

Research Paper

Relationship Between Health Literacy and Addiction Susceptibility in High School Adolescents



Zohreh Azarang¹ , Marhamat Farahaninia^{1*} , Mehri Bozorgnezhad² , Hamid Haghani³

1. Department of Community Health Nursing, School of Nursing and Midwifery, Iran University of Medical Sciences, Tehran, Iran.

2. Department of Medical-Surgical Nursing, School of Nursing and Midwifery, Iran University of Medical Sciences and Health Services, Tehran, Iran.

3. Department of Biostatistics, School of Public Health, Iran University of Medical Sciences and Health Services, Tehran, Iran.



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ABSTRACT

Background: Adolescence is a high-risk period. Teenagers experience risky behaviors in this period, including using abusive drugs and addiction. Meanwhile, sufficient awareness helps a person to interpret and analyze health-threatening factors. This study aimed to determine the relationship between health literacy and susceptibility to addiction in adolescents living in the western part of Tehran City, Iran.

Methods: This descriptive-correlational study was performed on 265 senior high school students in the western part of Tehran in 2021. The subjects were recruited by cluster random sampling. The study data were collected online using the addiction susceptibility questionnaire and health literacy measure for adolescents. The obtained data were sorted by frequency distribution, Mean±SD and analyzed utilizing the Pearson correlation coefficient, independent t-test, and analysis of variance in SPSS software, version 16. The significance level was set at 0.05.

Results: Most study subjects (56.4%) were female. Their Mean±SD score of health literacy was 65.31±21.15. Among the subscales of health literacy, “calculation”, with a Mean±SD score of 68.96±35.89, and “utilization”, with 61.29±25.05, had the highest and lowest mean scores, respectively. The Mean±SD score of addiction susceptibility was 25.3±30.05, and among its subscales, “showing off” with a mean score of 33.09±32.64 and “family dissatisfaction” with 19.75±35.47 had the highest and lowest mean scores, respectively. Health literacy and its dimensions had a negative correlation with addiction susceptibility ($P<0.001$).

Conclusion: According to the findings, it is recommended to use appropriate strategies to increase adolescent health literacy by health service providers, school officials, school health nurses, and teachers. The results of this study can be used as a source for further research on addiction and health literacy in adolescents.

*** Corresponding Author:**

Marhamat Farahaninia

Address: Department of Community Health Nursing, School of Nursing and Midwifery, Iran University of Medical Sciences, Tehran, Iran.

Tel: +98 (21) 43651800

E-mail: farahaninia.m@iums.ac.ir

Highlights

- Personal identity is formed during adolescence. Therefore, this group is very vulnerable to substance abuse and risky behaviors.
- Health literacy is one of the factors that gives adolescents a better understanding and shows healthier behaviors in dealing with health-related issues.
- The results of the study showed that although the addiction susceptibility of the adolescents was low, they lacked adequate health literacy.
- Adolescents' health literacy and addiction susceptibility are associated with their gender, level of interest in learning health-related topics, addiction in the family, mother's and father's education and occupation.
- By increasing health literacy and its dimensions in adolescents, their susceptibility to addiction decreases.

Plain Language Summary

Despite the extensive efforts made worldwide to control drugs, the prevalence of drug use continues to increase. Adolescents experience significant emotional, social, cognitive, and biological changes during their teenage years, which may negatively affect their behavioral choices. This study investigated the relationship between health literacy and susceptibility to addiction in senior high school students. The results showed a significant relationship between health literacy and addiction susceptibility; this means that with the rise in health literacy, the tendency to addiction decreases; also, with increasing interest in learning health-related topics, the susceptibility to addiction decreases.

Introduction

Addiction is one of the serious problems of human societies. It incurs significant health costs and requires more attention to adopt effective preventive approaches (WHO, 2020). Unexpectedly, the age of addiction is reduced, and the adolescents' tendency to substance abuse increased, which causes the rapid spread of the addiction phenomenon among this population (Ghanbari et al., 2013).

Addiction has gained a global scope and has become one of the four global crises after environmental degradation, atomic bombs, and poverty (WHO, 2018; Zeighami et al., 2021). No country is immune from the spread of addiction. Drug use has long been considered an antisocial and unacceptable behavior in all human societies, and different social classes are seriously involved with this issue (Moosavyzadeh et al., 2018). This problem has gone beyond medical boundaries and has become a psychological, social, and family problem that affects all aspects of people's lives, families, and society. Despite the extensive efforts that have been made worldwide to control drugs, the prevalence of drug use is still increasing (Cousijn et al., 2018).

Recently, a lot of attention has been paid to understanding how drug use starts and continues in teenagers (Zeinali, 2014). Adolescence is a critical developmental stage in which the likelihood of engaging in risky health-related behaviors increases (Khajouei & Salehi, 2017; Lee & Santiago, 2021). During this period, adolescents experience significant emotional, social, cognitive, and biological changes that affect their behavioral choices, such as the experience of smoking and drinking alcohol. Meanwhile, the use of these substances increases the possibility of using more dangerous drugs (Griffin & Botvin, 2011; Segal et al., 2014). On the other hand, starting to use substances in adolescence increases the probability of their use in later stages of life (Abedi et al., 2019). According to the National Survey on Drug Use and Health (NSDUH) in the United States, approximately 40.3 million people aged 12 or older had a substance use disorder (SUD) in 2020. Also, 28.3 million people struggle with alcohol use, and 18.4 million deal with an illicit drug use disorder (WHO, 2020).

There are no relevant statistics about substance use in Iran; however, the prevalence of addiction in this country has been estimated to rise from 3.7% in 2008 to 5.4% in 2016 (Dargahi & Beiranvand, 2020). According to the data issued by the United Nations Office

on Drugs and Crime (UNODC) in 2017, more than 400 million persons are addicted, accounting for 5% of the world population. Moreover, Iran is the fourth one, with a consumption rate of 1.13 % (Zeighami et al., 2021). Available statistics indicate that 16% of addicts in Iran are under 19 years old (Ghanbari Talab & Foulad Chang, 2015). Given the report issued by Iran's Drug Control Headquarter in 2017, about 2808000 persons in Iran are substance addicts; among them, those aged 15-64 years account for the largest proportion (65%) of substance users and 5.6% of drug addicts started using drugs at the age of 15 (Zeighami et al., 2021).

Adolescence is the second decade of life between childhood and adulthood, from ages 10 to 19. This is a unique time to start good health-related behaviors (WHO, 2020). Adolescence is when a person's relationship with new individuals and the environment in which they live changes dramatically (Saeedy Golluche et al., 2017). In general, the young and adolescent population with special feelings and emotional-psychological needs are easily exposed to dangers such as substance abuse. Since a large part of society is composed of young people, addiction is rapidly expanding among young and adolescent age groups. It has been shown that not all age groups are equally exposed to addiction, but as the age of people increases, the rate of addiction decreases (Sudo & Kuroda, 2017; Fleary et al., 2018; Brandt et al., 2019). Adolescence is a time for personal experiences and choices, and personal identity is formed during this time; therefore, adolescents are very vulnerable to substance abuse and risky behaviors (Hammerslag & Gulley, 2016; Winters et al., 2018).

Addiction susceptibility or vulnerability is somebody's lifetime risk of addiction. Everybody can become a person with a substance use disorder under certain circumstances. However, some people are prone to addiction and become addicted when exposed to drugs (Vassoler & Sadri-Vakili, 2014). It is more likely that adolescents who use drugs experience anxiety, low self-esteem, depression, and other psychological problems. Substance abuse puts adolescents at risk of academic failure and low adjustment. Thus, they lose job opportunities and income in the long run (Ghanbari Talab & Foulad Chang, 2015); Winters et al., 2018). In a society, addiction is like an iceberg, only the tip of which can be seen. What is seen as addiction is only a tiny part of addicts, and the slope of this mountain is hidden (Ahmadian & Rostami, 2016).

Health literacy makes adolescents better understand and show healthier behavior in dealing with their health issues (Fleary et al., 2018). The World Health Organization (WHO) has introduced health literacy as one of

the significant determinants of health (WHO, 2020) that includes individuals' knowledge, motivation, and competencies to access, understand, assess, and apply health information to make better everyday life decisions concerning healthcare, disease prevention, and health promotion and to have a better quality of life (Vozikis et al., 2014; Chu-Ko, 2021). Health literacy refers to interactions between social and individual factors (Mollakhilili et al., 2014). It addresses the concerns and dimensions of literacy in the field of health (Miri et al., 2016). Health literacy is a general framework that depends on the availability of information about risky health behaviors and their consequences (Tavakolikia et al., 2017; Brandt et al., 2019). People with low health literacy have a poorer health status and are less likely to understand written and spoken information provided by health professionals, leading to more hospitalization and higher medical costs (Ghanbari et al., 2017; Chu-Ko et al., 2021).

Evidence on health literacy concepts, such as interest in learning about health, understanding what is heard about health, and trying to follow what is taught about health, shows that health literacy may play an essential role in modulating health behavior in adolescents (Brandt et al., 2019). Consequently, acceptable levels of health literacy can help individuals understand health information and increase engagement with the healthcare system, thereby achieving promising health outcomes in the future (Chu-Ko, 2021). However, the health literacy of the general public in different countries is usually insufficient (Tavousi et al., 2016; Fleary et al., 2018; Mansfield et al., 2018; Reisi et al., 2020; Guo et al., 2020; Chu-Ko et al., 2021).

There is little evidence on health literacy in adolescents, and few studies have examined the relationship between health literacy and health behaviors in adolescents, particularly outside of the United States (Brant et al., 2019). Still, some studies have shown that low health literacy is common among adolescents, ranging from 34% in the United States to 93.7% in China, and is associated with adverse health behaviors (Brandt et al., 2019; Guo et al., 2022). According to a study in Taiwan, approximately 30% of adolescents lack sufficient health literacy or have problems in this regard and cannot properly analyze and evaluate health information (Chu-Ko et al., 2021). In the same way, the studies conducted in Iran have shown that the health literacy of adolescents was insufficient or inappropriate (Ghanbari et al., 2015; Saedi et al., 2016; Saeedy Golluche, 2017; Khajouei & Salehi, 2017). Also, systematic reviews of high school students from 2010 to 2021 showed insufficient health literacy among adolescents (Olyani & Peyman, 2021; Jafari et al., 2021).

Considering the sensitivity of adolescence, the high prevalence of addiction, as well as the increase in unsafe behaviors, and the important role of health literacy among adolescents, this study was conducted to determine the relationship between health literacy and addiction susceptibility among high school adolescents in the western part of Tehran City, Iran.

Materials and Methods

It was a descriptive-correlational study. The research subjects were 275 senior high school students in the west part of Tehran selected by cluster sampling approach in 2021. To determine the required sample size at the confidence level of 95% and the power of the test at 90%, we assumed that the correlation coefficient between health literacy and addiction susceptibility in adolescents is 0.2 so that the relationship between the two variables can be considered statistically significant. After quantification in the Equation 1, the minimum required sample size was estimated to be 265. Finally, considering the possibility of sample attrition and strengthening the statistical power of the tests, the sample size was increased to 275.

$$n = \frac{(z_{1-\alpha/2} + z_{1-\beta})^2}{w^2} + 3$$

$$1. w = \frac{1}{2} \ln \frac{1+r}{1-r}$$

$$n = \frac{(1/96 + 1.28)^2}{(0/2)^2} + 3 = 265$$

First, the necessary permits were obtained from the [Iran University of Medical Sciences \(IUMS\)](#) and the [General Education Administration](#) in Tehran. Then, according to the list of educational districts and high schools in the west part of Tehran, two areas were selected from each district (Districts 2, 5, 6, and 9), and one senior high school was chosen from each district (a total of 8 high schools). Then, 40 students were randomly selected from each school. The inclusion criteria for study subjects were as follows: Being 15-18 years old, lacking hearing and seeing problems based on the students' statements, and using virtual social networks. Due to the COVID-19 pandemic and the closing of schools, the study was done online. With the school director's help, the questionnaires' link was placed in the virtual groups ([WhatsApp](#) or [Telegram](#)) where the students were members. Completed questionnaires were sent to the researcher's email. Incomplete questionnaires were excluded.

The study data were collected using demographic information from the health literacy measure for adolescents (HELMA) and the adolescent addiction susceptibility questionnaire (ASQ-AV).

Demographic information questionnaire included students' age, gender, level of education, TV watching hours per week, amount of internet use per week, interest in health-related topics, and people with addiction in the family. Also, the level of education of parents and the parents' occupation were among the demographic characteristics.

The HELMA was designed and psychometrically evaluated by [Ghanbari et al. \(2016\)](#). This questionnaire contains 44 items in 8 dimensions: Access to health information (5 items), reading (5 items), understanding (10 items), assessment (5 items), using health information or utilization (4 items), communication (8 items), self-efficacy (4 items), and calculation (3 items). It is scored on a 5-point Likert scale, from never=1 to always=5. The sum of the score of the 8 dimensions represents the total health literacy score. In this study, to compare the subscales, the health literacy scores of adolescents were calculated out of 100 and divided into 4 levels: Inadequate (0-50), not very adequate (50.1-66), adequate (66.1-84), and excellent (84.1-100). The reliability of the questionnaire has been confirmed with $\alpha=0.93$, and re-testing of the scale at a 2-week interval indicated adequate stability (ICC=0.93). The Cronbach α coefficient for each dimension is between 0.61 and 0.89 ([Ghanbari et al., 2016](#)). The Cronbach α coefficient of the questionnaire was calculated as 0.98 in this study.

Adolescent addiction susceptibility questionnaire (ASQ-AV) was designed and psychometrically evaluated for the general population by [Zeinali et al, 2011](#), and in 2014 this questionnaire was designed for the adolescent population ([Zeinali, 2014](#)). This questionnaire has 50 questions and 10 subscales, including internal dissatisfaction, risky behaviors, unreliability, showing off, positive thoughts towards drugs, dissatisfaction with family, low spirituality and faith, deviation from the norms, self-centeredness, and risky relationships with friends. In this questionnaire, "yes" answers are scored 1, and "no" answers are scored 0. Higher scores in this questionnaire indicate a higher intensity of addiction susceptibility. Therefore, the closer a person's score is to 50, the more susceptible the person to addiction, and the nearer to 0 indicates a lack of addiction susceptibility. The validity and reliability of ASQ-AV and its subscales were found to be acceptable. The Cronbach α coefficient was estimated to be between 0.68 and 0.83 for subscales

and 0.87 for the whole scale (Zeinali, 2014). In this study, the Cronbach α coefficient of the whole scale was calculated as 0.88.

The obtained data were described via frequency distribution, Mean \pm SD. Then, the Pearson correlation coefficient, independent t-test, analysis of variance, and multiple linear regression model using SPSS software, version 16. The significance level was set at 0.05 for all the tests.

Results

According to the results, 56.4% of the adolescents were female; their Mean \pm SD age was 17.86 \pm 1.03 years. Also, 26.2% declared that there is an addicted person in their family, and 63.9% had an addicted father (Table 1). Most mothers (68.7%) were homemakers, and most fathers (74%) were employed. Also, 46.5% of mothers and 54.9% of fathers had a university education.

The Mean \pm SD score of health literacy was 65.31 \pm 21.15, and among its dimensions, the “calculation” subscale had the highest mean score (68.96 \pm 35.89), and the “utilization” subscale had the lowest mean score (61.29 \pm 25.05) (Table 2). There was a significant relationship between health literacy and gender, level of interest in learning health-related topics, addiction in the family, mother’s education and occupation, and father’s education and occupation ($P<0.001$). Health literacy was also higher in girls and adolescents who lacked an addicted person in their family ($P<0.001$).

The Mean \pm SD score of addiction susceptibility was 25.3 \pm 30.05. “Showing” off subscale, with 33.09 \pm 32.64, had the highest, and “dissatisfaction with the family”, with 19.75 \pm 35.47, had the lowest mean score among other dimensions (Table 3). There was a significant relationship between addiction susceptibility and gender ($P=0.022$), the level of interest in learning health-related topics ($P<0.001$), addiction in the family ($P<0.001$), mother’s education, father’s education and father’s occupation ($P<0.001$), so that addiction susceptibility in boys, and those with an addicted person in their own family was significantly higher than others.

Health literacy and its dimensions had a significant inverse correlation with addiction susceptibility, meaning that with the increase in health literacy and its dimensions, addiction susceptibility decreased (Table 4).

Discussion

This study determined the relationship between health literacy and addiction susceptibility in high school adolescents in the west part of Tehran. The results showed that the Mean \pm SD health literacy score in adolescents is 65.31 \pm 21.15, which is inadequate. Other studies have also demonstrated insufficient or low health literacy in students (Ghanbari et al., 2016; Saeedy Golluche et al., 2017; Khajouei & Salehi, 2017; Mansfield et al., 2018; Karimi et al., 2019; Namdar et al., 2021; Zare-Zardiny, 2021). Chu-Ko et al. (2021) reported that approximately 30% of participants had inadequate or problematic health literacy. Caldwell and Melton’s (2020) study indicates low health literacy among adolescents. Still, Linnebur and Linnebur’s assessment of American adolescents’ health literacy using the newest vital sign questionnaire reveals that two-thirds (62.9%) of the adolescent have an adequate level of health literacy, which is not in line with the results of the present study. Among the reasons for this difference, we can point out the difference in educational curriculum. In American schools, required health education is provided in the seventh and eighth grades. The additional information on reading, interpretation, and practice, using data obtained in school-based health education courses, can positively affect the improvement of adolescents’ health literacy and their development of lifelong health behaviors (Linnebur & Linnebur, 2018). This issue shows the need for more attention from Iran’s education officials on providing health education and improving students’ health literacy. Also, the results of a study on the level of adolescent health literacy in Melbourne and Beijing showed that Melbourne adolescents had a higher level of health literacy than their counterparts in Beijing. This study shows the significant role of cultural context and schools’ educational conditions in adolescents’ health literacy status. According to the school education protocol, students in Melbourne are influenced by the health education skills in their schools. The authors believed that the social environment was also one factor in improving health literacy among the students in Melbourne (Guo et al., 2020).

Our results showed that the “calculation” subscale had the highest and the “utilization” subscale the lowest mean score among other health literacy dimensions; this result was not in line with the study results of Aghamolaei et al. (2016) on high school students, in which the highest mean score of health literacy was related to the “understanding” of health topics and the lowest was “decision making” and “utilization” dimensions. The results of another study on the health literacy of female students using the health literacy for Iranian adults (HELIA)

Table 1. Frequency distribution of demographic characteristics of high school adolescents in the west of Tehran

Variables	No. (%) / Mean \pm SD (Range)	
Sex	Male	120(43.6)
	Female	155(56.4)
	Total	275(100)
School grade	10	78(28.4)
	11	92(33.5)
	12	105(38.2)
	Total	275(100)
TV watching (h)	<1	12(4.4)
	1-2	119(43.3)
	3-4	83(30.2)
	>4	61(22.2)
	Total	275(100)
Internet use (h)	1-2	101(36.7)
	3-4	86(31.3)
	>4	88(32.0)
	Total	275(100)
Interest in learning health-related topics	Almost nothing	15(5.5)
	Slight	34(12.4)
	Partly	89(32.4)
	Much	94(34.2)
	Too much	43(15.6)
Total	275(100)	
Having an addicted person in the family	No	203(73.8)
	Yes	72(26.2)
	Total	275(100)
Addicted person in the family	Myself	5(6.9)
	Father	46(63.9)
	Mother	2(2.8)
	Sister	1(1.4)
	Brother	18(25.0)
	Total	72(100)
Age (y)	16.86 \pm 1.03 (14-19)	

Table 2. Numerical indicators of health literacy of high school adolescents in the west of Tehran

Health Literacy and Its Subscales	Min	Max	Mean±SD	Based on 0-100		
				Min	Max	Mean±SD
Access	0	20	13.17±4.64	0	100	65.85±23.2
Reading	2	20	13.37±4.82	10	100	66.85±24.12
Understanding	3	40	27.17±9.29	7	100	67.92±23.24
Assessment	0	20	12.81±4.69	0	100	64.05±23.48
Utilization	0	16	9.81±4.01	0	100	61.29±25.05
Communication	4	32	20.58±7.26	12	100	64.31±22.69
Self-efficacy	0	16	10.9±3.5	0	100	63.07±21.91
Calculation	0	3	2.06±1.07	0	100	68.96±35.89
Total health literacy	24	167	109.06±35.33	14	100	65.31±21.15

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questionnaire also showed that the highest mean score was related to “understanding” and the lowest was “decision making” and “utilization” (Panahi et al., 2019), which were not matched with the results of the present study. These differences may be due to the differences in the study population and study instrument used for evaluating health literacy. The results of the present study are also not consistent with two other studies on high school adolescents’ health literacy using the HELIA question-

naire, which show that “understanding” had the highest and “calculation” had the lowest mean (Saeedy Golluche et al., 2017; Karimi et al., 2020). Our results are also in contrast with Zare-Zardiny (2021), who reported that the highest mean score was associated with “understanding”, and the lowest was the “assessment” dimensions. In the Chu-Ko et al. (2021) study, the mean score for understanding health information was the highest, and assessing health information was the lowest; however,

Table 3. Numerical indicators of addiction susceptibility of high school adolescents in the west of Tehran

Addiction Susceptibility and Its Subscales	Min	Max	Mean±SD	Based on 0-100		
				Min	Max	Mean±SD
Internal dissatisfaction	0	8	2.1±2.62	0	100	26.31±32.86
Risky behaviors	0	6	1.28±2.14	0	100	21.39±35.73
Unreliability	0	6	1.53±2.06	0	100	25.63±34.47
Showing off	0	5	1.65±1.63	0	100	33.09±32.64
Positive thoughts towards drugs	0	3	0.59±1.1	0	100	19.87±36.7
Dissatisfaction with family	0	3	0.59±1.06	0	100	19.75±35.47
Low faith and spirituality	0	5	1.04±1.61	0	100	20.8±32.38
Deviation from the norms	0	5	1.3±1.67	0	100	26.03±33.56
Self-centeredness	0	4	1.11±1.31	0	100	27.9±32.96
Risky relationships with friends	0	5	1.42±1.58	0	100	28.43±31.76
Total addiction susceptibility	0	48	12.65±15.02	0	96	25.3±30.05

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Table 4. Correlation between health literacy and its subscales with addiction susceptibility of high school adolescents of the west of Tehran

Addiction Susceptibility and Its Subscales	Health Literacy and Its Dimension								
	Access	Reading	Understanding	Assessment	Utilization	Communication	Self-efficacy	Calculation	Total Health Literacy
Internal dissatisfaction	r=0.549 P<0.001	r=0.525 P<0.001	r=0.514 P<0.001	r=0.471 P<0.001	r=0.545 P<0.001	r=0.509 P<0.001	r=0.566 P<0.001	r=0.099 P=0.1	r=0.567 P<0.001
Risky behaviors	r=0.599 P<0.001	r=0.604 P<0.001	r=0.636 P<0.001	r=0.557 P<0.001	r=0.533 P<0.001	r=0.604 P<0.001	r=0.63 P<0.001	r=0.086 P=0.155	r=0.652 P<0.001
Unreliability	r=0.585 P<0.001	r=0.573 P<0.001	r=0.599 P<0.001	r=0.539 P<0.001	r=0.529 P<0.001	r=0.585 P<0.001	r=0.644 P<0.001	r=0.104 P=0.086	r=0.631 P<0.001
Showing off	r=0.511 P<0.001	r=0.454 P<0.001	r=0.454 P<0.001	r=0.442 P<0.001	r=0.532 P<0.001	r=0.489 P<0.001	r=0.513 P<0.001	r=0.09 P=0.136	r=0.522 P<0.001
Positive thoughts towards drugs	r=0.558 P<0.001	r=0.542 P<0.001	r=0.555 P<0.001	r=0.501 P<0.001	r=0.506 P<0.001	r=0.531 P<0.001	r=0.586 P<0.001	r=0.18 P=0.003	r=0.59 P<0.001
Dissatisfaction with family	r=0.561 P<0.001	r=0.561 P<0.001	r=0.586 P<0.001	r=0.522 P<0.001	r=0.499 P<0.001	r=0.53 P<0.001	r=0.594 P<0.001	r=0.08 P=0.183	r=0.601 P<0.001
Low faith and spirituality	r=0.607 P<0.001	r=0.616 P<0.001	r=0.619 P<0.001	r=0.558 P<0.001	r=0.55 P<0.001	r=0.602 P<0.001	r=0.639 P<0.001	r=0.159 P=0.008	r=0.655 P<0.001
Deviation from the norms	r=0.573 P<0.001	r=0.566 P<0.001	r=0.566 P<0.001	r=0.542 P<0.001	r=0.563 P<0.001	r=0.588 P<0.001	r=0.62 P<0.001	r=0.127 P=0.036	r=0.623 P<0.001
Self-centeredness	r=0.505 P<0.001	r=0.492 P<0.001	r=0.519 P<0.001	r=0.471 P<0.001	r=0.521 P<0.001	r=0.508 P<0.001	r=0.585 P<0.001	r=0.116 P=0.054	r=0.558 P<0.001
Risky behaviors with friends	r=0.473 P<0.001	r=0.49 P<0.001	r=0.481 P<0.001	r=0.454 P<0.001	r=0.466 P<0.001	r=0.475 P<0.001	r=0.532 P<0.001	r=0.102 P=0.09	r=0.522 P<0.001
Total addiction susceptibility	r=0.622 P<0.001	r=0.61 P<0.001	r=0.621 P<0.001	r=0.568 P<0.001	r=0.592 P<0.001	r=0.611 P<0.001	r=0.664 P<0.001	r=0.125 P=0.039	r=0.666 P<0.001

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they used the European health literacy survey questionnaire developed for adults. Therefore, it may be difficult for adolescents to understand some of its contents due to lacking enough experience in life.

The results of our study showed that the mean score of health literacy was higher in girls, adolescents interested in learning health-related topics, adolescents with mothers and fathers with university education, working fathers, and retired mothers. Also, the mean score of health literacy was lower in adolescents who had an addicted family member. The reviewed studies show many differences regarding the relationship between demographic variables and health literacy. The results of [Saeedi et al. \(2016\)](#) study indicated that boys had higher health literacy than girls, and health literacy was associated with the level of education, parents' education, source of information, assessment of health status, and interest in learning health-related topics. [Khajouei and Salehi \(2017\)](#) found a significant relationship between health literacy, type of school, family income, and parental education level. Also, girls' health literacy was higher than boys. The results of two other studies also showed a higher level of health literacy among female students ([Budhathoki](#)

[et al., 2019](#); [Klinker et al., 2020](#)). [Paakkari et al. \(2020\)](#), in a comparative study on adolescents' health literacy in Europe, found that girls had higher health literacy than boys, which was in line with the present study's findings. According to [Ran et al. \(2018\)](#), these results have several possible explanations. Female students are more concerned about their health information and have a greater desire to obtain health-related information and refer to families, friends, teachers, and mass media to a greater extent. Also, female students pay more attention to health-related details than males. According to an educational systematic review, among 6 included studies, 5 found a positive relationship between parents' education and adolescents' health literacy. Of 13 studies examining gender, 9 found no relationship between sex and health literacy; 1 found a positive relationship for boys, and 3 found a positive relationship for girls ([Fleary et al., 2018](#)). The results of a study showed that the mean scores of decision-making and use of health information of health literacy dimensions were higher in boys ([Aghamolaei et al., 2016](#)). Another study showed higher health literacy of students with university-educated parents and fathers with a government job, consistent with the present research on educated parents ([Ramezankhani et al., 2020](#)).

According to [Stormacq et al., 2019](#), low socioeconomic status, particularly low educational achievement, is the most important determinant of health literacy ([Stormacq et al., 2019](#)).

According to the results, the mean score of addiction susceptibility was low, which is consistent with other studies among high school adolescents ([Mbanga et al., 2018](#); [Jia et al., 2018](#); [Miri & Miri, 2019](#); [Oshvandi et al., 2020](#); [Namazi et al., 2020](#)). The results of a study on students indicate their high addiction susceptibility (use of cannabis, cocaine, and heroin), which is not consistent with the results of the present study. The authors reported that most students in their research either lived in families with unfavorable socioeconomic status or often faced more stress in their daily lives due to family conditions such as poor housing, unsafe neighborhoods, and inappropriate schools ([Gerra et al., 2020](#)).

“Showing off” and “dissatisfaction with the family” had the highest and lowest mean scores among addiction susceptibility dimensions, respectively. This finding can be justified considering the age range of teenage girls and their desire to attract attention and introduce themselves as a special person to their age group. Other related studies have not mentioned the results of the subscales of addiction susceptibility; therefore, comparison was impossible.

Based on the results, the average addiction susceptibility score was higher in girls, adolescents with low levels or lack of interest in learning health-related subjects, those with an addicted person in the family, adolescents with illiterate parents, and those with stay-at-home mothers and unemployed fathers. The higher mean of addiction susceptibility in girls compared to boys was not predictable and should be considered as a warning sign.

The relationship between demographic variables and adolescents' susceptibility to addiction in existing studies reveals different results. Concerning the factors associated with the family role in drug addiction in young people, results show that having addicted parents or the presence of addicted persons in the family, family disputes and lack of affection in the emotional relationships with the family, parents without skill and proper supervision, improper parenting practices, and parental divorce or separation have had significant effects on drug addiction of the affected and normal adolescents ([Amiri et al., 2015](#)). The results of another study show that male gender, low education level of the parents, and having a history of addiction in one of the family members are associated with more addiction susceptibility of students ([Jalali & Rastineh, 2019](#)). Similar results are also observed in the study by [Baciu \(2019\)](#) among newly

arrived students at Bucharest universities. The results of the [Delgado-Lobete et al. \(2020\)](#) study show that among the demographic factors, only gender has a significant relationship with the degree of drug addiction in students, so Spanish male students are more inclined to drug addiction than girls. The results of three other studies have also reported male gender as a risk factor for drug use ([DelaTorre et al., 2019](#); [Lipperman-Kreda et al., 2019](#); [Rogowska, 2019](#)), which is incongruent with the findings of the current study. Other studies have reported that peer pressure, parental arguments, conflict and tension in the family, working mothers, lack of intimacy between family members, emotional disorders, low self-efficacy, rejection by others, and some personality traits increase the susceptibility to addiction ([Rostami et al., 2018](#); [Rounaghi et al., 2018](#)). Therefore, addiction susceptibility is influenced by many individual, family, and social factors.

The results show a significant negative relationship between health literacy and its dimensions with addiction susceptibility in adolescents. This result is consistent with the results of some other studies ([Degan et al., 2019](#); [Dahlman et al., 2020](#); [Moselman et al., 2021](#); [Rollova et al., 2021](#)). Also, in a systematic review of adolescent health literacy and health behaviors, among the 17 reviewed studies, 13 found a relationship between health literacy and health behaviors ([Fleary et al., 2018](#)). It should be noted that addiction susceptibility is a complex issue with various dimensions. Therefore, it is necessary to carry out more studies on the relationship between health literacy and addiction susceptibility among adolescents.

Conclusion

The results showed that health literacy and its dimensions had a negative association with addiction susceptibility. Considering the adverse consequences of addiction in adolescents and the inverse relationship between health literacy and susceptibility to addiction, it is suggested that health service providers, school nurses, school officials, and teachers provide appropriate educational interventions to increase students' health literacy and provide them with access to correct health information. It is also recommended that the school-based health education programs focus on growing adolescents' interest in learning about health, understanding what they hear about health, and trying to follow what is taught to improve students' health behaviors. In addition, the demographic variables affecting the tendency to addiction should be considered by families and schools. It is suggested that interventional studies be conducted based on the results of the present study.

One of the limitations of this study was the lack of sampling from technical and vocational schools. Consequently, the results of this research cannot be generalized to the students of these schools. The self-reporting method was used in data collection, which could affect the accuracy of the answers. Finally, this study has the specific limitations of cross-sectional studies that do not make cause-and-effect reasoning possible.

Ethical Considerations

Compliance with ethical guidelines

The Ethics Committee of Iran University of Medical Sciences approved the study (Code: IR.IUMS.REC.1400.176). Necessary permits were obtained from the Education Department of the relevant districts and high schools. The students and their parents were assured about the confidentiality of the information, and written informed consent was obtained from them.

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Authors' contributions

Conceptualization: Zohreh Azarang and Marhamat Farahaninia; Methodology: Zohreh Azarang, Marhamat Farahaninia, and Hamid Haghani; Investigation: Zohreh Azarang; Writing: Zohreh Azarang, Marhamat Farahaninia, and Mehri Bozorgnezhad; Supervision: Marhamat Farahaninia.

Conflict of interest

The authors declared no conflict of interest.

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