BMC Medical Education

RESEARCH

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Association between health-promoting lifestyle and electronic health literacy among Iranian university students

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Abstract

Background E-health literacy is the skill of searching, finding, understanding, and evaluating health information from electronic information sources and using this information to diagnose or treat a health disorder. Adequate health literacy results informed decision-making, and reduced health risks. This study aims to investigate the relationship between eHealth literacy and health-promoting behaviors among students at Khalkhal University of Medical Sciences.

Method This descriptive-analytical study was conducted with students who were selected using a census method. Three questionnaires were used: a demographic questionnaire, the Norman and Skinner eHealth literacy questionnaire, and the Walker Health-Promoting Lifestyle Questionnaire. Data were analyzed using SPSS version 26. Pearson correlation coefficients, independent t-tests, and analysis of variance were employed for comparisons. Multiple linear regression models were used to examine the relationship between eHealth literacy and health-promoting lifestyle, adjusting for some demographic variables.

Results A total of 255 participants were included in the study. The mean eHealth literacy score was 25.55 (SD = 6.4), and the mean health-promoting lifestyle score was 127.74 (SD = 23.59). There was a statistically significant difference in eHealth literacy scores based on economic status ($P < 0.004$). Pearson correlation analysis revealed a statistically significant correlation between the total eHealth literacy score and the health-promoting lifestyle score ($r = 0.43$, $p < 0.001$). According to the linear regression model, eHealth literacy significantly predicts health-promoting behaviors ($\beta = 1.63$, $p < 0.001$). Thus, each unit increase in eHealth literacy was associated with a 1.63 unit increase in the health-promoting lifestyle score.

Conclusion The level of eHealth literacy and health-promoting lifestyle are both above moderate. Nevertheless, more work needs to be done to improve eHealth literacy, and health-related behaviors. It is recommended that new educational programs integrated into the curriculum for students including how to search the Internet, introduction to health-related databases, and a lesson on health-promoting behaviors.

Keywords Health-promoting behavior, Lifestyle, eHealth literacy, Students, Iran

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Introduction

A vital component of social development and welfare is ensuring and improving the health of the population, which is recognized as a key aspect of sustainable development [1]. According to the World Health Organization (WHO), health encompasses complete physical, mental, and social well-being, not merely the absence of disease or infirmity. Thus, wellness includes the absence of psychological, economic, social problems, and physical health issues for every individual in society [1, 2]. Lifestyle has a close relationship with individual health. A health-promoting lifestyle involves behaviors that empower individuals to have greater control over their health, ultimately leading to improved community health. Health-promoting lifestyles are classified into six areas: nutrition, physical activity, stress management, interpersonal relations, spiritual growth, and health responsibility [3, 4]. The World Health Organization's statement at the First Global Conference on Healthy Lifestyles in Moscow indicated that 60% of global mortality and 80% of mortality in developing countries is due to unhealthy lifestyles, with the likelihood of this reaching 75% by 2030 [5]. Additionally, according to the WHO, hypertension, tobacco use, diabetes, lack of physical activity, overweight, and obesity are identified as the top five global mortality factors, which can be prevented through lifestyle changes [6]. Engaging in health-promoting behaviors is one of the best ways people can maintain and control their health.

Healthy living, supported by health literacy, leads to an enhanced quality of life. The term health literacy, introduced for the first time in 1974 during a health education panel, refers to cognitive skills essential in health care systems. Since then, this concept has been extensively discussed and defined in various contexts by researchers in literacy and health fields. Generally, health literacy is defined as a broad range of knowledge and skills related to acquiring, processing, understanding, and applying health information [7]. Adequate health literacy among individuals results in outcomes such as increased patient potential, informed decision-making, reduced health risks, improved disease prevention, enhanced safety, better quality of life, and higher quality of care [8–10]. Studies show that low health literacy is associated with adverse health outcomes, harmful health behaviors, lower patient satisfaction, and, in some cases, higher mortality rates. Furthermore, many believe that low health literacy contributes to increased health disparities [11].

The internet has become one of the primary sources of health-related information, allowing users to acquire the necessary knowledge to enhance personal health and prevent diseases. The proliferation of internet and mobile phone usage has made health information accessible to individuals at any time and place [12]. According to Norman and Skinner [13], eHealth literacy can be defined as the capacity to search, access, and analyze health information from electronic sources to address health issues. Additionally, eHealth literacy encompasses the personal skills and competencies required to obtain, communicate, process, and understand basic health information and services needed for making appropriate health decisions [11]. This combined skill requires individuals to be able to work with technology, think critically about media and science issues [13]. Individuals with eHealth literacy skills use web search strategies more effectively and have a higher ability to identify quality health information [14]. Internet users seeking health information look for specific topics, informational recommendations, information about preparing for surgery and post-surgery recovery, advice and guidance from other patients regarding symptoms, emotional support, and documenting adverse situations [15].

Students are considered an active and prominent segment of society. Students not only constitute the main part of the experts in various fields of every country, but also are the main managers in the future of every country and guiding it towards growth and perfection [16]. A proper lifestyle among this group can significantly impact learning, awareness, and academic success. Students with a healthier lifestyle are likely to exhibit greater flexibility and resilience in facing challenges [17]. According to the Statistical Center of Iran, the total number of students studying in Iran is over 3 million, which indicates that students constitute a significant part of the society. They are in contact with various groups such as family, friends, professors, classmates, etc., and their level of information and literacy can be reflected in these relationships. They can be health ambassadors in families and, with sufficient health literacy, contribute to the balanced flow of health information in the society [18]. Today, due to the abundance of health education available on the Internet and in cyberspace, students are faced with a vast amount of both true and false information. In order for students to obtain the correct information, they must first know how to extract this information and secondly, distinguish correct information from false information [19].

Studies conducted worldwide show that individuals aged 15–34, which includes most students, are more exposed to risky behaviors such as smoking, alcohol consumption, inappropriate sexual behaviors, and poor dietary habits [20, 21]. Research on the health-promoting lifestyle of students in Iran indicates that they are not in an optimal condition [22]. However, there is evidence that higher eHealth literacy is associated with a higher average of healthy lifestyle behaviors. In a study conducted among Turkish students, the average eHealth literacy score was above the moderate level, while the

average healthy lifestyle behavior score was at a moderate level. These scores varied depending on the academic year and faculty. Moreover, higher eHealth literacy was associated with more health-promoting behaviors [23]. A survey of Iranian medical students showed that better general health was associated with higher eHealth literacy. Students' eHealth literacy had a significant and inverse correlation with the depression subscale [11]. The results of a study on Jordanian students showed that participants had good health behaviors in terms of exercise, breakfast eating, smoking status, and sleep status. The mean eHealth literacy score was 16.6 out of 40, indicating an inadequate level based on the study scales. A statistically significant association was found between eHealth literacy and exercise performance [24]. A study of Filipino nursing students was also in line with previous studies. This study showed that eHealth literacy had a significant relationship with students' health promoting behavior [25].

As mentioned, the internet has become one of the primary sources of health-related information, allowing users to search for ways to improve personal health and prevent diseases. A significant number of internet users are students [26]. Due to their educational conditions, students in the medical sciences department are more at risk of general health damage and mental disorders than students in other groups. It is due to the presence of stressors such as the clinical educational environment, dealing with patients, the mental and emotional pressures of the clinic and hospital environment, and the complexity of the courses [27]. One way to promote a healthy lifestyle and health-promoting behaviors is to improve health literacy. Despite this, health literacy and health-promoting behaviors have mainly been studied among patients in Iran. Given the importance and role of the virtual space and the internet in fostering health-promoting behaviors, and creating a healthy lifestyle, and considering that the primary users of the internet are young people and students, this study aims to investigate the relationship between eHealth literacy and health-promoting lifestyle among students at Khalkhal University of Medical Sciences. We hypothesized that high eHealth literacy is associated with a better health-promoting lifestyle. Our other assumption was that individual variables affect the level of health-promoting lifestyle. The study had three objectives:

1. To determine the eHealth literacy score and health-promoting lifestyle score among the participants.
2. To explore the relationship between demographic variables and eHealth literacy scores and health-promoting lifestyle scores.
3. To assess the predictive power of eHealth literacy on health-promoting behaviors.

Materials and methods

Study design

This descriptive-analytical study was designed and conducted to examine eHealth literacy and health-promoting lifestyle among students at Khalkhal University of Medical Sciences from March to May 2024.

Participants

The study population consisted of all students from various fields at Khalkhal University of Medical Sciences (318 individuals), who were studied using a census method. Students studying in one of the fields of study at this university were included in the study. Students who were unwilling to participate in the study and guest students from other universities were excluded from the study.

Data collection method

Following the approval and final registration of the proposal and obtaining permission from the ethics committee, the questionnaires were completed. First, participants were provided with explanations about the study's objectives, and then they were given the questionnaires to complete.

Tools

Three questionnaires were used in this study:

- Demographic Questionnaire: This questionnaire included components such as age, gender, marital status, field of study, academic term, place of residence, residency status in Khalkhal, economic status, and parental education levels.
- eHealth Literacy Questionnaire: To assess students' eHealth literacy, the Norman and Skinner eHealth Literacy Questionnaire [13], designed in 2006, was used. This questionnaire consists of 8 components. Participants indicated their agreement with the questionnaire items on a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5). Scores ranged from 8 to 40, with a score above 32 indicating high eHealth literacy. In main study, item analysis was performed on the 8-item, producing a tight-fitting scale with $\alpha = 0.88$. Principal components analysis produced a single factor solution (56% of variance) [13]. The validity and reliability of the Farsi version of this questionnaire were confirmed in a study by Bazm et al., with factor loadings ranging from 0.723 to 0.862. Additionally, Cronbach's alpha coefficient was acceptable (alpha = 0.88, $p < 0.001$) [28]. The reliability coefficient (Cronbach's α) for this tool was 0.9 in present study.
- The third questionnaire is the Walker Health-Promoting Lifestyle Profile. Designed by Walker et al. [29], it consists of 52 questions. This tool measures

health-promoting behaviors across six dimensions: Nutrition: Assessing dietary patterns and food choices with 9 questions. Physical activity: Evaluating regular exercise patterns with 8 questions. Health responsibility: Evaluating personal responsibility for health with 9 questions. Stress Management: Identifying stress sources and management strategies with 8 questions. Interpersonal relations: Maintaining relationships and feelings of closeness with 9 questions. Spiritual growth: Feeling purposeful, seeking personal growth, self-awareness, and satisfaction with 9 questions.

- Participants are asked to indicate how often they engage in specific health-promoting behaviors on a 4-point Likert scale (Never (1), Sometimes (2), Often (3), and Usually (4)). The overall score for this tool ranges from 52 to 208, with higher scores indicating a healthier lifestyle. Walker and Hill-Polerecky reported a Cronbach's alpha of 0.94 for the tool and between 0.79 and 0.94 for its six subscales [30]. In Iran, the validity and reliability of the questionnaire were assessed by Mohammadi Zeydi et al. (2011) [31]. The reliability, measured by Cronbach's alpha, was found to be 0.82 for the entire questionnaire, with subscale values of 0.81 for Nutrition, 0.79 for Physical activity, 0.86 for Health responsibility, 0.91 for Stress Management, 0.75 for Interpersonal relations, 0.64 for Spiritual growth, and 0.82 for the total questionnaire. The reliability coefficient (Cronbach's α) for this tool was 0.9 in present study.

Data analysis method

Data analysis was conducted using SPSS version 26. Descriptive statistics (frequency, percentage, mean, and standard deviation) were used to provide statistics on health-promoting lifestyle scores and eHealth literacy based on demographic variables. Then, the normality of the data distribution was examined with the Shapiro-Wilk test. Also, by examining the skewness and kurtosis (between −2 and +2) and drawing a histogram, the variables under study were considered normal. Therefore, parametric tests were used. Pearson correlation coefficients were used to examine the relationships between eHealth literacy, and health-promoting lifestyle and its dimensions. Independent t-tests and analysis of variance (ANOVA) were used for comparisons. Multiple linear regression models were also employed to investigate the relationship between eHealth literacy and health-promoting lifestyle and its dimensions, adjusting for certain demographic variables.

Results

Out of 318 students, 255 expressed willingness to participate in the study (80.18%). Among the participants, 60.23% were women. More than 90% of the students were single. The majority of the participants were nursing students (43.47%). Most participants were in their second semester (30.89%). A significant portion of the participants were rural and non-local students (85.94% and 91.96%, respectively). About 69.87% of the samples were in a moderate economic status. The average age of the participants was 21.79 (SD = 2.18). According to the ANOVA test, the mean eHealth literacy score among participants varied by economic status, and this difference was statistically significant ($P < 0.004$). Participant characteristics are detailed in Table 1.

The overall eHealth literacy score was 25.55 (SD = 6.4), indicating a moderate level of eHealth literacy. Among the questions in this questionnaire, the question "Familiarity with using the Internet to answer health questions" received the highest score with a mean of 3.35 (SD = 0.97). Also, the question "Level of trust in health information available on the Internet" had the lowest mean (Mean = 3.13, SD = 1.05). The overall health-promoting lifestyle score was 127.74 (SD = 23.59), which was above moderate. Among the dimensions, the highest score was for spiritual growth (26.86, SD = 5.55) and the lowest score was for physical activity (18.27, SD = 5.24). Among the questions in this questionnaire, the question "I strive to achieve my long-term life goals" received the highest score with a mean of 2.86 (SD = 0.83). Also, the question "I spend my free time doing physical activities" had the lowest mean (Mean = 2.22, SD = 0.98). Scores for the studied variables and Cronbach's alpha by dimension are detailed in Table 2.

Based on Pearson correlation, a significant statistical correlation was found between the total eHealth literacy score and the health-promoting lifestyle score ($r = 0.43$, $p < 0.001$). Significant statistical correlations were also found between the eHealth literacy score and all dimensions of the health-promoting lifestyle (Table 3).

According to Table 4, there is a significant statistical relationship between overall eHealth literacy and overall health-promoting lifestyle adjusting sex, marital status, residence, residence (education place), economic situation, and age ($P < 0.001$). For each unit increase in eHealth literacy, the health-promoting lifestyle score increased by 1.63 units. Significant statistical relationship was found between eHealth literacy and all dimensions of the health-promoting lifestyle ($P < 0.001$), with the highest relationship in stress management. For each unit increase in eHealth literacy, the stress management score increased by 0.31 units.

Table 1 General characteristics of participants (*N* = 255)

Variable		*N* (%)	Electronic Health literacy (Mean (SD*))	Health-promoting lifestyle (Mean (SD))	*P*-value**	*P*-value***
Gender	Female	153(60.23)	25.93(5.70)	126.91(24.06)	0.25	0.49
	Male	101(39.77)	24.99(7.34)	128.99(22.93)		
Marital status	Single	233(93.20)	25.64(6.36)	127.33(23.28)	0.74	0.33
	Married	17(6.80)	25.11(6.74)	133.11(28.9)		
Field	Nursing	110(43.47)	25.61(6.96)	130.26(21.21)	0.18	0.1
	Public Health	45(17.78)	26(5.70)	120.24(24.62)		
	Environment Health	40(15.81)	23.62(5.85)	124.65(29.27)		
	Nutrition Sciences	40(15.81)	27.05(5.65)	130.41(23.96)		
	Health Information Technology	17(6.71)	26.05(5.70)	133(16.74)		
Term	2	76(30.89)	25.85(6.39)	128.56(19.05)	0.37	0.18
	4	71(28.86)	26.39(6.34)	131.01(21.44)		
	6	48(19.51)	24.39(6.91)	121.45(27.20)		
	8	51(20.73)	23.62(5.85)	127.39(28.28)		
Residence	Rural	214(85.94)	25.74(6.03)	128.77(22.67)	0.92	0.85
	Urban	35(15.06)	25.85(7.62)	127.99(23.43)		
Residence (education place)	Native	22(8.04)	24.9(6.24)	131.72(25.02)	0.56	0.41
	None-native	229(91.96)	25.72(6.38)	127.35(23.60)		
Economic situation	Weak	22(8.83)	22.59(7.72)	128.18(25.75)	0.004	0.84
	Moderate	174(69.87)	25.48(6.17)	127.2(24.63)		
	Good	53(21.28)	27.75(5.86)	129.38(19.96)		
Mother's education	Illiterate	24(9.56)	23(6.25)	119.2(14.45)	0.09	0.12
	Under diploma	69(27.49)	25.27(5.85)	125.02(23.88)		
	Diploma	90(35.85)	25.92(6.78)	130.13(23.56)		
	Academic education	68(27.09)	26.67(6.12)	129.38(19.96)		
Father's education	Illiterate	12(4.80)	24.08(7.22)	113(27.38)	0.17	0.14
	Under diploma	53(21.20)	24.47(5.66)	130.37(18.66)		
	Diploma	89(35.60)	25.58(6.48)	128.39(24.75)		
	Academic education	96(38.40)	26.64(6.43)	127.67(24.47)		

* standard deviation ** Electronic Health literacy *** Health-promoting lifestyle

The mean eHealth literacy score among participants varied by economic status, and this difference was statistically significant ($P < 0.004$)

Table 2 The scores of eHealth literacy and health-promoting lifestyle

Variable		Mean (SD)	Median	Minimum	Maximum	Cronbach's alpha
Electronic health literacy		25.55(6.40)	26	8	40	0.9
Health-promoting lifestyle	Nutrition	21.66(5.25)	22	3	36	0.93
	Physical activity (exercise)	18.27(5.24)	19	1	32	0.9
	Health responsibility	22.02(4.78)	22	5	36	0.9
	Stress management	21.18(5.26)	21	1	36	0.9
	Interpersonal relations/support	22.77(5.05)	23	2	36	0.89
	Spiritual growth (self-actualization)	26.86(5.55)	27	1	40	0.89
Total		127.74(23.59)	127	46	208	0.9

The overall eHealth literacy and health-promoting lifestyle scores were above moderate

Discussion

Given the key role of medical students in providing information related to lifestyle to patients and the general community, their lifestyle in terms of health promotion is a significant concern. Additionally, students are considered a country's workforce and valuable resource, making their lifestyle increasingly noteworthy. This study aimed to examine the status of health-promoting lifestyles and their relationship with eHealth literacy among medical students in the northwest region of Iran. The results indicate that both items under review were above moderate.

In this study, the overall health-promoting lifestyle score was above the moderate level. Among the dimensions, the highest score was for spiritual growth, while the lowest score was for physical activity. In a study

Table 3 Pearson correlation between study variables

Variable		Health-promoting lifestyle							Electronic health literacy
		Nutrition	Physical activity	Health responsibility	Stress management	Interpersonal support	Self-actualization	Total Health-promoting lifestyle	
Health-promoting lifestyle	Nutrition	$r=1$	$r=0.65^*$ $p<0.001$	$r=0.57^*$ $p<0.001$	$r=0.67^*$ $p<0.001$	$r=0.41^*$ $p<0.001$	$r=0.41^*$ $p<0.001$	$r=0.78^*$ $p<0.001$	$r=0.26^*$ $p<0.001$
	Physical activity	$r=0.65^*$ $p<0.001$	$r=1$	$r=0.62^*$ $p<0.001$	$r=0.69^*$ $p<0.001$	$r=0.46^*$ $p<0.001$	$r=0.38^*$ $p<0.001$	$r=0.81^*$ $p<0.001$	$r=0.23^*$ $p<0.001$
	Health responsibility	$r=0.57^*$ $p<0.001$	$r=0.62^*$ $p<0.001$	$r=1$	$r=0.62^*$ $p<0.001$	$r=0.53^*$ $p<0.001$	$r=0.48^*$ $p<0.001$	$r=0.81^*$ $p<0.001$	$r=0.4^*$ $p<0.001$
	Stress management	$r=0.67$ $p<0.001$	$r=0.69^*$ $p<0.001$	$r=0.62^*$ $p<0.001$	$r=1$	$r=0.65^*$ $p<0.001$	$r=0.48^*$ $p<0.001$	$r=0.86^*$ $p<0.001$	$r=0.37^*$ $p<0.001$
	Interpersonal support	$r=0.41^*$ $p<0.001$	$r=0.46^*$ $p<0.001$	$r=0.53^*$ $p<0.001$	$r=0.65^*$ $p<0.001$	$r=1$	$r=0.47^*$ $p<0.001$	$r=0.73^*$ $p<0.001$	$r=0.40^*$ $p<0.001$
	Self-actualization	$r=0.41^*$ $p<0.001$	$r=0.38^*$ $p<0.001$	$r=0.48^*$ $p<0.001$	$r=0.48^*$ $p<0.001$	$r=0.47^*$ $p<0.001$	$r=1$	$r=0.69^*$ $p<0.001$	$r=0.40^*$ $p<0.001$
	Total Health-promoting lifestyle	$r=0.78^*$ $p<0.001$	$r=0.81^*$ $p<0.001$	$r=0.81^*$ $p<0.001$	$r=0.86^*$ $p<0.001$	$r=0.73^*$ $p<0.001$	$r=0.69^*$ $p<0.001$	$r=1$	$r=0.43^*$ $p<0.001$

*$P<0.05$

Based on Pearson correlation, a significant statistical correlation was found between the total eHealth literacy score and the health-promoting lifestyle score

conducted by Soleymani Moghadam et al. on students at Gonabad University of Medical Sciences, the results showed that, contrary to this study, students had a low health-promoting lifestyle. However, similarly, the highest scores were in the dimensions of spiritual growth, and interpersonal relations, while the lowest scores were in physical activity [32]. In a study by Rezaian et al. at Rafsanjan University of Medical Sciences, results showed that the overall score for health-promoting behaviors among the students was in the middle range unlike the present study. The highest scores were in the spiritual growth spiritual growth section, and the lowest scores were in stress management. A statistically significant relationship was found between the overall health-promoting behaviors score and variables such as marital status and academic level [33].

Two studies found results inconsistent with the present study. Asadi et al. reported that the status of health-promoting lifestyle among nursing students at Ardabil School of Nursing and Midwifery was at a lower-to-average level. Significant relationships were found between dimensions such as spiritual growth, responsibility, stress management, nutrition, and physical activity with gender. The lowest average was in stress management, while the highest score was in responsibility [17]. Dan-Ping's study showed that health-promoting lifestyles among both groups of Taiwanese students, those studying health-related and non-health-related fields, were not at an optimal level. However, students in health-related fields had a better status. Differences based on gender, physical activity, and income were also found among students [34]. It appears that the status of health-promoting lifestyles is not very favorable, especially among medical students where higher scores were expected. On the other hand, in the current study, no differences in health-promoting lifestyle scores were found based on demographic variables, given the uniformity in cultural level, age group, educational level, and other factors. Another point that was evident in the present study and Iranian studies was the high score on the spiritual growth dimension. Perhaps the dominance of Islamic values and attention to spiritual issues is the reason for the higher score on the spiritual growth dimension in the Islamic Republic of Iran.

The overall eHealth literacy score among students indicated a slightly above moderate level of eHealth literacy. There was a difference in eHealth literacy scores among participants based on economic status. Similarly, Isa Zadeh et al. found that the eHealth literacy level among students at a military medical university was moderate. In their study, there was a significant and direct relationship between eHealth literacy and the students' age. Moreover, there was also a significant and direct relationship between eHealth literacy and the year of study [11].

Table 4 Multiple linear regression models adjusted for confounders

Variable		Sex		Marital status		Residence		Residence (education place)		Economic situation			Age	Electronic Health literally
		Female	Male	Single	Married	Urban	Rural	Native	None-native	Weak	Moderate	Good		
Nutrition	B*	-0.93	Ref	-3.34	Ref	0.98	Ref	1.05	Ref	1.68	0.15	Ref	-0.02	0.24
	P**	0.18	Ref	0.02	Ref	0.31	Ref	0.40	Ref	0.21	0.85	Ref	0.86	< 0.001
	CI***	-2.33,0.45	Ref	-6.17, -0.51	Ref	-0.93, -2.89	Ref	-1.41,3.52	Ref	-0.98,4.35	-1.53,1.84	Ref	-0.35,0.29	-0.007, 0.03
Physical activity	β	-2.17	Ref	-1.59	Ref	0.80	Ref	2.93	Ref	0.30	0.76	Ref	0.05	0.23
	P	0.002	Ref	0.26	Ref	0.40	Ref	0.02	Ref	0.02	0.37	Ref	0.75	< 0.001
	CI	-3.56, -0.78	Ref	-4.42,1.22	Ref	-1.1,2.71	Ref	0.46–5.4	Ref	0.33,5.66	-0.91,2.45	Ref	-0.26,0.37	0.13,0.34
Health responsibility	β	-0.58	Ref	-1.86	Ref	0.19	Ref	-0.37	Ref	1.52	1.58	Ref	-0.02	0.29
	P	0.34	Ref	0.13	Ref	0.81	Ref	0.72	Ref	0.19	0.03	Ref	0.88	< 0.001
	CI	-1.79,0.62	Ref	-4.31,0.58	Ref	-1.46,1.85	Ref	-2.51,1.76	Ref	-0.79,3.83	0.11,3.04	Ref	-3,0.25	0.19,0.38
Stress management	β	-0.46	Ref	-1.72	Ref	-0.51	Ref	1.18	Ref	2.64	0.12	Ref	-0.07	0.31
	P	0.50	Ref	0.22	Ref	0.59	Ref	0.33	Ref	0.04	0.88	Ref	0.64	< 0.001
	CI	-1.84,0.9	Ref	-4.52, 1.04	Ref	-2.29,1.36	Ref	-1.24,3.62	Ref	0.01,5.27	-1.53,1.79	Ref	-0.39-0.24	0.21,0.42
Interpersonal support	β	0.54	Ref	0.60	Ref	-0.43	Ref	0.72	Ref	2.5	0.9	Ref	-0.32	0.28
	P	0.42	Ref	0.66	Ref	0.64	Ref	0.54	Ref	0.11	0.27	Ref	0.04	< 0.001
	CI	-0.78,1.88	Ref	-2.11,3.31	Ref	-2.26,1.39	Ref	-1.64,3.09	Ref	-0.5,4.61	-0.7,2.52	Ref	-0.63,-0.13	0.18,0.38
Self-actualization	β	-0.11	Ref	0.39	Ref	-0.43	Ref	0.72	Ref	2.05	0.90	Ref	-0.32	0.28
	P	0.87	Ref	0.78	Ref	0.64	Ref	0.54	Ref	0.11	0.27	Ref	0.04	< 0.001
	CI	-1.55,1.31	Ref	-2.51,3.31	Ref	-2.26,1.39	Ref	-1.64,3.09	Ref	-0.5-4.61	-0.7,2.52	Ref	-0.62,-0.13	0.18,0.38
Total Health-promoting lifestyle	β	-3.64	Ref	-7.04	Ref	0.62	Ref	7.44	Ref	9.54	3.75	Ref	-0.44	1.63
	P	0.23	Ref	0.25	Ref	0.88	Ref	0.17	Ref	0.1	0.31	Ref	0.52	< 0.001
	CI	-9.66,2.37	Ref	-19.27,5.19	Ref	-763,8.87	Ref	-3.22,18.12	Ref	-1.98,21.08	-3.54,11.05	Ref	-1.83,0.94	1.16,2.10

*Regression coefficient ** P-value *** Confidence interval

Based on Table 4, a significant statistical relationship was found between eHealth literacy and all dimensions of the health-promoting lifestyle

Another similar study by Ghazi Mir Saeed and Ghaemi Zadeh among graduate students at Tehran University of Medical Sciences, the mean eHealth literacy score of the sample was above the moderate according to a one-sample t-test. Additionally, there was a significant difference in eHealth literacy levels between master's and doctoral students, but no significant difference was found in eHealth literacy between male and female students [35]. One point that was identified in this study, and which is also culturally true in different parts of Iran, is that economic status is associated with purchasing an internet access device, greater presence in cyberspace and internet sites, and increased eHealth literacy.

The study by Dastani et al. among students at Gonabad University of Medical Sciences showed that 45.1% of students had moderate eHealth literacy, 31.6% had good eHealth literacy, and 9.1% had very good eHealth literacy. Additionally, 12.3% of students were in a weak status and 1.9% were in a very weak status. There was no significant level of difference in eHealth literacy between different faculties [26]. In a systematic review conducted by Estrela et al., the results indicated that age negatively impacted digital health literacy, especially among older individuals. Gender did not have a statistically significant impact across the included studies. Higher education levels, higher income, and social support had a positive effect on digital health literacy [36]. Similarly, in the present study, higher economic status was associated with higher eHealth literacy levels. The use of the Internet and e-learning resources in Iran has made great progress compared to other countries in the region, especially after the coronavirus pandemic, which created an opportunity for the Iranian university and school education system to encourage students to use the capabilities of the Internet and cyberspace and to provide the necessary infrastructure.

In the present study, based on the linear regression model, there was a statistically significant relationship between overall eHealth literacy and overall health-promoting lifestyle. For each unit increase in eHealth literacy, the health-promoting lifestyle score increased by 1.63 units. A statistically significant relationship was also found between eHealth literacy and all dimensions of a health-promoting lifestyle. In line with the present study, Kim et al., in a systematic review and meta-analysis, reported that out of 29 studies, 22 demonstrated a positive relationship between eHealth literacy and health-related behaviors. The overall estimated correlation between eHealth literacy and health-related behaviors indicated a moderate correlation [37]. In the study by Ghazi Mir Saeed and Ghaemi Zadeh, better general health was associated with higher eHealth literacy, and eHealth literacy had a significant inverse correlation with depression [35].

Kim et al. found that eHealth literacy had a significant direct effect on health-promoting behaviors through three mediators among nursing students. Additionally, the overall model explained 46% of the total variance in health-promoting behaviors [38]. Turan et al., in their study on Turkish students, found that higher eHealth literacy was associated with higher levels of healthy lifestyle behaviors among students. The results indicated that eHealth literacy is an important parameter in promoting healthy lifestyle behaviors among nursing students [39].

It appears that a higher level of eHealth literacy positively impacts the choice of a healthy lifestyle among students. Individuals may increase control over their health and promote a healthy lifestyle through eHealth literacy. In fact, people are exposed to a wealth of health information through the Internet. Using useful information influences the choice of health-promoting behaviors. This requires informed decision-making, which requires that individuals be able to access, understand, and process sufficient health information to meet their needs. On the other hand, other conditions are also involved. First, the required hardware and software must be available. Second, the internet speed must be appropriate. The student must also be proficient in using a computer and searching the internet. Most importantly, he/she must have the time necessary to access quality information. University officials can introduce and promote health-promoting behaviors and encourage students to spread information in this field. Incorporating eHealth interventions into health education programs, developing mobile health applications, and using social media platforms for health promotion, may be useful. Developing Internet search skills and introducing health-related databases can also be included in curriculums.

Strengths and limitations

This study is one of the few studies that investigate the impact of e-health literacy on health promoting lifestyle among students. Nevertheless, the study was carried out in one university of the country and on a limited population. To enhance the generalizability of findings, recruiting a larger and more diverse participant pool is crucial. Other potential limitations included self-report bias, use of a single cross-sectional design, and lack of longitudinal data to examine changes over time.

Conclusion

In this study, the levels of eHealth literacy and health-promoting lifestyle were found to be above moderate. As eHealth literacy increases, so does the health-promoting lifestyle. It seems that understanding the relationship between e-health literacy and public health can provide useful information to policymakers and health planners to promote public health and improve students' health

literacy. The results of the study revealed that eHealth literacy can be integrated into health education programs. It is recommended that educational courses be added to the curriculum to enhance eHealth literacy, and that health-related applications be taught in a targeted manner. New educational programs can be integrated into the curriculum for students including how to search the Internet, introduction to health-related databases, and a lesson on health-promoting behaviors. Future research can be done to include students from other professions. Also, interventions can be designed to promote eHealth literacy or improve health-related behaviors, and the results of these interventions can be monitored over time.

Clinical implication

This study provided useful information about health promoting behaviors and eHealth literacy among students, which policymakers can consider to adjust future educational programs and promote health-promoting behaviors in this population.

Acknowledgements
The authors would like to thank the Student Research Committee of Khalkhal University of Medical Sciences for approval and support. Special thanks are extended to all participating students.

Author contributions
Authors' contributionsStudy design: YM, and HM; Data collection: SM, MT, and AA; Data analyzing: PS; Setting tables: SM, and MT; Preparing the original draft of the manuscript: YM, PS, and AA; Manuscript writing: all authors have read, edit, and approved the final manuscript.

Funding
This project was supported by Khalkhal University of Medical Sciences (project code: IR-KHS-1402-06-62).

Data availability
Availability of data and materials: The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
The research has approved by ethics committee of the Khalkhal University of Medical Sciences. The number of ethical code (IR.KHALUMS.REC.1402.013) allocated to it. Written informed consent was obtained from each participant before starting to complete the questionnaire. This method of consent was also approved by the relevant Institutional Review Board (Ethics Committee of Khalkhal University of Medical Science). Privacy and confidentiality of subjects were maintained. Moreover, the participants' data were kept confidential and only accessible to the main study investigators. Anonymized data was used for statistical analyses. Participants had the freedom to skip questions or stop answering at any time. The study was conducted by the Declaration of Helsinki, national guidelines, and laws.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Clinical trial number
Not applicable.

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Received: 30 August 2024 / Accepted: 4 February 2025
Published online: 15 February 2025

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