

The effect of oral health literacy of adolescents on their oral health status: A cross-sectional study from Southwestern Iran

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Original Article

Abstract

BACKGROUND AND AIM: Oral health literacy (OHL) has proved to be important in diminishing oral health inequalities and in promoting oral health. The aim of this study was to evaluate the correlation between OHL and dental indices of 12- to 15-year-old students in Ahvaz, Iran.

METHODS: In this cross-sectional study, a sample of 254 middle school students was selected by cluster random sampling method. The data were gathered using a previously-validated questionnaire, Oral Health Literacy Instrument (OHLI). Oral health status was evaluated using the Simplified Oral Hygiene Index (OHI-S) and the Decayed, Missing, and Filled Teeth (DMFT) index. Data were analyzed using SPSS software with a significance level of $P < 0.05$.

RESULTS: From a total of 254 students (mean age = 13.65 years, 51.57% male), 24.4% were caries-free. The OHL level of 50.2% of the students was inadequate and it was in positive correlation with the OHI-S, students' gender, grade, and their fathers' educational level ($P < 0.05$). The mean DMFT of the sample was 3.35 ± 2.72 and it was significantly higher among girls ($P = 0.004$). The mean OHI-S was 1.24 ± 0.91 .

CONCLUSION: According to our findings, students with higher OHL had better oral hygiene status and belonged to higher educated families. OHL-promoting programs for the students should be considered to improve their oral health and prevent future dental caries.

KEYWORDS: Health Literacy; Health Status; Mouth; DMF Index; Dental Caries

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Oral health literacy (OHL), globally known as "the degree to which individuals have the ability to gain, process, and understand basic oral health information and services needed to make appropriate oral health decisions",¹ has proved to be prominent in diminishing oral health inequalities and in promoting oral health.² From the public health point of view, this is a relevantly important matter considering that low level of health literacy contributes to different diseases, which can

greatly cost the public health system as well as the individuals.^{1,3} According to Batista et al., OHL is associated with oral health status and practices, and it could interfere with the individual's quality of life.⁴ Haerian Ardakani et al. indicated that the Decayed, Missing, and Filled Teeth (DMFT) index and the Gingival Index (GI) were considerably influenced by OHL and it was probable to reduce the DMFT and the GI through enough education.⁵ Some studies have exhibited associations between oral health, oral health

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habits, and OHL in adults. Further studies are required to establish their relationships and clarify the evidence. However, there are very few studies on OHL of adolescents.^{2,6-8}

Adolescence is a period of unparalleled transformation in which individuals reach high levels of liberty and less adult supervision. As a result, they often tend to reject predetermined standards. Moreover, because of inadequate performance and the underuse of preventive services, it is an importantly vulnerable phase of life. Therefore, they need a novel approach to educate them about means of achieving oral health.⁹⁻¹²

One of the action areas of World Health Organization (WHO) is to focus on OHL and behavioral improvements.¹³ Unfortunately, there is a shortage of related studies in this area as well as in adolescents. Therefore, the present study aimed to evaluate the correlation between OHL and dental indices of 12- to 15-year-old middle-school students in Ahvaz, Iran, in 2019. This study is one of the first attempts in measuring OHL in this population of Ahvaz.

Methods

This cross-sectional study was conducted on a sample of selected students using stratified cluster random sampling method from middle schools (two male and two female schools) in Ahvaz. The research was approved by the Ethical Committee of Ahvaz Jundishapur University of Medical Sciences (IR.AJUMS.REC.1398.116). Prior to the examination, the purpose of the study was explained to the students and they were informed that their information would stay confidential.

A pilot study was conducted on 30 students to calculate mean and standard deviation (SD) of OHL, and the required sample size, with $\alpha = 0.05$ and $\beta = 0.10$, was calculated as 254 students.

To reach the calculated sample size, 287 middle school students were enrolled in the study. They were 12- to 15-year-olds who provided signed informed consent. Any participant in mixed

dentition or undergoing orthodontic treatment was excluded from the study.

A trained investigator collected the data. Information about the students' demographic details, self-reported economic status, and their oral health-related habits (frequency of tooth brushing, flossing, and mouthwash usage, regularity of dental check-ups, and their last dental visit) was collected using a data collection form. The subjects' OHL was evaluated using a previously-validated and reliable questionnaire, Oral Health Literacy Instrument (OHLI). It contained two sections, reading comprehension and numeracy section. The reading comprehension was a text with 38 blank spaces about dental caries and periodontal disease. Under each blank space were four words from which the students had to choose to complete the sentences. There were 19 questions in the numeracy section to evaluate one's comprehension skills of doctor's directions given to patients for taking common prescriptions associated with dental treatment. The total OHLI score ranged from 0 to 100 which was categorized into three levels: inadequate (0-59), marginal (60-74), and adequate (75-100).¹⁴ This questionnaire was translated and validated in Persian by previous studies.⁵ An average of 15-20 minutes was required to complete the questionnaire and the data collection form.

To evaluate the students' oral health status, they underwent dental examination. To calibrate the accuracy of examinations, 15 students were reexamined two weeks later, and then the results were compared and showed a 95% similarity. The DMFT index and Greene-Vermillion Simplified Oral Hygiene Index (OHI-S) were determined according to the WHO standard diagnostic criteria.¹⁵ The DMFT index was obtained by calculating the number of decayed, missing, and filled permanent teeth.¹⁶ The OHI-S consists of two components, the Debris Index and the Calculus Index. To evaluate components, six tooth surfaces of six teeth were examined. Scores of the Debris Index and the Calculus Index were classified as:

0- (no debris/calculus)

1- (soft debris or stains/supragingival calculus covering less than one-third of the exposed tooth surface)

2- (soft debris/supragingival calculus covering more than one-third but less than two-thirds of the exposed tooth surface or presence of individual flecks of subgingival calculus around the cervical portion of the tooth)

3- (soft debris/supragingival calculus covering more than two-thirds of the exposed tooth surface or a continuous heavy band of subgingival calculus around the cervical portion of the tooth)

The values of both Debris and Calculus Indexes were combined and the total OHI-S was calculated.¹⁷ Finally, each student was given oral health education and their questions were thoroughly answered.

Data analysis was performed using the SPSS statistical software (version 23.0, IBM Corporation, Armonk, NY, USA) with a significance level of $P < 0.05$. The descriptive (mean and SD) and analytical statistics including correlation coefficient, Pearson chi-square, independent t-test, Mann-Whitney U, one-way analysis of variance (ANOVA), Kruskal-Wallis, and linear regression were used. In case of normal distribution of data, the means of two groups were compared using independent t-test and the means of more than two groups were compared using ANOVA. If the variables were not normal, Mann-Whitney U test was used to compare the means of two groups and Kruskal-Wallis

test was used for comparing the means of more than two groups.

Results

The study sample included 254 middle school students (131 boys and 123 girls with the mean age of 13.65 ± 0.99 years) mostly from 9th grade. Most of the parents' education degree was diploma (Table 1).

Table 1. Frequency table of the demographic characteristics of the participants

Variable	n (%)
Age (year)	
12	41 (16.1)
13	62 (24.4)
14	95 (27.4)
15	56 (22.0)
Grade	
7 th	81 (31.9)
8 th	84 (33.1)
9 th	89 (35.0)
Ethnicity	
Fars	154 (60.6)
Arab	100 (39.4)
Father's education	
Less than diploma	45 (17.7)
Diploma	111 (47.7)
Academic	98 (38.6)
Mother's education	
Less than diploma	59 (23.2)
Diploma	108 (42.5)
Academic	87 (34.3)
Economic status	
Very good	51 (20.1)
Good	121 (47.6)
Moderate and less	82 (32.3)

Table 2 shows the mean of OHL, DMFT, and OHI-S in boys and girls. The mean of OHL was 53.31 ± 19.96 .

Table 2. Comparison of mean Decayed, Missing, and Filled Teeth (DMFT) index, Simplified Oral Hygiene Index (OHI-S), and oral health literacy (OHL) scores in study sample by gender

Variable	Boys (mean \pm SD)	Girls (mean \pm SD)	P*
DMFT	2.83 \pm 2.45	3.87 \pm 2.88	0.004
Decayed	2.19 \pm 2.14	3.26 \pm 2.66	0.002
Missing	0.23 \pm 0.78	0.13 \pm 0.40	0.620
Filled	0.39 \pm 1.06	0.48 \pm 1.19	0.554
OHI-S	1.26 \pm 0.94	1.17 \pm 0.90	0.482
Debris I.	0.79 \pm 0.59	0.76 \pm 0.56	0.712
Calculus I.	0.46 \pm 0.46	0.40 \pm 0.44	0.228
OHL	49.09 \pm 19.83	57.80 \pm 19.18	< 0.001**
Reading comprehension	24.96 \pm 9.21	29.09 \pm 8.53	< 0.001**
Numeracy section	24.13 \pm 13.03	28.71 \pm 13.32	0.006**

*Mann-Whitney U test; **Independent t-test

DMFT: Decayed, Missing, and Filled Teeth; OHI-S: Simplified Oral Hygiene Index; OHL: Oral health literacy; SD: Standard deviation

OHL level of 50.2% of the participants was inadequate, whereas 22.5% had marginal, and 17.3% had adequate OHL. This score was higher among girls ($P < 0.001$) and 9th graders ($P < 0.001$) and was in a significant correlation with OHI-S ($r = -0.168$, $P = 0.007$). Also, those with academic-educated fathers had higher OHL score ($P = 0.020$). Linear regression model was created to test OHL associations with demographic variables and OHI-S. It was gathered that OHL was directly correlated with students' gender, their fathers' educational level, and students' grade, respectively. Also, the test showed a negative correlation between OHL and OHI-S and with an increase equal to one unit in OHI-S, 2.56 units were reduced from OHL (Table 3).

Table 3. Equation of regression of health literacy level with demographic variables and Simplified Oral Hygiene Index (OHI-S)

Variable	B	SE	P
Constant	13.53	6.69	0.040
Student's gender ¹	11.52	2.36	< 0.001
Father's education ²	7.68	2.44	0.002
Student's grade ³	7.46	1.38	< 0.001
OHI-S	-2.56	1.23	0.039

¹Male; ²Less than diploma; ³7th grade

OHI-S: Simplified Oral Hygiene Index; SE: Standard error

Through clinical examination, the mean DMFT of the participants was 3.33 ± 2.72 and 24.4% of the students were caries-free.

The mean DMFT was higher among girls ($P = 0.004$). Those who had never gone to a dentist had statistically significant lower DMFT mean ($P = 0.004$) because of fewer filled teeth ($P < 0.001$).

The mean OHI-S of the students was 1.22 ± 0.92 (the Debris Index was 0.78 ± 0.57 and the Calculus Index was 0.43 ± 0.45) which was lower among those who brushed their teeth at least twice daily ($P = 0.020$).

Table 4 shows the comparison of oral health-related habits between boys and girls.

Discussion

In the present study, the mean of OHL score was 52.10 ± 21.46 which was lower than the results from Haerian Ardakani et al. in Iran. They stated that the mean of OHL of university students was 76.88 ± 11.46 ,⁵ possibly owing to the different age groups of the participants of the two studies as adults are more concerned about their oral health and therefore, are more familiar with dental terms.³ Our findings indicated that OHL was significantly higher among girls which is in agreement with previous studies.³ It was found in our study that OHL was correlated with the fathers' education level and was higher in those with academic-educated fathers. The same findings were found in a study in Brazil in 2019.³

Table 4. Comparison of oral health-related habits in study sample by gender

Variable	Total (%)	Boys (%)	Girls (%)	P*
Brushing				
Standard	33.9	12.2	21.7	< 0.0001
Non-standard	66.1	39.4	26.8	
Flossing				
Standard	20.1	10.6	9.4	0.8270
Non-standard	79.1	40.9	39.0	
Mouthwash.				
Standard	13.4	5.9	7.5	0.3500
Non-standard	86.6	45.7	40.9	
Last dental visit				
Recently	30.7	16.1	14.6	0.5060
More than 6 months	49.6	24.0	25.6	
Never gone to a dentist	19.7	11.4	8.3	
Dental check-ups				
Every 6 months	9.8	5.1	4.7	0.8630
Once a year	8.3	4.7	3.5	
If needed	81.9	41.7	40.2	

*Chi-square test

According to previous studies, there is an association between education level and OHL among parents. Parents' health literacy can directly impact the health outcomes and the health literacy of their children.^{8,18}

In this study, OHL was associated with the students' grade. The latter is believed to be highly correlated with reading levels and may affect reading comprehension, a section of OHLI, thus, having an impact on OHL.¹⁹ Contrary to Haerian Ardakani et al.,⁵ our study showed no significant correlation between DMFT and OHL. Oral health habits that are based in early childhood can affect caries experience later in life.²⁰ Consequently, the DMFT index may not be a direct outcome of the students' recent actions. Since most of the examined sample in our study were in early adolescence and recently taking responsibility for their oral health,¹¹ their mean DMFT had no significant correlation with their OHL level. It is possible that as they age, a relation may develop, as stated in the studies.²⁵

Our findings showed that the mean DMFT of the participants was 3.35 ± 2.72 . This was 2.10 among secondary school students in a study in Eritrea in 2019.²¹ This variance might be due to cultural, geographical, and genetic differences, various food cultures,²² and different dental services approachability.²³ In another study in Khouzestan Province, Iran, it was 2.21 ± 0.17 among 12-year-olds.²⁴ The reason for a higher DMFT in our study could be the inclusion of older-aged students, since they have longer exposure to the cariogenic oral environment.²⁵

In the present study, the DMFT index was associated with gender and was significantly higher among girls, which is in line with Abdelhamid et al.²¹ and Gorgi et al.²³ studies. This can be a result of: 1- earlier eruption of teeth in girls and 2- frequent snacking and effortless access to food supplies throughout the day. Additionally, because of hormonal changes that happen early during puberty and menstruation, flow and the biochemical composition of saliva are modified, making

the oral environment significantly more cariogenic for girls. In other studies, there were no gender-related differences between these two variables.^{22,26}

Regarding the OHI-S in this study, the mean number was 1.24 ± 0.91 and it was found higher in boys, but the difference was not significant. In 2014, the OHI-S score of the school-aged adolescents from the Middle East Region was calculated equal to 0.90 ± 0.75 .²⁷ This difference could be due to the different sample size of our study compared to the 2014 survey. Also, Rachmawati et al. showed that the mean OHI-S among boys was 1.13, while the girls had a lower mean of 0.99.²⁸ We found that this score was 1.26 ± 0.94 among boys and 1.17 ± 0.90 among girls.

In our study, there was a negative correlation between OHI-S and OHL and regularity of brushing. In other words, students with a higher OHL score and those who brushed their teeth more had a lower OHI-S score. It has been previously reported that OHI-S decreases with more frequent tooth brushing, and higher level of OHL is related to better oral hygiene.^{28,29}

In the present study, approximately one third of the students brushed their teeth twice daily and around one fifth of them flossed every day. One study showed that 49.0% of the adolescents brushed their teeth once a day or even less.³⁰ In another study in Nigeria, 72.4% of the participants brushed their teeth twice daily, and 35.9% of them used dental floss.³¹ In this research, less than 15.0% of the students used mouthwash daily and had their dental check-ups every six months. Similar to our findings, Lee and Choi in Korea showed that 15.0% of the adolescents used mouthwash and 55.4% of them visited dental clinics during the past year.³²

It appears that frequent brushing, use of dental floss, and other oral health habits have yet to be a common practice among this group of adolescents. Similar to our findings, studies have observed that the caries rate increases with age owing to the neglect of oral health during adolescence.³³ Continuous

monitoring and regular review of this population are mandatory to improve the general and oral health of adolescents in the future. Furthermore, seeing that adolescence is a time for lifelong health habits creation,¹² home- and/or school-based oral health education programs are greatly needed.

Considering the cross-sectional design of the study, all the cause and effect relationships could not be expatiated and all limitations of these types of studies should be contemplated in interpreting the results of the current research.

Conclusion

According to our findings, more than half of the students had inadequate level of OHL and dental caries. In addition, OHL and prevalence of caries was higher among girls

and it was found that students with higher OHL had better oral hygiene status and belonged to higher educated families. Improving the OHL of students should be considered to ameliorate their oral health and prevent future dental caries.

Conflict of Interests

Authors have no conflict of interest.

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