



Health Literacy and Its Determinants in Adult Patients Referred to Dental Clinics: A Cross Sectional Study in Mashhad, Iran

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Abstract

Background: Health literacy is the capacity of individuals to obtain, understand, and interpret basic health information that is necessary to make appropriate health-related decisions.

Objectives: This study aimed to investigate the association between oral health literacy and the decayed, missing, and filled teeth (DMFT) index, which was conducted in Mashhad dental clinics in 2016.

Methods: In this cross-sectional study, 380 patients referred to private and public clinics in Mashhad filled out the oral health literacy adult's questionnaire (OHL-AQ). The questionnaire contained 4 sections: reading, numeracy, listening, and decision making. Each correct answer was assigned a score of 1 and incorrect or no response were assigned with zero score. The DMFT index was evaluated based on decayed, missing, and filling teeth. Data analysis was performed using chi-square and linear regression tests.

Results: The mean score for oral health literacy was 10.6 ± 3.4 . Among patients 46.8% had favorable oral health literacy level, 19.7% were with relatively favorable, and 33.4% were with unfavorable health literacy levels. The average of the DMFT index in the studied group was 8.3 ± 4.9 and was higher among males than females. A significant correlation between the health literacy level and the DMFT index was observed; however, the correlation was negative and weak ($R = -0.127$).

Conclusions: The average of oral health literacy level for the entire study population was relatively appropriate, and the majority of the subjects (46.8%) represented a good oral health literacy level. Furthermore, education, economic status, and collecting information from different sources of oral health are important factors affecting the level of oral health literacy.

Keywords: Oral Health Literacy, DMFT Index, Health Literacy

1. Background

Health literacy is the degree of an individual's capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions. This requires a complex set of skills involving reading, listening, analysis, decision making, and the ability to apply these skills to health situations. Health literacy is not merely dependent on the years of education or the ability to read and write (1-3).

According to the previous studies by the US Center for Health Care Strategies, people with little or no health literacy are less likely to understand written and spoken information provided by health professionals, act in a relatively weaker way when given instructions, and have a more unfavorable health status; their rate of hospitalization and referral to a physician is also higher. They are poor

in self-care skills, have less preventive care, and thus undergo more medical expenses (4-9). Nowadays, health literacy has been introduced as a global issue in the 21st century. Accordingly, the World Health Organization (WHO) recently reported health literacy as one of the largest determinants of health, and advised countries around the world to establish an association of all stakeholders in this area to monitor and coordinate strategic activities for promoting health literacy in different societies (10).

According to the vision document of the Islamic Republic of Iran, every Iranian should become health literate by the end of 2025 and must complete his/her health literacy through educational tools. Therefore, monitoring and measuring the degree of health literacy is a key component of health policies in Iran (11). Oral health literacy (OHL) is a subset of health literacy skills. With the adoption of health literacy, the most common definition of oral health liter-

acy is the degree of an individual's ability to acquire, process, and understand oral health information and make appropriate oral health decisions (12).

Decayed, missing, and filled teeth (DMFT) is one of the most important indices for dental caries experience among community members. Epidemiological studies on dental caries currently use the DMFT score owing to its reliability and validity (13). According to the WHO, the mean DMFT score for children aged 12 years was 3.0 in the United States, 2.6 in Europe and 1.7 in African regions (14). Previous studies carried out by Iranian researchers on DMFT showed an average rank for Iran in oral health in the world (DMFT = 1.2 to 1.6) (15-19). Furthermore, another study performed on 8-9 years old students in the city of Saveh, Iran showed a mean DMFT of 3.76 ± 2.63 (20).

2. Objectives

Based on the importance of oral health literacy in planning, teaching, and promoting oral health within the community, the present study aimed to investigate the association between oral health literacy and the DMFT index in Mashhad in 2016.

3. Methods

This cross-sectional study was conducted to determine the level of health literacy in the population of patients referred to public and private dental clinics in Mashhad from April to August 2016 using a multi stage random sampling method.

Based on the list provided by the deputy of treatment at the university, among the total private clinics in the city, 15 were selected and three public dental clinics were also included in this study. A part of the samples was collected from a state-run center, the faculty of dentistry at Mashhad University of Medical Sciences. Since the faculty of dentistry is considered a public health clinic, and due to the large number of patients referring to this faculty, most patients were selected from this center.

The sampling was conducted on the basis of inclusion and exclusion criteria until the required sample size was achieved. The sample size was determined using the Cochran's formula (5% chance of error) and based on a previous study by Haerian et al. (11). Thus an ideal sample size was calculated as 321 considering a 20% loss probability. For a high confidence the sample size was increased to 380 patients. The inclusion criteria were comprised of willingness to participate in the study, the ability of reading and writing, and the age within 20-70 year-old. The exclusion criteria were reluctant patients for intraoral examination or for filling the questionnaire.

This study was carried out by the field data collection method using the oral health literacy adults questionnaire (OHL-AQ) and intraoral examination. The oral health literacy questionnaire was completed by all patients admitted to the faculty of dentistry and the district clinics. Since data collection was conducted by interviewing with the patients, the objectives of this research was clearly explained, and those who consented to the study were included. Prior to the interview, patients were asked to read a plain text and those who were not able to read and complete the questionnaire were excluded from the study.

The Persian version of the OHL-AQ questionnaire had been validated in the course of a previous study (21) and its validity and reliability was also evaluated. The internal consistency and the stability of the questionnaire were evaluated to examine the reliability. The Cronbach's alpha coefficient was obtained at 0.72, and the test-retest analysis showed an interclass correlation coefficient (ICC) value of 0.84, both indicating satisfactory results. The validity of the questionnaire was evaluated using the scale content validity index (CVI), which was obtained 0.90, and the content validity ratio (CVR), which was calculated 0.85.

The questionnaire is divided into four parts: concepts of reading comprehension (6 questions), numeracy (4 questions), listening comprehension (2 questions), and decision making (5 questions).

The questionnaire had 6 scores for the reading part, 4 scores for numeracy, 2 scores for listening, and 5 scores for decision making. One score was assigned to each correct answer, and a score of 0 for questions that were not attempted or answered incorrectly. The score obtained for this questionnaire ranged from zero to seventeen. Based on the total score obtained, the level of health literacy was reported and classified into three categories: unfavorable oral health literacy (0-9), relatively favorable oral health literacy (10-11) and favorable oral health literacy (12-17).

The terminal section of the questionnaire consisted of behavioral habits for oral health and also demographic information such as age, gender, education level, and economic status of the patients. Since the patients were reluctant to state their income, their economic status was determined by an estimate based on their living conditions. Thus categorized the economic status with 3 questions about the district of residence (rural and urban), housing situation (personal and rental), and the residential home area per person ($< 20 \text{ m}^2$, $20-39 \text{ m}^2$, $\geq 40 \text{ m}^2$; Table 1).

In addition, a dental student conducted an intraoral examination in a well-lit room with the help of catheter and dental mirror for all patients in order to determine the DMFT index. The DMFT was calculated by summing the number of permanent teeth decayed and missing due to periodontal disease or dental decay and filled except for

Table 1. The Mean Score of Oral Health Literacy Based on Demographic Characteristics

Variables	The Mean Score of Oral Health Literacy	P Value
Gender		0.03
Female	11.09 ± 3.18	
Male	10.15 ± 3.65	
Age		0.12
18 - 24	11.34 ± 3.18	
25 - 44	10.60 ± 3.40	
45 and over	10.18 ± 3.70	
Education level		< 0.001
< High school diploma	9.20 ± 3.16	
High school diploma	10.50 ± 3.27	
> High school diploma	12.30 ± 3.12	
Occupation		0.95
Employed	10.65 ± 3.54	
Unemployed	10.71 ± 3.36	
Residence		0.49
Urban	10.71 ± 3.41	
Rural	10.29 ± 3.65	
Housing situation		0.75
Personal	10.72 ± 3.46	
Rental	10.62 ± 3.35	
Residential home area per person, m²		< 0.001
< 20	9.14 ± 3.18	
20 - 39	11.11 ± 3.36	
≥ 40	11.14 ± 3.39	
Family dimension		0.09
≤ 4	10.85 ± 3.48	
> 4	10.34 ± 3.27	
Type of clinic		0.01
Private	10.35 ± 3.48	
Public	11.15 ± 3.28	

the wisdom teeth. This was reported as total caries experienced.

The study protocol was approved by the Ethics Committee of Mashhad University of Medical Sciences (IR.MUMS.sd.REC.1394.91). The methodology was described to all patients and the written informed consent was obtained from the patients before the study. Also, it was ensured that the information on the oral health literacy and the patient's intraoral examination would

remain confidential.

In this study, SPSS version 16 was used to analyze the data. Descriptive and frequency tests were used to describe the data. Data distribution (whether normal or not) was assessed by the Kolmogorov-Smirnov test. Spearman's correlation test was used to examine the association between variables. Dependent variables were quantitatively predicted from the independent variables through multiple linear regression analysis. A significance level of 0.05 was considered in all tests.

4. Results

In this study, a total of 380 patients referred to the dental clinics in Mashhad responded to the oral health literacy questionnaire. These subjects were comprised of 160 patients (~ 42%) referred to public clinics and 220 (~ 58%) to private clinics. Out of the 380 patients involved in the study, 218 were female (57.4%) and 162 were male (42.6%). The mean age of all subjects was 33.18 ± 9.8 years; 31.22 ± 9.32 years for females and 35.8 ± 9.93 years for males. The majority of females (77.1%) were between the age range of 18 and 24 years and 63.6% of the males were 45 years or above. This difference was significant according to the chi-square test.

Regarding the educational level of the study population, 128 (33.7%) had higher education levels than high school diploma, 130 (34.2%) with high school diploma, and 122 (32.1%) with levels lower than high school diploma. The relationship between educational level and other variables was measured by chi-square test. According to the results of this test, the educational level had a significant relationship with age ($P \leq 0.001$). Among the studied population, 70% used a single source, 13.9% from the two sources, and 16.1% from more than two sources for oral health information. The relationship between oral health information resources and other variables was evaluated by chi-square test. The results showed a significant correlation of the acquisition of information via the Internet with age, education, and oral health literacy.

In this study, 46.8% of the subjects had favorable oral health literacy; 19.7% had relatively favorable oral health literacy, and 33.4% had unfavorable oral health literacy. The mean total health literacy in the population under study was 10.6 ± 3.4 , placing the participants in the 'relatively favorable' oral health literacy group (10, 11) according to the classification of the study. The mean total reading score was calculated 3.8 ± 1.43 (maximum score = 6), while the mean total value of the numeracy section was 3.01 ± 1.09 (maximum score = 4). In the listening section, the mean total score was 1.1 ± 0.65 (maximum score = 2). The mean

score for the decision-making section was obtained 2.6 ± 1.4 (maximum score = 5).

The Mann-Whitney test revealed that there was a significant difference between the mean score of oral health literacy based on gender, education level, residential home area per person, and type of clinic. The results of the association between the mean score of oral health literacy and other variables of the study (based on the Mann-Whitney test) are shown in Table 1. The association between the mean score of oral health and oral health-related variables was evaluated. In this regard, the mean score of oral health literacy significantly correlated with the frequency of brushing per day, the use of toothpaste, the number of sources used for obtaining oral health information, and the last visit to a dentist. The mean score of oral health literacy was significantly higher in those who used the books and Internet, and consulted with a dentist for obtaining oral health information (Table 2).

Linear regression analysis was performed for variables, which showed a significant association with the oral health literacy. According to the results of the test, there was a significant association between education level, gender, the type of clinic, and the number of sources used for oral health education (Table 3). Those with high school diploma or with a higher graduate degree had a higher oral health literacy. Moreover, a higher oral health literacy rate was observed for those with a residential home area of between 20 and 39 m² per person, as compared with an area of less than 20 m² per person. Oral health literacy was lower among those who used one or two sources of oral health information in comparison to those who used more than two sources. The results of this test are shown in Table 3.

The mean of total DMFT index was calculated as 8.3 ± 4.9 and the therapeutic needs were calculated based on the equation: $(D/D + F = \text{unmet therapeutic needs})$; where D is the number of decayed teeth and F represents the number of filled teeth (22). The mean score for unmet therapeutic needs was calculated as 43.8. The association between the DMFT index, oral health literacy, and four sections of the questionnaire was assessed by a correlation coefficient test. The results of this test showed that there was a significant correlation between DMFT and oral health literacy, but this correlation was negative and weak (P value = 0.013; $R = -0.127$). The DMFT had a weak negative correlation with the two sections of reading and numeracy (reading: $P = 0.026$, $R = -0.114$; numeracy: $P = 0.036$, $R = -0.108$). The DMFT had a negative correlation with the two sections of listening and decision-making, but not significantly (listening: $P = 0.711$, $R = -0.019$; decision-making: $P = 0.065$, $R = -0.095$).

5. Discussion

In the present study, the mean score of health literacy was 10.6 ± 3.4 , which is within the 'relatively favorable' category of oral health literacy. Thus 46.8% of the subjects had 'favorable', 19.7% had 'relatively favorable', and 33.4% had 'unfavorable' oral health literacy. In a study conducted in the city of Tehran by Naghibi Sistani et al. (23) that used a similar survey questionnaire to the present study, 44.3% of the subjects had favorable oral health literacy. The results of Naghibi Sistani et al. (23) are in line with the findings of the present study. In another study in India, Raman-deep et al. (24) distributed a researcher-made questionnaire among the subjects referred to the dental school, and the degree of favorable oral health literacy was obtained as 12.5%. In the present study, the mean oral health literacy was 11.09 ± 3.18 in females and 10.15 ± 3.65 in males and there was a positive correlation between health literacy and female gender (linear regression coefficient = 0.91 and P value = 0.01, Table 3). Given the fact that the females have more leisure time, they can obtain their health information using various sources, resulting in higher health literacy.

Education was an important factor in predicting health literacy in the current study, as people with a high school diploma (mean value = 10.50 ± 3.27 , coefficient = 1.05) and > high school diploma (mean value = 12.30 ± 3.12 , coefficient = 2.75) had significantly higher oral health literacy than < high school diploma. The results of the present study are in line with the findings of other studies (4, 11, 23, 25-29). Carthery-Goulart et al. (30) obtained a ratio on education and functional health literacy (FHL) and stated that, for a year increase to the duration of study, the degree of health literacy increased by 3.87 points. Therefore, health literacy and education should be considered when making public health policies because these two factors are effective in the perception of individuals towards health-related information. In the present study, people who took advantage of other resources (e.g., Internet, books, dentist, etc.) to obtain oral health information had significantly higher oral health literacy. Thus those who used a single source of information had 1.96-fold and those who used two sources of information had 1.40-fold lower oral health literacy compared with those who used more than two sources. This finding is consistent with that of Naghibi Sistani et al. (23). A high percentage of participants in the present study obtained information from the Internet (74.7%) or a dentist (45.3%). Most of the participant that obtained information from the Internet included women, employed people, and people with > high school diploma. The majority of people who obtained oral health information from the dentist, included women, unemployed peo-

Table 2. The Mean Score of Oral Health Literacy Based on Oral Health-Related Variables

Variables	The Mean Score of Oral Health Literacy	P Value
Frequency of brushing per day		< 0.001
Less than once per day	9.52 ± 3.54	
Once per day	11.2 ± 3	
More than once per day	10.98 ± 3.71	
The use of toothpaste		0.01
Yes	10.82 ± 3.35	
No	8.92 ± 3.88	
Dental visit		0.04
Less than 6 months ago	10.98 ± 3.08	
Within 6 months to a year ago	11.34 ± 3.56	
More than a year	10.27 ± 3.50	
Frequency of taking sweet snacks per day		0.25
Less than 3 times	10.61 ± 3.42	
Three times or more	11.18 ± 3.40	
Smoking		0.10
Yes	9.36 ± 4.08	
No	10.78 ± 3.35	
Number of used resources for getting information about oral hygiene		< 0.001
One source	10.14 ± 3.44	
Two sources	10.14 ± 3.18	
More than two sources	12.68 ± 2.69	
The type of resources used to obtain oral health information		
Internet	11.88 ± 2.79	< 0.001
Dentist	11.47 ± 3.16	< 0.001
Radio and TV	11.29 ± 3.57	0.005
Books	12.0 ± 3.0	0.006
Newspapers	10.8 ± 4.3	0.587
Family	10.6 ± 3.7	0.798
Friends	11.0 ± 3.3	0.555
Oral health self-assessment		0.15
Good	10.79 ± 3.32	
Bad	10.74 ± 3.56	
I do not know	9.33 ± 3.80	

ple, and people with high school diploma. Since employees are required to be present at the workplace for a specified period, they are probably less likely to go to the dentist to obtain oral health information. Searching the Internet may be the easiest way to obtain oral health information in this group, but unemployed people have more free time to use any kind of source. As previously mentioned, the females in the present study have a higher degree of

health literacy and seek health information from a variety of sources, which may lead to higher health literacy than males.

The mean DMFT in the present study was 8.3 ± 4.9 . This rate was obtained as 10.88 by Torabi et al. for population aged 35 - 44 in Kerman, 6.55 in Saudi Arabia, 11.44 in Istanbul, and 4.71 in Uganda (31-34). In the current study, the DMFT increased significantly with age. Hence, lower DMFT

Table 3. Factors Affecting Oral Health Literacy

Variables	Regression Coefficient	Lower Bound	Upper Bound	P Value
Gender				
Female	0.91	0.16	1.66	0.01
Male	Referent	-	-	-
Educational level				
> High school diploma	2.75	1.91	3.59	0.001
High school diploma	1.05	0.27	1.84	0.009
< High school diploma	Referent	-	-	-
Type of clinic				
Public	0.66	0.03	1.29	0.03
Private	Referent	-	-	-
Housing area per person,m²				
> 40	0.77	-0.33	1.87	0.16
20 - 39	1.53	0.65	2.41	0.001
< 20	Referent	-	-	-
Oral health information resources				
1	-1.96	-2.81	-1.10	0.001
2	-1.40	-2.52	-0.27	0.01
> 2	Referent	-	-	-

was observed in subjects aged 18 - 24 years (23.6 fold) and in the age group of 25 - 44 (80.3 fold) in comparison to the subjects aged 45 years or above. The results of this study are in agreement with the findings of Kamberi et al. (35) in Europe, Pakpour et al. (36) in Iran, and Kutesa et al. (34) in Uganda. Several studies have examined the effect of aging on the DMFT index, confirming the results of the present study. Thus it may be attributed to the constant effect of time on decayed teeth. Younger people also paid more attention to preventive programs, probably resulting in their higher oral health.

In our study, there was a significant association between different levels of education and the DMFT index. The mean DMFT index was 9.62 ± 5.34 for the < high school diploma, 7.62 ± 4.76 for the high school diploma and 7.63 ± 4.35 for > high school diploma. Apparently, the DMFT index decreases with increasing levels of education. Torabi et al. (31) found no significant association between education and DMFT. However, in a study conducted on a population of Australians aged 45 - 54 years, it was concluded that the DMFT index was less in people with higher literacy (37). Pakpour et al. (36) conducted a study on students in Qazvin (Iran) and reported that parental education was a determining factor in predicting DMFT; therefore, the DMFT index is reduced with the increase in parental education. In the present study, smoking was identified as an important

risk factor for predicting the mean DMFT. The DMFT index was 2.42 times lower in non-smokers than smokers. This factor remained to be evaluated in other studies. Since these people are often overlooked for their oral hygiene, higher DMFT index is expected to be an important indicator for assessing oral health.

The DMFT index had a negative and weak correlation with oral health literacy as the DMFT index was decreased with increasing oral health literacy. The results of a study conducted by Haerian et al. (11) on undergraduate students using the OHI questionnaire in Yazd (Iran) are also in line with the findings of the present study. Haridas et al. (38) also achieved similar results during a study in India. The results indicated that those with higher oral health literacy had lower DT, MT, and DMFT indices, and were more likely to have filled teeth. Difficulty for patients with low oral health literacy to understand the guidelines and preventive recommendations may lead to fewer adherences to preventive recommendations. As a result, oral dental illnesses, including decayed teeth, are more prevalent among such patients. It should also be noted that the current study has limitations. Since the study design was cross-sectional, no causal inferences could be made. Thus further longitudinal studies may be required to confirm the findings reported here. Furthermore, there is potential for bias, such as reporting bias or recall bias (e.g. pa-

tients may have shared limited or selected information or provided inaccurate responses to the questions due to inaccurate memory). Despite the relatively favorable health literacy level in our study, the DMFT score was high (8.8 ± 4.9). Therefore, it is suggested to evaluate other oral health indices such as the periodontal index in future studies.

5.1. Conclusions

The results of this study showed that the oral health literacy of referred subjects to dental clinics in Mashhad was relatively favorable and most of the subjects had favorable oral health literacy. This rate was higher in females, people who had at least a high school diploma, people with a better economic status, referred subjects to public clinics, and those who use several sources, such as the Internet, books, dentist, etc., for obtaining oral health information. The DMFT index was 8.8 ± 4.9 in the studied population. This indicator was higher among older people, smokers and those who did not use toothpaste. Also, DMFT was significantly lower in those who had higher oral health literacy.

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Footnotes

Conflict of Interests: The authors declared no conflict of interests in this study.

Ethical Approval: The study protocol was approved by the Ethics Committee of Mashhad University of Medical Sciences (IR.MUMS.sd.REC.1394.91).

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