

RESEARCH

Open Access



A comparative study of healthy lifestyle behaviors and related factors among Iranian male and female adolescents: a cross-sectional study

Shayesteh Shirzadi^{1,2,6*}, Zahra Arab Borzu³, Shayesteh Jahanfar⁴, Somayeh Alvani^{5*}, Maliheh Balouchi^{5*}, Hadiseh Jalali Gerow⁵, Soudabeh Zarvekanloo⁵ and Fatemeh Seraj⁵

Abstract

Background Adolescent health requires focused attention due to their vulnerability to risky behaviors and emerging health challenges such as mental health disorders, non-communicable diseases and unhealthy lifestyle patterns. This study, therefore, explored and compared healthy lifestyle behaviors and associated factors among Iranian male and female adolescents.

Methods This cross-sectional study was conducted in first and second high schools in the Iran 2023. Sampling was done first in clusters and then simple random sampling ($N=500$). Data were collected using a demographic characteristic and the Health Promoting Lifestyle Profile II (HPLP-II) questionnaires. The inclusion criteria were obtaining written consent form to participate and the absence of any physical or mental disabilities. The exclusion criteria included withdrawal of consent during the study and incomplete completion of the questionnaires. Statistical analyses, including ANOVA, independent t-tests, and linear multiple regression, were performed using SPSS version 22, with a significance level set at $p < 0.05$.

Results There was a significant difference between the mean score of physical activity and gender ($p < 0.05$). In the male adolescents, an inverse correlation was observed between age and the total score of health-promoting behaviors across all dimensions. Furthermore, a direct correlation was identified between stress management with both adolescents' grade and father's education level. Additionally, there was a positive relationship between nutrition dimension with the presence of parents within the household, as well as the status of having a mother who is a housewife (p -value < 0.05). Among females, there was a negative significant relationship between health-promoting behaviors total score and its three dimensions of physical activity, spiritual growth, and health responsibility with

*Correspondence:
Shayesteh Shirzadi
shayestehshirzadi@gmail.com
Somayeh Alvani
alvanisomayeh7@gmail.com
Maliheh Balouchi
balouchi.m79@gmail.com

Full list of author information is available at the end of the article



© The Author(s) 2025. **Open Access** This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/>.

of age and grade of adolescents. Also, there was a positive correlation between nutrition dimension and presence of parents in the family (p -value < 0.05).

Conclusions Female adolescents reported lower physical activity levels than males. These findings underscore the importance of paying attention to promoting physical activity in adolescent females. A notable finding was the decline in health-promoting behaviours with age among both genders. This suggests that interventions begin early in adolescence and address the unique challenges that older adolescents face, such as academic pressures and increased autonomy.

Keywords Health Behavior, Healthy lifestyle, Adolescent, Male, Female, Iran

Background

In the modern era, adopting a healthy lifestyle is a fundamental prerequisite for well-being within human communities, facilitated by health-promoting behaviors (HPBs) [1]. According to Pender's theory, HPBs include practices aimed at enhancing or maintaining health and self-actualization for individuals or groups. These behaviors encompass six dimensions: spiritual growth (SG), health responsibility (HR), physical activity (PA), nutrition (NUT), interpersonal relationships (IR), and stress management (SM) [2]. Adhering to a healthy lifestyle can significantly reduce mortality risk [3] and increase life expectancy [4].

Adolescents, aged 10 to 19, represent over 16% of the global population, making this developmental stage crucial for establishing the foundation for adult health [5]. Adolescent health requires particular attention due to their vulnerability to risky behaviors, societal pressures, and emerging health challenges, including mental health disorders and non-communicable diseases [6, 7].

Many adult health issues have roots in adolescence, where high-risk behaviors can significantly impact long-term health outcomes [8]. A cohort study revealed that adolescents engaged in dieting or disordered eating were at higher risk of continuing these behaviors into adulthood [9]. Similarly, research in the United States indicates that 90% of smokers begin smoking before age 18, and alcohol consumption typically starts between 18 and 21 [10].

The prevalence of unhealthy lifestyles among adolescents raises serious concerns [11, 12], adversely affecting their health-related quality of life [13]. These behaviors include poor dietary habits, sedentary lifestyles, excessive screen time, smoking, and risky sexual activities, which can lead to obesity, cardiovascular diseases, musculoskeletal problems, emotional disturbances, and psychological disorders [14]. Adolescents' sense of invincibility often contributes to their engagement in high-risk behaviors [15, 16].

A survey involving 148,839 adolescents across 37 countries found that only a minority, primarily males, achieved high scores on healthy lifestyle assessments [17].

Unhealthy dietary habits, substance abuse, and social isolation are also prevalent among this group [18–20].

Health promotion interventions are crucial for improving adolescent well-being and addressing various health challenges [21]. A healthy lifestyle correlates positively with academic performance [22], enhanced quality of life [23], subjective well-being, and overall happiness [24].

Significant differences exist between male and female adolescent lifestyles. Female adolescents are more likely to be overweight or obese, consume fast foods, and have higher BMIs than males [25]. In contrast, females tend to be more self-critical, responsible about health, and proactive in seeking nutritional and health-related information. Meanwhile, male adolescents are less likely to follow health guidelines and may neglect personal hygiene, highlighting the need for targeted health education [26].

Cultural factors significantly influence adolescent lifestyles. These influences can lead to both positive and negative behavioral outcomes. Family traditions and peer interactions play pivotal roles, while the conditions of schools and neighborhoods also impact health decisions [27, 28]. Different cultural contexts create diverse adolescent experiences [29], with both beneficial and adverse effects [28]. For example, a study among Iranian adolescents identified factors such as difficulty saying “no” to peer pressure, inadequate family support, hierarchical family structures, and cultural or religious influences as significant determinants of lifestyle choices [30].

Despite advancements in global health policies, adolescent health remains a significant concern, particularly in low-income countries compared to developed nations [31]. Comparative studies indicate that adolescent health in Iran needs greater prioritization and improvement [32]. Iranian adolescents specifically require education on reproductive health, personal health promotion and life skills [33].

Adolescent behaviors are influenced by multiple factors, including parental guidance, school environments, cultural contexts, public health policies, sociodemographic aspects and spirituality [14, 34]. Therefore, comprehensive support and targeted interventions are essential for this age group [35]. Understanding gender-specific lifestyle differences is crucial for designing

effective health programs, raising awareness, and promoting health behaviors tailored to the needs of both male and female adolescents [25, 26, 36]. This study, therefore, investigated and compared healthy lifestyle behaviors and associated factors among Iranian male and female adolescents.

Methods

Study design and participants

This cross-sectional study, conducted in 2023, examined and compared health-promoting behaviors and associated factors among male and female students in Firuzeh, a city in eastern Iran.

The inclusion criteria for the study were obtaining written consent form to participate and the absence of any physical or mental disabilities, as determined by a review of the physician's and healthcare provider's examination results in the students' health records. The exclusion criteria included withdrawal of consent during the study and incomplete completion of the questionnaires. Sampling was done first in clusters and then simple random sampling. Firuzeh City, as defined by its Education Department, consists of two regions, each serving as a cluster. From each region, two first and second high schools (for males named Imam Hussain and Valiasr and for females named Om-Al-Aeme and Zeynab Kobra) were randomly selected. Within each selected school, students were randomly sampled in proportion to the school's population size, ensuring that larger schools contributed a proportionally larger share of participants. At each stage, both schools and students were chosen through simple random sampling from the student lists. The following formula is used to determine the sample size of, Including $\alpha = 0.05$, prevalence rate ($p = 0.5$), and accuracy level ($d = 0.054$) [37] the sample size was estimated to be 320. Considering the design effect 1.5 and dropout rate of 5%, the final sample size was estimated to be 500 adolescents.

$$n = \frac{z^2 (1 - \alpha/2) \times pq}{d^2}$$

Data collection took place from April 21 to May 10, 2023, in schools. In coordination with school officials, questionnaires were distributed to students after the conclusion of their classes. During questionnaire completion, two public health students were present to assist with any questions. All students voluntarily signed an informed consent form prior to participating in the study and completing the questionnaires. For minors (students under 16), consent was obtained from their parents or legal guardians. Written permission from school authorities was also obtained before conducting the study.

Instruments

The self-administered survey contained two sections:

Demographic and underlying profile This part of the questionnaire included information related to age, gender, body mass index (students' height and weight were extracted from their health records and calculated the $BMI = \text{weight (kg)}/\text{height}^2$ [in meters]), educational level (first and second high schools), mother's and father's educational level (illiterate, elementary, middle school, diploma, university), father's occupation (employee, worker, self-employed, retired), mother's occupation (housewife, employee, labourer, self-employed, retired), household size (number of people living together in the family), birth rank, presence of parents in the family (only father, only mother, both), underlying disease (cardiovascular, diabetes, kidney, thyroid, liver, etc.) and smoking (cigarettes and hookah).

Health-promoting lifestyle profile-II The Health-Promoting Lifestyle Profile II (HPLP-II) was developed by Walker in 1987 to measure health-promoting behaviors (HPBs) [2]. In this study, the Persian version of the HPLP-II, validated by Mohammadi Zeidi et al. [38], was used. Internal consistency was evaluated using Cronbach's alpha, which yielded a value of 0.78. The scale consists of 52 items, scored on a 4-point Likert scale (never = 1, sometimes = 2, often = 3, and always = 4), with the total score ranging from 52 to 208. The HPLP-II measures health-promoting behaviors across six dimensions: Health Responsibility (e.g., "Read or watch TV programs about improving health," "Attend educational programs on personal health care"). Nutrition (e.g., "Choose a diet low in fat, saturated fat, and cholesterol," "Limit use of sugars and foods containing sugar (sweets)"). Spiritual Growth (e.g., "Believe that my life has purpose," "Feel content and at peace with myself"). Interpersonal Relationships (e.g., "Discuss my problems and concerns with people close to me," "Praise other people easily for their achievements"). Physical Activity (e.g., "Follow a planned exercise program," "Do stretching exercises at least 3 times per week"). Stress Management (e.g., "Take some time for relaxation each day," "Accept those things in my life which I cannot change"). The physical activity and stress management dimensions consist of 8 items, with a score range of 0–32, while the other dimensions have 9 items, with a score range of 0–36. Higher scores in each dimension indicate more favorable health-promoting behaviors.

Data analysis

The data were analyzed using SPSS 22 (SPSS Inc, Chicago, IL, USA) and reported by mean (\pm SD) for quantitative variables and frequency (percent) for qualitative variables. The ANOVA and independent sample t-tests were used to analyze the relationship between HPBs and demographic characteristics. Then, linear multiple regression analyses were used to adjust confounding

variables on HPBs. A significance level of less than 0.05 was considered.

Results

The mean age of adolescent males and females was 14.56 ± 1.3 and 15.25 ± 1.6 , respectively. The number of people in first high school was 334 (67.9%) and 158 (32.1%) in second high school. Most participants had the first rank at birth, (47.8%), had no underlying disease (95.7%), and did not smoke (94.5%). The demographic and underlying characteristics of the adolescents are shown in Table 1.

Based on the results, there was no statistically significant difference between the total score mean of health-promoting behaviors of adolescent females and males (p -value > 0.05). Still, there was a statistically significant difference between the mean physical activity score of teenage females and males, so the mean physical activity score in females was lower than that of adolescent males (p -value < 0.05) (Table 2).

In addition, females had the highest mean score in spiritual growth, and interpersonal relationships ranked next. The lowest mean score was related to physical activity, and health responsibility was in the next rank. Also, males had the highest mean score in the dimension of spiritual growth, and nutrition was in the next rank. The lowest mean score was related to health responsibility, and stress management was next. Except for physical activity (p -value < 0.05), these differences were not statistically significant in any of the health-promoting behaviour dimensions (p -value > 0.05) (Table 2).

According to the results of a study of the relationship between demographic and underlying variables with HPBs and its domains among adolescent males, there was a statistically significant negative relationship between the age of adolescent males and the total score of HPBs and all its subscales (p -value < 0.05). There was a significant relationship between nutrition dimension with the presence of parents in the family and the mother's job (p -value < 0.05). Also, there was a significant relationship between stress management with the father's education level and grade (p -value < 0.05) (Table 3).

According to the results, among adolescent females, there was a negative significant relationship between HPBs total score and its three dimensions of physical activity, spiritual growth, and health responsibility with two variables of age and grade (p -value < 0.05). There was also a significant relationship between the presence of parents in the family and the nutrition dimension (p -value < 0.05). Furthermore, a statistically significant relationship was found between the birth order and physical activity (p -value < 0.05) (Table 4).

The results of linear regression analyses indicated that after adjusting for confounding variables, age, father's

job and smoking in adolescent females, and also BMI in adolescent males were independent predictors of HPBs (P < 0.05) (Table 5).

Discussion

The present study investigated and compared health-promoting behaviors (HPBs) among adolescent females and males, revealing several key findings. Based on the results, males' mean physical activity score was significantly higher than that of females. Data collected globally from 298 surveys conducted in schools across 146 countries indicated the prevalence of insufficient physical activity among adolescents, with 77.6% of males and 84.7% [39]. Previous studies suggest that 61.9% of Iranian women are less active compared to men, with significant influences from income, education, and social support [40]. Male adolescents are often encouraged to participate in physical activities, while girls may face societal pressures, social expectations, and safety concerns that discourage such engagement [41]. Boys are often encouraged to engage in sports and physical activities from a young age, while girls may be steered towards less active pursuits [42]. Boys typically have higher energy levels and muscle mass, which can contribute to greater physical activity engagement [43].

Low physical activity among Iranian women can be attributed to various interrelated factors, including socioeconomic conditions and personal preferences. Additionally, cultural perceptions and gender roles contribute to low engagement in physical activities, as many women face barriers such as inadequate facilities and societal expectations.

Supportive educational institutions and instructors, adaptable urban settings, and positive attitudes toward physical activity all play crucial roles in promoting physical activity among adolescents. Motivation levels, perceptions of personal competence, and body image also significantly influence adolescents' engagement in physical activities. The enjoyment factor of these activities, coupled with the influence of peers and family members, further supports healthy lifestyle choices. Additionally, the availability of environmental opportunities, such as accessible parks, gyms, and safe spaces for exercise, is essential in fostering physical activity. Together, these factors contribute to the overall health and well-being of adolescents by encouraging regular physical activity, which is critical for their physical, mental, and emotional development.

Increasing awareness of gender equality in physical activities may fill this gap as more initiatives target female participation and empowerment in physical activities. Individuals, organizations, and policymakers can also work together to promote better health habits.

Table 1 Demographic and underlying characteristics of the male and female adolescents (N=500)

Variables	Adolescent Females Frequency(%)	Adolescent Males Frequency(%)	Total Frequency(%)
Age			
Mean ± SD	14.56 ± 1.315	15.25 ± 1.66	14.82 ± 1.43
≤14	76(24.8)	33(17.8)	109
14–16	138(45.1)	68(36.5)	206
≥16	92(30.1)	85(45.7)	177
Grade			
First High School	109(58.6)	225(73.5)	334(67.9)
Second High School	77(41.4)	81(26.5)	158(32.1)
Number of Children in the Family			
1	17(7.2)	9(4.8)	26(7.1)
2	92(30.2)	62(33.3)	154(31.3)
> 2	197(64.4)	115(61.8)	312(63.4)
Birth order			
1	140(45.8)	95(51.1)	235(47.8)
2	91(29.7)	51(27.4)	142(28.9)
> 2	75(24.5)	40(21.5)	115(23.4)
Father's education level			
Illiterate	11(3.6)	7(3.8)	11(3.6)
Elementary	99(32.4)	52(28)	99(32.4)
Middle School	95(31)	56(30.1)	95(31)
Diploma	89(29.1)	61(32.8)	89(29.1)
University	12(3.9)	10(5.4)	12(3.9)
Mother's education level			
Illiterate	12(3.9)	12(6.5)	24(4.9)
Elementary	142(46.4)	56(30.1)	198(40.2)
Middle School	76(42.8)	51(27.4)	127(25.8)
Diploma	68(22.2)	59(31.7)	127(25.8)
University	8(2.6)	8(4.3)	16(3.3)
Father's job			
Employee	28(9.2)	28(15.2)	56(11.4)
Laborer	72(23.5)	48(26.1)	120(24.5)
Self-employed	200(65.4)	103(56)	303(61.8)
Retired	6(2)	5(2.7)	11(2.2)
Mother's job			
Housewife	277(90.5)	156(83.9)	433(88)
Employee	11(3.6)	13(7)	24(4.9)
Laborer	7(2.3)	6(3.2)	13(2.6)
Self-employed	11(3.6)	11(5.9)	22(4.5)
Presence of parents in the family			
Both parents	284(92.8)	170(91.4)	454(92.3)
Only Mother	18(5.9)	13(7)	31(6.3)
Only father	2(0.7)	3(1.6)	5(1)
None	2(0.7)	0	2(0.4)
Having an underlying disease			
Yes	13(4.2)	8(4.3)	21(4.3)
No	293(95.7)	178(95.7)	471(95.7)
Smoking			
Yes	8(2.6)	19(10.2)	27(5.5)
No	298(97.4)	167(89.8)	465(94.5)

Table 2 Mean total score of HPBs and its dimensions in adolescent males and females (N=500)

Variabls	Adolescent Females	Adolescent Males	P value	Effect Size
Nutrition	23.8±5.82	24.6±4.5	0.097	0.15
Physical activity	19.09±5.52	22.5±5.7	0.001	0.6
Interpersonal relationships	24.6±4.8	24±4.6	0.13	0.12
Spiritual growth	27.7±5.72	27.9±5.44	0.637	0.036
Health responsibility	20±5.34	20.8±5.76	0.092	0.15
Stress management	22.3±4.92	21.6±2.54	0.096	0.18
Total HPBs	137.55±25.49	141.63±24.9	0.085	0.16

Table 3 The relationship between demographic and underlying variabls with HPBs and its domains among adolescent males (N=500)

Variabls	Nutrition mean ± SD	Physical activity mean ± SD	Interpersonal relationships mean ± SD	Spiri-tual growth mean ± SD	Health responsibility mean ± SD	Stress man-agement mean ± SD	Total HPBs
Age							
<=14	24.7±4.02	23.4±5.5	24.2±4.5	28.2±5.33	22±5.92	22.18±4.25	145.1±23.8
14–16	25.2±4.64	22±5.85	24.2±4.9	28.8±5.25	20±5.16	21.4±4.36	141.8±25.2
>=16	23.7±5	21.8±5.7	23.07±4.21	26.4±5.61	20.23±6.07	21.09±4.8	136.3±25.8
p-value	0.003	0.001	0.01	0.001	0.001	0.01	0.001
Effect size	0.33	0.3	0.25	0.43	0.37	0.24	0.36
Grade							
First High School	24.8±4.2	22.7±5.8	24.06±4.45	28.3±5.36	21.01±5.8	21.5±4.47	142.9±2.45
Second High School	24.2±4.96	22.2±5.59	23.9±4.5	27.4±5.5	20.7±5.63	21.8±4.65	144.2±2.57
p-value	0.55	0.09	0.175	0.06	0.06	0.031	0.109
Effect size	0.13	0.08	0.04	0.16	0.12	0.07	0.51
Father's education level							
Illiterate	22.2±5.08	19.7±3.94	22.14±4.01	27±5.59	21±8.02	21.14±4.29	133.29±25.26
Elementary	24.7±4.11	22.05±5.04	23.96±4.4	28.5±4.51	21.4±5.23	21.9±3.94	142.5±23.03
Middle School	24.1±4.5	21.3±6.33	23.6±4.64	27±5.5	19.7±5.23	20.8±4.5	136.7±24.7
Diploma	25.3±4.8	24.2±5.63	24.2±4.86	28.4±6.14	21.19±5.8	22.04±5	145.6±26.9
University	23.8±3.93	23.2±4.56	25.9±3.98	27.9±5.1	22.4±5.94	22.6±4.5	145.8±21
p-value	0.55	0.09	0.175	0.66	0.06	0.031	0.109
Effect size	0.65	0.81	0.91	0.25	0.41	0.35	0.52
Mother's job							
Housewife	24.9±4.45	22.6±5.5	23.9±4.53	28.1±5.32	21.09±5.5	21.7±4.42	142.5±24.3
Employee	24±4.58	24.4±5.6	25.7±4.6	26.6±5.6	21.84±6.34	22.07±4.5	144.7±24.9
Laborer	21.8±4.62	20±8.96	21.8±6.4	27±7.87	15.5±6.5	20.8±7.02	127±35.2
Self-employed	21.8±4.44	19.5±5.04	23.7±4.3	26.7±5.8	19.4±6.7	20.63±5.14	132.2±27.4
p-value	0.049	0.123	0.346	0.619	0.103	0.828	0.259
Effect size	0.68	0.81	0.78	0.26	0.97	0.22	0.68
Presence of parents in the family							
Both parents	24.9±4.52	22.6±5.6	24.1±4.6	28±5.39	20.9±5.58	21.6±4.5	142.4±25
Only Mother	21.3±3.47	21.6±6.61	22.3±4.7	27.07±6.48	20.7±4.45	21.38±4.82	133.9±25.5
Only father	22.6±3.5	19±4	23.1±1.15	23.6±0.57	20.6±3.31	21.6±0.57	131±11.03
p-value	0.015	0.475	0.41	0.306	0.89	0.97	0.38
Effect size	0.92	0.72	0.4	0.54	0.07	0.11	0.64

BMI was an independent predictor of HPBs among male adolescents, and various studies indicate that engaging in healthy lifestyle practices can lead to lower BMI and improved health outcomes. Key health behaviours include adequate sleep, nutrition, physical activity, limiting sedentary time and avoidance of smoking, which are linked to better BMI outcomes [44, 45].

Based on the results, there was a significant negative relationship between the age of adolescent males and the total score of HPBs and all its subscales. Also, there was a negative significant relationship between age with HPBs total score and its three dimensions of physical activity, spiritual growth, and health. In addition, age was an independent predictor of total HPBs among female

Table 4 The relationship between demographic and underlying variables with HPBs and its domains among adolescent females (N = 500)

Variables	Nutrition mean \pm SD	Physical activity mean \pm SD	Interpersonal relationships mean \pm SD	Spiritual growth mean \pm SD	Health responsibility mean \pm SD	Stress management mean \pm SD	Total HPBs
Age							
<=14	24.24 \pm 6.38	20.28 \pm 5.41	25.04 \pm 4.8	28.4 \pm 5.72	20.3 \pm 5.3	22.7 \pm 4.8	140.7 \pm 24.7
14–16	23.5 \pm 5.17	18.22 \pm 5.31	24.3 \pm 4.95	27.1 \pm 5.8	20.32 \pm 5.2	22.03 \pm 5.05	135.8 \pm 26.4
>=16	21.8 \pm 4.19	14.8 \pm 4.57	23.47 \pm 4.19	25.6 \pm 4.3	16.01 \pm 4.5	20.32 \pm 4.59	122 \pm 19.7
p-value	0.163	0.001	0.236	0.031	0.002	0.096	0.004
Effect size	0.44	0.99	0.34	0.56	0.89	0.511	0.82
Grade							
First High School	24.2 \pm 6.05	19.9 \pm 5.4	24.7 \pm 4.9	28.25 \pm 5.6	20.45 \pm 5.37	22.7 \pm 4.79	141.3 \pm 24.9
Second High School	22.5 \pm 4.95	16.8 \pm 5.17	24.2 \pm 4.5	26.2 \pm 5.56	18.8 \pm 5.09	21.5 \pm 5.2	132.2 \pm 25.6
p-value	0.128	0.001	0.33	0.005	0.001	0.191	0.005
Effect size	0.58	0.66	0.53	0.6	0.58	0.56	0.6
Birth order							
1	24 \pm 5.7	19 \pm 5.62	24.86 \pm 4.86	27.98 \pm 5.79	20.5 \pm 5.31	22.7 \pm 4.76	139.9 \pm 25.7
2	24.1 \pm 6.68	18.8 \pm 5.52	24.26 \pm 4.96	27.1 \pm 5.88	19.52 \pm 5.11	22.17 \pm 5	135.5 \pm 25.9
> 2	23.01 \pm 4.83	17.96 \pm 5.13	24.73 \pm 4.58	27.98 \pm 5.39	19.74 \pm 5.65	22.1 \pm 5.16	135.5 \pm 24.4
p-value	0.394	0.04	0.646	0.474	0.352	0.616	0.32
Effect size	0.18	0.19	0.13	0.17	0.19	0.12	0.18
Presence of parents in the family							
Both parents	24.5 \pm 5.79	19.1 \pm 5.4	24.6 \pm 4.8	27.7 \pm 5.73	20.19 \pm 5.3	22.5 \pm 4.8	138 \pm 25.3
Only Mother	20.8 \pm 5.59	18.2 \pm 5.8	24.9 \pm 5.06	28 \pm 4.5	17.22 \pm 5.34	20.27 \pm 4.96	129.6 \pm 25.9
Only father	15.5 \pm 0.7	17 \pm 5.6	20 \pm 5.6	20 \pm 1.41	17 \pm 3.55	19 \pm 9.89	109 \pm 38.1
None	24 \pm 2.8	28 \pm 2.82	29.5 \pm 4.94	30.5 \pm 0.7	24 \pm 7.07	25 \pm 1.41	162.2 \pm 5.65
p-value	0.027	0.117	0.269	0.244	0.078	0.167	0.102
Effect size	1.8	1.9	1.9	2.5	1.27	1.09	2.2

adolescents. Thus, with increasing age, the mean score of health-promoting behaviors decreased.

Similar to the findings of the current investigation, previous studies have indicated that younger adolescents exhibit more favorable health-promoting behaviors [46–49]. Younger individuals achieved higher scores in overall health-promoting behaviors, as well as in specific domains such as nutrition, physical activity, and stress management [46]. Furthermore, a multinational study of 37 countries observed a decrease in healthy lifestyle practices among adolescents as they age [17]. Adolescents often face increased stress and peer pressure, negatively impacting their health behaviors [50]. As adolescents age, they may experience changes in their social environments, such as moving from structured school settings to more independent lifestyles, leading to decreased engagement in health-promoting activities [51].

These findings may be related to younger adolescents being more under parental care, which may lead to a healthier lifestyle. Older adolescents are more autonomous and less controlled by the family. Also, in Iran, adolescents in the last years of school education have to prepare themselves for the university entrance exam, and this issue can cause neglect and less attention to health-promoting behaviors.

The study's results showed that the mean nutrition score of adolescent females and males was significantly related to the presence of parents in the family. The mean score was lower if only the father or mother were present in the family, and adolescent males whose mothers were housewives had a higher mean nutrition score.

Family relationships [52] and parental monitoring have a significant impact on various health-promoting behaviors [53]. A study encompassing 2765 adolescents revealed adolescents whose parents did not establish eating rules were more prone to engaging in unhealthy eating practices such as meal skipping and consumption of sugary beverages [19].

The reason that can be mentioned to interpret these results is that family cohesion and the presence of both parents can effectively manage family plans so that people have a regular meal plan that helps improve the condition of their children. It can also be said that working mothers often leave home early in the morning and stay at work until late, which makes them unable to eat at the same time as their children. Their children eat breakfast and lunch alone, which can change their habits and influence the nutritional behaviours of children and adolescents. Another reason that can be mentioned is that working mothers may not have enough time to prepare

Table 5 The predictive demographic and underlying characteristics of total HPBs in male and female adolescents based on a Multivariate Linear regression test ($N=500$)

Variables	Adolescent Males (Adjusted $R^2 = 30\%$)		Adolescent Females (Adjusted $R^2 = 35\%$)	
	Beta	p-value	Beta	p-value
Age	-2.5	0.06	-0.184	0.032
BMI				
<=17.75	0.48	0.001	0.1	0.38
17.75–20.32	0.3	0.035	0.32	0.78
>=20.32	ref		ref	
Grade				
First High School	0.25	0.31	-0.047	0.574
Second High School	ref		ref	
Number of Children in the Family	1.22	0.63	0.09	0.98
Birth order	-0.92	0.68	-0.103	0.158
Father's education level				
Illiterate	ref		ref	
Elementary	0.04	0.9	0.11	0.67
Middle School	0.12	0.68	0.1	0.7
Diploma	0.21	0.5	0.07	0.77
University	0.1	0.8	0.34	0.32
Mother's education level				
Illiterate	ref		ref	
Elementary	0.026	0.91	0.13	0.38
Middle School	0.034	0.89	0.2	0.4
Diploma	0.12	0.23	0.25	0.33
University	0.18	0.45	0.22	0.39
Father's job				
Employee	ref		0.05	0.03
Laborer	1	0.32	ref	
Self-employed	0.13	0.13	0.16	0.6
Retired	0.25	0.3	0.079	0.11
Mother's job				
Housewife	ref		ref	
Employee	-0.3	0.68	-0.035	0.4
Laborer	-0.1	0.3	-0.07	0.286
Self-employed	-1.1	0.14	-0.11	0.284
Presence of parents in the family				
Both parents	ref		ref	
Only Mother	-0.8	0.3	-0.07	0.29
Only father	-5	0.7	-0.027	0.055
Having an underlying disease				
Yes	ref		ref	
No	0.25	0.84	0.071	0.221
Smoking				
Yes	ref		-0.158	0.006
No	0.4	0.49		

a regular meal plan for their children due to their busy schedules, which can lead to incorrect eating habits.

Parents can exert a pivotal influence on their children's dietary preferences by establishing guidelines pertaining to meals and promoting a healthy diet. Educational institutions and healthcare professionals can design strategies informing parents about the importance of implementing

explicit regulations regarding eating habits and the profound effects they can have on adolescents' holistic health and well-being. Also, policymakers can consider measures to support working mothers with children, such as reducing their working hours.

Also, we found adolescent males whose fathers' education level was higher had a higher mean stress management score.

The educational attainment of parents is one of the factors in the adoption of a healthy lifestyle among adolescents [52, 54, 55]. In a study by Hacıhasanoglu et al., [55], students with higher mothers' education levels showed increased mean scores in healthy lifestyle behaviours compared to those with lower educated mothers. This trend was also noted in fathers' education levels. Another study by Ardic and Esin [52] found a significant positive correlation between mothers' education levels and aspects such as health responsibility and stress management, as well as a similar relationship between fathers' education levels and positive life perspectives.

Parents with a higher level of education may be more aware of the changes associated with adolescence, and also have higher health literacy which can help them better understand adolescents' conditions and cope with and effectively manage the stress of this period.

In addition, father's occupation was independent predictor of HPBs in female adolescents. Females whose fathers had government jobs had healthier behaviours.

In Iran, people working in the public sector are usually educated and have stable incomes. Educated people usually have a healthier lifestyle and can be role models for their families. Also, a better economic situation can lead to healthier lifestyle choices in children.

Resilience-enhancing elements like supportive surroundings, effective interpersonal communication, and participation in extracurricular pursuits are pivotal in preventive measures. Being aware of the adolescence period for people who work with adolescents, especially families and teachers, can lead to a better understanding of these conditions and the ability to deal with them appropriately. Also, adolescents themselves should be empowered and learn the necessary skills for maintaining mental health and coping with the stressful conditions of adolescence.

Health-promoting behaviors of adolescent females who were not smoking were better than those who smoked. These results were consistent with other studies [56, 57].

Increased awareness of smoking-related diseases and risks, improving perceptions, and fostering healthier lifestyle choices among adolescents can enhance health-promoting behaviors.

The current study faced several limitations. As a cross-sectional study, causal relationships cannot be established, and the reliance on self-reported data introduces the potential for recall and social desirability biases. Additionally, the study's focus on a specific cultural and geographic context may limit the generalizability of the results. Future research should explore longitudinal approaches and include a broader range of artistic and

socioeconomic variables to understand adolescent health behaviours' complexities better.

Conclusion

This study investigated and compared health-promoting behaviours among Iranian male and female adolescents, revealing significant gender differences and the influence of familial and demographic factors. Female adolescents reported lower physical activity levels than males. Promoting physical activity among adolescent females requires targeted strategies that address their unique needs and barriers. Effective interventions often involve a combination of peer support, improving self-efficacy, school-based initiatives, and a focus on environmental and social factors. The study highlights the critical role of parents' presence in the family, father's level of education, and mothers' employment status on adolescents' HPBs. For example, the presence of both parents and higher parental education levels positively influenced adolescents' nutritional behaviours and stress management. A notable finding was the decline in health-promoting behaviours with age among both genders. This suggests that interventions begin early in adolescence and address the unique challenges that older adolescents face, such as academic pressures and increased autonomy. Tailored programs to maintain or enhance health behaviours as adolescents transition into adulthood are essential.

Acknowledgements

We appreciate the financial support of the Students Research Committee (Project No.151) of Neyshabur University of Medical Sciences and all the participants in this study.

Author contributions

S.S, S.A and M.B designed the study. S.A., M.B, F, S, H.J. G and S.Z. Collected data. S.S and Z.AB analyzed and interpreted results. S.S. wrote the manuscript. S.J. critically appraised the study and edited the manuscript.

Funding

This study was financially supported by the Students Research Committee (Project No.151) of Neyshabur University of Medical Sciences and did not have a role in the design of the study and collection, analysis, and interpretation of data and in writing the manuscript.

Data availability

All data generated or analysed during this study are included in this published article.

Declarations

Ethics approval and consent to participate

The Ethics Committee of Neyshabur University of Medical Sciences (ethics code: IR.NUMS.REC. 1401.005) provided ethical approval for the study protocol. All the participants voluntarily signed the informed consent form before the interviews. In the case of minors, individuals younger than 16, informed consent was obtained from their parents or legal guardians. Also, written permission obtained from the school authority prior to the study. All methods were performed in accordance with the Declaration of Helsinki.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

¹Noncommunicable Diseases Research Center, Neyshabur University of Medical Sciences, Neyshabur, Iran

²Department of Public Health, Neyshabur University of Medical Sciences, Neyshabur, Iran

³Department of Biostatistics and Epidemiology, School of Health, Zahedan University of Medical Sciences, Zahedan, Iran

⁴Department of Public Health and Community Medicine, Tufts School of Medicine, Boston, USA

⁵Students Research Committee, Neyshabur University of Medical Sciences, Neyshabur, Iran

⁶Healthy Ageing Research Centre, Neyshabur University of Medical Sciences, Neyshabur, Iran

Received: 8 August 2024 / Accepted: 29 January 2025

Published online: 11 February 2025

References

- Fortunka KB. Factors affecting human health in the modern world. *J Educ Health Sport*. 2020;10(4):75–81.
- Walker SN, Sechrist KR, Pender NJ. The health-promoting lifestyle profile: development and psychometric characteristics. *Nurs Res*. 1987;36(2):76–81.
- Hu P, Zheng M, Huang J, Fan H-Y, Fan C-J, Ruan H-H, et al. Effect of healthy lifestyle index and lifestyle patterns on the risk of mortality: a community-based cohort study. *Front Med*. 2022;9:920760.
- Li Y, Pan A, Wang DD, Liu X, Dhana K, Franco OH, et al. Impact of healthy lifestyle factors on life expectancies in the US population. *Circulation*. 2018;138(4):345–55.
- WHO. Adolescent health 2024 [Available from: https://www.who.int/health-topics/adolescent-health#tab=tab_1]
- Walsh Ó, Nicholson AJ. Adolescent health. *Clin Integr Care*. 2022;14:100123.
- Moghaddam HT, Bahreini A, Abbasi MA, Fazli F, Saeidi M. Adolescence Health: the needs, problems and attention. *Int J Pediatr*. 2016;4(2):1423–38.
- KHANI F, HOSSEINMARDI N, AZIZI POURMOTABBEDA. H. The effects of drug exposure in adolescence on behavior and cognitive functions during Adulthood. 2021.
- Hazzard VM, Hooper L, Larson N, Loth KA, Wall MM, Neumark-Sztainer D. Associations between severe food insecurity and disordered eating behaviors from adolescence to young adulthood: findings from a 10-year longitudinal study. *Prev Med*. 2022;154:106895.
- Clayton HB, Lowry R, August E, Everett Jones S. Nonmedical use of prescription drugs and sexual risk behaviors. *Pediatrics*. 2016;137(1).
- Song Y, Liu J, Zhao Y, Gong L, Chen Q, Jiang X, et al. Unhealthy lifestyles and clusters status among 3637 adolescents aged 11–23 years: a school-based cross-sectional study in China. *BMC Public Health*. 2023;23(1):1279.
- Jiang J, Zhang Y, Chen L, Liu J, Cai S, Chen Z, et al. Research on the association between unhealthy lifestyle and psychological distress among Chinese children and adolescents aged 9–18 years. *Zhonghua Liu Xing Bing Xue Za Zhi = Zhonghua. Liuxingbingxue Zazhi*. 2023;44(10):1567–74.
- de Moraes MA. INDIVIDUAL AND COMBINED EFFECTS OF LIFESTYLE BEHAVIORS ON THE HEALTH-RELATED QUALITY OF LIFE OF ADOLESCENTS. *Health Soc*. 2024;4(03):10–33.
- Arafa A, Yasui Y, Kokubo Y, Kato Y, Matsumoto C, Teramoto M et al. Lifestyle Behaviors of Childhood and Adolescence: contributing factors, Health consequences, and potential interventions. *Am J Lifestyle Med*. 2024;15598276241245941.
- Morrell HE, Lapsley DK, Halpern-Felsher BL. Subjective invulnerability and perceptions of tobacco-related benefits predict adolescent smoking behavior. *J Early Adolescence*. 2016;36(5):679–703.
- Milić M, Vlačić R-M, Križanić V. Perception of invulnerability, engaging in risky behaviors and life satisfaction among high school students. *Kriminologija Socijalna Integracija: časopis Za Kriminologiju Penologiju i poremećaje u ponašanju*. 2019;27(2):177–203.
- Marques A, Loureiro N, Avelar-Rosa B, Naia A, de Matos MG. Adolescents' healthy lifestyle. *Jornal de Pediatria (Versão em Português)*. 2020;96(2):217–24.
- El-Ammari A, El Kazdough H, Bouftini S, El Fakir S, El Achhab Y. Social-ecological influences on unhealthy dietary behaviours among Moroccan adolescents: a mixed-methods study. *Public Health Nutr*. 2020;23(6):996–1008.
- Holubcikova J, Kolarcik P, Madarasova Geckova A, van Dijk JP, Reijneveld SA. Lack of parental rule-setting on eating is associated with a wide range of adolescent unhealthy eating behaviour both for boys and girls. *BMC Public Health*. 2016;16:1–8.
- Okada LM, Azeredo CM, Silva RRV, Silveira MF, De Haikal DsA L, et al. Association between health risk behaviors and food consumption in adolescents. *Psychol Health Med*. 2023;28(8):2286–99.
- Zulkefly NS, Dzeidee Schaff AR, Zaini NA, Mukhtar F, Dahlan R. A pilot randomized control trial on the feasibility, acceptability, and initial effects of a digital-assisted parenting intervention for promoting mental health in Malaysian adolescents. *Digit Health*. 2024;10:20552076241249572.
- Faught EL, Gleddie D, Storey KE, Davison CM, Veugelers PJ. Healthy lifestyle behaviours are positively and independently associated with academic achievement: an analysis of self-reported data from a nationally representative sample of Canadian early adolescents. *PLoS ONE*. 2017;12(7):e0181938.
- Solera-Sanchez A, Adelantado-Renau M, Moliner-Urdiales D, Beltran-Valls MR. Health-related quality of life in adolescents: individual and combined impact of health-related behaviors (DADOS study). *Qual Life Res*. 2021;30:1093–101.
- Smith NDW, Bradley-Klug KL, Suldo SM, Dedrick RF, Shaffer-Hudkins EJ. Associations between multiple health-promoting behaviors and subjective well-being in high school age youth. *J Sch Health*. 2022;92(1):52–62.
- Iduriyekemwen N, Abiodun M, Sadoh W, Onyiriuka A. Gender differences in clinical characteristics and lifestyle behaviours of overweight and obese adolescents. *West Afr J Med*. 2023;40(4):438–44.
- Филькина ОМ, Кочерова О, Малышкина А, Воробьева Е, Долотова Н. Гендерные особенности информированности и отношения подростков к здоровому образу жизни. Гигиена и санитария. 2022;101(2):218–24.
- Talitha S, Karjoso TKK, TINJAUAN, SISTEMATIK: META-SINTESIS FAKTOR, SOSIAL BUDAYA YANG MEMPENGARUHI GAYA HIDUP REMAJA. *PREPOTIF: JURNAL KESEHATAN MASYARAKAT*. 2022;6(1):799–811.
- Sucipto W, Avezahra MH. Pengaruh Budaya Terhadap Remaja. *Flourishing J*. 2023;3(5):205–10.
- Maspul KA, Bruneton C, Naing TKK, Popov R, Saleh P. Exploring Adolescent Development in Diverse Cultures: Insights and Implications. *PESHUM: Jurnal Pendidikan, Sosial dan Humaniora*. 2023;2(6):1202-15.
- Zareiyani A. Healthy or unhealthy lifestyle: a thematic analysis of Iranian male adolescents' perspectives. *Iran J Nurs Midwifery Res*. 2017;22(1):1–7.
- Ghazi Nezhad M. Objective and subjective youth exclusion in Iran; dimensions and indicators. *Strat Stud Sport Youth*. 2014;14(29):79–49.
- Moghadam R, Tabibi J, Hajinabi K. A comparative study of adolescent and youth health status: a systematic review. *J Health Promotion Manage*. 2019;8(6):67–75.
- Taheri A, Yousefianzadeh O, Saeedizadeh M. A qualitative study of the health information seeking behaviour of adolescent girls in Iran indicates that public libraries could help supply information required about puberty. *Health Inform Libr J*. 2022;39(3):255–67.
- Xiang G, Li Q, Du X, Liu X, Xiao M, Chen H. Links between family cohesion and subjective well-being in adolescents and early adults: the mediating role of self-concept clarity and hope. *Curr Psychol*. 2022;41(1):76–85.
- Gasparetto AS, Bonfim TA, Teston EF, Marchetti PM, Galera SAF, Giacon-Arruda BCC. Contexts of vulnerabilities experienced by adolescents: challenges to public policies. *Revista Brasileira De Enfermagem*. 2020;73:e20190224.
- Boraita RJ, Ibor EG, Torres JMD, Alsina DA. Gender differences relating to lifestyle habits and health-related quality of life of adolescents. *Child Indic Res*. 2020;13:1937–51.
- Moeini B, Dashti S, Teymooori P, Mousali AA, Sharifi M, Akbar Zadeh M, et al. Health-promoting behaviors among high school students in Hamadan in 2013. *Pajouhan Sci J*. 2015;13(3):49–57.
- Zarvekanloo S, Rahimi Z, Borzu ZA, Shirzadi S. Healthy Lifestyle Behaviors and Menopausal Symptoms in Postmenopausal women: a cross-sectional study. *J Educ Community Health*. 2023;10(4):217–24.
- Guthold R, Stevens GA, Riley LM, Bull FC. Global trends in insufficient physical activity among adolescents: a pooled analysis of 298 population-based surveys with 1·6 million participants. *Lancet Child Adolesc Health*. 2020;4(1):23–35.
- Asar ME, Saleh E, Ghaneapur M. Innovative and motivational SDT-based approach to promote Iranian women's physical activity. *J Adv Pharm Educ Res*. 2023;13(1–2023):62–5.

41. Portela-Pino I, López-Castedo A, Martínez-Patiño MJ, Valverde-Esteve T, Domínguez-Alonso J. Gender differences in motivation and barriers for the practice of physical exercise in adolescence. *Int J Environ Res Public Health*. 2020;17(1):168.
42. Condessa LA, Chaves OC, Silva FM, Malta DC, Caiiffa WTJRdsp. Sociocultural factors related to the physical activity in boys and girls: PeNSE 2012. 2019;53:25.
43. Mayo X, Luque-Casado A, Jimenez A, del Villar FJS. Physical activity levels for girls and young adult women versus boys and young adult men in Spain: a gender gap analysis. 2020;12(15):6265.
44. Hart PJJ. The influence of healthy lifestyle and health status on body mass index (BMI) in adults. 2021;6(2):142–6.
45. Šímková S, Dvořáčková O, Velemínský MJNL. Assessment of healthy lifestyles in relation to BMI. 2022;43(7–8).
46. Guedes DP, Zuppa MA, Yamaji BHS. Health-promoting domains and lifestyle of a sample of Brazilian adolescents. *J Educ Health Promotion*. 2023;12(1):83.
47. García-Poole C, Byrne S, Rodrigo MJ. Adolescent lifestyle profiles and personal and community competences. *Eur J Dev Psychol*. 2018;15(5):531–47.
48. Inchley J, Currie DB, Budisavljevic S, Torsheim T, Jastad A, Cosma A et al. Spotlight on adolescent health and wellbeing: Findings from the 2017/2018 Health Behaviour in School-aged Children (HBSC) survey in Europe and Canada. International report. Volume 1: Key findings. 2020.
49. Reniers RL, Murphy L, Lin A, Bartolomé SP, Wood SJ. Risk perception and risk-taking behaviour during adolescence: the influence of personality and gender. *PLoS ONE*. 2016;11(4):e0153842.
50. Aira T, Vasankari T, Heinonen OJ, Korpelainen R, Kotkajuuri J, Parkkari J et al. Psychosocial and health behavioural characteristics of longitudinal physical activity patterns: a cohort study from adolescence to young adulthood. 2023;23(1):2156.
51. Moshki M, Torabi F-SJMMUMS. Lifestyle factors and their association with some relevant factors in adolescence using the theory of planned behavior. 2013;22(2):117–26.
52. Ardic A, Esin MN. Factors associated with healthy lifestyle behaviors in a sample of Turkish adolescents: a school-based study. *J Transcult Nurs*. 2016;27(6):583–92.
53. Rew L, Arheart KL, Thompson S, Johnson K. Predictors of adolescents' health-promoting behaviors guided by primary socialization theory. *J Spec Pediatr Nurs*. 2013;18(4):277–88.
54. Yañez AM, Bennasar-Veny M, Leiva A, García-Toro M. Implications of personality and parental education on healthy lifestyles among adolescents. *Sci Rep*. 2020;10(1):7911.
55. Bawaked RA, Gomez SF, Homs C, Esteve RC, Cardenas G, Fito M, et al. Association of eating behaviors, lifestyle, and maternal education with adherence to the Mediterranean diet in Spanish children. *Appetite*. 2018;130:279–85.
56. Celebi C, ÇALIK KÜTÜKCÜ E, SAĞLAM M, BOZDEMİR ÖZEL C, İNAL INCE D, VARDAR YAĞLI NJT et al. Health-promoting behaviors, health literacy, and levels of knowledge about smoking-related diseases among smokers and non-smokers: a cross-sectional study. 2021;84(2).
57. Kim M-O, Yu M, Ju S-J, Kim K-S, Choi J-H, Kim H-JJKJHE et al. Depression cognition and health promoting behaviors of smoking and non-smoking college students. 2013;30(3):35–46.

Publisher's note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.