Research in Health & Medical Sciences *Original Article*

2023 December; 2(4)

Prevalence of Obesity and Factors Influencing Physical Activity Among High School Female Students in Khash City, Sistan and Balochestan Province, Iran

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Received: 2025/04; Revised: 2025/05; Accepted: 2025/06

Abstract

Obesity, recognized as one of the most significant public health threats, has shown an alarming increase in recent years. This study aimed to assess the prevalence of obesity and the factors influencing physical activity among high school female students in Khash City, Sistan and Baluchestan Province, Iran.

This descriptive-analytical study was conducted on 200 high school female students in Khash City during the academic year 2020-2021. Data was collected using a three-part questionnaire, including a checklist for measuring height, weight, and Body Mass Index (BMI), demographic questions, and the standardized Physical Activity Questionnaire for Adolescents (PAQ-C). The collected data were analyzed using SPSS software version 21, descriptive statistics, and the Chi-square test at a significance level of 0.05.

Results revealed that 89 (44.5%) of students skipped breakfast in their daily diet, while 139 (69.5%) consumed fast food. Additionally, 170 (85%) had never received nutrition education, and 165 (82.5%) exhibited low physical activity levels. The Chi-square test identified significant associations between physical activity level and parental income ($p=0.049$), as well as hours of mobile phone use and television viewing ($p<0.001$). However, the Chi-square test showed no significant relationship between physical activity level and obesity, parental education level, BMI, or school type ($p>0.05$).

Socio-economic factors, along with individual behaviors such as digital device usage, significantly influence the physical activity levels of adolescents. Implementing policies aimed at providing affordable sports facilities and promoting a healthy lifestyle can be effective in reducing obesity. Moreover, the development and integration of educational programs in schools to enhance nutritional awareness and emphasize the importance of physical activity are essential.

Keywords: Obesity Prevalence, Students' Physical Activity, Socioeconomic Factors

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Introduction

Obesity is defined as an abnormal accumulation of fat tissue in all or specific parts of the human body, resulting from calorie intake exceeding the body's needs (1). As a chronic condition stemming from an unhealthy lifestyle, obesity has become a significant health challenge for healthcare systems worldwide, occurring not only among adults but also in adolescent populations (2). Recognized as one of the most critical public health problems globally, its growing prevalence has garnered attention from health authorities (3). According to the World Health Organization (WHO), approximately 1.5 billion individuals over the age of 20 are overweight worldwide (4). Obesity and overweight are significant health concerns not only in developed countries like the United States but also in other regions. For instance, in the Eastern Mediterranean, combined prevalence rates range from 25% to 81.9%, highlighting the issue as a significant public health problem (5).

Research in Iran similarly reveals a high prevalence of overweight and obesity among adolescents (6). For example, in Sanandaj, the rates are reported as 14.6% for overweight and 3.4% for obesity among adolescents (7), while in Rasht, the rates are 7.6% and 5.9%, respectively (8). Body Mass Index (BMI), calculated as weight divided by height squared, serves as a reliable indicator for diagnosing obesity. Individuals are categorized into four groups based on BMI: underweight (BMI<18.5), normal weight (BMI 18.5-24.9), overweight (BMI 25-29.9), and obese (BMI≥30) (9, 10).

Urbanization, industrialization, lifestyle changes, and altered dietary habits have driven the growing rates of obesity and overweight in both developed and developing countries (11). Obesity poses significant health risks, increasing the likelihood of non-communicable diseases such as hypertension, high cholesterol, cardiovascular diseases, liver issues, respiratory problems, and arthritis (12). Adolescence is a critical period for developing obesity and overweight, which are linked to mortality in adulthood. Studies indicate that adolescent obesity often continues into adulthood due to unhealthy lifestyle behaviors, such as poor diets and sedentary habits (13). Addressing these modifiable behaviors early can play a crucial role in reducing the long-term prevalence of obesity (14).

Physical activity is one of the simplest and most effective ways to maintain good health and achieve a healthy weight, as approximately one-third of daily energy expenditure is attributed to physical activities, with even higher levels among active individuals (15). WHO data shows that physical inactivity is among the top 10 causes of mortality globally, with approximately 2 million deaths annually attributed to inactivity (16). For example, a study among male high school students in Yazd revealed that only 11.6% engaged in at least 60 minutes of daily physical activity, while 55% reported more than 2 hours of sedentary behavior, such as television viewing or gaming, in a typical day (17). A study in Qom similarly reported very low physical activity levels among students (18).

Unhealthy lifestyle habits, especially physical inactivity, not only threaten the health of this vulnerable group but also increase the societal risk of non-communicable diseases such as cardiovascular disorders, diabetes, osteoporosis, hypertension, psychological issues, and even certain cancers (2, 19).

Given the importance of physical activity in enhancing physical and mental health and the adverse health outcomes associated with overweight and obesity—particularly among adolescents—this study aims to determine the prevalence of obesity and factors influencing physical activity among high school female students in Khash City, Sistan and Balochestan Province.

Methods

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This study was a descriptive-analytical and cross-sectional design. The statistical population included all high school female students in Khash City, Balochistan Region, who were enrolled during the academic year 2020–2021. The sample size was calculated using the following formula, with Type I error (α) set at 0.05 and Type II error (β) at 0.2, based on the study conducted by Sedighi et al. (2015), which examined the relationship between obesity and physical activity levels among students (12). The correlation coefficient (r) was considered -0.44. The final calculated sample size was approximately 200 individuals.

$$n = \left(\frac{z_{1-\frac{\alpha}{2}} + z_{1-\beta}}{\omega}\right)^2 + 3 \qquad \omega = \frac{1}{2} \times \log\left(\frac{1+r}{1-r}\right)$$

Sampling Method

A multi-stage sampling method was employed. In the first stage, high school girls' schools in Khash City were considered sampling clusters. The district's Department of Education then identified six schools (clusters) for sampling and issued the necessary permissions. In the second stage, classes within the selected schools were treated as sampling strata. The strata were randomly chosen, and all students in the selected classes who met the inclusion criteria were enrolled in the study.

Inclusion and Exclusion Criteria

Inclusion criteria for students were enrollment in one of the high schools in Khash City, absence of underlying medical conditions, and willingness to participate in the study. Students who declined to continue collaboration while completing the questionnaire were considered part of the exclusion criteria.

Measurement Tools

The study utilized a three-part questionnaire as the data collection tool, which included: a checklist for measuring height, weight, and Body Mass Index (BMI); demographic questions covering age, ethnicity, parents' education levels, household economic status, and breakfast consumption; and the standardized Physical Activity Questionnaire for Adolescents (PAQ-C).

Height was measured using a tape measure in meters, with students standing barefoot and upright against a wall. Weight was recorded in kilograms using a digital floor scale (Camry, model EB9332, made in China) with a maximum weight capacity of 200 kg and an accuracy of 100 grams. Students were weighed barefoot and in minimal clothing.

The standardized Physical Activity Questionnaire for Adolescents (PAQ-C), consisting of nine Likert-scale questions rated from 1 to 5, was employed. Higher scores indicated greater physical activity. The validity of the instrument was confirmed through confirmatory factor analysis (CFA) ($\chi^2(27)=106.63$, TLI=0.901, CFI=0.906, RMSEA=0.071, 90% CI: 0.063–0.082), and its reliability was established with a Cronbach's alpha coefficient of 0.80 (2, 20).

Implementation Method

After obtaining the required permissions and introduction letters, the researcher visited the selected schools, presented the introduction letters to school officials, and explained the study and its objectives. A list of classes and the number of students in each class was prepared to determine sampling strata. Since the study was conducted during the COVID-19 pandemic, student attendance at schools was not mandatory. As a result, class selection (strata) was based on the number of students present. In some schools, all classes and their attending students were evaluated, while in others, classes with higher attendance were selected, and the present students were included in the study.

Once the classes were chosen, the researcher coordinated with the school administration to schedule a suitable time for data collection that

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would not disrupt the educational process. The researcher visited the classes, introduced themselves, explained the study objectives, methodology, and confidentiality of information to the students, and invited those interested to sign the informed consent form to participate. The height and weight of students meeting the inclusion criteria were measured according to standard procedures and recorded in the checklist section of the questionnaire. Students were then asked to answer the remaining questions in the questionnaire, including demographic information and the physical activity questionnaire, attentively and patiently. The completed questionnaires were collected after 15 minutes. Due to the COVID-19 pandemic, all health protocols were strictly observed by both the researcher and students.

Statistical

After data collection, SPSS software version 21 (IBM Corporation, Armonk, NY) was used for data analysis. The normality of the distribution for quantitative variables was assessed using the Kolmogorov-Smirnov test. Data analysis included Chi-square tests. Descriptive statistics, such as percentages, means, and standard deviations, were utilized to present the findings. A p-value of <0.05 was considered the threshold for statistical significance.

Ethics Code

The present research project was reviewed and approved by Zahedan University of Medical Sciences with the ethical approval identifier IR.ZAUMS.REC.1399.300

Results

The findings of this study indicated that the average age of students was 16.31 ± 0.82 years. Among the participants, 73 students (36.5%) were classified as underweight. A total of 21 students (10.5%) reported a perceived sense of poor health, while 79 students (39.5%) stated their health status as moderate. On average, the daily duration of television viewing and mobile phone usage among students was 55.28 minutes and 166.94 minutes, respectively. (Other demographic and socioeconomic characteristics are detailed in Table 1).

Table 1. Participants' demographic and socioeconomic characteristics

Variables	Categories	Total (n=200)
		N(%) / M±SD
Age	Mean±SD - (Min-Max)	16.31±0.82 - (15-18)
Grade	High school (year 1)	86(%43)
	High school (year 2)	56(%28)
	High school (year 3)	58(%29)
Weight	Mean±SD- (Min-Max)	49.57±8.08 - (39-75)
Height	Mean±SD -(Min-Max)	158.27±7.62 - (100-179)
BMI	Mean±SD -(Min-Max)	19.86±0.25 -(12.31-43)
Obesity	Under weight	73(%36.5)
	Normal	120(%60)
	Overweight or Obesity	7(%3.5)
Ethnicity	Baluch	161(%80.5)
	Persian	39(%19.5)
Father's education	≤High school	160(%80)
	≥ High school	40(%20)
Mother's education	≤High school	164(%82)
	≥ High school	36(%18)

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Parents' income level	High(>10 million tomans)	18(%9)
	Average(5-10 million tomans)	40(%20)
	Low(<5 million tomans)	142(%71)
Perceived health status	Healthy	100(%50)
	Average	79(%39.5)
	Not healthy	21(%10.5)
Household Size	Mean±SD -(Min-Max)	5.09±2.26 -(3-10)
Minutes of Television Watching Per Day	Mean±SD -(Min-Max)	55.28±92.20 -(0-480)
Minutes of Mobile Phone Usage Per Day	Mean±SD -(Min-Max)	166.94±153.81 -(0-720)

The study findings indicated that 89 students (44.5%) reported skipping breakfast in their daily dietary routine, while 139 students (69.5%) included fast food in their daily meals. A total of 99 students (49.5%) stated they did not experience satisfactory sleep. Furthermore, 170 students (85%) had never received any nutrition education. The majority of the participants,165 (82.5%), exhibited low levels of physical activity. (Detailed data is provided in Table 2). In Table 3, the physical activity levels of the female students under study are presented, categorized by obesity status, academic grade, and parental income levels.

Table 2. Participants' health behaviors and health education status

Variables	**Categories**	**Total (n=200)**
		N(%)
Breakfast	No	89(%44.5)
	Yes	111(%55.5)
Fast-food	No	61(30.5)
	Yes	139(69.5)
Sleep satisfaction	Enough(8-10 hours)	40(%20)
	Average(6-8 hours)	61(%30.5)
	Not enough(<6 hours)	99(%49.5)
Nutrition education	No	170(%85)
	Yes	30(%15)
Level of physical activity	Low(<30 minutes)	165(%82.5)
	Average(30-60 minutes)	34(%17)
	High(>60 minutes)	1(%0.5)

Table 3. Obesity, Grade, Parents' income level, and physical activity among female students in Khash

		LPA			**Total**	**p**
		Low	**Moderate**	**High**		
Obesity	Under weight	63(86.30%)	10(13.70%)	0(0%)	73	0.235
	Normal	96(80%)	23(19.17)	1(0.83%)	120	
	Overweight or Obesity	6(85.71%)	1(14.29%)	0(0%)	7	
Grade	High school (year 1)	64(74.42%)	22(25.58%)	0(0%)	86	0.185
	High school (year 2)	43(76.79%)	12(21.43%)	1(1.78%)	56	
	High school (year 3)	58(100%)	0(0%)	0(0%)	58	

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Parents' income level	Low (<5 million tomans)	138(97.18%)	4(2.82%)	0(0%)	142	0.049
	Average (5-10 million tomans)	21(52.5%)	19(47.5%)	0(0%)	40	
	High (>10 million tomans)	6(33.33%)	11(61.11%)	1(5.56%)	18	

LPA: level of physical activity

Using the Chi-square test, the relationship between physical activity levels and obesity, academic grade, household size, BMI, and school type was examined among the participants. The results indicated no statistically significant relationship between physical activity and these variables ($p \leq 0.05$). However, the Chi-square test revealed a statistically significant association between physical activity levels and parental income ($p = 0.049$). Additionally, it demonstrated significant relationships between physical activity levels and minutes of television watching as well as mobile phone usage ($p < 0.001$) (Table 3).

Discussion

School years are a critical phase of life for ensuring long-term health. Engaging in proper physical activity during growth years contributes significantly to stabilizing health, offering immense potential for enhancing well-being in this age group (21). Changes in physical activity patterns, however, can pave the way for the onset of specific diseases (22).

The findings of this study provide a clear perspective on the health status and lifestyle behaviors of high school female students in Khash City. A notable proportion of underweight students (36.5%) reflects a low BMI compared to global standards (23), potentially influenced by socio-economic factors and limited access to adequate nutritional resources. The study by Motlagh and colleagues similarly indicated that the Sistan and Baluchestan ethnic group exhibited the lowest prevalence of overweight compared to other ethnic groups (24). The high average duration of mobile phone usage and television watching (166.94 and 55.28 minutes per day, respectively) highlights the role of sedentary behaviors in students' lifestyles. Similarly, the study by Poujol et al. noted a recent surge in mobile phone usage among adolescents, which poses potential health risks (25).

Additionally, 85% of the students in this study had not received any nutrition education, which could significantly influence unhealthy dietary choices, such as fast food consumption (69.5%). Pushpa et al. reported that most nutrition education interventions lead to a reduction in consumption of unhealthy foods, improved healthy eating habits, increased physical activity, and higher intake of fruits and vegetables (26). Based on these findings, it is recommended that nutrition education programs be designed and implemented in schools, with a focus on promoting healthy and sustainable food alternatives. Such initiatives could help reduce fast food consumption and improve nutritional health among adolescents.

The results of this study revealed that the majority of participating students exhibited low levels of physical activity, which may indicate a sedentary lifestyle among adolescents. According to the data analysis, there was no significant relationship between physical activity levels and factors such as obesity, educational level, household size, BMI, or type of school. This lack of association may reflect the complexity and interplay of social, cultural, and economic factors influencing physical activity, necessitating further research. Granger et al. also emphasized the role of gender, income, and culture in physical activity (27).

On the other hand, the study found a significant association between physical activity levels and parental income. This finding underscores the role of socioeconomic factors in

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shaping opportunities for participation in sports and recreational activities. Students from lower-income families may face economic constraints that limit access to sports facilities or reduce participation in physical activities. Similarly, Granger et al. highlighted the importance of examining the impact of income on physical activity (27). The study by Mousavi et al. also reported very low physical activity levels among students, with 68% categorized as inactive (28). Furthermore, the results of this study align with findings from research conducted on youth in countries such as Iran, the UK, China, and Lithuania, which demonstrated that the majority of adolescents and young people did not engage in sufficient physical activity to maintain their health (29–32).

The findings also revealed that the average daily duration of mobile phone usage and television watching among students was considerably high, with a significant relationship observed between these behaviors and physical activity levels ($p<0.001$). This highlightes the negative impact of excessive use of digital technologies on adolescents' physical activity. These results align with similar national and international studies. For instance, the studies by Shakeri et al. in Tehran and Fallahzadeh et al. (33) highlighted low physical activity and extensive technology use as major contributors to reduced general health among adolescents. Globally, research by Fomby et al. (34) also demonstrated the adverse effects of widespread digital device usage on adolescents' physical activity and health patterns.

Strengths and Limitations of the Study

This study presented a comprehensive analysis of the demographic, socioeconomic, and health-related behaviors of students, showcasing notable strengths, such as the precise statistical analyses of variable correlations and its focus on critical public health topics, including low physical activity and the impact of technology use. However, the study also faced limitations, such as its cross-sectional design, which does not allow for the assessment of long-term changes; the absence of evaluation of psychological and cultural factors influencing physical activity; and its limited generalizability due to a focus on a specific geographic region. Moreover, the lack of a thorough examination of gender differences could have provided additional valuable insights. These strengths and weaknesses highlight the need for future studies with broader and longitudinal designs to enhance generalizability and address the current gaps in the research.

Conclusion and Recommendations

The results of our study indicate that socioeconomic factors, along with individual behaviors such as the use of digital devices, have a significant impact on adolescents' physical activity levels. Addressing these challenges necessitates targeted policymaking and widespread education. Policies may include providing affordable sports facilities for low-income families, reducing the time spent on mobile phones and television through awareness campaigns, and promoting active and healthy lifestyles.

Moreover, the findings underscore the importance of designing and implementing educational programs in schools to enhance nutritional awareness and emphasize the role of physical activity. Such interventions can play a crucial role in encouraging healthy habits and improving adolescents' overall well-being.

Acknowledgments

The authors sincerely thank the students and school administrators for their collaboration in data collection for this study. Special gratitude is also extended to Zahedan University of Medical Sciences for providing financial and moral support, enabling the execution of this research.

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Funding

This study was financially supported by Zahedan University of Medical Sciences, and the authors express their deepest appreciation for this support.

Conflicts of Interest

The authors declare no conflicts of interest related to this study.

Authors' Contributions

The study design was conducted by Shahroudi and Izadi. Data collection was carried out by Arefeh Mir-Balouch-Zahi and Motahareh Safdari. Statistical analysis and manuscript writing were collaboratively completed by Shahroudi, Izadi, Mir-Balouch-Zahi, and Safdari. All authors have reviewed and approved the final manuscript.

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