



## Research article

## Sex differences in high-risk health behaviors among school-going adolescents in Yazd, Iran; a cross-sectional study



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## ABSTRACT

**Objective:** Adolescents are exposed to a wide range of high-risk health behaviors. This study aimed to investigate the high-risk health behaviors of adolescents in an Iranian adolescent population and gender differences.

**Method:** This cross-sectional descriptive study recruited high school students in Yazd city in center of Iran. Schools were randomly selected. In each school, all selected classes were included. Sampling in each class was census. The study investigated self-reported high-risk health behaviors. Students completed the Global School-based Student Health Survey (GSHS), an anonymous, validated questionnaire.

**Results:** 2420 students participated in this study (52.5% male). The age range was 12–19 years. Daily consumption of  $\geq 1$  serving of fruit and vegetables per day was reported by 77.4% and 49.5% of respondents, respectively. Adequate physical activity was reported by only 18.4% of adolescents, and significantly less frequently by girls than boys ( $p < 0.001$ ). 11.8% were current smokers (M/F ratio: 2.6), and 20.5% (M/F ratio: 1.5) were ever used hookah. The prevalence of ever alcohol and substance abuse was 15.5% and 8.8%, respectively. The prevalence of tobacco and substance use was significantly higher in participants' boys than in girls ( $p < 0.001$ ). Males were over twice more likely to report frequent fighting in the past 12 months than girls. Overall, girls reported more parental supervision than boys (82.1% vs. 73.4%) and parental monitoring (90.6% vs. 86.8%), while boys reported higher levels of awareness over leisure activities than girls (65.8% vs. 58.4%).

**Conclusions:** High-risk health behaviors are more common in boys than girls. Health policymakers should use these results in prioritizing and designing health interventions to promote youth health. Further studies are recommended to identify the factors influencing the prevalence of these behaviors.

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### 1. Introduction

Adolescence is an evolutionary stage of life characterized by rapid physical, cognitive, emotional, and social changes [1]. Adolescent are exposed to a wide range of high-risk health behaviors such as violence, substance use, smoking, and unhealthy eating habits [2–4]. The population of 1.2 billion young people, has attracted the attention of health policy-makers to design health interventions to improve the lifestyle of adolescents and subject is needed prevent non-communicable diseases in adulthood, to help achieve the goals of sustainable development in 2030 [5–7].

School is the most important place for students to learn and gain new experiences by spending significant daily hours with their peers. Pleasure-seeking, cyberspace access, the possibility of an easy and cheap supply of various drugs. Lack of supervision of parents are the reasons for high-risk health behaviors in adolescents that are affected by this environment [7,8]. Evidence shows that a free, honest, and loving parental relationship with support and supervision can have a positive effect on psychosocial functioning and it can reduce risky behaviors in adolescents [9,10].

Most high-risk health behaviors, such as smoking, unhealthy diet, and substance use begin before the age of 18 [11–13]. Addiction and abnormal social behaviors in boys and unhealthy eating habits, and sedentary lifestyles in girls have been reported as the priority of risky behaviors [14]. Gender differences can be caused by culture and social environment; also it can be influenced by the expectations of parents appropriate to the gender of their children [15].

Health behaviors among adolescents are interrelated and they may form behavioral clusters [16,17]. A study from 89 countries shows that 82.4% of adolescents have had two high-risk health behaviors and more. In these countries, smoking, alcohol consumption, sedentary and inadequate consumption of fruits and vegetables in boys, and inactivity in girls have been reported in clusters [18]. A study shows that 15% of adolescents have developed three or more dangerous behaviors. Women, people 15 years of age and older, black, and socioeconomically low are likely to have three or more risk factors [19]. Similar results have been reported for adolescents with multiple high-risk behaviors in Serbia (19.3%), Malaysia (83.2%), and Ghana (94.8%) [20,21]. This clustering and having more than one risky behavior is due to the common connections of such behaviors in the social environment of adolescence [22,23].

Due to the young population structure in Iran, the present study aimed to determine the pattern of high-risk health behaviors among adolescents based on gender to identify at-risk populations. This is the first GSHS (Global school-based Student Health Survey) [24] conducted in Yazd city of Iran. Results can help health policymakers to better understand the factors influencing the occurrence of these behaviors to design preventive interventions and promote the health of future adults and reduce the future burden of disease and accidents.

### 2. Methods

#### 2.1. Study design and population

In this cross-sectional descriptive study, in 2016, high school students in Yazd (Iran) were studied. School sampling was done in a multi-stage method using cluster and stratified sampling methods from both education areas by random. In stratified sampling in each district, schools were selected, in proportion to gender to complete the sample size. The proportion of students in public/private schools was also considered.

Clusters were determined at the school level and the size of each cluster was estimated at 25 students. The maximum sample size that can provide a good estimate of all high-risk health behaviors studied ( $P = 0.5$ ,  $1 - \alpha = 0.95$ ,  $d = 3.5\%$  and cluster coefficient 1.5);

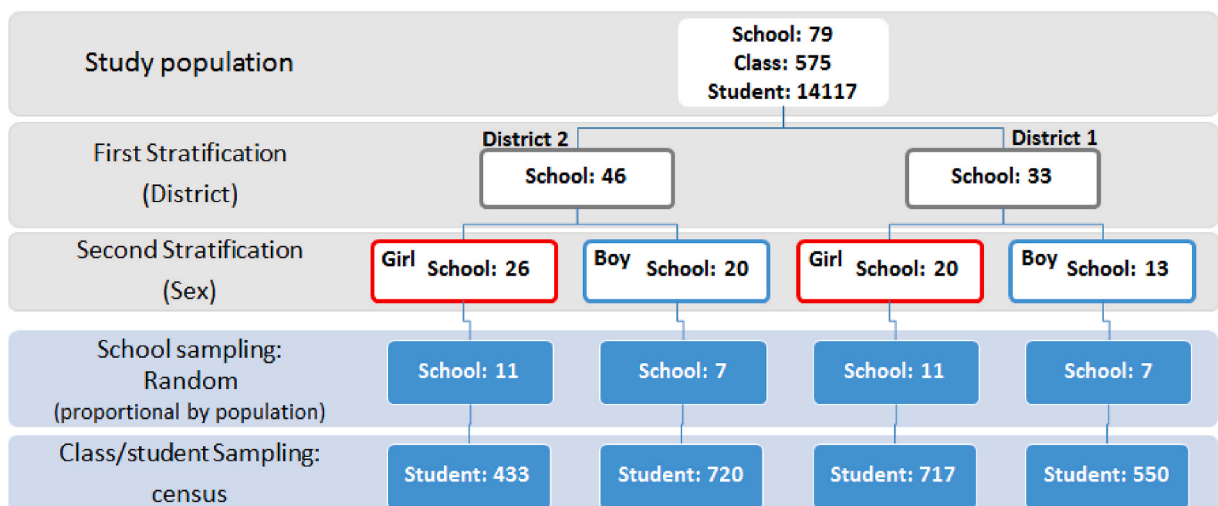


Fig. 1. Flow diagram of sampling.

was selected (for each gender 1250 student). The sampling framework was the list of schools in the two education districts by gender and type of school. Each high school has two courses, junior high school (7–9 grades) and senior high school (10–12 grades). In each selected school, all students in the middle grade (8 and 11) were enrolled. All non-Iranian students were excluded from the study. Data collection was performed by medical interns under the supervision of the researchers. Fig. 1 shows a flow diagram of the sampling.

The questionnaire used was the Persian version of the GSHS questionnaire proposed by WHO (World Health Organization) [24], which its validity and reliability have been confirmed [25]. Smoking even one time over the past 30 days defined as current smoker. In factors such as brushing teeth, dietary behavior, tobacco use, passive smoker, substance use, injury and violence; the responses was divided in two categories “Never or Zero” and “others”. A full definition of high-risk health behaviors is given in Table 1.

Parental support was assessed with the following questions: How many times during the last 30 days have parents/guardians reviewed your homework, understood your problems and concerns, how do you spend your free time, and they controlled your belongings without permission. It also asked, “How many times in the last 30 days have your school students been kind and helpful?” “Most of the time/always” answers zero code, and “rarely/never/sometimes” options were given code 1 (without protective factors). Absence from school without permission was also questioned [31]. Six items were summed and divided into three groups of protection: high = 0–1, moderate = 2–4, low = 5–6 were classified.

Written permission was obtained from the Education Organization. With the consent of the school principal, the questioning time is set. The study was explained to all respondents willing to participate. To maintain confidentiality, no personal ID was provided in the questionnaire. Students were allowed to withdraw from the study at any time before or during data collection. All participants had the right to refuse to respond to any question. Those who had informed written or oral consent to participate were included in the study. The research proposal was approved by the ethics committee of Shahid Sadoughi University of Medical Sciences, Yazd, Iran No: IR.SSU.MEDICINE.REC.1399.225. Data were coded and analyzed using SPSS software version 16. All prevalence variables were coded to represent a high-risk behavior. The description of the variables is expressed in frequency and percentage. A Chi-square test was used to compare the prevalence rates. Logistic regression method used to adjust the results based on type of school, grade, educational area and parent education. Significant levels less than 0.05 were considered.

### 3. Results

#### 3.1. Sample characteristics

In total, 36 high schools were selected. All selected schools participated, but the response rate of students in the class/grade was between 90 and 95% (2420 students). The response rate for the questions is from 90.5% for alcohol use to 98.2% (Brushing teeth). The age range was 12–19 years (mean:  $15.7 \pm 1.4$ ). 52.5% of participants were male and 50.7% were studied in governmental schools. The demographic characteristics of the students participating in the study including distribution of gender, grade, and educational area, type of school and parent education are presented in Table 2.

A sedentary lifestyle, unhealthy dietary habits, and injuries are the most common risk factors, and lack of personal hygiene and substance abuse are in the last ranks (Fig. 2).

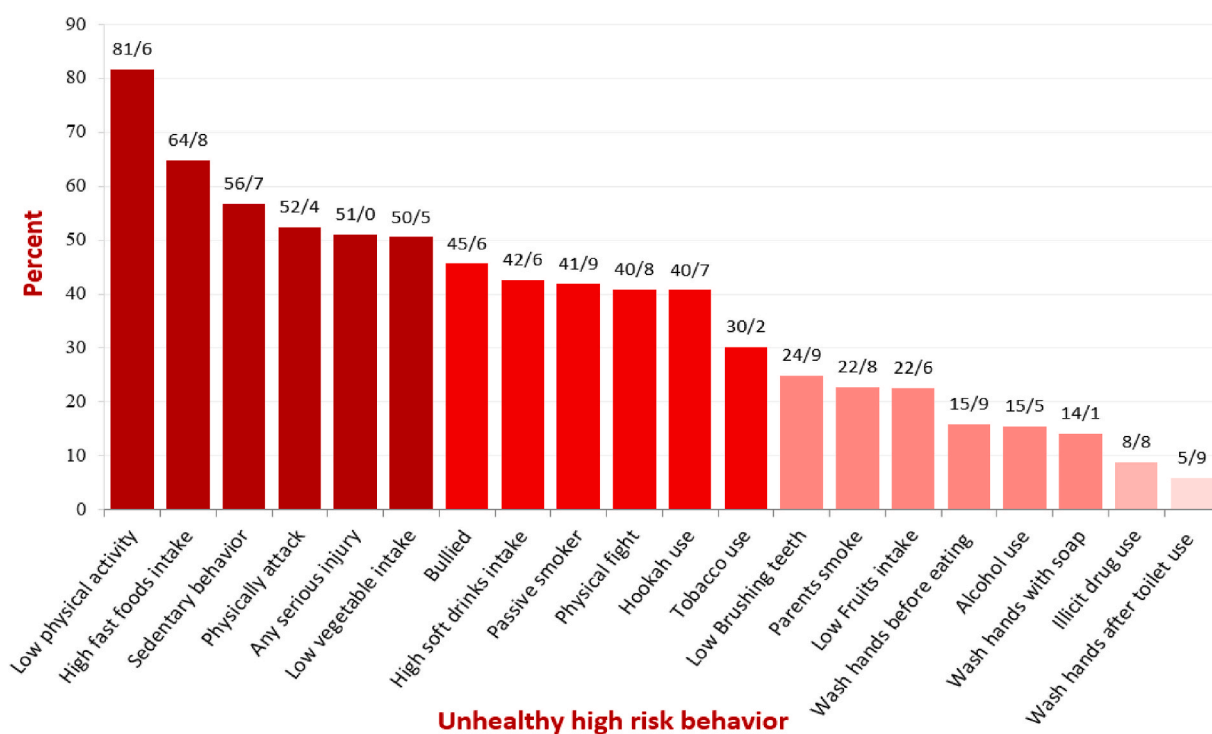
In total, 55.1% of participants ate fruit (less than twice a day), and only 9.3% of students ate three or more vegetables per day. Consumption of fruits and vegetables at least once a day was reported in 77.4% and 49.5% of participants. 16.8% of adolescents had not consumed carbonated beverages in the last 30 days, and two-thirds of participants have eaten fast food in the past week. There is no difference between the two genders in inadequate consumption of fruits and vegetables, but in boys, carbonated beverages (P-value: 0.02), and women, fast food (P-value: 0.002) is significantly higher. Oral health, hand hygiene behaviors, and sedentary lifestyle are more common in girls than boys. (P-value: <0.001) One in four participants does not brush once a day. About 15% of an adolescent do

**Table 1**  
High-risk health behavior description.

High-risk health behavior	Measurement criteria
Inadequate Consumption of fruits	less than once per day [26]
Inadequate Consumption of vegetables	less than one serving per day [26]
High consumption of fast food	consumption of one day and more during the last 7 days [27]
High consumption of carbonated soft drinks	at least once a day for the past 30 days [27]
Inadequate Brushing and hand washing	Less than once per day [28]
washing hands before eating, after using the toilet, and with soap	Never or rarely [28]
Low physical activities	60 min of moderate to vigorous physical activity per day for at least 5 days [26]
Leisure-time sedentary behavior	3 h or more a day [26]
Substance use	Positive history of drug use, alcohol use, smoking, and hookah on lifetime and/or over the past 30 days (current use) [29]
Second-hand smoker	Smoking by others in your presence for at least one day over the past 7 days [29]
Serious injury	injuries which causes her/his to miss at least one full day of usual activities, in the last 12 months [30]
Physical attack	a history of being hit or harassed with a weapon (such as a stick, knife, or gun) by one or more people in the last 12 months [30]
Physical fight	If two students with almost equal strength fought with each other in the last 12 months [30]
Bullying	A student/students harass another student with a bad deed or unpleasant word during the past 30 days (not including arguing or friendly harassment between two students of equal strength) [30]

**Table 2**  
Demographic characteristics of students who responded - Yazd (Iran).

Variable		Number	Percent
Sex	Male	1270	52.5
	Female	1150	47.5
Grade	8th	1149	47.5
	11th	1271	52.5
Educational area	1	1267	52.4
	2	1153	47.6
Types of school	Governmental	1226	50.7
	Private	1194	49.3
Mother education	Primary school and less	487	21.5
	Middle school	495	21.9
	high school	637	28.1
Father education	College	645	28.5
	Primary school and less	449	19.8
	Middle school	472	20.8
	high school	684	30.1
	College	665	29.3



**Fig. 2.** Rank of the behavioral risk factors in adolescents - Yazd (Iran).

not wash their hands before eating. Four-fifths of teens have low physical activity, and more than half of students engage in 3 h or more of leisure-time sedentary behavior (Table 3).

11.8% of adolescents were current tobacco users. Smoking is more common in boys than girls (16.9% vs. 6.4%). Hookah smoking in the last 30 days, stated by 20% of students. Compared to cigarettes; a higher percentage of girls, smoke hookah (24.4% vs. 16.6%). Higher current use of tobacco smoke in boys is significantly higher. (P-value: < 0.001) The present study showed a prevalence of 41.9% passive smokers. 20.2% of fathers and 4.7% of mothers are smokers. During a lifetime, 8.8% and 15.5% of adolescents reported having used drugs and alcohol, respectively. Using 1.8 times more in boys than girls. (P-value: <0.001) About half of the students have been injured at least once in the last 12 months due to the attack. Also, physical fight was reported in 41% (boys 2.2 times more than girls). In the last 30 days, boys have been more exposed to bullying than girls. (P-value: <0.05) (Table 3).

Multivariate analysis showed inadequate physical activity and sedentary behavior in girls is significantly more prevalent than boys (ODDs ratio = 1.639, 95%CI 1.162–2.312). Substance use, injury and violence, passive smokers and poor personal hygiene was significantly more prevalent in boys. (P-value: <0.001) (Table 4).

22.4% of students reported that their parents frequently checked their homework and 37.8% of parents were aware of their free

**Table 3**  
Distribution of high-risk behavior in an adolescent by sex - Yazd (Iran) N = 2420.

	Risk behavior	(num. of participants)	Total	Sex		P-Value
				Male	Female	
Oral and hand hygiene (past 30 days)	Brushing teeth < once/day	(n = 2381)	592 (24.9)	424 (34.4)	168 (14.6)	<0.001
	Wash hands before eating (Never/rarely)	(n = 2372)	376 (15.9)	211 (17.2)	165 (14.4)	0.072
	Wash hands after toilet use (Never/rarely)	(n = 2371)	141 (5.9)	104 (8.5)	37 (3.2)	<0.001
	Wash hands with soap (Never/rarely)	(n = 2369)	333 (14.1)	220 (18.0)	113 (9.9)	<0.001
Dietary behavior (past 30 days)	Fruits <1 servings/day	(n = 2370)	536 (22.6)	276 (22.5)	260 (22.7)	0.922
	Vegetable <1 servings/day	(n = 2371)	1197 (50.5)	624 (51.1)	573 (49.9)	0.565
	Carbonated beverages ≥1 servings/day	(n = 2375)	1012 (42.6)	550 (44.9)	462 (40.2)	0.022
	Fast foods ≥1 serving/past 7 days	(n = 2363)	1531 (64.8)	750 (61.8)	781 (68.0)	0.002
Physical activity	Inadequate physical activity/past 7 days	(n = 2362)	1927 (81.6)	955 (78.5)	972 (84.8)	<0.001
	Leisure-time sedentary behavior ≥3 h/day	(n = 2351)	1334 (56.7)	632 (52.3)	702 (61.4)	<0.001
Tobacco use	Smoking (lifetime)	(n = 2364)	713 (30.2)	439 (36.1)	274 (23.9)	<0.001
	Smoking (past 30 days)	(n = 2331)	274 (11.8)	201 (16.9)	73 (6.4)	<0.001
	Hookah use (lifetime)	(n = 2375)	966 (40.7)	495 (40.4)	471 (41.0)	0.786
	Hookah use (past 30 days)	(n = 2359)	484 (20.5)	296 (24.4)	188 (16.4)	<0.001
Passive smoker	Anyone smoke in your presence/past 7 days	(n = 2338)	980 (41.9)	556 (46.6)	424 (37.0)	<0.001
	Parents smoke	(n = 2326)	530 (22.8)	283 (23.9)	247 (21.6)	0.199
Substance use (lifetime)	Drug use	(n = 2345)	208 (8.8)	136 (11.3)	72 (6.3)	<0.001
	Alcohol use	(n = 2191)	339 (15.5)	215 (20.5)	124 (10.8)	<0.001
Injury and violence	Physically attack/past 12 months	(n = 2320)	1216 (52.4)	655 (55.6)	561 (49.1)	0.002
	In physical fight/past 12 months	(n = 2342)	955 (40.8)	662 (55.4)	293 (25.5)	<0.001
	Any serious injury/past 12 months	(n = 2352)	1199 (51.0)	691 (57.5)	508 (44.2)	<0.001
	Bullied/past 30 days	(n = 2282)	1041 (45.6)	600 (52.6)	441 (38.7)	<0.001

time activities. The frequency of these protective factors is significantly different by sex. (P-value: <0.001) In the last 30 days, one in five students did not attend school for one day without permission (Table 5).

Only 6% of students reported high parental involvement and one in three teens reported high school/parent involvement in their activities. As parental protection increases; high-risk health behaviors have decreased (Table 6).

**Table 4**  
The association between High-risk health behaviors and sex among school-going adolescents in Yazd, Iran.

High-risk health behavior	adjusted odds ratio*	95% confidence interval	P-Value
Oral and hand hygiene (past 30 days)	0.459	0.380–0.554	0.001
Dietary behavior (past 30 days)	0.975	0.713–1.333	0.872
Inadequate physical activity/sedentary behavior	1.639	1.162–2.312	0.005
Tobacco use	0.887	0.742–1.060	0.188
Passive smoker	0.630	0.524–0.759	0.001
Substance use (lifetime)	0.404	0.298–0.553	0.001
Injury and violence	0.444	0.354–0.557	0.001
Injury and violence	0.444	0.354–0.557	0.001

**Table 5**  
Parental and school involvement in an adolescent by sex - Yazd (Iran) N = 2420.

Protective factors (num. of participants)	Total	Sex		P-Value
		Male	Female	
Truancy (n = 2357)	494 (21.0)	319 (26.4)	175 (15.3)	<0.001
Peer support (n = 2345)	578 (24.6)	260 (21.7)	318 (27.7)	0.001
Parental supervision (n = 2353)	526 (22.4)	321 (26.6)	205 (17.9)	<0.001
Parental Connectedness (n = 2335)	640 (27.4)	332 (27.9)	308 (26.9)	0.578
Parental bonding (n = 2324)	879 (37.8)	403 (34.2)	476 (41.6)	<0.001
Parental monitoring (n = 2313)	262 (11.3)	154 (13.2)	108 (9.4)	0.005

**Table 6**  
Protective factors and number of behavioral risk factors in adolescence - Yazd (Iran).

		Total	Number of behavioral risk factors (n = 2365)					P-Value
			0-1	2	3	4	≥5	
			N (%)	N (%)	N (%)	N (%)	N (%)	
Parental and school involvement	High	139 (5.9)	2 (1.4)	36 (25.9)	42 (30.2)	25 (18.0)	34 (24.5)	<0.001
	Moderate	1436 (60.7)	42 (2.9)	155 (10.8)	349 (24.3)	337 (23.5)	553 (38.5)	
	Low	790 (33.4)	10 (1.3)	63 (8.0)	135 (17.1)	209 (26.5)	373 (47.2)	
Total		2365 (100)	54 (2.3)	254 (10.7)	526 (22.2)	571 (24.1)	960 (40.6)	

## 4. Discussion

### 4.1. Oral and hand hygiene

Most students take care of their health, girls more than boys. This gender difference has been reported in other studies [32,33]. In this study, 24.9% of students stated that they had never/rarely brushed, which is consistent with previous findings in low/middle-income countries, but this is an oral health problem. Since oral health interventions are more common in primary schools, it is necessary to continue health education in high schools. Less than 15% of students do not wash their hands, which is not relevant compared to the average of 80 countries and should be improved [34]. Personal hygiene varies between countries, it is about 30% higher in high-income countries, depending on variables such as economic status, urbanization, and parental education [28,35].

### 4.2. Dietary habits

The average consumption of fruits and vegetables was 1.6 and 1 time per day, respectively, which is similar to national findings in vegetables, but for fruits, consumption is higher than the national average [36]. Half of the students consume vegetables and 77.4% consume fruits in their daily diet, but only 54.9% and 20.5% of students receive the recommended amount of vegetables and fruits per day, respectively. Inadequate consumption has been reported in all countries and is probably much less than the minimum recommended by the WHO (400 g) [26]. In some studies, adequate intake of fruits and vegetables is defined 5 times or more per day, which results of 11 countries in EMRO countries (19.4%) and the United States (22.3%) shows a difference with our findings (less Of 10%) [37,38]. Unlike others, the daily consumption of vegetables and fruits in this study is not different between girls and boys. In the EMRO region, boys [37], and low/middle-income countries, girls have reported higher consumption of fruits and vegetables [39]. In this study, the self-report measurement was based on the frequency of consumption and not the amount consumed, the judgment that adolescents received enough fruits and vegetables daily is not accurate, also consumptions varies between seasons.

The prevalence of fast food consumption (64.8%) is higher than the national report (24%) and low/middle-income countries (39%) [27,40,41]. Getting hungry because of the long school hours makes them buy fast food from the buffet, necessitate a change in school health policies to establish regulations to limit the sale of these in the school buffet as well as consumption as a snack. Health education helps to improve adolescents' eating habits.

### 4.3. Physical activity

Only 21.5% of boys and 15.2% of girls had the recommended physical activity, which is similar to other studies, in both developed and developing countries [42]. Cultural and religious beliefs, especially for girls, and more attention to education compared to exercise have made sedentary lifestyle more common in the area, except where adolescents need to work for household income [43,44]. 56.7% of students have more than inactive such as watch TV and/or play computer games for more than 2 h a day [45]. These causes "mindless eating" and overeating and exposes them to more advertising for unhealthy snacks. In this study, girls were less physically active than boys, which is consistent with the results of such studies [46,47]. Urbanization, apartment housing, motorized transportation, and changes in the pattern of youth leisure with computer games can all play important roles. Also, the traditional family



structure in Iran and socio-cultural conditions such as fewer clubs or specific green space, it has made girls have more limited access. Despite the lack of facilities, intervention is necessary to encourage people to engage in physical activity at home and in the neighborhood.

#### 4.4. Smoking

The prevalence of current smoking (11.8%) in the present study is lower than the world average (13.6%), but it is higher than from national study in Iran (6.1%) and EMRO countries (8.5%) [48,49]. 30.5% stated that they have experienced smoking at least once and 20% are current hookah users. It is a worrying situation. also, adolescents 41.9% are second-hand smoke, it is less compared to international (55.9%) and national (43.8%) studies [48,50]. The findings of this study, similar to all other studies in Iran and elsewhere in the world, show a higher prevalence of smoking in boys than girls, although this ratio is lower in high-income [51]. Family and social restrictions for girls can be the reasons for this difference. However, the higher prevalence of smoking in boys can be influenced by the behavior of smoking fathers, according to social learning theory (learning through same-sex observation) [52]. It is a significant finding that the sex ratio for hookah use was less than for cigarettes (1.5 vs. 2.6). Less awareness and differences in attitudes have made girls more inclined to smoke a hookah. This attitude can gradually change the social norm and increase the prevalence of tobacco smoking - similar to western countries.

Despite the ratification of the WHO Framework Convention on Tobacco Control (WHO FCTC) in 2005 in Iran [53] and the implementation of some of its laws, family-centered preventive counseling and smoking cessation need to be strengthened. Therefore, intervention is necessary to prevent the occurrence of this behavior in adolescents because the onset of this behavior was in 90% of smokers at school age under 18 years [48].

#### 4.5. Alcohol and illicit drug

This study showed unexpected lifetime Alcohol and illicit drug use among students, despite the illegal consumption in Iran. Although the prevalence of alcohol use is lower than the global average due to cultural-religious factors and criminology of alcohol consumption, it is slightly higher than the national average consumption among adolescents (15.5 vs. 13%) [54,55]. Alcohol consumption in boys is almost twice that of girls, which is consistent with the findings of some researchers in Iran and other countries [56]. Approximately one in 10 students have a lifetime history of drug use and abuse is more in boys than girls. Fewer restrictions, more friendly gatherings, and easier access for boys in Iran may be the reasons for this difference. Studies have shown that drug use is increasing in Iran, the age of onset of drug use is under 18 years with the first use at school or a friend's house [57,58]. It is necessary to identify the factors influencing the onset of use, which helps in selecting the appropriate strategy based on cultural evidence. Preventive programs should be started in schools, such as life skills training to prevent substance use; however, such interventions are still not culturally acceptable in Iran and their implementation in educational settings is limited.

#### 4.6. Injury and violence

One in two students has been involved in physical violence/bullying or reported serious injury, which is consistent with the results of other studies in Iran [59,60]. In other EMRO countries, compared to the world (except Africa), a high prevalence of youth violence has been reported [61–63]. In this study, less than half of respondents (45.6%) reported being a victim of bullying in the past month, which is higher compared to middle/high-income countries [64]. More research is needed on the role of socio-economic factors that may affect violence, such as unstable economic conditions and income inequality.

Similar to other studies, boys are more physically fighting than girls, and they are more likely to be bullied and injured. Some studies report that girls are more prone to psychological violence, while boys are more likely to experience physical violence [60]. Sex hormones can make this difference. Of course, the proportion of this gender difference varies between countries, which may be due to different cultures, or having high-risk health behaviors such as high substance uses or alcohol consumption [65]. Teaching healthy relationships and stress management through family-centered interventions and school staff involvement can improve interpersonal relationships among students. Identifying types of bullying, direct (verbal/physical) or indirect harassment (internet/virtual networks), is suggested to select the best intervention strategy to reduce it.

#### 4.7. Protective factors

Approximately 25% of parents' supervision of students' homework and control of 10% of their personal belongings shows that parents - less than the results of other studies - play a low supportive role for their children [66,67]. having  $\geq 5$  risk behaviors in the adolescent with low parental involvement is almost twice as common in students with high parental involvement. This suggests a relationship between parental supervision and the reduction of high-risk health behaviors in children [68]. High level of parental involvement causes their children to choose less risky behaviors. Conversely, adolescents' high-risk health behaviors can increase parental supervision [69]. Limited parental involvement has a protective effect on some high-risk health behaviors, and some require multiple supports. Further analysis is suggested for the causal preventive effect of parental supervision on the different prevalence of each high-risk health behavior -separately- especially in boys and girls.

#### 4.8. Strength and limitations

This study is cross-sectional and no causal interpretation can be made, future longitudinal studies are needed. This study did not include adolescents who dropped out of school and did not go to school, high-risk behavior may be different between two groups, and findings may not be representative of all adolescents. This study relies on self-report, therefore, some behaviors may not be properly expressed by students. High-risk sexual behaviors were not studied due to cultural constraints. Job and family resources “from the variables of social class” can also be related to high-risk behaviors in young people, which in this study; it has not been addressed. The large sample size, using a standard questionnaire for several high-risk health behaviors are the main strengths of the study. It can be a basis for comparison with future research to show the trend of change over time.

#### 5. Conclusion

This study shows the high prevalence of high-risk health behaviors among adolescents. The most common of which are inactivity, unhealthy eating habits, and fight/bullying with the injury. The abundance of second-hand smoke and drug use was unexpected. These risk behaviors may persist in adulthood, it will be difficult to prevent or control high-risk health behaviors throughout life because, over time, these habits become a lifestyle. The school health program in Iran includes all topics and high-risk health behaviors but the results of this study showed that it is necessary for policymakers to evaluate and revise it, moving towards Health Promoting Schools (HPS) and designing health interventions to promote youth health. Periodic studies are recommended for the evaluation of interventions.

#### Author contribution statement

Mahmood Vakili: Mahboobahsadat Mirzadeh: Mohsen Mirzaei: Conceived and designed the experiments; Analyzed and interpreted the data; Wrote the paper.

Mozhgan Modarresi: Abbas Ali Imani: Performed the experiments; Analyzed and interpreted the data.

Reihaneh Raei: Reihaneh Karimi: Arezoo Aghakoochak: Performed the experiments; Contributed reagents, materials, analysis tools or data.

#### Data availability statement

Data will be made available on request.

#### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper

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#### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2023.e16404>.

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