based on empirical benchmark indices, after paired comparisons, the final weight calculated contractors were ranked based on the total weight.

Above table shows final weight and contractors' priority based on empirical criteria.It is observed that contractor 1 has the most weight final weight (0.360) therefore based on empirical criterion contractor 1 is ranked as the first. After that contractor 5 with final weight (0.188) is ranked second. Contactor 2 with final weight (0.181) and contractor 4 with final weight (0.155) are ranked in the third and fourth. Contactor 3 with final weight (0.116) is in last place.

Table 5. final weight and Prioritization of contractors based on empirical criteria				
Contractors Final weight Priority				
Contractor 1	0.360	1		
Contactor 2	0.181	3		
Contractor 3	0.116	5		
Contactor 4	0.155	4		
Contractor 5	0.188	2		



#### STANDARD INDEX OF FINANCIAL ECONOMICS

Contractors on basis of economic criteria for prioritizing financial indices, after paired comparisons, the final weight calculated contractors were ranked based on the total weight.

Table 6. final weight and Prioritization of contractors on the basis of financial economic criteria				
Contractors Final weight Priority				
Contractor 1	0.138	4		
Contactor 2	0.164	2		
Contractor 3	0.165	1		
Contactor 4	0.140	3		
Contractor 5	0.093	5		

Above table shows final weight and contractors' priority based on financial economic criteria. It is observed that Contactor 3 has the most weight with final weight (0.165). Therefore, on the basis of financial economic criteria contractor 3 is ranked as the first. After that contractor 2 with final weight (0.164) is ranked the second. Contactor 4 with final weight (0.140) and contractor 1 with final weight (0.138) are ranked in third and fourth. Contractor 5 with final weight (0.093) is in last place.



#### MACHINERY STANDARD INDEX

To prioritize criteria based on indicators of machinery contractors, so do paired comparisons, the final weight calculated contractors were ranked based on the total weight.

Table 7. final weight and Prioritization of the contractors based on standard machines				
Contractors Final weight Priority				
Contractor 1	0.387	1		
Contactor 2	0.112	4		
Contractor 3	0.306	2		
Contactor 4	0.116	3		
Contractor 5	0.078	5		

Above table shows final weight and contractors' priority based on machinery standard criteria. It is observed that contractor 1 has the most weight with final weight (0.387) therefore based on machinery standard are ranked as the first. Then contractor 3 with final weight (0.306) is ranked second. Contactor 4 with final weight (0.116) and contractor 2 with final weight (0.112) are ranked in third and fourth. contractor 5 with final weight (0.078) is ranked in the last place.



#### MANAGEMENT AND STAFF BENCHMARK INDICES

Contractors according to standard criteria for prioritizing management and staff, after paired comparisons, the final weight calculated contractors were ranked based on the total weight.

Table 8. final weight and contractors on basis of criteria Prioritization of management and staff				
Contractors Final weight Priority				
Contractor 1	0.385	1		
Contactor 2	0.205	2		
Contractor 3	0.187	3		
Contactor 4	0.088	5		
Contractor 5	0.134	4		

Above table shows final weight and contractors' priority based on management and staff criteria. It can be seen that contractor 1 has the most weight with final

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weight (0.385) therefore based on criterion of management and staff is ranked as the first. Then contractor 2 with final weight (0,205,216) is ranked the second. Contactor 3 with final weight (0.187) and contractor 5 with final weight (0.134) are ranked in third and fourth respectively. Contactor 4 with final weight (0.088) is in the last place.



#### **GOOD REPUTATION BENCHMARK INDICES**

For prioritizing of Contractors according to standard criteria good reputation, after paired comparisons, the final weight calculated contractors were ranked based on the total weight.

Table 9. final weight and Prioritization of based on criteria of contractors' good reputation				
Contractors Final weight Priority				
Contractor 1	0.359	1		
Contactor 2	0.261	2		
Contractor 3	0.088	4		
Contactor 4	0.230	3		
Contractor 5	0.062	5		

Above table shows finalweight and contractors' priority based on good reputation criteria. It can be seen that contractor 1 has the most weight with final weight (0.359) therefore based on criteria of good reputation is the first rank. After that contractor 2 with final weight of 2 (0.261) is ranked the second. Contactor 4 with final weight (0.230) and contractor3 with final weight (0.088) are ranked in third and fourth respectively. Contractor 5 with final weight (0.062) is in last place.



Based on past performance benchmark indices to prioritize contractors, after paired comparisons, the final weight calculated contractors were ranked based on the total weight.

Table 10. final weight and Prioritization of contractors based on past performance benchmark				
Contractors Final weight Priority				
Contractor 1	0.465	1		
Contactor 2	0.228	2		
Contractor 3	0.149	3		
Contactor 4	0.095	4		
Contractor 5	0.072	5		

Above table shows final weight and contractors' priority based on past performance criteria. It can be seen that contractor 1 has the most weight with final weight (0.465) therefore, contractor 1 ranked is the first based on past performance benchmark. After that contractor 2 with final weight (0.228) is ranked second. Contactor 3 with final weight (0.149) and contractor 4 with final weight (0.095) are ranked in third and fourth. Contractor 5 with final weight (0.072) is in last place.



## FINAL WEIGHT AND PRIORITIZATION OF CONTRACTORS

In this space to finalize the priorities of paired comparisons contractors after final weight calculated contractors were ranked based on the total weight. Final ranking is as follows. (Coding companies have been random).

Table 11. Final ranking of contractors			
Contractors Final weight Priority			
Contractor 1	0.339	1	
Contactor 2	0.198	2	
Contractor 3	0.159	3	
Contactor 4	0.140	4	
Contractor 5	0.104	5	

Above table shows final weight and contractors' priority. It can be seen that contractor 1 has the most weight with final weight (0.339), so the first rank is contractor 1. After that contractor 2 with final weight (0.198) is ranked the second. Contactor 3 with final weight (0.159) and contractor 4 with final weight (0.140)are ranked in third and fourth. Contractor 5 with final weight (0.104) is in the last place.

Investigation about evaluation of contractors of health -medical projects by AHP method in Iran's Southeast region and to determine the relationship between crite-





ria and indicators and quantitative analysis to evaluate and select proper rating schematic end model optimized to be presented in such projects did not show accurate and reliable results are not achieved so in evaluation of suggestions, the final selection will be based solely on the lowest bid, in fact, many crucial differences between options are ignored decision and the differences between competencies and capabilities of the contractors participating in the tender would not affect the ranking and final selection. In other words, the selection was based on a comprehensive assessment of the options will not be decided. In the proposed model in this study, all the issues and problems of the intended bid is considered as one of the measures decided on the model, therefore, prioritization and final selection decision will be based on a comprehensive evaluation options based on the best choice, not necessarily the lowest price offered is not a contractor. The results of such prioritization and selection of long-term profitability and competitive ability for organization will follow.

According to extensive conducted studies, in this research in order to identify criteria and indicators chosen contractor as well as the use of scientifically based decision-making model, it is recommended for future tenders in health-medical projects in Iran's Southeast region; selected contractor will be utilizing the model proposed in this study. Applying this pattern results from the failure of such contracts as well as improving quality problems will be reduced and ultimately lead to lower costs.

Since the identification of fundamental studies and applied research criteria and no extreme measures cannot be made known; expanding the scope of the identified criteria adds richness to select the better. When evaluating and selecting contractors, should always consider the fact that real-world decisions are made based on criteria related to one another, therefore, the use of statistical technique to determine the dependence of measures to achieve more accurate results and more realistic is required.

In this study, the fuzzy AHP technique was used for ranking contractors. It is suggested that similar research methods and decision-making models such as data envelopment analysis (DEA), VIKOR, LINMAP, etc. are used for this work. These techniques there can be logical or used in a fuzzy environment.

Modeling, selection criteria, process logic, calculation of individual utility functions criteria to determine weights, processes and procedures and decision-making models students in field of knowledge management and computer programming and visual design and create favorable environment in software is specialized field of engineering students.

The major limitation of this study is large number of the large number of references that should be taken to obtain expert opinion. Another limitation is limited basic criteria in the selection of the contractor in the research literature.

The third limitation of this study is that after identifying the criteria of fuzzy hierarchical analysis presented in this study is not just about the selection of contractors is true and probably many more results to be achieved in the population.

At the end of this research we hope to be able to scientifically explain some of the problems of development projects and presents the appropriate solution further testing is also helpful.

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### Examining prevalence and risk factors for anemia in referred gynecological diseases to Ali Ibn Abi Talib Hospital of Zahedan city

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#### ABSTRACT

Anemia is a common blood disorder that is one of the Hygiene & Health problems of today, In which there is not enough red blood cells or hemoglobin in the blood. Research shows, amount of anemia in women is more than men; Especially about young girls are entering puberty and begin of menstruation. Iron deficiency in diet is other underlying factors that cause anemia, Blood loss caused by Continuous bleeding at the time of menstruation, digestive disorders, vaginal infections, cancer and pregnancy are some of the factors that in gynecological diseases can also cause anemia ,However, in addition to iron ,absence of some required nutrients and vitamins for the body can also cause anemia. Information and to identify risk factors by the patient, Nowadays can help healthcare system in the diagnosis and treatment, In addition, the doctor can recognize treatment according to patient involvement with any of the underlying disease and apply for treatment with detailed knowledge of risk factors , In this article, have tried also careful study risk factors for anemia in patients referring to gynecology clinic Ali ibn Abi Talib Hospital in Zahedan, Statistical population is provided for patient involvement with each risk factor. We hope to be able to do this research, take effective step to improve the public health.

**KEY WORDS:** PREVALENCE, RISK FACTORS, ANEMIA, GYNECOLOGICAL DISEASES, ZAHEDAN

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#### **INTRODUCTION**

Anemia is a common blood disorder that is one of the hygiene and health problems of today, in which there is not enough red blood cells or hemoglobin in the blood. Hemoglobin in red blood cells causes, oxygen to bind with red blood cells to reach to various tissues of body by capillaries. Because all human cells depend on oxygen to survive, its deficiency leads to hypoxia and results in wide range of problems. Physiologically anemia can be caused by iron deficiency, folic acid, and vitamin B12. Research shows, amount of anemia in women is more than men; especially about young girls are entering puberty and begin of menstruation. More pregnant women due to physiological changes in the body that is created during pregnancy and childbirth, strike to anemia, (Baig-Ansari & Badruddin, 2004).

Blood loss caused by continuous bleeding at the time of menstruation, digestive disorders, vaginal infections and or cancer can also cause anemia. Iron deficiency in diet is other underlying factors that is caused anemia, if the food, which is used daily, have small amount of iron or in the diet remove meat, occurs Iron deficiency. Pregnant women, especially those who are breastfeeding due to functional systems of body need iron several times more than typical person and their diet should be rich in iron. Frequent consumption of drugs that destroy vitamin D in the body use of drugs and supplements that prevent to absorption of iron, Catching chronic diseases associated with bleeding such as: Tuberculosis, catching the fruit worms and parasites, and lack of digestive enzymes, especially stomach acid, are factors that prevent iron absorption. Pregnant women during pregnancy should regularly visit to their doctor and it is better examined in terms of catching anemia before pregnancy, and if they need to use medicines and supplements, after improvement, action to be pregnant.

Due to the increased iron requirements during pregnancy. In addition to increasing amount of this material in their diets, From the fourth month of pregnancy until three months after giving birth, should use iron supplements (Guralnik et al., 2004) for the detection of anemia, blood test is the best way, type and severity of anemia is determined by testing and doctor can diagnose that is this deficiency can be remedied with diet or is there need of medication. If is need to medication, doctor prescribes course of required medication and again test is taken from individual and if necessary, medicine consumption would be extended for the new period. Noting this point is essential that never should not be arbitrarily used tablets and iron supplements. more common Segmentation of anemia (decreased hemoglobin) is based on MCV or the volume of red blood cells, So that MCV less than 80 as microcytic anemia, MCV within the normal range (100-80), Normocytic anemia (normal cell volume) and high MCV, are called macrocytic anemia (Lindenfeld, 2005).

The most important signs and symptoms of anemia include: Fatigue and feel exhausted, lethargy, hair loss, restlessness and discomfort, Shortness of breath or difficulty in breathing, poor concentration, palpitations, sensitivity to cold air, Chest pain, tinnitus, headaches, affect the sense of taste, Dry tongue, difficulty in swallowing, restless leg syndrome, Dry and scaly or spoon-shaped nails, First of all, should identify presence or absence of anemia and also its type and then if necessary use of supplements under medical doctor (Shirvani & Nikfar, 2001). Anemia is recognized in terms of laboratory that hemoglobin or hematocrit of person concerned is less than the desired, its probability and severity is diagnosed based on amount of patient's hemoglobin and hematocrit deviation from the estimated value of age and sex. The amount of average hematocrit for adult men 47% (7  $\pm$  sd) and for adult women 45% (5  $\pm$  sd) as well as the World Health Organization (WHO) defines anemia ,Hemoglobin less than 130 grams per liter (13 grams per deciliter) for men and 120 grams per liter (12 grams per deciliter) for women. Iron deficiency anemia is the most common type of anemia in women. Research has shown that women's problems has significant relationship with anemia, iron deficiency and the underlying disease (Shirvani & Nikfar, 2001).

It is possible the person who has iron deficiency and subsequently anemia to reduce or getting reducing or cut bleeding during menstruation , conflict depends on the body's iron reserves which usually goes away with prescription pills, but if not natural and does not respond to treatment, should be closely examined the cause. Because it may disturb hormonal cycle which if disrupted can cause gastrointestinal disorders. On the contrary, this issue can also occur, Excessive menstrual bleeding causes strike to anemic and muscle cramps occurs in yourselves and cannot do your daily activities, If menstrual bleeding is excessive high, it is called menorrhagia. Excessive bleeding, irregular bleeding, any bleeding after menopause can be reasons for establishing anemia. Intestinal disorders and Indigestion of food can also be underlying factors of anemia, No absorption of nutrients and vital elements are the Chronic or acute problems that involves patients with intestinal disorders and digestive disorders and can also be causes of types of anemia. Celiac disease is chronic disease of the small intestine, As well indigestion problems cause utilization of nutrients and vital elements for the human body (Safavi, 2006). There are many underlying causes of anemia and risk factors for it are widespread .in the present study with prepared questionnaire and consider referred women to Ali ibn Abi Talib hospital in city of Zahedan in first six months of 2015,has been paid to examining prevalence and causes types of anemia in the target population.

#### METHODS

For a total 350 patients referred to the Ali ibn Abi Talib hospital in city of Zahedan in terms of personal information (Age, weight, height, marital status, education, occupation, income, hometown) Behavior and relationships of sexual (Age at marriage, age at menarche, age at first sexual intercourse, age at first pregnancy, investigate menstrual abnormality, risky sexual behavior and having multiple sexual partners), Blood pressure, use of dietary supplements, dietary information, Underlying disease, type of consumable drugs and catching to types of anemia were evaluated and analyzed in this study, received Information from the questionnaires were analyzed by using spss software .Researchers in the current study have used library resources and international authoritative articles for clinical reasoning of above article.

#### FINDINGS

In this study of the total 350 patients admitted to hospital, 279 patients (79.71%) have faced with types of anemia, symptoms of anemia and iron deficiency or had suffered to the underlying disease, anemia and poor diet . These statistics provide a place of reflection in order to further investigation for researchers. Iron deficiency anemia has been a public health problem that Developing and developed countries are caught in that. According to the definition provided by the World Health Organization in 2014, Iron deficiency anemia is called to reduce the concentration of blood hemoglobin that is less than the normal range that this amount depending on the age, sex and physiological conditions (such as pregnancy) is different. Investigations in above study indicate of the total statistical population, 241 case (68.85%) of clients have been involved with iron deficiency anemia that show the importance of this subject.

#### **IRON DEFICIENCY ANEMIA**

Iron deficiency anemia is the most common cause of anemia in the world; But because of it, significant number of patients remain unknown. Iron deficiency anemia (IDA) is to reduce red blood cells or insufficient hemoglobin in red blood cells, This anemia is created due to other diseases. So, for proper treatment of anemia, the cause must be found (Davari, 2005). In the present research ,have paid to statistical analysis of relationship between gastrointestinal irritation, menstrual disorders, reproductive tract infections, nutrition and blood pressure with Iron deficiency anemia. According to the latest medical research, from every fifth Iranian woman, one person is suffering from anemia and factors listed is related to one of these silent disease(Shirvani & Nikfar, 2001). The body requires raw materials such as iron and vitamins especially folic acid, for hematopoiesis. But most people around the world have little access to food sources of iron (vitamin B12 such as meat) (Shirvani & Nikfar, 2001). So anemia, resulted from Iron deficiency is considered the most common and the most important anemia of people in the world. The main part of hematopoiesis of body occurs through bone marrow. Because of this, factors that cause to damage bone marrow, can be caused anemia.

Research shows that two-thirds of Iranians nutritional problems is caused by shortages and reception problem of iron. Anemia in children start from period after 6 months and have negative impact on IQ of people. Ability to learn and concentration of girls especially in adolescence are overwhelmed by the complications of anemia. disregard health issues often arise due to culture and economic poverty, and lack of human health, with there poor eating habits gives hand in hand to people caught this dangerous disease. From the perspective of traditional medicine, consumption of a cup of tea after meals reduces iron absorption more than 95% and consumption of an orange or two tangerines shortly after eating will increase the iron absorption of foodstuffs .Unfortunately, in Iran we are seeing mistaken belief after meals. Anemia, is not only iron deficiency but many factors are effective involved in this disease that may be unaware of their existence that is included such as intestinal disorders, pregnancy, hemorrhage and.... The rest of this article becoming familiar with findings of scientific research and conclusions.

Prevalence: The prevalence suggests of the total statistical population 241 case (68.85%) of patients have involved with Iron deficiency anemia that had exposed to Iron deficiency anemia.

Table 1 shows the risk of anemia. The impact on initial indicators in risk factors, and underlying disease of target population in two danger zone (red) and warning (orange) and the other (black).

Diet lacking in required vitamins and vital elements for hematopoiesis is one of very important underlying causes of Iron deficiency anemia, Diets which is available small amount iron, vitamin b 12, folic acid and other vital elements such as zinc, copper, etc. in them, increases the risk of Anemia. In the present research 170 cases (48.57%), have denied use of vital dietary supplements to prevent anemia and 137 cases (39.14%),have not informed from sufficient public information about the proper diet to prevent anemia.

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Table 1. Evaluation of Initial indicators of patients and their relationship with risk factors for anemia in women referred to Ali ibn Abi Talib hospital in city of Zahedan					
Chronic Diseases	Pregnancy	Menstruation	Intestinal disorders	Food poverty	Index / Risk Factors
37.4	27.2	23.9	29.5	28.8	Average of age
63.5	62.8	60.2	56.3	53.4	Average of weight
166.3	165.1	158.2	155.9	155.6	Average of Height
24.6	20.8	20.4	23.3	23.9	The average age of first sexual exercise
14.3	14.1	13.1	13.8	13.4	The average age of first menstruation

*Intestinal disorders:* Intestinal disorders which affects on absorption of nutrients by your body, Can increase risk of catching your to anemia. causes and symptoms of Coronel disease, irritable bowel syndrome, celiac disease, ulcerative colitis and diverticulosis and any gastrointestinal discomfort have been questioned in terms of catching the disease and history of catching and symptoms. A total of 128 cases (36.57%), have confirmed intestinal disorders and gastrointestinal disorders which in conjunction with the intestinal disorder celiac disease with 12 case (3.42%)of reported having involvement are included highest rate of intestinal disorders and It should be noted that all 12 cases of celiac disease (100%) have confirmed anemia, 101 (28.85%) cases have confirmed digestive disorders such as indigestion, abdominal pain, bloating, diarrhea, rectal bleeding and loss of appetite.

*Menstruation:* Generally, women in menstrual age become anemic than men and postmenopausal women. 48 case (13.71%) have confirmed menstrual disorders, 9 case (2.57%), irregular cycles, 21 case (6%) major bleeding during menstruation, 8 case (2.28%) other cases and also 12 case (3.42%) have confirmed low bleeding during menstrual. Which can be a sign of anemia. 93 case (26.57%) have confirmed existence of the symptoms of anemia such as paleness, general weakness, dizziness, shortness of breath and lack of focus. However, comparing the symptoms of anemia is not logical due to simi-



larity to menstrual symptoms during menstruation but these similarities can also be thought-provoking.

*Pregnancy:* increased the risk of anemia during pregnancy and 119 case (34%) have confirmed anemia during pregnancy and of those, 74 case (21.14%) have confirmed use of dietary supplements and proper diet to prevent anemia during pregnancy.

*Chronic Diseases:* Diseases such as cancer, liver or kidney failure or other chronic diseases increase the risk of anemia. 12 case (42.3%) have confirmed anemia during involvement with Chronic Diseases.

*Genital tract infections:* Although genital tract infections doesn't have direct relationship with anemia and the present study does not have able to prove it but from among the 12 patients with pelvic inflammatory disease 7 case (2%) have confirmed anemia and from 68 patients with genital infection contains Vaginal yeast infections, dermatitis, etc. 13 case (71.3%) have confirmed anemia.

*Health Literacy:* The ability of individuals to acquire, analyze, and understand basic health information and services that they need to them to be able to take the right decisions about issues related to their health that is called health literacy. in the present study amount of General Information of all clients have been measured by asking questions which have filled the questionnaire which unfortunately 213 case (85.60%) have poor public information in relation to anemia, treatment strategies, prevention and symptoms of anemia and only 29 (28.8%) case enjoy excellent public information in the field of anemia.

#### **CONCLUSION**

In terms of physiologic, Anemia can be caused by deficiency of iron, folic acid, also be created lack of vitamin B12. anemia associated with Iron deficiency and vitamin deficiency, can be prevented with one diet high in vitamins, This vitamins are available in organized food and in Nature that Unfortunately, bad eating habits, dependence on poor diet and poverty in Sistan and Baluchestan Province is cases and underlying factors to cause iron deficiency anemia with examine credible sources of nutrition and traditional medicine, we find iron-rich foods such as dark green leafy vegetables, artichokes, apricots, beans, lentils, peas, soybeans, meat, nuts, prune and raisin for having adequate iron stores should be included in the diet. Folate and his family folic acid are available in citrus, banana, dark and leafy vegetables, legumes, and fortified foods. Vitamin B12 is also available naturally in meat and dairy products. Also this vitamin is also available in some soy milk.

Research has shown that foods rich in vitamin C such as citrus will help iron absorption. Unfortunately, the lack of adequate information and having public information has been caused cultural poverty and has become iron deficiency to health threat.

Results of this study show increasing Factors the risk of developing Iron deficiency anemia Include Inappropriate and inadequate feeding, age over 60 years, Recent illness, such as Ulcers or duodenal, diverticulitis, colitis, hemorrhoids, Celiac disease or digestive tract tumors, pregnancy, menstrual disorders and Chronic diseases including cancer, Liver or kidney disease are most important underlying factors that create risk of developing anemia. Anemia covers a wide range of diseases and in above study are also available Symptoms of anemia in patients with fungal infections and bacterial vaginal and sometimes anemia has been confirmed by the patient that can not decisive comment and is required to do practical research but should be named anemia as today's threatening the health of patients and society.

The results of above study with considered study population ,shoud to say immune performance systems of women is weaker compared to men and many diseases are caused bad performance of immune system which include blood diseases Such as aplastic anemia, leukemia, sickle cell anemia, and myelofibrosis and this means intensifying the anemia and involvement of women compared to men, women Considering that are involved to pregnant have likely to more involves Iron deficiency and anemia, and all pregnant women should be use iron tablets at the end of fourth month to three months after delivery and then also measured their iron stores by doing experiments and share with doctor.

Ministry of Health in Iran provide iron pills and gives free to these mothers through health homes and health centers care. In addition in these centers, is performed Learning the importance of iron supplementation, Preventive ways of iron deficiency anemia and nutrition advice and food sources of iron by Staff and nutrition expert. But it seems do not relevant measures in areas in Sistan and Baluchestan Province or demands required to further work by the officials and personnel therapeutic of Province. Menstrual disorders as Women's chronic distress can cause severe anemia in women and require more attention of doctors and health care workers and health of country and demand more detailed and clinical research, amount of anemia in women is more than men; Especially about young girls are entering age of puberty and begin of menstruation.

More pregnant women due to physiological changes in their body that is ceated during pregnancy and childbirth, are suffering from anemia, brings need to Notices

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and Sounding the alarm bell for This stratum of society, Celiac disease is faced patients with these problems as a disease of malabsorption of nutrients, the absorption of iron and vitamin B12 .Iron deficiency and anemia in this study have been confirmed in all patients and has required to rigorous scientific research in these patients in the province. At the end declare gratitude and thanks from all Ali bin Abi Talib hospital personnel in city of Zahedan in order to accompany the researchers of above study.

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