

Oral health literacy and information sources among adults in Tehran, Iran

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Objective: To assess oral health literacy level and oral health information of Iranian adults in Tehran, and to determine the factors related to oral health literacy. **Basic research design:** A cross-sectional population study. **Participants:** A random sample of 1,031 adults in Tehran, Iran. **Methods:** Oral health literacy was measured using an oral health adult literacy questionnaire (OHL-AQ). Variation in use of information sources by socio-economic and demographic background was estimated by odds ratios. A multiple linear regression model served to determine predictor factors of OHL-AQ scores controlling for characteristics of the subjects and number of information sources. **Results:** The mean OHL-AQ score was 10.5 (sd 3.0). Women ($p < 0.001$), younger ($p < 0.001$), and better educated participants ($p < 0.001$) had higher OHL-AQ scores. The most common sources of oral health information were dentists (52.6%), and TV/Radio (49.5%). According to the regression model, females ($p = 0.001$), high educational level ($p < 0.001$), and use of multiple information sources (two sources $p = 0.01$, three sources or more $p = 0.002$) were the main predictor factors of OHL-AQ scores. **Conclusions:** The average oral health literacy level of Iranian adults was low. Disseminating evidence-based oral health care information from multiple sources including TV/radio, dentists, and other health professionals in different settings should improve public oral health literacy.

Keywords: oral health; oral health literacy; information sources; Iran

Introduction

One of the ways to reduce oral health disparities and improve the quality of dental care is by improving the public's oral health literacy (Horowitz and Kleinman, 2012). Oral health literacy (OHL), like general health literacy is critical for empowering individuals' ability to find and process oral health information from different and complicated sources in everyday life to promote and maintain good oral health (Kanj and Mitic, 2009).

In addition to a variety of information sources, rapid growth of information technologies with a large amount of complex health information presents a challenge for low literacy adults to find appropriate health information from their daily activities (Hesse *et al.*, 2005; Lee *et al.*, 2011).

Evidence links poor health literacy to several adverse health outcomes including poor health and health care knowledge, poor general and mental health status (Dewalt *et al.*, 2004). Reports indicate that strengthening health literacy through educational programs improves the health knowledge and health behaviour of pregnant women (Noronha *et al.*, 2012); and disseminating adequate basic information could reduce health disparities (Loh *et al.*, 2009).

While one indication is that oral health literacy is an important determinant of oral health (Naghibi Sistani *et al.*, 2013a), knowledge about oral health literacy and factors related to it are scarce in countries with developing health care systems such as Iran. This study therefore

aimed to evaluate oral health literacy level and oral health information sources of Iranian adults in Tehran, and to explore the effect of information sources and background factors on oral health literacy scores.

Methods

This cross-sectional population study used self- and interview-administered questionnaires among adults in Iran's capital, Tehran, with its population of 8 million and mix of socio-economic backgrounds.

Multi-stage random area sampling was used with the sample-size calculated as 1050 ($\alpha = 0.05$; the prevalence of adequate oral health literacy, 0.4 obtained from a pilot study; and design effect, ~2).

All 22 districts of Tehran were considered as strata each weighted according to its population. Within each stratum, we sampled clusters at random. Next blocks of houses were selected randomly from each cluster, and then ten houses in each block were selected systematically. Finally, among all adults residing in the same house, individuals were selected at random. Any unable to read or write Persian (the local language) was excluded.

Interviewers from the Iranian Students' Polling Agency (ISPA), a professional agency, assisted in data collection. To reduce inter-interviewer variability, all interviewers underwent a training session where the main researcher explained the questionnaire protocols. In total 1,031 adults participated.

We measured oral health literacy by a newly developed instrument, the Oral Health Literacy Adults Questionnaire (OHL-AQ), which was tested in a pilot study and showed to be reliable and valid (Naghibi Sistani *et al.*, 2013b). It contains 17 items in four sections: reading comprehension comprises six questions which assess reading and the ability to comprehend oral health knowledge; numeracy comprises 4 questions assessing ability to calculate numbers in a dental prescription and a mouth-rinse instruction; listening comprises 2 questions evaluating effectiveness of communication skills; and decision-making comprises 5 questions related to common oral health problems and items extracted from medical history form.

The correct answers were scored 1 and those wrong or unanswered, 0, giving a total score for the questionnaire ranging from 0 to 17. For analysis, the OHL-AQ scores were classified into three levels: inadequate, 0-9; marginal, 10-11; and adequate, 12-17 based on piloting (Naghibi Sistani *et al.*, 2013b).

Oral health information sources were identified by asking from which sources do you usually receive oral health information? Participants could select one or more sources from: book/newspaper, TV/radio, internet, dentist, and family/friends. For analysis each source was coded 0 if not selected or 1 if selected.

Among background information acquired was demographic data comprising age, gender, educational level, and economic status. Age was categorised as: 18-24, 25-44, or 45-65 years. Education was measured in years and classified as either: 1-11 or 12 years and more.

As the measure of economic status we used living area in square metres per person (m^2/p where p included children): a valid and reliable indicator of economic status in Iran (Donyavi *et al.*, 2011; Naghibi Sistani *et al.*, 2013a). This proxy measure was categorised as three levels: <20 , 20-39 and ≥ 40 m^2/p .

In addition to descriptive statistics, the statistical significance of OHL mean differences between subgroups was compared by one-way analysis of variance (ANOVA), and an independent sample t-test. Assessment of factors related to the oral health information sources was estimated by odds ratios, using a univariate logistic regression model. Use of information sources or not as an outcome was the comparison. A multiple linear regression model served to test which variables predict oral health literacy scores, controlling for background characteristics and number of oral health information sources used. SPSS v.18 software was used for the analysis with the significance was set at 0.05.

The ethics committee of the Tehran University of Medical Sciences approved the study. Before being invited to take part, participants were informed of the scientific goal of this research, participation being voluntary and their right to withdraw at any time.

Results

The 1,031 participants' mean age was 36.2 (sd 12.9) and ranged from 18 to 65 years. The oral health literacy scores approximated to a normal distribution and ranged from 1-17 with mean 10.5 (sd 3.0) and mode 11. Of all the participants 35% had OHL-AQ scores classified as inadequate, 25% as marginal, and 40% as adequate.

Differences in OHL-AQ mean scores by age, gender, and socio-economic background are shown in Table 1.

Of the studied subjects 42% were aware of the relationship between oral and general health and 73% of the respondents believed fluoridated toothpaste is helpful in preventing tooth decay. All questions in the numeracy and listening sections were answered correctly by 60 to 90% of the respondents and under 55% answered correctly to four of the five questions in the decision-making section (Figure 1).

Among oral health-information sources used by respondents, dentists (52.6%) and TV/radio (49.5%) were the most common sources, followed by book/newspaper (32.7%), family/friends (30%), and internet (16.1%). Of the subjects 1% reported receiving information from no sources, 46% from one, 27% from two, and 26% from three or more sources. Mean oral health literacy scores increased according to numbers of information sources used respectively: 8.4 (sd 1.6), 9.9 (sd 2.9), 10.7 (sd 3.0), 11.7 (sd 2.7), ($p < 0.001$).

Oral health literacy scores were independently associated with most of the information sources (Table 2). Adults aged 18 to 24 were more likely to use a book/newspaper (OR=1.8, 95%CI 1.2-2.7) and internet (OR=3.3, 95%CI 2.0-5.6) as information sources compared to those older. Women selected media (OR=1.3, 95%CI 1.0-1.7) more often than did men (Table 2).

To obtain the main predictive factors for oral health literacy scores, the final multiple linear regression model is presented in Table 3. Females ($p=0.001$, 95%CI 0.26-0.99), high educational level ($p < 0.001$, 95%CI 1.02-1.90), and use of multiple information sources (two sources $p=0.01$, 95%CI 0.41-4.19, three sources or more $p=0.002$, 95%CI 1.05-4.84) had a significant positive effect on oral health literacy scores.

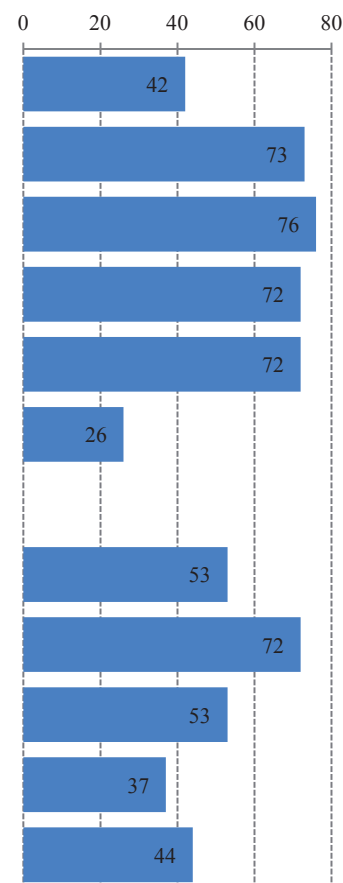
Table 1. Distribution of oral health literacy scores by socio-economic and demographic characteristics among adults in Tehran, Iran

	<i>n</i>	(%)	OHL mean (sd)	<i>p</i>
Age	1,030			<0.001*
18-24 years	251	(24.4)	10.3 (3.0)	
25-44 years	485	(47.1)	11.0 (2.9)	
45-65 years	294	(28.5)	10.1 (2.9)	
Gender	1,030			<0.001**
Male	504	(48.9)	10.2 (3.0)	
Female	526	(51.0)	10.9 (2.9)	
Education	1,022			<0.001**
< 12 years	280	(27.4)	9.3 (2.9)	
≥ 12 years	742	(72.6)	11.0 (2.9)	
Living area (m^2/p)	947			0.02 *
<20	296	(31.3)	10.2 (3.1)	
20-39	485	(51.2)	10.8 (2.9)	
≥ 40	166	(17.5)	10.8 (2.9)	

*By ANOVA test; **By independent sample t-test

Reading comprehension section:

1. Research shows that there may be a link between oral diseases and other health problems such as myocardial infarction.
2. One of the most common oral diseases is tooth decay. Brushing with toothpaste that contains fluoride ...
3. ... at least twice a day ...
4. ... with flossing and avoiding foods with lots of sugar could prevent tooth decay
5. Every person has 32 permanent teeth ...
6. ... and gets the first one at six years old.



Decision-making section:

13. The best decision if little bleeding occurs after brushing or flossing is brushing and flossing daily.
14. The best decision if pain and swallowing occur in mouth is attending the doctor or dentist.
15. The best way to remove stain and calculus from teeth is having dental scaling.
16. When I signed "I exonerate my dentist from unintentional complications of treatment" means that my dentist is not responsible for unintentional complications of treatment.
17. When I said "I have a history of allergy to some drugs" I mean, I feel unable to breathe and have redness in my skin after taking some drugs.

Figure 1. Participants' percentage correct answers to the reading-comprehension and decision-making sections of the OHL-AQ in Tehran, Iran (n=1,031)

Table 2. Factors related to the oral health-information sources according to the socio-demographic characteristics, and oral health literacy scores by regression model among adults in Tehran, Iran (n=1,031)

Factor	Book/Newspaper		Internet		TV/Radio		Dentist		Family/Friends	
	%	OR	%	OR	%	OR	%	OR	%	OR
Age										
18-24yrs	38.6	1.8 (1.2, 2.7)	23.1	3.3 (2.0, 5.6)	49.4	0.9 (0.6, 1.3)	46.6	0.8 (0.5, 1.1)	31.9	1.01 (0.7, 1.4)
25-44yrs	34.2	1.5 (1.1, 2.1)	17.3	2.3 (1.4, 3.8)	49.3	0.9 (0.7, 1.2)	56.1	1.1 (0.8, 1.5)	28.0	0.8 (0.6, 1.1)
45-65yrs	25.2	1.0 (referent)	8.2	1.0 (referent)	50.0	1.0 (referent)	51.7	1.0 (referent)	31.6	1.0 (referent)
Gender										
Female	30.6	0.8 (0.6, 1.0)	14.4	0.7 (0.5, 1.0)	53.0	1.3 (1.0, 1.7)	54.4	1.1 (0.9, 1.4)	28.9	0.8 (0.6, 1.1)
Male	34.9	1.0 (referent)	17.9	1.0 (referent)	45.8	1.0 (referent)	50.6	1.0 (referent)	31.2	1.0 (referent)
Education										
≥12yrs	37.9	2.4 (1.7, 3.3)	20.1	3.8 (2.3, 6.5)	49.6	1.0 (0.7, 1.3)	54.7	1.3 (1.0, 1.7)	29.2	0.9 (0.6, 1.2)
< 12yrs	20.0	1.0 (referent)	6.1	1.0 (referent)	49.3	1.0 (referent)	47.1	1.0 (referent)	31.1	1.0 (referent)
OHL										
12-17	38.6	1.6 (1.2, 2.3)	23.3	2.4 (1.6, 3.7)	53.7	1.5 (1.1, 2.0)	60.4	2.0 (1.5, 2.7)	32.9	1.2 (0.9, 1.7)
10-11	31.0	1.2 (0.8, 1.7)	11.8	1.0 (0.6, 1.8)	51.8	1.4 (1.0, 1.9)	53.3	1.5 (1.1, 2.1)	27.8	0.9 (0.6, 1.4)
0-9	27.0	1.0 (referent)	10.9	1.0 (referent)	42.9	1.0 (referent)	42.9	1.0 (referent)	28.1	1.0 (referent)

OR, Odds ratio (95% confidence interval in parentheses); **Bold**, Significant at p<0.05; OHL, oral health literacy

Table 3. Factors related to the oral health literacy scores controlling for background characteristics, and numbers of oral health information sources by multiple linear regression model among adults in Tehran, Iran (n=1,031)

Factor	Regression coefficient	95%CI	p
Age			
18-24 years	-0.42	-0.96, 0.10	0.11
25-44 years	0.41	-0.03, 0.36	0.06
45-65 years	referent		
Gender			
Female	0.63	0.26, 0.99	0.001
Male	referent		
Education			
≥12 years	1.46	1.02, 1.90	<0.001
< 12 years	referent		
Living area (m ² /p)			
≥40	0.27	-0.28, 0.82	0.33
20-39	0.19	-0.22, 0.61	0.37
<20	referent		
Information sources			
No source	referent		
One source	1.38	-0.49, 3.26	0.14
Two sources	2.30	0.41, 4.19	0.01
Over two sources	2.94	1.05, 4.84	0.002

Discussion

To our knowledge this was the first population study of oral health literacy among adults in Tehran, Iran. Results indicated that the level of oral health literacy among adults was low; two-thirds of adults had significant difficulties in the OHL test.

Among Iranian adults, we found dentists and media (TV/radio) were the main sources of oral health information, as was found in Saudi Arabia (Wyne *et al.*, 2005). Americans rate television as their primary source of health information (Pribble *et al.*, 2006), while studies from France (Renahy *et al.*, 2008) and Switzerland (Seemater-Bagnoud and Santos-Eggimann, 2007) found physicians to be the main source of health information.

Earlier studies found variation in individuals' oral health knowledge. In the present study, 73% of respondents reported believing that fluoridated toothpaste is helpful in preventing tooth decay compared to 72.5% in Croatia, 95.6% in Italy (Cuković-Bagić *et al.*, 2012) and 66% among Australian (Gussy *et al.*, 2008). More than two-thirds of our subjects knew that sugar caused dental caries compared to 91% of Baltimore adults in the US (Macek *et al.*, 2011).

Findings from the regression model revealed that multi-sources approach for receiving oral health information, higher educational level, and female gender are the main predictors for higher oral health literacy scores. This is in line with previous findings (Atchison *et al.*, 2010; Jones *et al.*, 2007) as might be expected, more highly educated participants have greater ability to find and understand oral health information, and decide wisely regarding oral health problems.

Although no gender differences appeared based on age, educational level, or number of information sources used, women scored higher on oral health literacy ($p < 0.001$) and gender remained as a predictor factor for oral health literacy scores in the multivariate regression model. This may be due to Iranian women's more frequent use of media (TV/radio), (OR=1.3, 95%CI 1.0-1.7).

The Islamic republic of Iran Broadcasting organisation has developed policies and priorities to disseminate health-related research findings in both audio and visual media (Ashoorkhani and Majdzadeh, 2012). These include several health-educational programs in media (TV/radio), most of them broadcasted at times women at home are likely to watch. The scientific quality and accuracy of this health news has, however, been discussed (Ashoorkhani and Majdzadeh, 2012).

In addition, the least common source for finding oral health information was the internet. Our findings are similar to those revealing that younger and more highly educated individuals showed more of a tendency to seek health information online (Hesse *et al.*, 2005). This emphasises the responsibility of health authorities to provide valid and science-based health care information on the net.

Deprived individuals and minorities who are less educated or unable to communicate effectively with health-care providers do not obtain sufficient scientific oral health information (Horowitz and Kleinman, 2012; National Institute of Dental and Craniofacial Research, 2005). On the other hand, we found that each additional information source associates with higher oral health literacy scores confirming the significance of disseminating health information to the public via multiple sources (Loh *et al.*, 2009).

Attitudes are positive among physicians and other non-dental staff in primary health care centres in Iran towards disseminating preventive oral health messages (Rabiei *et al.*, 2012) supporting the use of a multi-health information sources approach. Media providing evidence-based information should be encouraged to improve the awareness among the less advantaged population.

In addition, while schools include children from different socioeconomic backgrounds, low-cost school-based interventions have been shown to be effective in improving the oral health knowledge of primary school children (Chapman *et al.*, 2006), the gingival health of preadolescents (Saied-Moallemi *et al.*, 2009) and the oral cleanliness of adolescents (Yazdani *et al.*, 2009). It seems justified in countries with developing health care systems more emphasis should be placed on activities at the schools in order to enhance oral health-related literacy skills of those youngsters with low socioeconomic status during their first stages of education.

The representative sample of the present study increases the generalisability of the study results. In addition, stratified multi-stage random area sampling, outside of dental/medical settings, helps to reduce selection bias in our population-based survey. A cross-sectional design, however, limits the study results to the associations at that specific point in time, precluding conclusions concerning causality.

The use of the OHL-AQ functional tools proved suitable in this non-English-speaking country. Unlike word recognition tests, such as the Rapid Estimate of Adult

Literacy in Dentistry (Lee *et al.*, 2007), the OHL-AQ functionally assesses different aspects of individuals' literacy skills. The OHL-AQ is more general than other existing OHL instruments in that it evaluates two additional skills: listening or communication and appropriate decision-making.

Conclusions

Study results indicated low oral health literacy level among Iranian adults. Specifically men, the less well-educated and those receiving oral health information from few sources were at greater risk of having limited oral health literacy skills. To tackle these inequalities, found particularly in countries with developing oral health care systems, we advocate providing tested and accurate oral health information through multiple sources to increase oral health literacy.

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References

Ashoorkhani, M. and Majdzadeh, R. (2012): Improving the quality of health news. *International Journal of Preventive Medicine* **3**, 440-443.

Atchison, K.A., Gironde, M.W., Messadi, D. and Der-Martirosian, C (2010): Screening for oral health literacy in an urban dental clinic. *Journal of Public Health Dentistry* **70**, 269-275.

Chapman, A., Copestake, S.J. and Duncan, K. (2006): An oral health education programme based on the National Curriculum. *International Journal of Paediatric Dentistry* **16**, 40-44.

Cuković-Bagić, I., Dumancić, J., Nuzzolese, E., Marusić, M. and Lepore, M.M. (2012): Oral health awareness in Croatian and Italian urban adolescents. *Collegium Antropologicum* **36**, 221-226.

Dewalt, D.A., Berkman, N.D., Sheridan, S., Lohr, K.N. and Pignone, M.P. (2004): Literacy and health outcomes: A systematic review of the literature. *Journal of General Internal Medicine* **19**, 1228-1239.

Donyavi, T., Naieni, K.H., Nedjat, S., Vahdaninia, M., Najafi, M. and Montazeri, A. (2011): Socioeconomic status and mortality after acute myocardial infarction: a study from Iran. *International Journal for Equity in Health* **10**, 9.

Gussy, M.G., Waters, E.B., Riggs, E.M., Lo, S.K. and Kilpatrick, N.M. (2008): Parental knowledge, beliefs and behaviours for oral health of toddlers residing in rural Victoria. *Australian Dental Journal* **53**, 52-60.

Hesse, B.W., Nelson, D.E., Kreps, G.L., Croyle, R.T., Arora, N.K., Rimer, B.K. and Viswanath, K. (2005): Trust and sources of health information: the impact of the Internet and its implications for health care providers: findings from the first Health Information National Trends Survey. *Archives of Internal Medicine* **165**, 2618-2624.

Horowitz, A.M. and Kleinman, D.V. (2012): Oral health literacy: a pathway to reducing oral health disparities in Maryland. *Journal of Public Health Dentistry* **72**, S26-30.

Jones, M., Lee, J.Y. and Rozier, R.G. (2007): Oral health literacy among adult patients seeking dental care. *Journal of the American Dental Association* **138**, 1199-1208.

Kanj, M. and Mitic, W. (2009): *Health literacy and health promotion: definitions, concepts and examples in the Eastern Mediterranean region*. www.gchp7.info/resources/downloads/t1.pdf

Lee, J.Y., Rozier, R.G., Lee, S.Y., Bender, D. and Ruiz, R.E. (2007): Development of a word recognition instrument to test health literacy in dentistry: the REALD-30--a brief communication. *Journal of Public Health Dentistry* **67**, 94-98.

Loh, S., Packer, T.L., Yip, C.H. and Passmore, A. (2009): Targeting health disparity in breast cancer: insights into women's knowledge of their cancer profile in Malaysia. *Asian Pacific Journal of Cancer Prevention* **10**, 631-636.

Macek, M.D., Manski, M.C., Schneiderman, M.T., Meakin, S.J., Haynes, D., Wells, W., Bauer-Leffler, S., Cotten P.A. and Parker, R.M. (2011): Knowledge of oral health issues among low-income Baltimore adults: a pilot study. *Journal of Dental Hygiene* **85**, 49-56.

Naghbi Sistani, M.M., Yazdani, R., Virtanen, J., Pakdaman, A. and Murtomaa, H. (2013a): Determinants of oral health: does oral health literacy matter? *ISRN Dentistry* **2013**, 249591.

Naghbi Sistani, M.M., Montazeri, A., Yazdani, R. and Murtomaa, H. (2013b): New oral health literacy instrument for public health: development and pilot testing. *Journal of Investigative and Clinical Dentistry* **4**, Epub ahead of print.

National Institute of Dental and Craniofacial Research, National Institutes of Health, U.S. Public Health Service, Department of Health and Human Services (2005): The invisible barrier: Literacy and its relationship with oral health. A report of a workgroup sponsored by the national institute of dental and craniofacial research. *Journal of Public Health Dentistry* **65**, 174-182.

Noronha, J.A., Bhaduri, A., Bhat, H.V. and Kamath, A. (2012): Interventional study to strengthen the health promoting behaviours of pregnant women to prevent anaemia in southern India. *Midwifery* **29**, e35-41.

Pribble, J.M., Goldstein, K.M., Fowler, E.F., Greenberg, M.J., Noel, S.K. and Howell, J.D. (2006): Medical news for the public to use? What's on local TV news. *The American Journal of Managed Care* **12**, 170-176.

Rabiei, S., Mohebbi, S.Z., Patja, K. and Virtanen, J.I. (2012): Physicians' knowledge of and adherence to improving oral health. *BMC Public Health* **12**, 855.

Renahy, E., Parizot, I. and Chauvin, P. (2008): Health information seeking on the Internet: a double divide? Results from a representative survey in the Paris metropolitan area, France, 2005-2006. *BMC Public Health* **8**, 69.

Saied-Moallemi, Z., Virtanen, J.I., Vehkalahti, M.M., Tehrani, A. and Murtomaa, H. (2009): School-based intervention to promote preadolescents' gingival health: a community trial. *Community Dentistry and Oral Epidemiology* **37**, 518-526.

Seemater-Bagnoud, L. and Santos-Eggimann, B. (2007): Sources and level of information about health issues and preventive services among young-old persons in Switzerland. *International Journal of Public Health* **52**, 313-316.

Wyne, A.H., Chohan, A.N., Al-Abdulsalam, Z., Al-Qedrah, A. and Al-Qahtani, S. (2005): Oral health knowledge and sources of information among male secondary school children in Riyadh. *Saudi Dental Journal* **17**, 140-145.

Yazdani, R., Vehkalahti, M.M., Nouri, M. and Murtomaa, H. (2009): School-based education to improve oral cleanliness and gingival health in adolescents in Tehran, Iran. *International Journal of Paediatric Dentistry* **19**, 274-281.