

## Associations of physical activity and sedentary behaviors with dietary behaviors among mid-adolescent female students in the southeast of Iran

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### ABSTRACT

Given the complexity of dietary behaviors and physical activity of adolescents and its relationship to the chronic diseases later on, the present study aimed to investigate the relationship between the physical activity and sedentary behaviors with dietary behaviors of female high school students in the southeast of Iran. This cross-sectional study was conducted in four public high schools in the southeast of Iran (Zahedan) on a sample of 457 female students of Tenth Grade. Information collected using a self-reported 38-item questionnaire with the content validity ratio (CVR) of 0.79, the content validity index (CVI) of 0.88 and the reliability ( $\alpha$ ) of 0.70. The data were analyzed by SPSS15 Software by linear and logistic regression models. Physical activity and socio-economic class of students were predictors of their healthy dietary behavior. Students who had spent much time in sedentary behaviors were more likely to consume fast foods. It is recommended to implement some combined interventions including training, consultation and environmental supports in schools along with the focus on family intervention so as to strengthen and lengthen the effects of interventions.

**KEY WORDS:** PHYSICAL FITNESS, NUTRITION, TEENS

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## INTRODUCTION

Despite major plans of public health to increase the public awareness regarding the promotion of healthy dietary behaviors and physical activity of healthy people by 2020, these issues are still considered as major concerns of the public health. (America's Health Literacy: 2008) Nowadays, non-communicable diseases have been prevalent in both developed and developing countries. It has been well proven that poor dietary habits are directly associated with the outbreak of some serious health problems such as diabetes, cardiovascular diseases and probably some types of cancers in the future life of the adolescents. (Ogden et al 2012, Rao 2008).

In comparison, increased physical activity is related to the lower blood pressure, body fitness and blood fat regulation. It also reduces the depression and anxiety and increases self-esteem and quality of life. On the other hand, a decrease in the physical activity and increase in the sedentary activities are significantly associated with the risk of obesity, (Singh et al., Vuori 2010; Hills et al., 2006; Andersen et al., 2011; Kantomaa et al., 2008; Motl et al., 2004) cardiovascular health defects, (Ankoski et al. 2011; Healy et al 2011; Henson et al. 2013) and mortality. (León-Muñoz et al., 2013; Matthews et al. 2012).

Key indicator of bodily activity includes physical activity and activities with low mobility (sedentary activities), while dietary behavior includes the diet and the number of meals. (Jiménez-Pavón et al. 2011-Rodríguez et al., 2011).

The ideal diet for teenagers includes supplying needed calories by eating nutrient foods such as fruits, vegetables, dairy, whole grains, and low-fat protein and limiting the consumption of high-fat foods and beverages. Then, it is recommended for the teenagers to have healthy diet with eating at least five portions of fruits and vegetables a day and limiting fat intake to less than thirty percent of their energy needs, (Nelson et al., 2005) as well as having at least sixty minutes of moderate to severe physical activity most of the days of the week and participation of two hours or less per day in sedentary activities, (Sanchez et al., 2007).

However, some studies reported that only 30-40% of teenagers have at least sixty minutes of physical activity five times or more per week (Larsen et al. 2004) and the level of sedentary activities increases in their older age. (Driskell et al., 2008).

In addition, the nutritional trends suggest that most teenagers don't adhere to the recommended diet of servings five portions of fruits and vegetables a day, consuming dairy products two or more times a day, and having grains six times a day whereas they may not eat breakfast regularly. In comparison, they may eat fast food two or more times a week. (Larson et al., 2008) On the other hand, nearly a quarter of their daily calorie is supplied by having sugary drinks, (Harrington 2008).

Data suggest that in recent years, there has not only been a decrease in the level of Iranian teenagers' physical activities, but their food tastes have also had a tendency towards the high-calorie foods and the foods lacking of nutritional value (Kelishadi et al. 2005).

However, healthy nutrition and regular physical activities which are parts of the health promoting behaviors can prevent wasting of costs, causing morbidity, and mortality (Lee and Loke 2005). Given the importance of healthy nutrition and physical activity to maintain and improve the public health, the current study aimed to investigate the relationship between the physical activity and sedentary behaviors, and dietary behaviors of female high school students in the southeast of Iran (Zahedan) so as to assess the current status of the adolescent behaviors; then, the results can be used for planning of health promotion interventions in schools.

## MATERIAL AND METHODS

The present cross-sectional school-based study was carried out in the South East of Iran (Zahedan) in 2015. First, 4 female state high schools were randomly selected; then, all students in Grade 10 ( $n = 457$ ) were enrolled in the study through a census. The objectives of the study and the way of answering the questionnaire were explained to the participants. The subjects were entered into the study with observing the ethical codes and voluntary. Data collected via a self-reported questionnaire including demographic questions (11 items), healthy dietary behaviors (14 items), physical activity and sedentary behaviors (7 items), the status of the school and description of the weight (6 items). The questionnaire has content validity ratio (CVR) of 0.79, the content validity index (CVI) of 0.88 and the reliability ( $\alpha$ ) of 0.70 that examines the students' nutritional status and physical activity during the week before the study. The minimum and maximum scores for nutrition were 14 and 64, respectively; for the physical activity dimension, the minimum, and maximum scores were 7 and 47, respectively. The questionnaires did not include any identifying information and the students were explained that the information was solely analyzed in the group. The allocated time to complete the questionnaire was 15-20 minutes. After collecting the data, they were analyzed by SPSS 15 Software using the linear and logistic regression models.

## RESULTS

The study included a total of 457 teenage girls of 10<sup>th</sup> Grade in the 14-17 age range and majority of them were at the birth rank of 1-3. Half of their fathers were employees and their education levels were around diploma. Most of their mothers were housewives and majority of them had the high school diploma as well. Table 1 dem-

Table 1. The prevalence of dietary behaviors, Physical/sedentary activities and weightrelated	
Dietary behaviors	Percent (95% CI)
Student who did not eat fruit drink 100% fruit juices	53.08(48.47-57.69)
drank 100% fruit juices one to three day/week	24.45(20.48-28.41)
drank 100% fruit juices four to six day/week	6.17(3.94-8.38)
drank 100% fruit juices one times/day	12.11(9.10-15.12)
drank 100% fruit juices two or more times/day	4.19(2.33-6.03)
Student who did not drink milk	35.90(31.47-40.33)
drank milk one to three day/week	35.24(30.83-39.65)
drank milk four to six day/week	9.47(6.76-12.17)
drank milk one times/day	14.54(11.28-17.79)
drank milk two or more times/day	4.85(2.86-6.82)
Student who did not drink a can or glass of cola or other	47.80(43.18-52.40)
drank a can or glass of cola or other one to three day/week	10.79(7.92-13.65)
drank a can or glass of cola or other four to six day/week	6.83(4.49-9.15)
drank a can or glass of cola or other one times/day	29.07(24.88-33.26)
drank a can or glass of cola or other two or more times/day	5.51(3.40-7.61)
Student who did not drink a can or glass of energy/Sports drank	90.52(87.82-93.23)
drank a can or glass of energy/Sports drank one to three day/week	5.50(3.40-7.61)
drank a can or glass of energy/Sports drank four to six day/week	0.66(0.08-1.40)
drank a can or glass of energy/Sports drank one times/day	2.20(0.84-3.55)
drank a can or glass of energy/Sports drank two or more times/day	1.10(0.13-2.06)
Student who did not eat fruit	3.74(1.99-5.49)
ate fruit one or two day/week	18.72(15.12-22.32)
ate fruit three to six day/week	28.85(24.67-33.03)
ate fruit five to seven day/week	48.68(44.06-53.29)
Student who did not eat vegetables	13.44(10.28-16.58)
ate vegetables one or two day/week	40.31(35.77-44.83)
ate vegetables three to six day/week	28.41(24.24-32.57)
ate vegetables five to seven day/week	17.84(14.30-21.37)
Student who did not eat beef/lamb	10.57(7.73-13.41)
ate beef/lamb one or two day/week	29.52(25.30-33.72)
ate beef/lamb three to six day/week	36.12(31.68-40.55)
ate beef/lamb five to seven day/week	23.79(19.85-27.72)
Student who did not eat chicken/fish	7.93(5.43-10.42)
ate chicken/fish one or two day/week	34.80(30.40-39.20)
ate chicken/fish three to six day/week	34.14(29.76-38.51)
ate chicken/fish five to seven day/week	23.13(19.23-27.02)
Student who did not eat dairy products	5.95(3.76-8.13)
ate dairy products one or two day/week	29.74(25.51-33.95)
ate dairy products three to six day/week	25.77(21.73-29.80)
ate dairy products five to seven day/week	38.55(34.05-43.04)
Student who did not eat sweets/chocolate	10.35(7.53-13.16)
ate sweets/chocolate one or two day/week	24.67(20.68-28.65)
ate sweets/chocolate three to six day/week	46.26(20.68-28.65)
ate sweets/chocolate five to seven day/week	18.72(15.12-22.32)
Student who did not eat nuts	18.94(15.32-22.56)
ate nuts one or two day/week	39.21(34.69-43.71)
ate nuts three to six day/week	24.01(20.06-27.95)
ate nuts five to seven day/week	17.84(14.30-21.37)
Student who did not eat goody	23.79(19.85-27.72)
ate goody one or two days/week	18.72(15.12-22.32)
ate goody three to six day/week	39.87(35.34-44.38)
ate goody five to seven day/week	17.62(14.10-21.13)

Student who did not eat fast food	40.31(35.77-44.83)
ate fast food one or two days/week	9.47(6.76-12.17)
ate fast food three to six day/week	42.73(38.16-47.29)
ate fast food five to seven day/week	7.49(5.05-9.91)
Students who did not eat breakfast	11.45(8.51-14.39)
ate breakfast on all 7 days	53.74(49.14-58.34)
<b>Mean of Dietary behaviors (SD)</b>	<b>43.69(6.20)</b>
<b>Physical/sedentary activities</b>	<b>Percent (95% CI)</b>
Student who did not participate in at least 60 minutes of physical activity	46.56(32.11-41.01)
participated in physically active at least 60 minutes/day on 1 or 2 days/week	41.85(37.29-46.40)
participated in physically active at least 60 minutes/day on 3 or 4 days/week	13.44(10.28-16.58)
participated in physically active at least 60 minutes/day on 5 or 6 days/week	3.96(2.16-5.76)
participated in physically active at least 60 minutes/day on all 7 days	4.19(2.33-6.03)
Student who did not participate in muscle-strengthening activities	50.00(45.38-54.61)
participated in muscle-strengthening activities on 1 or 2 days/week	40.97(36.42-45.50)
participated in muscle-strengthening activities on 3 or 4 days/week	4.41(2.51-6.30)
participated in muscle-strengthening activities on 5 or 6 days/week	1.54(0.40-2.67)
participated in muscle strengthening activities on all 7 days	3.08(1.48-4.67)
Student who did not go to jam	70.26(66.04-74.48)
went jam on 1 or 2 days/week	21.59(17.78-25.38)
went jam on 3 or 4 days/week	6.61(4.31-8.90)
went jam on 5 days/week	1.54(0.40-2.67)
Student who did not play video or computer games or used a computer	49.34(44.72-53.95)
played video or computer games or used a computer for 1 to 2 hours/day	44.05(39.46-48.63)
played video or computer games or used a computer for 3 or more hours/day	6.61(4.31-8.90)
Student who did not watch television	9.03(6.38-11.67)
Student who watched 1 to 2 hours/day of television	55.95(51.36-60.53)
Student who watched 3 or more hours/day of television	35.02(30.61-39.42)
A student who did not use mobile (whats up, Viber, email, ...)	38.99(34.48-43.49)
used mobile (whats up, Viber, email, ...) 1 to 2 hours/day	37.00(32.54-41.46)
used mobile (whats up, Viber, email, ...) 3 or more hours/day	24.01(20.06-27.95)
<b>Mean of Physical/sedentary activities (SD)</b>	<b>22.49(4.84)</b>
<b>Weight-related</b>	
Student who described themselves as Obese	4.41(3.76-8.13)
Student who described themselves as Overweight	22.25(11.08-17.55)
Student who described themselves as Normal weight	53.08(48.47-57.69)
Student who described themselves as low weight	14.32(18.40-26.08)
Student who described themselves as Underweight	5.95(2.51-6.30)

onstrated the prevalence of dietary behaviors, Physical/sedentary activities and weight related variables. As can be seen, teenagers who do not have all-natural juice and milk twice a day or more were about 4 and 5 %, respectively. Nearly half of them had fruits every day, 18% vegetables, 15% milk and dairy products, and 18% nuts. In addition, nearly half of the surveyed adolescents reported the least level of daily physical activity and stretching exercises. The percentage of adolescents who spend more than two hours a day for sedentary activities including working with the computer, watching TV, using cell phones and social networks were about 35.7 and 24 %, respectively. Moreover, about 40% of students reported to be overweight and 60% reported severe weight loss.

The physical activity and socio-economic classes were predictors of the healthy nutritional behavior (Table 2).

The results (Table 3) also showed that, there is a positive significant relationship between the consumption of fast foods and behaviors related to the physical activity in the studied high school students.

## DISCUSSION

The findings of the present study illustrated that the majority of the studied adolescents do not have daily all-natural juice and less than a quarter of them do not eat, milk. Almost half of them have daily breakfast, fruits and less than a quarter of them eat once or more

Dietary Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t	P value
	B	Std.Error	Beta		
Physical/sedentary activities	0.33	0.05	0.26	5.84	0.001
Family Economy	0.99	0.38	0.11	2.56	0.01

Sedentary Behavior	Fast food OR (95% CI)
Watched TV $\geq 2$ hours per day	Reference
No	0.63(0.43-0.94)*
Yes	
Used mobile (whats up, Viber, email, ...) $\geq 2$ hours per day	Reference
No	0.55(0.36-0.84)**
Yes	
Played video or computer games or used a computer for something other than school work $\geq 2$ hours on an average school day	Reference
No	0.54(0.28-1.03)*
Yes	
Ate at least one meal or snack at a fast food restaurant $\geq 1$ day/week	
*p<0.05	
**p<0.01	

fizzy sugary drinks daily. Half of them do the least level of physical activity and stretching exercises and almost a third of them are engaged in sedentary activities. A quarter of them were overweight or obese. A statistical significant relationship was observed between the unhealthy nutrition and physical activity behavior and socio-economic classes of the student and between the fast food consumption and sedentary behaviors.

The results indicate that the removal of breakfast meal among the students ranged from 1.7 to 30% and having daily breakfast reported to be 31-33%. The results also suggest the high level of not having breakfast in female students and its growing prevalence rate with the low socio-economic status and higher ages. Students who eat breakfast regularly, have healthier food choices and adolescents who go to school without having breakfast, their typical foods are chips, popcorn and sugary drinks. In this regard, the results of the present study are consistent with the previous ones.

Regarding the consumption of milk and dairy products at least 1-3 times a day, the consumption level has been reported to be 2-25.1% and lack of consumption of the same group reported to be 14.8 – 22.4 % ; however, it has been reported that 98% of Swedish adolescents use milk and its products at least once a day. Similar to previous studies, the subjects in the present study, despite the daily distribution of milk in schools, use milk and dairy products at the lower level.

With respect to the consumption of fruits and vegetables, the results of previous studies indicate that 11.5 – 68.2 % of adolescents in different countries have daily natural juices and fruits, and 11.6 – 58% of them eat fruits and vegetables at least once or more a day. In a study in Iran, the mean frequency of the consumption of fruits and vegetables among the students were 1.2 and 1.1 times a day, respectively. In the present study, the consumption of natural juices was at the lower level, but due to the availability of fruits in Iran, almost half of the students have daily fruit consumption. However, like the previous studies, the consumption level of vegetables was at the lower level.

In the present study, the consumption of red and white meat was observed only in one quarter of the students. While the consumption level of red meat among the adolescents of Syrian and Swedish has been reported equal to 62% and 82 % a day, respectively. According to other studies, high-protein diets containing red meat would also be resulted in weight control.

The results of studies reflect lower consumption of fruits, vegetables, fish, dairy products and eggs among adolescents; they also get more unhealthy foods like French fries, burgers, sugary drinks and a variety of jellies. Due to containing high sugar and energy, sodas cause to overweight and reduced consumption level of fruits, vegetables and dairy products. However, this relationship has not been seen in some studies. In the pre-

sent study, half of the students had fizzy sugary drinks more than twice a day.

The prevalence of watching TV more than 2 hours a day among the American students showed a significant reduction from 43% in 1999 to 32% in 2013 and an increase to 43.3% in 2015. There has also been an increase in the time allocated to using computer and playing video games from 22% in 2003 to 43% in 2015. In comparison, Iranian female adolescents were similar to American teenagers in this regard; however, the prevalence of reduction in the physical activity and sedentary behaviors in Jordanian adolescents was reported to be at higher level; and in European adolescents, the results showed that only 18% of them have consistently healthy behaviors and 21% of them had consistently unhealthy behaviors. The percentage of watching TV in the studied adolescents was similar to the results of above-mentioned studies, but the time spent on computer games was lower in this population.

The results indicate that nearly one-third of adolescents had daily fast food and nearly a quarter of them eat fast food more than three times a week; in the families with high income and residents of the North of the city, the level of fast food consumption was high. The results indicate that one of the factors influencing the food choices in adolescents is their socio-economic status. On the other hand, consumption of fast foods and a sedentary life style are among the factors of overweight in adolescents. Like the previous studies, fast consumption level was high. Furthermore, a significant relationship was observed between the socio-economic status of students and their orientation to unhealthy nutrition. In general, the role of the family's economic status on food choices can be justified due to the increased purchasing power and access to a variety of foods.

The prevalence of overweight in female Asian teens was reported 6.2 – 18.9 % and the obesity 1.8 – 4.7 %; the overweight in adolescents of Spain, Mexico, Ecuador, Jordan, Taiwan, the U.S, and New Zealand has been reported to be 8.3 – 26.6 % and the obesity 3.9 – 18%. The results showed that the prevalence of overweight or obesity among the Filipino teens has had a reduction from 11.4 % in 2003 to 9.4% in 2011. Similar description of weight with Asian teens has been reported in the present study by our participants.

The results demonstrated a relationship between the sedentary behaviors and less healthy diet. The adolescents who watch TV more than 5 hours a day and don't exercise are more likely to consume fast foods. The present study also showed that adolescents with more sedentary activities have more chances to use fast foods. Said the reasons for this might be the fact that adolescents who watch TV more and have less physical activity are more inclined to the advertised foods and they normally eat more food while watching TV.

According to the results and since the health promotion of this age range can be effective in the prevention of non-communicable diseases in the developing countries, it's recommended to establish the necessary measures to comply with the principles of healthy lifestyle habits, because subsequent attempts to change the established habits will be very difficult and perhaps impossible. On the other hand, given the importance of the family in Iran and due to the emotional and financial dependency of adolescents to families in this age range, the strong impact of family support on physical activity and dietary behaviors of students is logical. Therefore, designing training programs with an emphasis on the central role of the family can be effective in the promotion of healthy dietary behaviors and doing physical activities in this age group. Therefore, it's also necessary to design and implement interventions based on behavior change for adolescents in the schools.

## LIMITATION

Students participated in this study were limited to the public schools and grade 10, therefore, are not representative of all adolescents in this age group. In addition, the data collected are based on a self-administered questionnaire.

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## CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

## AUTHORS CONTRIBUTIONS

The overall implementation of study design, data management and analysis and manuscript preparation were the results of joint efforts by multiple individuals who are listed as coauthors of this paper. All authors read and approved the final manuscript.

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