

Junk Food Consumption, Physical Fitness and Academic Grade Point Average among Teenage Girl's Students in Kangavar County, Kermanshah Province, Iran

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Abstract

Background: The consumption of unhealthy food is increasing among both children and adults, which can have detrimental effects on their overall health. The present study aimed to investigate the relationship between the consumption of junk foods with standard physical fitness tests and academic grade point average among 13-15-year-old girls' students in Kangavar County, Kermanshah Province, Iran.

Methods: This was a descriptive-correlation study. From 380 girl's students aged 13-15 years in Kangavar County, Kermanshah Province, Iran, 181 individuals voluntarily participated in the study. The schools were selected using the multi-stage cluster sampling method. Height, weight, and body mass index were evaluated based on the defined Body Mass Index (BMI) cutoffs in the National Health and Nutrition Survey. To check the amount of junk food consumption, Junk Food Frequency Questionnaire of Kamangar and colleagues (2023) was used. In order to assess the cardio-respiratory endurance of students, a 540-meter test was conducted. Additionally, a modified supine pull-up test was used to measure the endurance and strength of the shoulder muscles, sit-up tests were performed to measure abdominal muscle endurance, and a flexibility box was used to evaluate the flexibility of lower and posterior muscles (thighs). The grade point average of the students at the end of the year was used to measure the academic grade point average. The data were analyzed using descriptive statistics in order to calculate mean and standard deviation. Variables were examined for correlation using the Spearman correlation method.

Results: Consuming junk food was found to have a considerable negative correlation with physical fitness factors related to health, such as cardio-respiratory endurance ($r=0.371$, $P=0.04$), muscle strength ($r=-0.241$, $P=0.002$), muscle endurance ($r=-0.249$, $P=0.01$), and flexibility ($r=-0.134$, $P=0.01$), but there was a direct and significant correlation between junk foods consumption and body mass index ($r=0.18$, $P=0.04$). Also, there was no significant correlation between the consumption of junk foods and the academic grade point average of the subjects ($r=-0.06$, $P=0.12$).

Conclusions: Our results indicated that increased consumption of junk food has an inverse correlation with physical fitness and a direct correlation with the body mass index of the students. It is recommended to pay more attention and support parents and policymakers regarding nutrition and physical activities in society and schools.

Keywords: Foods, Physical fitness, Student

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1. Introduction

All over the world, physical inactivity and sedentary lifestyle rank among the four leading causes of death. Inactivity is increasing in many countries and has major adverse consequences for the public health of people all over the world, which include: Non-communicable diseases, such as cardiovascular diseases, diabetes, and cancer spreading rapidly, along with other risk factors such as high blood pressure, increased blood sugar, overweight, and obesity (1). Obesity rates are on the

rise in developing countries due to lifestyle changes brought about by economic development, resulting in a positive energy balance and changes in socio-cultural conditions. The prevalence of obesity has increased worldwide in the past 50 years, reaching pandemic levels. Obesity represents a major health challenge because it substantially increases the risk of diseases such as type 2 diabetes mellitus, fatty liver disease, hypertension, myocardial infarction, thereby contributing to a decline in both qualities of life and life expectancy. Obesity is also associated with unemployment, social disadvantages and

reduced socio-economic productivity, thus increasingly creating an economic burden (2). During early adolescence, individuals take responsibility for their eating habits, attitudes, and behaviors, which can have significant impacts on their eating habits and behaviors later in life (3). This is a crucial period in a person's adolescence for establishing healthy eating habits to prevent health and nutritional problems. Adolescents' eating habits may be affected by both psychological and physiological changes that occur during puberty (4). Importantly, the World Obesity Federation and other organizations, including the American and Canadian Medical Associations, have declared obesity a chronic progressive disease clearly distinct from being just a risk factor for other diseases (5). Improper diet and physical inactivity are the primary environmental factors that contribute to obesity and overweight, which are the most significant causes of non-communicable diseases (1, 6). Adolescents account for more than one-fifth of the world's population. During this stage, various physiological and psychological factors can affect their health. Ignoring these factors may lead to negative consequences such as weight loss or obesity (7). Children and adolescents often consume high-fat, sugary, and salty foods while eating fewer fruits, vegetables, and whole grains (8). The term "junk food" was coined by Sharma in 1972 to describe unhealthy or nutritionally deficient foods (9). Junk food is a term used to describe food that is high in calories from sugar and/or fat, and may contain sodium, but has little or no dietary fiber, protein, vitamins, minerals, or other vital nutritional value. Some common examples of junk food include sodas, snack foods such as potato chips, puffs, crackers, and candy. Popular fast-food items like hamburgers, French fries, and ice cream are also considered junk food (10, 11). In Iran, similar to other developing countries, the dietary patterns of children and teenagers are transitioning from traditional foods to fast foods. For instance, a study conducted by Shahbazi and colleagues revealed that nearly 50% of students consumed soft drinks on a daily basis (12). According to surveys, children consume a variety of junk foods such as chips, processed juices, and chocolates throughout the week (13).

On the one hand, the human body requires high-quality nutrients to perform physical activities properly; on the other hand, malnutrition can have

a negative impact on physical activity (9). However, few studies have investigated this issue. One study conducted by Lamba and colleagues discovered that boys and girls who regularly consume junk food scored lower in jumping and 100-meter running tests as compared with other groups (14). Similarly, Kamangar and colleagues found that high consumption of junk foods can have an adverse effect on physical fitness factors (15). Additionally, children's consumption of junk food can lead to dependence on these substances, resulting in overweight and obesity. Increased consumptive behavior, also known as hyperphagia, refers to the consumption or desire to consume large amounts of food in adolescent humans and animals, which results from increased metabolic activity. Recent research suggested that excessive consumption of junk food during adolescence can have significant and long-term effects on the developing brain (16). During this critical period, the adolescent brain becomes more sensitive to the rewarding properties of foods that increase dopamine levels and activate the mesocorticolimbic pathway. This can lead to an increased motivation to consume high amounts of sweetened junk food during adolescence, which can have negative impacts on their health and well-being in the future (17). It is important to understand that a person's consumption habits can have a significant impact on their academic performance and extracurricular activities. Engaging in physical activity and maintaining a nutritious diet can increase a person's ability to learn. According to research conducted by the National Academy of Medicine, physical activity can considerably enhance a child's cognitive abilities, overall health, and academic performance (18). In addition, a previous study showed that inadequate food consumption is linked to poor concentration, learning, and academic performance (19). Recent studies have also indicated that a person's diet can have an impact on their learning and memory abilities, not only in childhood but also during adolescence (16, 19).

On the other hand, by examining the effect of breakfast and food consumption, Zipp and Eissing showed that children who eat breakfast, had better mental, physical and clinical knowledge (20). Therefore, the present study aimed to investigate the correlation between the consumption of junk food and physical fitness as well as academic performance in 13-15-year-old female students in

Kangavar County, Kermanshah Province, Iran.

2. Methods

This was a descriptive-correlational study on 380 female students aged 13 to 15 in the 2022-2023 academic year. First, three schools in the west of Kangavar County, Kermanshah Province, Iran were selected using a multi-stage cluster. As a result of attrition during the study, 200 individuals were selected to participate in the present study. Since the students involved had not yet reached the legal age, a separate meeting was conducted with their parents to present the details of the study and obtain their consent. Then, the students were provided with main details of the study. Finally, tests were administered and questionnaires were distributed to the participants. A wall-mounted meter was used to measure the height of the participants. Each student stood against the wall without shoes, and the distance from their heel to the highest point of their head was measured using a digitalized medical scale with 1% precision. The scale was also used to record the weight of the student in kilograms. For accuracy, the student wore minimal clothing during the weighing process. In a study conducted by Kamangar and colleagues, researchers used a Junk Food Frequency Questionnaire to determine the amount of junk food consumption among the participants (15). The questionnaire consisted of 18 types of junk foods, including fast foods, snacks, and non-nutritious foods from various sources. The participants were asked to record their junk food consumption frequency per day, week, and month for each food item. Based on the total frequency of junk food consumption over the desired period, the participants were grouped into different categories. The content validity of the questionnaire was approved by ten sports management professors and several sports experts, with a Cronbach's alpha of 0.78. A 46-question questionnaire was used to assess nutritional knowledge, attitude, and behavior of students. The questionnaire had a mean validity ratio of 87% and a mean validity index of 85%. Test-retest (Spearman correlation coefficient) determined the scientific reliability of the questionnaire to be 80%, while the internal correlation of Cronbach's alpha was 82%. The academic grade point average (AGPA) of the students at the end of the year was used to measure their academic performance. Based on their responses to the junk food consumption

questionnaire, the students were categorized into four groups: very high dependency (more than 3000 times per year), high dependency (2000-3000 times per year), less dependency (1000-2000 times per year), and independent (less than 1000 times per year). Questionnaires were distributed among the students and they were asked to fill them out. After that, different health-related fitness tests were conducted based on groups. Several tests were carried out to evaluate the cardio-respiratory endurance of the students. These tests included a 540-meter run, a modified supine pull-up test to measure the endurance and strength of shoulder muscles, sit-up tests to measure the endurance of abdominal muscles, and a flexibility box test to measure the flexibility of lower and posterior thigh muscles. To measure the body mass index of the students, the reference population table was used, which includes children and adolescents who have had their height and weight measured in the National Health and Nutrition Survey (NHANES-I) project. The classification of Body Mass Index (BMI) is based on the percentile range of BMI. More than 95 percentile of BMI is considered obesity, between 85 and 95 percentile of BMI is considered overweight, 15th to 85th percentile of BMI is considered normal weight, and less than 15 percentile of BMI is considered thinness for age and sex (4). Descriptive statistics were used to calculate the mean and standard deviation of age, height, and weight. The normality of the data was checked using the Kolmogorov-Smirnov test. The Spearman correlation was used to investigate the relationship between junk food consumption and physical fitness, nutritional knowledge, attitude and behavior, and academic grade point. All statistical tests had a significant level of 5%. Statistical calculations were performed using SPSS version 24.

3. Results

The study analyzed the age, height, weight, and BMI of the participants. According to results, mean age of the participants was 14.27 ± 0.66 years, mean height was 160.63 ± 6.41 cm, mean weight was 55.57 ± 10.75 kg and BMI was 21.48 ± 23.63 kg/m². The inclusion criteria were: parental consent, girls aged between 13-15 years, those who have not engaged in regular exercise over the past three months. The exclusion criteria were: getting injured, going to the gym, and not participating in the physical fitness tests.

3.1. Junk Foods Consumption Rate

According to Figure 1, 49.8% of student were dependent and highly dependent on junk foods. This means that they used junk foods more than 2,000 times a year.

3.2. Junk Foods Consumption and Physical Fitness

The consumption of junk foods has been found to have an inverse and significant correlation with various physical fitness factors including cardio-respiratory endurance, muscle strength, muscle endurance, and flexibility. The correlation coefficients for these factors are $r=0.371$, $r=-0.241$, $r=-0.249$, and $r=-0.134$ respectively, with corresponding P values of 0.04, 0.002, 0.01, and 0.01. Figure 2 illustrates a direct correlation between junk food consumption and BMI in 13-15-year old students in Kangavar County, Kermanshah Province, Iran. The correlation coefficient is $r=0.18$ with $P<0.04$. The study found that 25.5% of the students were overweight and 19.5% were obese.

3.3. The Correlation between the Consumption of Junk Foods and an Individual's Nutritional Knowledge, Attitude, and Behavior

According to study results, almost all students (99%) had a moderate to good understanding of nutrition. Furthermore, more than three-quarters of students (75.5%) had moderate to high scores in nutritional attitudes, and over 88.5% had moderate to high scores in nutritional behavior. We also found a significant and inverse correlation between junk food and nutritional knowledge in students ($r=-0.17$, $P=0.03$). However, there was no significant correlation between junk food and nutritional attitude in students ($r=0.034$, $P=0.08$). Further, there was a significant and inverse correlation between junk food and nutritional behavior in students ($r=-0.163$, $P=0.002$). Therefore, increasing knowledge and nutritional behavior could lead to a reduction in the consumption of junk food.

3.4. The Correlation between Consuming Junk Food and Levels of AGPA

The study results showed that 83.5% of the participants had a good to high AGPA. According to Figure 3, there was no significant correlation between the consumption of junk foods and the AGPA of students ($r=-0.066$, $P=0.12$).

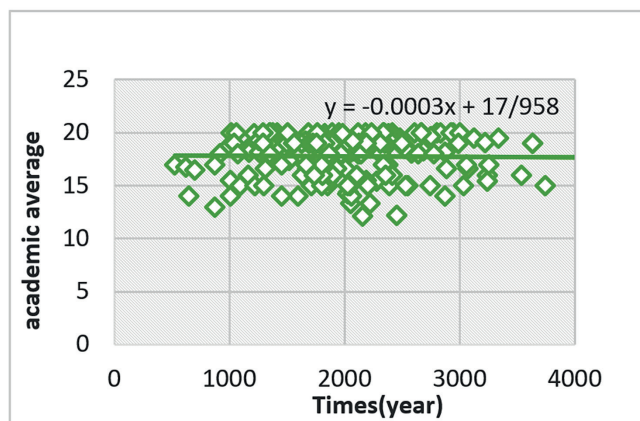


Figure 1: The figure shows the distribution chart of junk foods consumption versus AGPA; AGPA: Academic Grade Point Average.

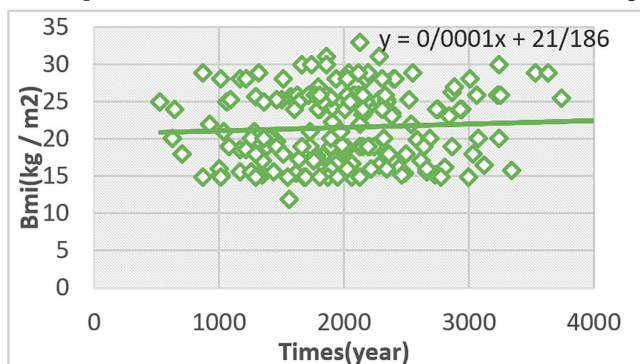


Figure 2: The figure shows the relationship between junk foods consumption and body mass index.

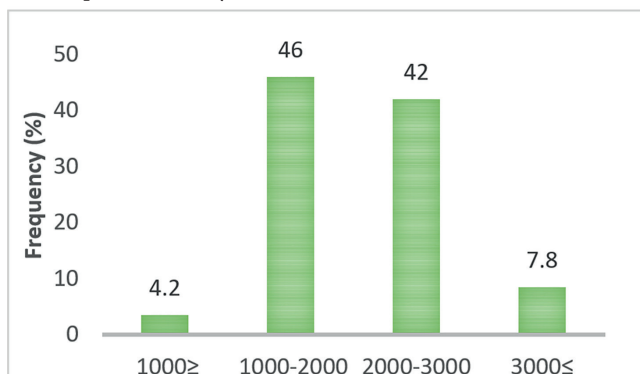


Figure 3: The figure shows the frequency chart of student' consumption of junk foods per year.

4. Discussion

According to the findings of this study, the consumption of unhealthy foods was high. Some other studies also reported similar results (12, 13, 21, 22). In line with the present study, Shahbazi and colleagues found that about 50% of students consumed soft drinks every day (12). In the Healthy Heart Study, it was found that the eating patterns were mostly unhealthy foods (21). According to a study conducted by Kelishadi and colleagues on adolescents, the consumption of biscuits, cakes, chocolates was found to be more than eight times

a week, while the consumption of salty and fatty snacks was found to be 4.9 times a week (13). Another study, conducted in American elementary schools, revealed that 71% of students consumed junk food (23). Kamangar and colleagues also reported a high rate of junk food consumption. They found that 52.1% of students were dependent and highly dependent on junk foods (15). Junk foods have become quite popular among children and adolescents due to various reasons, such as media advertising, changes in lifestyle and eating habits, and the attractive and inexpensive appearance of such foods. This can result in increased motivation to consume large quantities of junk and sweetened foods during this phase of life (24). In Iran, there is an increasing risk of non-communicable diseases among younger age groups. Moreover, Iranian children and adolescents are opting for processed and unhealthy food instead of traditional options (13).

Based on the results of this study, there was a significant decrease in physical fitness factors related to health as the consumption of junk food increases. This finding was supported by previous studies (14, 25). However, limited research has been conducted on the relationship between junk food and fitness. A study conducted by Kamangar and colleagues in 2023 revealed that male students aged 10-12 years in Kamyaran County, Kurdistan province, Iran, who consumed more junk food experienced a decrease in cardiorespiratory endurance, muscle strength of abdominal and shoulder muscles, as well as flexibility of back muscles (15). Study of Lamba and Garg found that individuals who regularly consumed junk food tended to be more overweight than those who did not. Additionally, the results showed that adolescent boys who were dependent on junk food had significantly lower jumping scores as compared with non-dependent boys (14). In addition, Nazarali showed that with increasing fat consumption, which is also high in junk foods, the score of some physical fitness tests (scores of long and sitting tests, flexibility and two Agility 4×9) decreased significantly (25). Thus, according to the balance of energy received and consumed and with the increase in the amount of energy received (with junk food), adolescent are fatter and their physical activity decreases. In contrast to the findings of the study on junk food and physical fitness, the study revealed no correlation between the amount

of energy intake and the level of physical activity, which is associated with physical fitness (26). It has been noted that some evidence reported conflicting results as compared with the present study (27, 28). The difference in the results could be due to the various foods evaluated, differences in physical fitness tests, level of physical activity, and the age of the participants.

The study has reported a high rate (43%) of overweight and obesity among the participants. Additionally, there was a significant and direct correlation between the consumption of junk food and body mass index. These findings were consistent with the results of several other studies (25, 29, 30). For instance, in study by Kamangar and colleagues, the rate of overweight and obesity has been reported to be high (31.1%) (15). In a meta-analysis study, it was found that the consumption of junk food is high among students and highlights the need to improve the school food environment, including limiting students' exposure to unhealthy foods (31). It was found in the previous studies that overweight and obese adolescents aged 18 to 32 tend to consume more junk food, which is consistent with the findings of the present study (25, 30). In contrast with our study, Zarei and colleagues stated that there is no correlation between diet patterns and overweight and obesity (27). Also, Ayusari and co-workers showed that despite the fact that obese participants consumed more fat, there was no significant correlation total fat consumption and body mass index, total fat mass, and visceral fat mass (32).

In another study on 199,135 adolescents and 72,900 children from China and Taiwan, it was suggested that children's BMI was higher for those who consumed Fast food more frequently; however, adolescents' BMI was lower for those who consumed Fast food more frequently (33). This difference may be due to the cross-sectional nature of these studies as well as physical activity and extracurricular activities, so that these activities prevent the increase in BMI by increasing the body's metabolism.

Based on the findings of the present study, participants exhibited high levels of knowledge, attitude, and nutritional behavior. As participants' nutritional knowledge and behavior increased, their consumption of junk food decreased.

Inadequate nutritional knowledge not only has a negative impact on body composition indicators but also increases the risk of developing non-communicable diseases and reduces overall physical fitness (34). Kigaru and co-worker found that participants with moderate to high nutritional knowledge, attitude, and behavior reported similarly in the research by Kenya (35). Bennur and Gulcihan also showed that there is a significant correlation between the consumption of soft drinks and unhealthy foods and the nutritional awareness of adolescent (29). Based on the present study and the information provided, it is evident that having good nutritional knowledge, attitude, and behavior can significantly impact one's eating habits. However, this study found no significant correlation between junk food consumption and nutritional attitudes, which could be due to the limited scope of the study and potential misunderstandings of the participants' nutritional attitude questions. As nutritional attitudes have a significant impact on the eating habits of adolescents, further research is needed to investigate the causes of poor nutritional attitudes among this population. Interestingly, in a study showed that nutritional knowledge is low among different groups of people, including physicians and athletes. For instance, in Jafari and Barzegari reported low nutritional knowledge in secondary schools in Isfahan (36). A previous study indicated that while adolescents have adequate nutritional knowledge, they still struggle to practice healthy eating habits (37). Adolescents face a number of health challenges but because they are considered to be at a relatively healthy life-stage, they have not been given adequate attention in global health and nutrition goals until recently. Numerous factors influence the dietary behaviours of adolescents, including brain development and understanding of matters that might affect health, the broader familial, socio-cultural, and economic environment in which an adolescent lives, eats, studies, works and plays (38). In this study, 52% of the participants had a very good AGPA score, while 31.5% had a good score. It was found that there was no significant correlation between junk food consumption and AGPA. This was in line with a study, Purtell and Gershoff showed that high levels of fast food consumption are predictive of slower growth in academic skills in a nationally representative sample of children (39). On the other hand, researchers from secondary schools in Germany, by examining the effect of breakfast

and food consumption, showed that children who eat breakfast, had better mental, physical and clinical knowledge (20). Also Burrows and colleagues showed that there was a positive and significant correlation between diet and academic achievement, including breakfast, regular consumption of meals and compliance with national recommendations for fruit consumption (40). Some studies have confirmed the correlation between food and academic performance (20, 40), but due to the cross-sectional nature of the present study and the lack of other food items, this correlation was not confirmed.

4.1. Limitations

This study had certain limitations including: lack of access to adolescent in other ages, cross-sectional nature of the study, and lack of access to parents' nutritional knowledge, not controlling the mental and motivational conditions of the participants in physical fitness tests.

5. Conclusions

The findings indicated a significant negative correlation between the consumption of junk foods and health-related physical fitness factors. However, there was a significant positive correlation between the consumption of junk foods and body mass index. Physical fitness factors and body mass index are strong predictors for adolescents' health. Moreover, physical fitness of adolescents is crucial for ensuring a healthy society in the future. Improving the diet and exercise habits of adolescents is key to promoting their health and preventing diseases. It is recommended that parents, policymakers, and schools prioritize nutrition and physical activity, and that national media support these efforts.

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Authors' Contribution

Yusuf Khazai: Contributions to research design

and data collection, drafting the manuscript. Mohammad Azizi: Contributions to research design and data collection and analysis, drafting the manuscript and reviewing the revision critically. Hadi Abdullahzad: Contributions to data analysis, drafting the manuscript. Aiuob Kamangar: Contributions to data analysis, drafting the manuscript. All authors have read and approved the final manuscript and agree to be accountable for all aspects of the work, such as the questions related to the accuracy or integrity of any part of the work.

Ethical Approval

The Ethics Review Board of Razi University of Kermanshah, Iran approved the present study with the code of IR.RAZI.REC.1400.027. Also, written informed consent was obtained from the participants.

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