



Oral Health Literacy: Decision-Making and Reading Comprehension Skills as the Determinants of Self-Reported Oral Health

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Article Info	ABSTRACT
<p>Article type: Original Article</p>	<p>Objectives: Oral health literacy (OHL) is a concept far beyond reading and including other skills such as numeracy skills, listening, and decision-making. Self-reported oral health(SROH) is a reliable and cost-effective measure of dental and periodontal conditions. The current study aimed to evaluate the association between various aspects of OHL and SROH.</p>
<p>Article History: Received: 15 Mar 2024 Accepted: 10 Sep 2024 Published: 10 Apr 2025</p>	<p>Materials and Methods: This cross-sectional study was conducted among adults visiting a dental school. One interviewer asked each individual "How would you describe your oral health at present?" to measure SROH. Two response categories were "good" and "poor". OHL-AQ (Oral Health Literacy Adult Questionnaire) was used to measure different aspects of OHL (Reading comprehension and knowledge, listening, numeracy and communication, and decision-making skills). The total scores ranged from 0 and 17. To analyze the data binary logistic regression and chi-square tests were performed. (P=0.05)</p>
<p>* Corresponding author: Department of Community Oral Health, School of Dentistry, Tehran University of Medical Sciences, Tehran, Iran Email: k-sargeran@tums.ac.ir</p>	<p>Results: Totally 253 adults participated. Most participants (65.21%) were females. The numbers of subjects with good and poor SROH were 127(50.20%) and 126(49.80%) respectively. The mean age of the participants was 37.75±10.69 years and ranged from 18 to 65 years. The overall mean OHL score was 11.74±3.12. Out of the components of OHL in OHL-AQ, reading comprehension and knowledge skills (p=0.032), and decision-making skills (p=0.013) had a significant positive correlation with good SROH. In contrast, listening (p=0.955) and numeracy skills (p=0.349) did not exhibit a similar association.</p> <p>Conclusion: OHL level, particularly decision-making, reading comprehension, and knowledge skills, is associated with SROH.</p> <p>Keywords: Health literacy; Oral Health; Self-Assessment</p>
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INTRODUCTION

Literacy is a currency to success in different aspects of life including health [1]. Oral health literacy (OHL) is a thriving field [2]. Personal health literacy is defined as "the degree to which individuals can find, understand, and use information and services to inform health-related decisions and actions for themselves and others"

by Healthy People 2030 [3]. This definition refers to functional oral health literacy, in the sense that oral health literacy is not just a theoretical aspect of knowledge; In fact, health literacy is a concept far beyond reading and includes other skills such as writing, numeracy skills, reading, listening and decision making [1].

Although information about oral health literacy is

little in developing countries [4], there has been an upward trend in OHL studies in Iran in recent years [5–9]. Increasing the level of health literacy reduces health inequalities [10,11]. People with poor health literacy are less aware of oral health issues, develop more severe oral diseases [12,13], and have difficulty understanding or interpreting health instructions correctly [14]. Many people are unaware that they have limited health literacy and even if they know they are ashamed to express the issue when communicating with doctors. On the other hand, many healthcare professionals lack sufficient knowledge about the importance of assessing health literacy levels. In other words, the lack of health literacy is an invisible barrier to health promotion and it is necessary to evaluate its level [1]. Naghibi Sistani et al. designed an oral health literacy assessment instrument, named Oral Health Literacy Adult Questionnaire (OHL-AQ), and evaluated its validity and reliability in a sample of adults in Tehran, Iran [15]. The OHL-AQ evaluates various aspects of health literacy such as reading comprehension, knowledge skills, numeracy skills, decision-making, listening, and communication skills [15]. In this questionnaire, OHL is categorized as inadequate (0–9), marginal (10–11), and adequate (12–17) based on the total score. Among adults in Tehran, 35% had inadequate OHL, 25% had marginal OHL, and 40% had adequate OHL [16].

Self-reported oral health (SROH) is a valuable tool in epidemiological studies by reducing study costs [17,18]. It is a valid and reliable measure regarding dental, periodontal, and TMJ conditions. [19–22] Few studies were conducted showing the association between poor SROH and low levels of OHL [16,23]. However, to the best of our knowledge, no studies have evaluated the role of the four different aspects of OHL in relation to SROH. The current study aimed to determine the effect of the different components of health literacy on SROH.

MATERIALS AND METHODS

Ethics:

Informed consent was taken from all the participants before the enrollment. The participants' personal information was kept confidential and only the researchers of this study

had access to it. This study was reviewed and approved by the local ethics committee (ethics number: IR.TUMS.DENTISTRY.REC.1400.181)

Study design and subjects:

This cross-sectional study was conducted among adults visiting the School of Dentistry, Tehran University of Medical Sciences. Data were collected between January 2022 and March 2023. The subjects were selected through non-probability sampling (convenience sampling). All the adults aged 18-65 years were considered eligible to participate in the present study. The inclusion criteria were the ability to read and write in Persian and the willingness to participate in the study. The subjects who did not want to participate or had a physical or mental disability were excluded from the study. One person interviewed the entire sample population. The interviewer did not help the subjects answer, read, or understand the questionnaire questions.

Sample size calculation:

The sample size was calculated using the PASS software (Power Analysis and Sample Size Software (2021). NCSS, LLC. Kaysville, Utah, USA) following the method described by Hsieh et al. In PASS software, tests for the Odds Ratio in Logistic Regression with One Normal X and Other Xs (Wald Test) were applied [24]. The data from the first 50 subjects were used as a pilot test to obtain the measures needed for sample size calculation. Since the variable "decision making" was normally distributed, it was considered X. According to the output of multiple logistic regression for the pilot group, P0, the Odds ratio and R-squared were equal to 0.30, 2.19, and 0.39. Considering a 5% level of significance and 95% power, the minimum required sample size was equal to 165 subjects. We also considered a 20% dropout rate, so a sample size of 207 subjects was needed.

Measures:

The interviewer asked each individual "How would you describe your oral health at present?" to measure self-reported oral health. Two response categories were "good" and "poor". OHL-AQ (Oral Health Literacy Adult Questionnaire) was used to measure oral health literacy. Its reliability and validity

were approved in another study [15]. The questionnaire contained four sections, 14 questions, and 17 items. Each item was scored as 1 for a correct answer and 0 for an incorrect answer. Therefore, the total score ranged from 0 to 17. OHL levels were categorized as inadequate (scores 0–9), marginal (scores 10–11), and adequate (scores 12–17). The reading comprehension section evaluated reading and knowledge skills, containing three questions and six items. The numeracy section presented a prescription for antibiotic consumption and an instruction on using a mouth rinse. Four questions (four items) were asked in this part. In the listening section, the interviewer explained some sentences about extraction aftercare, and two related questions (two items) were asked afterward. This section was intended to evaluate communication skills, too. The last part, the decision-making section, included five questions (five items) about common oral health problems and history forms. Finally, some demographic variables were asked such as age, gender, number of education years, and economic status. Living area in square meters per person (m^2/p) was asked to assess the economic status. Living area in square meters per person (m^2/p) has been shown to be a valid and reliable indicator for assessing economic status in Iran [25].

The primary outcome was first the relationship between OHL and SROH and second, the relationship between four components of OHL and SROH. The secondary outcomes were the association between age, gender, level of education, socioeconomic status, and SROH. Potential confounders for primary outcome measures might be the mentioned demographic characteristics. These demographic characteristics were adjusted in the analysis.

Statistical analysis:

Data related to each individual was coded, entered, and analyzed using SPSS software version 26 (IBM Corp. Released 2019. IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp n.d.). Binary logistic regression analysis assessed the effect of reading, numeracy, listening, and decision-making abilities on self-reported oral health.

The analysis was performed in both adjusted and unadjusted forms. In the adjusted regression model, covariates were reading, numeracy, listening, decision-making scores, and demographic variables. An analysis was also performed on the sum of OHL scores. The chi-square test of independence was used to compare the frequency of correct answers for each question between individuals with good and poor self-reported oral health. The significance level was set at 0.05.

RESULTS

In this cross-sectional study, 253 adults participated who visited the School of Dentistry, Tehran University of Medical Sciences. All the participants answered the SROH question and completed the questionnaires. Most participants (65.21%) were females. The numbers of subjects with good and poor self-assessed oral health were 127(50.20%) and 126(49.80%) respectively. The mean age of the participants was 37.75 ± 10.69 years and ranged from 18 to 65 years. The overall mean OHL score was 11.74 ± 3.12 . A total of 62, 44, and 147 respondents had respectively inadequate (0-9 scores), marginal (10-11 scores), and adequate OHL levels (12-17 scores) respectively. Table 1 demonstrates the study sample characteristics. A significant association was observed between good self-reported oral health and the sum of oral health literacy scores in the unadjusted logistic regression model ($P \leq 0.001$) (OR=1.24, 95% confidence interval=1.13,1.36) and when adjusted for the demographic characteristics. ($P=0.006$) (OR=1.16, 95% confidence interval=1.04,1.29) As Table 2 demonstrates higher education ($p=0.024$), lower age ($p=0.001$), and higher living area in square meters per person($p=0.027$) contributed to good self-reported oral health. Out of the four components of oral health literacy in OHL-AQ, reading comprehension and knowledge skills ($p=0.032$), and decision-making skills ($p=0.013$) had a significant positive correlation with good self-reported oral health. Listening ($p=0.955$) and numeracy skills ($p=0.349$) did not have a statistically significant effect on self-reported oral health.

Table 1. Demographic characteristics and the scores of the four components of oral health literacy according to OHL-AQ*

Questionnaire item	Self-reported oral health	
	Good (n=127)	Poor (n=126)
Gender		
Female	87(68.50%)	78(61.90%)
Male	40(31.57%)	48(38.09%)
Age mean(\pm SD)	35.72(\pm 11.37)	39.79(\pm 9.56)
Years of education mean(\pm SD)	14.21(\pm 3.09)	12.40(\pm 3.71)
Living area(m²/p) mean(\pm SD)	29.95(\pm 14.77)	25.14(\pm 10.10)
Total oral health literacy score mean(\pm SD)	12.62(\pm 2.93)	10.96(\pm 3.09)
Reading comprehension section mean(\pm SD)	4.24(\pm 1.34)	3.57(\pm 1.35)
Numeracy section median(first quartile-third quartile);(min-max)	4(3-4);(0-4)	3(2-4);(0-4)
Listening section median(first quartile-third quartile);(min-max)	2(1-2);(0-2)	2(1-2);(0-2)
Decision-making section mean(\pm SD)	3.62(\pm 1.23)	2.87(\pm 1.46)

*Oral Health Literacy Adult Questionnaire. SD: standard deviation. min: minimum. max: maximum

Table 2. The correlation between the covariates (the left column) and good self-assessed oral health according to the logistic regression analysis (n=253)

Questionnaire item	Unadjusted OR (95% CI)	P	Adjusted OR (95% CI)	P
Gender				
Female	1.00 (ref)		1.00 (ref)	
Male	0.75 (0.44,1.26)	0.27	0.77 (0.43,1.38)	0.38
Age	0.96 (0.94,0.99)	0.003	0.95 (0.93, 0.98)	0.001
Years of education	1.17 (1.08,1.27)	<0.0001	1.12 (1.02,1.23)	0.02
Living area(m²/p)	1.03 (1.01,1.05)	0.004	1.03 (1.00,1.05)	0.03
Oral Health Literacy scores				
Reading comprehension section	1.45 (1.20,1.76)	<0.001	1.28 (1.02,1.61)	0.03
Numeracy section	1.36 (1.06,1.75)	0.02	0.85 (0.61,1.19)	0.35
Listening section	1.42 (0.98,2.04)	0.06	1.01 (0.66,1.55)	0.95
Decision-making section	1.50 (1.24,1.82)	<0.0001	1.34 (1.06,1.68)	0.01

OR: Odds Ratio; P: p-value

The logistic regression curves (Figure 1) show the changes in the probability of the occurrence of good self-reported oral health as a function of changes in the level of oral health literacy and its constituents. Individuals with good self-reported oral health had higher knowledge regarding the number of teeth and their eruption time; They could better decide what to do in case of feeling pain and swallowing in the mouth and gained a better understanding of the items on a dental examination form (Table 3).

DISCUSSION

As the results of the current study demonstrated, decision-making, reading comprehension, and knowledge skills significantly associated with self-reported oral

health. Besides, level of education, age and socio-economic status influence self-reported oral health.

The literature supports the association between health literacy and self-reported oral health [16,23,26]. One study found a significant positive correlation between OHL and oral hygiene self-efficacy with SROH. In addition, they evaluated merely two dimensions of OHL (numerical skills and reading comprehension), and both were significantly correlated with SROH [27]. The study by Parker et al. [23] showed that OHL-related outcomes (such as the use of dental services and oral health knowledge) were generally risk indicators for seven parts of poor self-reported oral health.

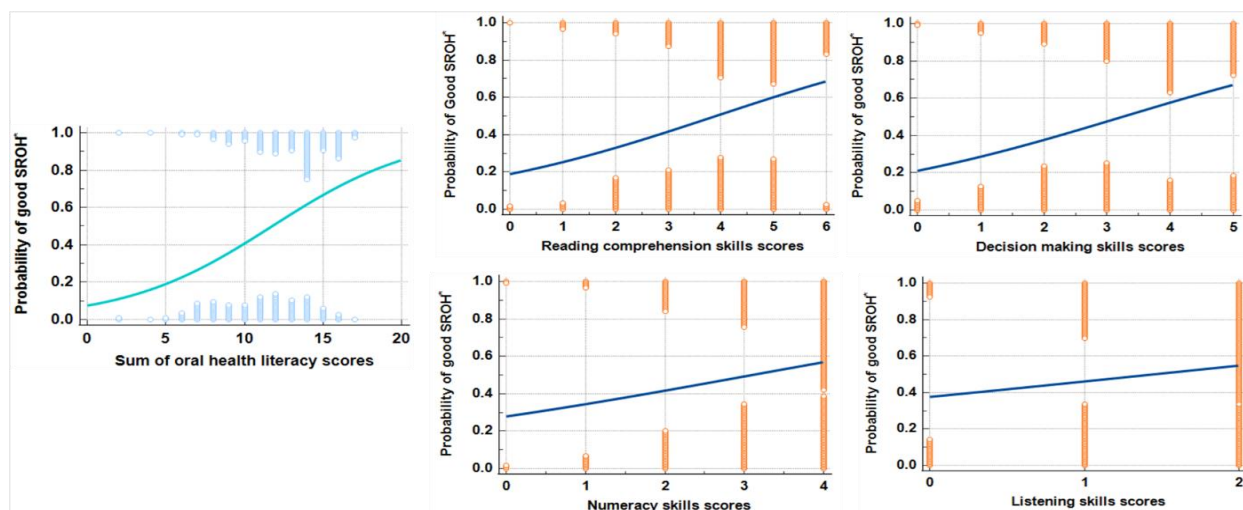


Fig 1. Logistic regression curves showing the probability of good self-reported oral health occurrence versus the scores of oral health literacy and its components in the Oral Health Literacy-Adult Questionnaire (n=253)
SROH: self-reported oral health

Table 3. Comparison of correct answers to reading comprehension and decision-making questions between participants with good or poor self-reported oral health (n=253)

Questionnaire item	Self-reported oral health		Chi-square analysis	
	Good (n=127) N(%)	Poor (n=126) N(%)	X ²	P-value
Reading Comprehension and knowledge skills				
Q1- Research shows that there may be a link between oral diseases and other health problems such as <u>myocardial infarction</u> .	56(44.09%)	52(41.27%)	0.21	0.650
Q2-One of the most common oral diseases is tooth decay. Brushing with toothpaste that contains <u>fluoride</u> ...	99(77.95%)	92(73.01%)	0.83	0.361
... at least twice <u>a day</u> ...	103(81.10%)	98(77.77%)	0.43	0.51
..., with flossing and avoiding foods with lots of <u>sugar</u> could prevent tooth decay	109(85.83%)	97(76.98%)	3.27	0.071
Q3- Every person has 32 <u>permanent</u> teeth ...	110(86.61%)	87(69.05%)	11.32	0.001
... and gets <u>the first one</u> at six years old.	62(48.82%)	24(19.05%)	24.98	<0.0001
Decision-making				
Q10- The best decision if little bleeding occurs after brushing or flossing is <u>brushing and flossing daily</u>	87(68.50%)	82(65.08%)	0.33	0.563
Q11- The best decision if pain and swallowing occur in the mouth is <u>to visit the doctor or dentist</u>	109(85.83%)	80(63.49%)	16.70	<0.0001
Q12- The best way to remove stains and calculus from teeth is <u>to have dental scaling</u>	94(74.01%)	84(66.66%)	1.64	0.201
Q13- When I signed "I exonerate my dentist from unintentional complications of treatment" meant <u>that my dentist is not responsible for unintentional complications of treatment</u>	82(64.57%)	45(35.71%)	21.06	<0.0001
Q14- When I said "I have a history of allergy to some drugs" I mean, I feel <u>unable to breathe, and have redness in my skin after taking some drug</u>	88(69.29%)	71(56.35%)	4.54	0.033

The correct answers are indicated with underlining

One aspect of poor self-reported oral health was self-rated oral health, where participants were asked whether they considered their oral health to be fair or poor.

In their study, the OHL score did not have a significant association with self-rated oral health. However, it was linked to other indicators of poor self-reported oral health such as having extracted teeth, feeling the need to fill or extract teeth, dissatisfaction with the appearance of the mouth and avoiding certain foods. Fair or poor self-rated OHL was significantly higher in subjects older than 38 years, men, problem-based dental attenders, and those who think they should brush their teeth once a day or not at all [23]. The results of this study contrasted with the current study as the OHL score showed no significant association with self-rated oral health. However, we should consider that the OHL instrument in Parker's study (REALD30) only evaluated word recognition contrary to OHL-AQ.

Another study reported that lower levels of oral health literacy, higher age, lower education, and poor tooth-brushing behavior contributed to poor self-reported oral health [16]. There is a controversy in the literature regarding the effect of age on self-reported oral health. Consistent with the results of the current study, some studies have concluded that people of higher age have lower levels of self-perceived oral health in general [16,23,28]. In a few studies, it was shown that there is no significant relationship between self-perceived oral health and age [29–32]. Two studies demonstrated that poor self-reported oral health is significantly associated with lower age; however, the populations of these studies were elderly people [33,34].

The components of health literacy include conceptual and cultural knowledge, listening and speaking (linguistic literacy), writing and reading (written literacy), and counting skills. Most available oral health literacy assessment instruments focus on limited aspects of oral health literacy [15]. For instance, the Rapid Estimate of Adult Literacy in Dentistry (REALD), only measures word recognition ability [35]. The Test of Functional Health Literacy in Dentistry (TOFHLiD) [36] and Oral Health Literacy Instrument (OHLI) [12] evaluate the

numeracy skills and comprehension of written oral health information.

One strength of the current study was the application of a questionnaire assessing different aspects of oral health literacy, unlike the previous questionnaires. In the current study, the Oral Health Literacy Adult Questionnaire (OHL-AQ) was utilized to evaluate reading comprehension, knowledge skills, numeracy, listening, decision-making, and communication skills. Naghibi Sistani et al. designed and evaluated the reliability and validity of OHL-AQ. Their sample was randomly selected from adults in Tehran, Iran [15]. Thus, another strength of OHL-AQ is being a context-specific questionnaire. Previous studies also appreciated the use of localized questionnaires [37,38].

One limitation of the current study was that the sample was not representative of the general population due to non-probability sampling. This may cause selection bias. Since the design of the current study is cross-sectional, there can be no assumptions of causality. Also, oral health self-assessment in the form of one question may not be a good indicator of the actual situation of oral health status.

CONCLUSION

Within the limitations of the current study, our results demonstrated that oral health literacy level, particularly decision-making, reading comprehension and knowledge skills, is associated with self-reported oral health.

CONFLICT OF INTEREST STATEMENT

None declared.

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