Article

Predictors of eHealth Literacy Among Turkish Adolesents: Perspectives from Preventive Health Practices And Health Promotion Activities

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Abstract: Objective: This study aimed to determine impact of eHealth literacy on health promotion activities and preventive health practice among adolescents.

Methods: This cross-sectional study was conducted between March and May 2022 with 706 adolescents in Çorum, Turkey. A face to face questionnaire form including socio demographic characteristics, preventive health practices, eHealth Literacy scale and Adolescent Health Promotion Scale were used. The data of the research were analyzed with the SPSS 22.0 program. Percentage, mean, Pearson Correlation analysis and multiple regression analysis were used in the analyzes. The $p<0.05$ value was considered statistically significant in the evaluations.

Results: In the study, 55.8% were female and the mean age of the whole group was 16.09±2.63 years. The mean score of eHealth Literacy scale was 29.40±6.29. The mean of the total scores obtained from the Adolescent Health Promotion Scale was 137.97±21.87. Among the adolescents 96.0% didn't use alcohol and 81% didn't smoke. The rate of annual weight measure was 68.8%. Measurements of annual blood pressure, annual blood iron, annual cholesterol, annual dental examination and regular exercise rate were below 50%. There was a significant positive correlation between eHealth literacy and the Adolescent Health Promotion Scale ($p<0.001$). Multiple linear regression analysis was performed to predict eHealth literacy using the variables of Adolescent Health Promotion and preventive health practices. eHealth literacy was positively and significantly predicts health promotion behaviors ($\beta= 0.27$, $t (695)= 7.54$, $p<0.001$). eHealth literacy increased annual weight measurement by more than 0.13 ($\beta=0.13$), the annual blood iron measurement by more than 0.16 ($\beta=0.16$), annual dental examination by more than 0.11 ($\beta=0.11$).

Conclusions: Adolescents ehealth literacy was high and effected via health promotion activities and preventive health practices. Developing eHealth litracy interventions will be important for environments with a high concentration of adolescents (schools, courses). Also, primary health care services should be entegrated with school environment.

Keywords: Adolescents; eHealth; health promotion; healthy lifestyle; preventive health

1. Introduction

General health status and health behaviors of adolescents have been closely monitored in recent years [1-3]. It is estimated that adolescents comprise one-sixth of the world's population. In this well-known healthy phase of life, one million adolescents die each year from illness and injuries [4]. Smoking, obesity, insufficient physical activity, heavy episodic dirnking are main the risk factors for adolescents [5]. The common denominator in these factors are that most adolescent morbidity and mortality is related to individual behaviors and, as such, is preventable [6].

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Adolescent health and well-being are dynamic. During this phase, most habits detrimental to health are acquired and manifest health problems in adulthood, adding an avoidable financial burden to the health systems. To ensure good health, daily needs must be met by health promotion, prevention of disease and access to preventive, curative and rehabilitative services. It is also important to foster healthy behaviour, such as physical activity, health literacy and support for emotional well-being [6,7].

The development of digital media and communication technology has increased access to health-related information through the internet. Today, by returning from the traditional ways of acquiring health-related information, electronic health information resources have been transferred via the internet. Health literacy, a concept preceding eHealth literacy, is shown to be closely associated with health-related factors, such as health behavior, disease management, and quality of life, infection control in various studies. In recent years, health literacy has been a center of attraction on health improvement focus [8,9]. Accordingly, eHealth literacy—the ability to seek, find, understand, and appraise health information from electronic sources and apply the knowledge gained for addressing or solving a health problem [10] has been adopted as an integral part of healthy life activities and general health in the community as well as adolescents [11,12]. E-health literacy is considered essential for improving healthcare delivery and quality of care as well [13,14].

Adolescents, who are called the digital natives of the digital age, use the internet skillfully and widely [15]. The most researched health information on the internet is about daily health problems [16], physical well-being [17], mental health [16], social problems [18]. All these evidences reveal that adolescents do not have problems in accessing health-related information, but they are insufficient to meet their needs for medical care.

Investment on the health of adolescents in the community means investment the healthy adults of the future. All these evidences reveal that adolescents do not have problems in accessing health-related information, but they are insufficient to meet their needs for medical care. Adolescents should be encouraged to use primary care services. Recommended clinical preventive health practices for adolescents were immunizations, screening tests and councelling services. Recommended screenings for adolescents include measuring height and weight, blood pressure, vision and hearing, and screening for high cholesterol, anemia and tuberculosis etc. [19]. Considering all of this evidence, it seems that there is a general belief that adolescents constitute the healthy segment of society and preventive health care practices are often disregarded. No previous study has investigated trifurcating joint of eHealth literacy, health promotion activites and preventive health care practices among adults.

The aim of the this study was to determine the predictors of eHealth literacy via health promoting activities and preventive health practices among Turkish adolescents.

Research questions investigated in this study were:

1.What is the level of eHealth literacy of adolescents?

2.What is the level of health promotion activities of adolescents?

3.What is the rate of preventive health practices among adolescents?

4.Is there any relationship between eHealth literacy with health promotion activities and preventive health practices of adolescents?

2. Materials and Methods

This cross-sectional study was conducted with a total of 706 adolescents ranging from 14-19 years of age between March and May 2022. The participants were recruited from two high schools chosen by a simple random sampling method among the public high schools affiliated to Çorum Provincial Directorate Of National Education.

The sample was determined by a random draw from nine high schools (N=2700) in the Çorum city of, Turkey. Power analysis was performed according to the results of regression analysis. G-Power software was used for power analysis, and the sample size

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was calculated as 337 students based on the following parameters: a power of 80% and a confidence interval of 95%. Two high schools were determined and criteria for selecting the adolescents were as follows: Being in the 14-19 age group, using internet, not having a chronic condition or disability and speaking Turkish.

2.1. Ethical considerations

The study was planned in accordance with the Helsinki Principles and was approved by the Non-İnterventional Clinical Research Ethics Committee (Date: 10 February 2022, No.47). Written consent was obtained from the parents of the adolescents and from all students provided verbal consent (respecting the voluntary nature of participation in the study).

2.2. Data Collection

The data of the study were collected by applying a group questionnaire with a questionnaire form. In the questionnaire form, besides the socio-demographic characteristics, preventive health practices, eHealth Literacy scale Adolescent Health Promotion Scale were used.

2.3. Measures

2.3.1. Descriptive Information Form

The descriptive information form is composed of questions about the socio-demographic characteristics of the adolescents such as age, gender, educational status of parents, place of income level, health saticfaction, chronic conditions and preferred health service primarily.

2.3.2. Preventive Health Practices

A short questionnaire with nine questions was designed to ascertain the adolescents preventive health practices. The questionnaire was designed to measure the following constructs: Annual weight measurement, annual blood pressure measurement, annual blood glucose measurement, annual blood cholesterol measurement, annual hemoglobin measurement, annual dental examination, annual eye examination, non-smoking status, non-alcohol use, regular walking for 30 minutes daily. Participants were asked to respond using a “yes” or “no” answers.

2.3.3. The eHealth Literacy Scale (eHEALS)

The scale was developed by Norman and Skinner in 2006 to measure individuals’ combined knowledge, comfort, and perceived skills at finding, evaluating, and applying electronic health information for health problems [20]. An eight-item scale were a 5-point Likert-type as “1= strongly disagree, 2= disagree, 3= undecided, 4= agree, 5= strongly agree”. The lowest score is 8 and the highest score is 40. High scores obtained from the scale indicate a high level of e-Health literacy. Coefficient alpha (α) in the original version was 0.88 in the original version. The Turkish version of the scale was used in this study [21] and cronbach alpha coefficient was found 0.84 in this study.

2.3.4. The Adolescent Health Promotion Scale (AHPS)

The scale which was consisted of 40 items and six sub-scales was developed by Chen et al. [16] to assess the health promotion behaviors of adolescents. The sub-scales are

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categorized as life appreciation (10 items), health responsibility (15 items), exercise (4 items), nutrition behaviors (3 items), social support (4 items), and stress management (4 items). The items are rated a Likert type as 1= never, 2= sometimes, 3= usually, 4= frequently, 5= always in the scale. The subscale scores are summed up within themselves, and the total scale scores are obtained by the sum of the subscales (between 40-200 point). Higher scores indicate that healthy lifestyle behaviors are quite positive [22]. The Turkish validity and reliability studies were conducted by Temel et al. [23] with cronbach alpha was 0.93. In this study, the coefficient alpha (α) was 0.90.

2,4. Statistical Analysis

Data management and analysis *were performed* using SPSS 22.0. The suitability of the data to the normal distribution was examined with the Kolmogrow Smirnow test. Number, percentage, mean and standard deviation were used as descriptive analysis. The relationship between e-health literacy and health promotion behaviors was evaluated by Pearson correlation analysis. In order to identify predictors of eHealth literacy multiple regression analysis were used.

Before conducting the regression analysis, we computed the values for tolerance and variance inflation factor (VIF) to ensure that no multicollinearity existed in these variables and that the values met the requirements (tolerance from 0.21 to 0.96, VIF from 1.04 to 1.62 for the model). In addition, multivariate normality and homoscedasticity were checked. The model was used via the following values: correlation: R = 0.630–0.334, Durbin–Watson: 1.66, Mahal distance = 3.94 and Cook's distance = 0.005–0.013. Significance levels were set at the 5% level ($p<0.05$).

3. Results

Of the participants, 55.8% of the adolescents were female and the mean age of the whole group was 16.09±2.63 years (min-max:14-19). Among the adolescents' parents, 31.4% of mothers and 52.4% of fathers were high school graduates. It was found that 73.5% of them satisfied with their health and, 88.2% use public health service primarily. The mean score of eHealth Literacy scale was 29.40±6.29. The mean of the total scores obtained from the Adolescent Health Promotion Scale was 137.97±21.87 (Table 1).

Table 1. Demographics and characteristics of the sample (N = 706).

Variables	n (%)	Mean±SD
Age		16.09±2.63
Gender		
Female	394 (55.8)	
Male	312 (44.2)	
Place of residence		
Urban	595 (84.3)	
Rural	111 (15.7)	
Mother education		
<High school	484 (68.6)	
≥ High school	222 (31.4)	
Father education		
<High school	336 (47.6)	
≥ High school	370 (52.4)	
Income level		
High	329 (46.6)	

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Low	377 (53.4)	
Health satisfaction		
Satisfied	519 (73.5)	
Non-satisfied	187 (26.5)	
Preferred health service primarily		
Public	623 (88.2)	
Private	83 (11.8)	
eHealth literacy	Min-max:8-40	29.40±6.29
Health Promotion	Min-max:40-200	137.97±21.87
Life appreciation	Min-max:10-50	35.70±6.73
Health responsibility	Min-max:15-75	52.72±8.76
Exercising	Min-max:4-20	12.07±4.30
Nutritional	Min-max:3-15	10.52±2.59
Stress	Min-max:3-15	10.05±2.86
Social support	Min-max: 4-20	13.65±3.43

Table 2 shows an overview of preventive health practices of adolescents.

Table 2. Preventive health practices of adolescents (N=706).

Variables	n (%)
None-alcohol users	642 (96.0)
None-smokers	572 (81.0)
Annual weight measurement	486 (68.8)
Annual blood iron measurement	342 (48.4)
Annual blood pressure measurement	339 (48.0)
Annual dental check-up	325 (46.0)
Exercise regularly (30 min/d)	302 (42.8)
Annual blood cholesterol measurement	234 (33.1)
Annual eye check-up	170 (24.0)
Annual blood-glucose measurement	150 (21.2)

It is apparent from this table that 96.0% of the adolescents do not use alcohol and 81% do not smoke. The rate of those who had their annual weight measured remained at 68.8%. Annual blood pressure measurement, annual blood iron measurement, annual cholesterol measurement, annual dental examination and regular exercise rate were below 50%. As seen in this table, Annual eye examination and annual blood glucose measurement, which are among preventive health practices, were below 25%.

The results of the correlational analysis are presented in Table 3.

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Table 3. The relationship between eHealth literacy and adolescent health promotion scales scores.

	1	2	3	4	5	6	7	8
eHealth literacy	1.0*							
Adolescent Health Promotion Total Scale	0.371	1						
Life appreciation	0.317		1					
Health responsibility	0.351			1				
Exercise	0.201				1			
Nutrition behaviors	0.122					1		
Stress management	0.226						1	
Social support	0.229							1

*p<0.001.

The results, as shown in Table 3, indicate that There was a significant positive correlation between eHealth literacy and the AHPS (r=0.371; p<0.001). Also, a positive correlation was found between AHPS subscales and eHealth literacy (p<0.001) (Table 3).

Table 4 provides the results obtained from multiple regression analysis of eHealth literacy.

Table 4. The effect of eHealth literacy on health promotion and preventive health practices.

Model 1	B	β	t	p
Adolescent Health Promotion	0.01	0.27	7.54	<0.001
Annual Weight Measurement	0.15	0.13	3.55	<0.001
Annual Blood Pressure Measurement	-0.08	-0.09	0.83	0.41
Annual Blood Cholesterol Measurement	-0.04	-0.04	1.09	0.27
Annual Dental Examination	0.10	0.11	2.76	<0.01
Annual Blood Iron Measurement	0.04	0.16	1.13	0.26
Annual Blood Glucose Measurement	−0.99	−0.19	3.52	<0.001
Annual Eye Examination	0.07	0.08	0.71	0.48
Exercise Regularly (30 Min/D)	-0.01	-0.01	0.24	0.98
Non-Smokers	-0.08	-0.09	2.16	0.03
Non-Alcohol Users	-0.12	-0.11	2.69	<0.01
R	0.526			
R^2	0.27			
DW	1.66			
F	10.565			
p	<0.001			

Multiple linear regression analysis was performed to predict eHealth literacy using the variables of Adolescent Health Promotion and preventive health practices. As a result of the analysis, it was found that a significant regression model (F11,695) p<0.001 and 27% of the variance in the eHealth literacy (R^2adjusted:0.27) were explained by the independent variables. Accordingly, eHealth positively and significantly predicts health promotion behaviors (β= 0.27, t (695)= 7.54, p<0.001).

Also, eHealth literacy increased annual weight measurement by more than 0.13 (β=0.13), the annual blood iron measurement by more than 0.16 (β=0.16), annual dental examination by more than 0.11 (β=0.11).

4. DISCUSSION

eHealth literacy combines information and media literacy. It is becoming increasingly important as individuals continue to seek medical advice from a variety of web-based sources, primarily social media. Empirical studies have also found that eHealth literacy positively affects health outcomes in people with chronic disease and [24, 25].

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College students with higher eHealth literacy have been found to be less likely to consume unhealthy foods [12]. This research article highlights the importance of eHealth literacy among adolescents. The main issues addressed in this article are: a) eHealth literacy level, b) Health promotion activites and c) preventive health practies. Up to now, far too little attention has been paid to these triple topics in worldwide. Most studies in the field of adolescent health have only focused on eHealth literacy and health lifestyle behaviors.

Today, where digitalization is intense, there are more opportunities for adolescent health than in the past. Despite the strong interest in adolescent health globally, it is clear that there are unmet needs. The present study was indicated that eHealth literacy has an significant effect on preventive health practices and health promotion behaviors.

In this study, adolescents' ehealth literacy level was found to be relatively high and acceptable with scores of 29.40±6.29. In a study conducted in China, the eHealth scores of adolescents were found to be above 30 [26] and in Korean adolescents it was reported 3.59 as item mean [27]. In addition, a Philippines study found eHealth literacy level (at 32.45) was higher among adolescents [28]. In a Turkish study, the mean score was 27.5 [29]. Comparison of the findings with those of other studies confirms that as proficient users of the internet, adolescents have a moderate level of eHealth skills. Therefore, applying effective strategies to improve "adolescent eHealth literacy" is suggested in schools.

Adolescence is like a spectrum of opportunities for acquiring many lifelong health habits. Adolescent health behaviors play an important role in promoting a healthy lifestyle that can have an impact on lifelong health outcomes. The current study found the health promotion behaviors of adolescents was middle level with 137.97±21.87 out of 200. The result was similar to Turkish and Nigerian studies [30, 31].

The current study found that adolescents had low health responsibility (Table 1). This outcome is paralel to that of other studies which were found lowest level of health responsibility [32, 33]. A possible explanation for this is that the adolescents lack pay attention and rational thinking about their health. Therefore, they were less likely to regularly perform health responsibility behaviors such as checking their blood pressure and cholesterol levels regularly, participating in health education courses, and avoiding eating foods laden with preservatives [34]. This study suggest that, although adolescents have good health promotion activities except health responsibility, they do not feel responsible for promoting their health.

In this study, it was observed that adolescents did not tend to preventive health practices at the expected level, except for not smoking and not using alcohol. Also, although adolescents' health responsibility behaviors were high (Table 1), they participated in most preventive health practices below 50%. This situation does not coincide with moderate level of health promotion behaviors (Table 2). These results reflect a poor disease-centered perspective among adolescents. However, these barriers may be appear from parents obstacles because parents health behavior can affect their health responsibility. Parental eHealth literacy, parental active use were all related to adolescent eHealth literacy [35]. These findings indicate that they need to learn about the more comprehensive perspective of preventive health practices. In this regard, mobile-based applications may be used to improve their knowledge and attitudes about these important issues.

In reviewing the literature, little data was found on the association between preventive health practices of adolescents and health promoting behaviors. Generally, adolescents cared more about the psychosocial aspects of health than the physical dimensions [36]. As mentioned in the literature, in general, adolescents do not have a healthy lifestyle. Dental check-up [37,38], physical activity, diet regime, tobacco and alchol use [2] were more examined topics among adolescents. Apart from the known protective practices for adolescents, no additional inquiries were made in previous studies. However, In 2019, the World Health Organization (WHO) identified 10 threats to global health, and one of these threats is poor primary health care [39]. Although the WHO has clear, evidence-based guidance on routine health checkups for young children and older adults [40], but it is lacking for adolescents. There has been little research on the potential value

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of comprehensive adolescent health screening in countries with weak health systems and a high burden of disease in adolescents, including high physical health, nutrition, mental health, and behavioral needs. In the United States, recommendations for routine health screening in adolescents have largely focused on primary health care settings with screening oriented toward common mental health and behavioral concerns (e.g., substance use, unprotected sexual activity) as well as growth [41]. Routine laboratory screening is not universally recommended but is guided by clinical context (e.g., urine testing for chlamydia in sexually active young women or lipid profiles in obese adolescents). In other high-income countries with reasonable access to primary care such as Australia, more opportunistic approaches are currently recommended that encourage psychosocial and behavioral assessment whenever young people present for health care [42] The challenge now is the lack of an adequately trained health workforce. Adolescent health and medicine is not adequately covered in medicine, nursing and public health training. Adolescent health education should be continued in pre- and post-graduation education, which is the key to the future.

Primary health care is the first step in the health care system, and ideally should provide comprehensive, affordable, community-based care throughout life. Achieving universal coverage in adolescent health may be possible by benefiting from primary health care services. Measurement of biochemical values and monitoring of blood pressure are among the most neglected preventive health practices in adolescents. Adolescents need be screened for physial examination during clinical preventive services visits. For this reason, development of new curricula in adolescent medicine for both undergraduates and postgraduates, with a new compulsory module on adolescent health for postgraduate training in family medicine.

In recent years, there has been an increasing amount of literature on eHealth and its positive correlations with health promoting behaviors [43]. More recent attention has focused on the provision of effects of high eHealth literacy level on adolescent health promotion such healthy dietary behaviors, exercise regime, sleep habits, vaccinations and COVID-19 related behaviors [11, 12, 26, 44].

The most obvious finding to emerge from the this study was that eHealth literacy was significantly associated with health promoting behaviors and preventive health practices (Table 3) and that 27% of the factors affecting health promotion and health practices were explained by the eHealth literacy (Table 4). Comparison of the findings with those of other studies confirms that higher eHealth literacy engaged better in health-promoting activities [43-46] and eHealth literacy were more likely to have a higher rate of health services utilization among adolescents [47]. In a Chinese study, eHealth literacy was showed a strong mediator of the association between cognitive social factors (performance expectancy and health motivation) and health-promoting behaviors [48]. However, there is extensive literature on adolescent sexual and mental health [49,50], the literature on physical health checks of adolescents is insufficient. The absence of routine health check-ups during adolescence in low- and middle-income countries is a missed opportunity for prevention, early identification, and treatment of health issues, and health promotion [51]. Whereas the health and well-being of adolescents are essential for achieving the Sustainable Development Goals (SDGs) and Goal 3 is on good health and well-being [52]. Changes in adolescence affect the spectrum of diseases and health-related behaviours; they are responsible for the epidemiological transition that takes place during the second decade from infectious diseases to noncommunicable conditions. At the same time, health problems and behaviours that arise during adolescence – chronic illnesses and alcohol use, for example – affect physical and cognitive development. Adolescents' evolving capacities affect how they think about their health, how they think about the future, and what influences their decisions and actions. All of this has implications for the types of interventions needed and how programmes should be implemented [53].

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5. Conclusions

This study focused on the relationship between eHealth literacy, health promoting behaviors and preventive health practices that are crucial for adolescent health. All these results must be interpreted with caution for adolescents. Adolescents had a moderate eHealth literacy level, and health promotion activities and poor preventive health practices. The results revealed that there is a positive moderate relation between the eHealth literacy and health promotion activities and that as the eHealth literacy of the adolescent increases, the more their healthy lifestyle activities increase. It was identified that the eHealth literacy effects health promotion and preventive health practices of adolescents. The study results showed the health patterns of a sample of Turkish adolescents. Thus, health policymakers are required to design adolescent-centered health websites to improve their decisions on preventive health. On the other hand, improving the eHealth literacy skills of adolescents through parental guidance might enhance their health technology use and preventive health practices. Future research studies should examine the determinants of adolescents' eHealth literacy.

The findings of this study have a number of important implications for future practice. Health promoting activities emerged as a primary concern along with preventive health practices. Developing eHealth literacy interventions will be important for environments with a high concentration of adolescents (schools, courses). To draw a full picture of relations on eHealth literacy and adolescent health, additional studies will be needed. Restructuring of primary health services in a way that encourages adolescents may be recommended. Primary health care services should be entegrated with SDGs. In public health policies classroom-based health education and digital literacy programs should emphasize to change adolescents health behaviors.

The generalisability of these results is subject to certain limitations. The scope of this study was limited in terms of urban high schools. The recruitment occurred through two high schools in the city center. Lastly, preventive health practices of adolescents were evaluated in line with their own statements.

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