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Quick Response Code:

Website: www.jehp.net
DOI: 10.4103/jehp.jehp_400_19

Effect of health literacy among students on the adoption of osteoporosis-preventive behaviors in Iran

Rahman Panahi, Leili Yekefallah¹, Mahya Shafaei¹, Leila Dehghankar¹, Mohamad Anbari², Narges Hosseini³, Elham Hasannia³

Department of Health Education and Health Promotion, School of Medical Sciences, Tarbiat Modares University, Tehran, ¹Social Determinants of Health Research Center, Research Institute for Prevention of Non Communicable Diseases, School of Nursing and Midwifery, ³Student Research Committee, School of Nursing and Midwifery, Qazvin University of Medical Sciences, Qazvin, ²Occupational Health Department, School of Public Health and Institute of Public Health Research, Tehran University of Medical Sciences, Tehran, Iran

Address for correspondence:

Ms. Leila Dehghankar, Social Determinants of Health Research Center, Research Institute for Prevention of Non-Communicable Diseases, School of Nursing and Midwifery, Qazvin University of Medical Sciences, Qazvin, Iran.
E-mail: dehghan247@gmail.com

Received: 16-07-2019
Accepted: 04-02-2020
Published: 28-07-2020

Abstract:

BACKGROUND: In chronic diseases such as osteoporosis, understanding the factors that improve prevention, such as health literacy (HL), is essential in reducing the incidence of these diseases. This study aimed to determine the association between HL and adoption of osteoporosis-preventive behaviors among students in Qazvin.

SUBJECTS AND METHODS: This is a cross-sectional study in which 375 female students (aged 15–18 years) at high schools (grades 10th, 11th, and 12th) in Qazvin city were selected, in 2019. Sampling method was multistage. To collect data, the standardized questionnaire for measuring HL in adolescents (health literacy measure in adolescents), in addition to another questionnaire for assessing osteoporosis-preventive behaviors, was used. Data were analyzed using SPSS 22 by descriptive statistics and logistic regression. The association considered significant when $P < 0.05$.

RESULTS: The mean scores of adoption of osteoporosis-preventive behaviors and HL were 22.43 ± 5.60 and 70.84 ± 12.58 , respectively. Logistic regression showed that there was a significant association between the adoption of osteoporosis-preventive behaviors and HL ($P = 0.001$). In addition, the association between the adoption of osteoporosis-preventive behaviors and age was also significant ($P = 0.048$ and odds ratio = 3.35).

CONCLUSIONS: Young students and those of low HL showed less adoption of osteoporosis-preventive behaviors. Therefore, it is necessary to pay more attention to design educational programs that may raise the knowledge and awareness of those students about such these diseases, mainly prevention.

Keywords:

Adoption, behavior, chronic disease, health literacy, osteoporosis, students

Introduction

According to the World Health Organization (WHO) definition, osteoporosis could be diagnosed when standard deviation of the bone density is less than the mean of its peak by 2.5 in young adults.^[1] By 2020, the National Osteoporosis Foundation estimates that 58.2 million people approximately will be exposed to osteoporosis.^[2]

Nowadays, the yearly estimated national expenditure on this chronic disease is about

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2.754 billion United States Dollars.^[3] Given the increase in their age average, it is also expected that 50% of total osteoporosis fractures among Asians may occur by 2050.^[4] For the same period, Iran would have 0.85% and 12.4% of hip fractures burden worldwide and in the Middle East Region, respectively.^[5]

Therefore, osteoporosis is considered a serious problem in developed as well as developing countries, including Iran.^[6] In osteoporosis, bone mass decrease and bone tissue destruction result in an increased risk of fractures.^[7] This disease begins early in

How to cite this article: Panahi R, Yekefallah L, Shafaei M, Dehghankar L, Anbari M, Hosseini N, *et al.* Effect of health literacy among students on the adoption of osteoporosis-preventive behaviors in Iran. *J Edu Health Promot* 2020;9:191.

adolescence^[5] and increases with age,^[8] which means that osteoporosis is often childhood disease with age-related consequences. Importantly, it is preferred to be prevent osteoporosis during young ages to maximize bone mass as it is not usually diagnosed until early adulthood.^[1,7]

In this regard, the challenge of osteoporosis prevention programs is to identify young people at risk and urge their risk reduction behaviors.^[7] On the other hand, determining the factors influencing osteoporosis prevention and their exact impact, including health literacy (HL), can be effective in minimizing the prevalence of this disease.^[9] Moreover, HL can be one of the most predominant factors in adopting these behaviors by raising awareness and understanding and evaluating the benefits of these diagnostic and preventive behaviors.^[10]

The WHO has introduced HL as a cognitive and social skill that determines the motivation and ability of individuals to access, understand, and use information in a way that leads to maintaining and improving their health.^[11] Actually, the pathway between HL and health outcomes can be through fulfilling healthy behaviors and change in lifestyle, such as physical activity, healthy food consumption, smoking cessation, and alcohol intake reduction, which impacts the health status in general.^[12] In teenage years, many physical and psychosocial changes take place and in turn affect the quality of life in adulthood.^[13] Thus, it is a very critical time for adults to improve their lifelong health-related behaviors by obtaining accurate and reliable health information and then reflect this on their behaviors.^[14]

HL can be used as an effective and preventive educational tool, and its three main components including knowledge, skills, and behaviors should be considered.^[13,15] It should be noted that osteoporosis-preventive behaviors are affected by complex group of individual, physiological, and social factors.^[16] For example, Hosking *et al.* have reported that the pathway of calcium, in general, have been well known; however, the asymptomatic osteoporosis and the types of physical activity that contribute to bone capacity are less understood.^[3] Therefore, the aim of our present study was to determine the association between HL and the adoption of osteoporosis-preventive behaviors among students at high schools in Qazvin, Iran.

Subjects and Methods

This is a descriptive, cross-sectional study in which 375 girls in their second semester studying at high schools/ the academic year 2018–2019 in Qazvin were selected via multistage sampling. A list of high schools in Qazvin was prepared, compiled, and then divided into two districts, northern and southern, according to their location. Of

each district in Qazvin, six high schools for girls were randomly selected, then using a random sampling three classes were selected from each school (36 classrooms), and finally, all students of the selected classes were recruited to the study.

One of the objectives of this study was to determine the level of students' HL. Therefore, $P = 0.25$ was set as a reference for the frequency of adequate HL among students.^[17] In addition, Cochran's formula for calculating sample size which considers 80% as a test power and 95% as a statistical confidence interval was used. At first, the calculated sample size was 288 girls according to the formula shown below. Considering the dropout percentage which may reach 30%, we had increased the sample up to 375.

$$n = \frac{Z^2 \cdot pq}{d^2} \quad n = \frac{1.96^2 \times 0.25 (1 - 0.25)}{0.05^2} = 288$$

We included the girls who were living and studying at high schools in Qazvin, aged 15–18 years, and willing to participate in the study were included. Lack of satisfaction to complete the questionnaire and the incompleteness of questionnaire were considered exclusion criteria.

Regarding data collection, the used questionnaire encompasses two sections: (a) the demographic and background characteristics such as age, education level, field of study, parents' occupation and level of education, interest in health issues, health status, and students' priority in asking questions about health and diseases and (b) the health literacy measure in adolescents questionnaire. This valid questionnaire was designed, psychoanalyzed, and used by Ghanbari *et al.* in 2016.^[14] Moreover, Cronbach's alpha coefficient was 0.95 as calculated in the study of Saeedi *et al.*^[17]

The HL questionnaire consists of 44 items embraced in eight domains, namely access to information (5 items), reading (5 items), understanding (10 items), appraisal (5 items), implementation (4 items), communication (8 items), self-efficacy (4 items), and calculation (3 items). The questionnaire is about self-assessment of person's capability to perform a specific action in dealing with health information, and it has been developed on a 5-point Likert scale: never (score 1), rarely (score 2), sometimes (score 3), mostly (score 4), and always (score 5).

Based on cutoff points 50, 66, and 84, the HL of the adolescents is ranked in four levels: inadequate (0–50), semi-adequate (50.1–66), adequate (66.1–84), and very adequate (84.1–100).^[18] The two "inadequate" and "semi-adequate" categories were merged under the

category of “undesirable”, also the two “adequate” and “very adequate” categories were categorized under “desirable”.^[19]

The third part of the questionnaire consists of 15 comprehensive questions about nutrition, activity patterns, and specific preventive behaviors of osteoporosis. Hence, consumption of food stuffs during the week was classified also on a 5-point Likert scale (at all, less than twice a week, 3–4 times a week, more than four times a week, and on a daily basis). Food stuffs were categorized into eight groups; dairy products, cereals, grains, vegetables, fruits, red and white meat, carbonated beverages, and coffee. Regarding the weekly physical activity, patterns were classified on a 4-point Likert scale. Physical activity varied in several ways to help calcium absorption, such as exposure to the sunlight and consumption of food-containing Vitamin D.

The validity of this tool was checked in the study of Yekefallah *et al.* Furthermore, the reliability was calculated using retest with a correlation coefficient being 78%.^[20] About 10% of the sample have been recruited for pilot study (30 girls); the questionnaires have been filled by the students and analyzed for pretesting the internal consistency using SPSS ver 22. (IBM Corporation, Armonk, NY). We found the HL questionnaire reliable because the Cronbach’s alpha coefficient ranged from 0.8 to 0.9.

According to the researchers in this study, the adoption of preventive behaviors was classified into two levels: poor (score <50%) and good (score is from 50% to 100%).^[21] Logistic regression was also used to study the correlation between the different factors within the study.

Data analysis

SPSS software version 23 was used to analyze the collected data using descriptive statistics and logistic regression. Entering variables was done simultaneously using the method of contrasting the classified independent variables as indicator, and the first class of variables was chosen as the reference class. In this study, the preventive behavior of osteoporosis was the dependent variable, whereas HL, age, educational level, field of study, parents’ occupation and education level, interest in health topics, health status, and students’ priority in raising questions about health and diseases were the independent variables which were entered to the model. The significance level in this study was based on $P < 0.05$.

Ethics

The ethical code of the study was obtained from the Deputy of Research and Technology at Qazvin University of Medical Sciences (IR.QUMS.REC.1397.197)

and presented as a reference to the Qazvin Educational Department and school officials. The nature and objectives of the study were explained, and the questionnaires were distributed and completed. The confidentiality was assured; meanwhile, the questionnaires were completed in the classrooms of students and with the assistance of school officials.

Results

Among the 375 students in our study, only three were excluded due to the lack of interest (the participation rate was 99.2%). A total of 127 students were about 16 years old (40.6%) and 159 were in the 10th grade (42.7%). Table 1 shows the other demographic and background characteristics of the sample.

The rate of adoption of osteoporosis-preventive behaviors among 235 students (63.2%) was poor while it was good among 137 (36.8%) of the participants. The mean and standard deviation of the total scores for the adoption of osteoporosis-preventive behaviors and HL in the

Table 1: Demographic and background characteristics of the participants

Variable	Frequency (%)
Age (years)	
15	54 (14.5)
16	151 (40.6)
17	127 (34.1)
18	40 (10.8)
Educational grade	
10 th	159 (42.7)
11 th	158 (42.5)
12 th	55 (14.8)
Field of study	
Experimental	90 (24.2)
Math	127 (34.1)
Human	83 (22.3)
Conservatory	72 (19.4)
Father’s occupation	
Employed	263 (70.7)
Unemployed	11 (3.0)
Retired	88 (23.7)
Other	3 (0.8)
Mother’s occupation	
Homemaker	253 (68.0)
Employed	99 (26.6)
Others	10 (2.7)
Father’s educational level	
Under diploma	104 (28.0)
Diploma	116 (31.2)
Academic	147 (39.5)
Mother’s educational level	
Under diploma	103 (27.7)
Diploma	149 (40.1)
Academic	120 (32.3)

students were 22.43 ± 5.60 out of 36 and 70.84 ± 12.58 out of 100, respectively. Furthermore, 136 (36.6%) students have shown undesirable HL, whereas 236 (63.4%) of them have shown desirable HL.

Table 2 presents the correlation between the factors and the adoption of osteoporosis-preventive behaviors among students based on logistic regression. As shown in the results, there was a statistically significant association between the adoption of osteoporosis-preventive behaviors and age ($P < 0.048$), this in turn explained the good level of the adoption of osteoporosis-preventive behaviors among the 18-year-old students, which was 3.53 times more than other younger ones.

In addition, the association between the adoption of osteoporosis-preventive behaviors and HL was also statistically significant ($P < 0.001$), so the students who have very adequate and adequate HL have shown a

good level of adopting the preventive behaviors, 9.48 and 5.16 times, respectively, more than those students who have inadequate level of HL [Table 2]. There was no significant association between the adoption of osteoporosis-preventive behaviors and other variables as $P > 0.05$.

Discussion

This research was one of the first studies to investigate the relationship between HL and adoption of osteoporosis-preventive behaviors among female students in Qazvin. The findings of this study showed that the adoption of osteoporosis-preventive behaviors in most girls was at poor level. In other studies conducted by Yekefallah *et al.*,^[22,23] the level of adoption of osteoporosis-preventive behaviors in young ladies was undesirable. Low level of HL in the dimension of the use of information can be due to the lack of appropriate

Table 2: Association between the adoption of osteoporosis-preventive behavior among students in logistic regression test

Variable	Levels	OR	P
Age (years old)	16/15	0.6	0.215
	17/15	1.1	0.86
	18/15	3.36	0.042*
Educational grade	11 th /10 th	0.738	0.407
	12 th /10 th	0.303	0.091
Field of study	Mathematics/experimental	0.987	0.971
	Human sciences/experimental	0.614	0.203
	Conservatory/experimental	0.849	0.755
Father's education	Diploma/under diploma	1.423	0.405
	Academic/under diploma	1.744	0.300
Mother's education	Diploma/under diploma	1.160	0.672
	Academic/under diploma	1.356	0.751
Father's occupation	Unemployed/employed	1.511	0.59
	Retired/employed	0.857	0.612
	Others/employed	13.128	0.131
Mother's occupation	Employed/homemaker	0.817	0.638
	Others/homemaker	0.934	0.881
Health literacy	Semi-adequate/inadequate	1.886	0.042*
	Adequate/inadequate	5.163	0.009*
	Very adequate/inadequate	9.487	0.0048*
Interest in health topics	Low/not interested	1.198	0.726
	Moderate/not interested	1.802	0.181
	High/not interested	0.830	0.689
	Over/not interested	0.730	0.574
Self-assessment of health status	Good/very good	0.774	0.408
	Moderate/very good	0.516	0.072
	Bad/very good	0.320	0.087
	Very bad/very good	0.384	0.329
Referral to people and resources related to health and diseases	Parents/teacher	0.116	0.092
	Doctor/teacher	0.176	0.179
	Other health staff/teacher	0.150	0.228
	Other people (friend, relative, chancellor.)/teacher	0.08	0.082
	Internet/teacher	0.122	0.101
	Book/teacher	0.096	0.182

*The significant level was considered < 0.05 . OR=Odds ratio

measures to health knowledge,^[24] and this in turn could be the main reason behind the poor adoption of osteoporosis-preventive behavior's in the present study.

In this study, 36.6% of the students had undesirable HL while 63.4% of them had desirable HL. Based on the literature, 41% of the students in Chang's study^[25] and 47% in Sørensen *et al.*'s study^[26] had desirable levels of HL, which was consistent with the present study, but Ghanbari *et al.* showed 57.5% of the students had undesirable HL^[14] and also Ye *et al.*'s stated that only 14.4% of the students had adequate HL.^[13] The difference in the results can be justified by the use of various tools for measuring HL, in addition to social and cultural conditions.

The results showed that there was a positive significant association between the adoption of osteoporosis-preventive behavior's and age as successful experiences and level of self-efficacy improve with increase in age of the students.^[27] Interestingly, self-efficacy positively effects calcium intake and exercise^[16] and reflects on its relationship with HL.^[14] In the study of Hosseini *et al.*, there was nonsignificant relationship between age and nutritional osteoporosis-preventive behaviors,^[28] and this was inconsistent with the present study.

Dairy products full of fats may result in increasing the rejection rate of these products among young women.^[29] The difference between the results of this study and other studies may be due to geographical, regional, demographic, or cultural variations between the targeted groups of participants.

It should be noted that the development of bone and density of bones in the early stages of life would be affected by behaviors, such as nutrition and physical activity.^[29] In childhood and adolescence (i.e., by the age of thirty), mass and density of the bones reach their peak, and then, achieving the maximum bone mass in the first three decades of life and maintaining it during the mid-ages can significantly reduce the risk of osteoporosis, which is common in girls at young age.^[6]

According to the results, another factor that influences the adoption of osteoporosis-preventive behaviors was HL. Although little research has been done in this regard,^[30] some researchers believe that HL is a strong predictor of health and can be an effective factor in increasing health behaviors such as adopting of preventive behaviors.^[10] In their study, Panahi and Kazemi concluded that HL can be one of the most important factors in preventing osteoporosis in women by improving the understanding, perception, and evaluation of the benefits of diagnostic and preventive behaviors.^[9] In this case, it can be said that the prevention and treatment of chronic diseases are

complex and require a wide range of activities related to adequate HL, which supports health status check-up in women, such as dental and eye examinations, influenza and pneumonia vaccination, mammography, and osteoporosis screening,^[31] in addition to encourage high calcium intake and physical activity.^[32] On the other hand, inadequate HL is negatively associated with the adoption of preventive care.^[33]

Given osteoporosis, there is no cure; thus, the prevention is the most effective way to manage this long-term disease.^[27] Health efforts should pay more attention toward the prevention of osteoporosis among teenagers who have the tendency to change more than adults.^[34]

Limitation

Selection of high schools, lack of access to students who have left school, poor literature, and the self-administered questionnaires were the most prominent limitations, which make it difficult to compare the results of this study with other studies. Furthermore, this study was conducted among female students at high schools only in Qazvin which in turn limits the generalizability of these results in other parts of the country. One more limitation was overlooking students' skills such as speaking and listening in addition to the background and cultural knowledge of these students.

Hence, it is recommended for the future to conduct this study on a larger scale in Iran including both genders and to compare them separately in different educational grades at public and nonpublic schools. Furthermore, it is also indicated to use the results of this study in designing osteoporosis-preventive interventions among students which can be fruitful for this group within the society.

Conclusions

The results in our study indicate that adoption of osteoporosis-preventive behaviors was poor among young female students with lower levels of HL. Therefore, more attention should be paid to adolescents to achieve health goals through improving the health outcomes. Policymakers should give special care to promoting the HL status by designing educational programs which will reflect on the adoption of osteoporosis-preventive behaviors. It is suggested that more extensive studies should be carried out to clarify the effect of HL on the adoption of osteoporosis-preventive behaviors.

Acknowledgment

This study comprises part of research at Qazvin University of Medical Sciences.

Financial support and sponsorship

Deputy of Research and Technology at Qazvin University of Medical Sciences (Grant code: 28.6.29803).

Conflicts of interest

There are no conflicts of interest.

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