Association of oral health behavior and the use of dental services with oral health literacy among adults in Tehran, Iran

Mohammad Mehdi Naghibi Sistani[1], Jorma I. Virtanen[2,3], Reza Yazdani[4], Heikki Murtomaa[5]

Correspondence: Dr. Mohammad Mehdi Naghibi Sistani
Email: m.naghibi@mubabol.ac.ir

[1]Department of Community Oral Health, Oral Health Research Center, Faculty of Dentistry, Babol University of Medical Sciences, Babol, Iran,
[2]Department of Community Dentistry, Research Unit of Oral Health Sciences, University of Oulu, Oulu, Finland,
[3]Medical Research Center, Oulu University Hospital, Oulu, Finland,
[4]Department of Community Oral Health, School of Dentistry, Tehran University of Medical Sciences, Tehran, Iran,
[5]Department of Oral Public Health, Institute of Dentistry, University of Helsinki, Helsinki, Finland

ABSTRACT

Objective: To assess the association of oral health behavior (OHB) and the use of dental services with oral health literacy (OHL) among Iranian adults. **Methods:** This was a cross-sectional population study of a random sample of 1031 adults aged 18–65 in Tehran, Iran. We collected data on tooth brushing frequency, the consumption of sugary snacks and beverages, and time since last dental visit. To measure OHL, we used a validated OHL adults' questionnaire (OHL-AQ). In addition to descriptive analysis, we used multiple logistic regression models to assess the association of OHB and the most recent dental visit with OHL while controlling for socioeconomic and demographic factors. **Results:** The participants' mean age was 36.3 (standard deviation 12.9), and 51% were women. Of the participants, 81.3% reported brushing their teeth daily ($\geq$1/day), 37.6% consumed sugary snacks or beverages between meals less than once daily (<1/day), and 36.8% used dental services within the past 6 months. In the adjusted models, high OHL scores significantly correlated with daily ($\geq$1/day) tooth brushing (odds ratio [OR] = 1.97, 95% confidence interval [CI]: 1.30–2.98), the consumption of sugary snacks or beverages (<1/day between meals) (OR = 1.56, 95% CI: 1.13–2.15) and the recent use of dental services ($\leq$6 months) (OR = 1.59, 95% CI: 1.15–2.21), respectively. **Conclusions:** OHL relates significantly to improved OHB and the use of dental services. Oral health promotion programs should, therefore, take into account improvements in adults' OHL, particularly in countries with developing health-care services.

Key words: Oral health behavior, oral health literacy, use of dental services

INTRODUCTION

Oral health literacy (OHL) skills are intended to help individuals to act on oral health information, to use

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the health-care system, and to communicate actively with oral health professionals.[1] OHL has proved to be critical in reducing oral health disparities and in promoting oral health.[2] Low OHL predicts poor self-reported oral health[3,4] and poor periodontal status.[5] While previous findings clarified the effect of health literacy on health-care utilization,[6,7] the relationship between OHL and dental service utilization remains inconsistent.

Limited OHL has proved to be a barrier to Canadian immigrants' participation to the oral health-care system and their use of dental services.[8] Canadian adults who visited the dentist regularly had significantly higher OHL scores than did those who visited the dentist only to address pain.[9] Similarly, Jamieson *et al.*[10] reported that indigenous Australians with no recent dental visits (<1 year ago) had lower OHL scores. Conversely, earlier studies found a nonsignificant association between OHL and dental care visits among American adults.[11,12] Burgette *et al.*[13] also found that dental utilization as measured by time since last dental visit was a poor predictor of OHL scores.

Although long-standing poor oral health behavior (OHB) such as infrequent dental visits and tooth brushing as well as frequent use of sugary snacks and drinks could result from limited OHL,[14] findings about the association between OHL and OHB are contradictory. Ueno *et al.*[14] found that adults with poor OHB and clinical status to have lower OHL scores. Low OHL scores also associated significantly with lower tooth brushing frequency among older adults.[15] Respectively, caregiver's lower levels of OHL associated with their children's poor OHB.[16,17] In contrast, the association of OHL with OHB,[18] and OHL with dental neglect[19] was proved to be nonsignificant after adjusting for sociodemographic variables.

Despite conflicting reports on the association of OHB and dental visits with OHL, data on these relations in countries with developing oral health-care systems, such as Iran, are unavailable. The present study, therefore, aimed to assess the association of OHB and the use of dental services with OHL among Iranian adults.

METHODS

Design and data collection
In 2011, we conducted this cross-sectional population-based survey of 1031 adults in the Iranian capital, Tehran. Tehran's eight million inhabitants cover a broad range of socioeconomic backgrounds. Interviewers from the Iranian Students' Polling Agency, a professional agency, assisted with the data collection. To reduce inter-interviewer variability, all interviewers participated in a training session, in which the head researcher explained the questionnaire protocols.

Sampling
Multistage random area served as the sampling method, and the sample size was calculated by estimating a single proportion. All 22 districts of Tehran served as individual strata, each weighted according to its population. Within each stratum, we sampled clusters at random. We then randomly selected subsequent blocks of houses from each cluster until we had systematically selected ten houses from each block. Finally, we randomly selected individuals from the adults residing in the same house. We excluded any adults who were illiterate in Persian (the local language).[3]

Questionnaire
Oral Health Literacy-Adults Questionnaire (OHL-AQ), which proved to be a valid and reliable instrument, served to measure adults' OHL levels.[20] The questionnaire contains 17 items into four sections: reading comprehension (to assess reading literacy and oral health knowledge), numeracy (be able to calculate in a dental prescription and a mouth-rinse instruction), listening (to evaluate the effectiveness of the patient's communication skills), and decision-making (to show the ability to apply literacy skills related to common oral health problems and items extracted from the medical history form).

The correct answers were scored as 1; incorrect or missing answers, 0. The total score for the questionnaire ranged from 0 to 17. We classified the OHL-AQ scores into three levels: inadequate (0–9), marginal (10–11), and adequate (12–17) which was tested and validated in the pilot study.[20]

Measures
We measured OHB with self-reported questions about tooth brushing habits and consumption of sugary snacks or beverages between daily meals. Response alternatives for frequency of tooth brushing were "twice or more daily", "once daily", and "less than once daily," but for the regression analysis were dichotomized as "once or more daily (≥1/day)" and "less than once daily (<1/day)" based on optimal tooth brushing.[21] We categorized the consumption

of sugary snacks or beverages between daily meals "once or more daily (≥1/day)" and "less than once daily (<1/day)" as an optimal OHB.[22] Finally, we classified the use of dental services "within the last 6 months (≤6 months)" and "more than 6 months ago (>6 months)" according to the guidelines of the American Academy of Pediatric Dentistry[23] and the Iranian Dental Association.[24]

Background data included age, gender, level of education, and economic status. We categorized age as: 18–24, 25–44, or 45–65 years but used noncategorical age in the regression models. We measured education in years and dichotomized it as either: "1–11" or "12 years and more." Formal education served as the social level, which previous health studies have shown to be an accurate indicator.[25,26] Living area in square meters per person (m²/p, where *P* included children) served as the measure of economic status, a valid and reliable indicator of economic status in Iran.[3,26] We categorized this proxy measure on three levels: <20, 20–39, and ≥40 m²/p.

Statistical analysis
In addition to descriptive statistics, we used Chi-square test to assess the significant difference between OHB and the use of dental services with demographic and socioeconomic background factors. We used three multiple logistic regression models to estimate the factors related to the outcome variables "self-reported OHB" and "use of dental services" with odds ratios (ORs). The regression models were adjusted by the following independent variables: age, gender, educational level, living area in square

meters per person (m²/p), and OHL. Significance was set at <0.05. We analyzed all data with SPSS software, version 22 for Windows (SPSS Inc., Chicago, IL, USA).

Ethics
The ethics committee of the Tehran University of Medical Sciences approved the study. Before being invited to take part, participants received information about the scientific goal of this research that their participation was voluntary and that they could withdraw at any time.

RESULTS

The participants' OHB and use of dental services according to demographic and socioeconomic background factors appear in Table 1. Overall, 81.3% of the participants reported brushing their teeth once or more daily, while 9.7% reported rarely or never brushing their teeth. Of the participants, 62.4% reported consuming sugary drinks and beverages between meals once or more daily, and 63.2% reported that their last visit to the dentist was more than 6 months ago while 9.4% said they had never visited the dentist.

Women (*P* < 0.001), the more highly educated (*P* < 0.001), and those with higher economic status (*P* = 0.001) reported brushing their teeth more often. Consumption of sugary snacks and beverages between meals was more frequent among younger participants (*P* = 0.005) and more highly educated adults (*P* = 0.01), whereas using dental services within the past 6 months was more common among older participants

Table 1: Oral health behavior and the use of dental services by demographic and socioeconomic background factors among adults (*n*=1031) in Tehran, Iran

	Tooth brushing, *n* (%)				Sugary snacks and beverages, *n* (%)			Last dental visit, *n* (%)		
	≥2/day	1/day	<1/day	P*	<1 time	≥1 time	P*	≤6 months	>6 months	P*
Age (years)										
18-24	87 (34.7)	115 (45.8)	49 (19.5)	0.6	81 (32.4)	169 (67.6)	0.005	74 (29.5)	177 (70.5)	0.01
25-44	192 (39.6)	201 (41.4)	92 (19.0)		172 (35.8)	309 (64.2)		197 (40.8)	286 (59.2)	
45-65	108 (36.9)	134 (45.7)	51 (17.4)		132 (45.1)	161 (54.9)		107 (36.5)	186 (63.5)	
Gender										
Male	152 (30.2)	223 (44.2)	129 (25.6)	<0.001	183 (36.5)	319 (63.5)	0.4	176 (35.1)	325 (64.9)	0.2
Female	235 (44.8)	227 (43.2)	63 (12.0)		202 (38.7)	320 (61.3)		202 (38.4)	324 (61.6)	
Education (years)										
<12	80 (28.7)	124 (44.4)	75 (26.9)	<0.001	121 (43.4)	158 (56.6)	0.01	88 (31.4)	192 (68.6)	0.02
≥12	303 (40.8)	322 (43.4)	117 (15.8)		259 (35.1)	478 (64.9)		288 (39.0)	451 (61.0)	
Living area†										
<20	89 (30.2)	135 (45.8)	71 (24.1)	0.001	111 (37.9)	182 (62.1)	0.8	89 (30.3)	205 (69.7)	<0.001
20-39	187 (38.6)	220 (45.4)	78 (16.1)		176 (36.4)	307 (63.6)		179 (37.0)	305 (63.0)	
≥40	78 (47.0)	64 (38.6)	24 (14.5)		65 (39.2)	101 (60.8)		82 (49.4)	84 (50.6)	

*Obtained by Chi-square, †m²/p (square meters of living area per person)

(*P* = 0.01), those with higher education (*P* = 0.02) and higher economic status (*P* < 0.001).

The results of multiple logistic regression analysis (both univariate and adjusted models) revealed female gender (OR = 2.37, 95% confidence interval [CI]: 1.66–3.38), higher education (OR highest level versus lowest level = 1.86, 95% CI: 1.25–2.77), and higher OHL scores (OR highest level versus lowest level = 1.97, 95% CI: 1.30–2.98) as the most significant contributing factors to daily (≥1/day) tooth brushing [Table 2].

In addition, advanced age (OR = 1.01, 95% CI: 1.00–1.02) and higher OHL scores (OR highest level versus lowest level = 1.56, 95% CI: 1.13–2.15) remained the most significant factors related to infrequent use of sugary snacks or beverages (<1/day between meals) in the adjusted model [Table 3].

Finally, those with a large living area (OR highest level versus lowest level = 2.05, 95% CI: 1.37–3.09) and higher OHL scores (OR highest level versus lowest level = 1.59, 95% CI: 1.15–2.21) reported frequent use of dental services (≤6 months) [Table 4].

DISCUSSION

Tooth brushing
The present study results revealed that Women, the more highly educated and those with higher OHL reported brushing their teeth more frequently. The present findings are in line with those of previous studies showing that higher socioeconomic status,[27,28] OHL scores,[4,14,15] and gender[28-30] relate to more frequent tooth brushing. Gender differences in brushing habits may stem from women's desire to be more socially attractive.[31]

Moreover, female participants have shown higher levels of OHL[3] than their male counterparts, probably due to their better skills in acting healthy. One out of ten participants, however, reported brushing their teeth rarely or never, indicating poor oral hygiene habits among a notable percentage of Iranian adults.

Sugary drinks and snacks
Diet and undoubtedly, sugar consumption contribute significantly to the development of dental caries.[32] Nearly two-thirds of the participants in the present study reported consuming sugary drinks and snacks between meals once or more daily, reflecting poor dietary habits with respect to optimal dental health behavior.[22]

Table 2: Factors related to daily (≥1/day) tooth brushing behavior according to sociodemographic backgrounds and oral health behavior scores among adults (*n*=1031) in Tehran, Iran

	OR (95% CI)*	P	OR (95% CI)†	P
Age	1.00 (0.99-1.01)	0.64	1.00 (0.99-1.02)	0.25
Gender				
Male	1.00 (reference)	<0.001	1.00 (reference)	<0.001
Female	2.52 (1.81-3.51)		2.37 (1.66-3.38)	
Years of education				
<12	1.00 (reference)	<0.001	1.00 (reference)	0.002
≥12	1.96 (1.41-2.73)		1.86 (1.25-2.77)	
Living area (m²/p)				
<20	1.00 (reference)		1.00 (reference)	
20-39	1.65 (1.15-2.37)	0.006	1.41 (0.96-2.06)	0.07
≥40	1.87 (1.12-3.11)	0.01	1.54 (0.91-2.63)	0.10
Oral health literacy scores				
0-9	1.00 (reference)		1.00 (reference)	
10-11	1.48 (1.00-2.19)	0.04	1.18 (0.78-1.81)	0.42
12-17	2.60 (1.78-3.79)	<0.001	1.97 (1.30-2.98)	0.001

*By simple regression analysis, †Adjusted OR. OR: Odds ratio, CI: Confidence interval

Table 3: Consumption of sugary snacks or beverages (<1/day between meals) according to sociodemographic backgrounds and oral health behavior scores among adults (*n*=1031) in Tehran, Iran

	OR (95% CI)*	P	OR (95% CI)†	P
Age	1.01 (1.00-1.02)	<0.001	1.01 (1.00-1.02)	0.005
Gender				
Male	1.00 (reference)	0.45	1.00 (reference)	0.95
Female	1.10 (0.85-1.41)		1.00 (0.76-1.32)	
Years of education				
<12	1.00 (reference)	0.01	1.00 (reference)	0.10
≥12	0.70 (0.53-0.93)		0.75 (0.54-1.05)	
Living area (m²/p)				
<20	1.00 (reference)		1.00 (reference)	
20-39	0.94 (0.69-1.26)	0.68	0.95 (0.69-1.29)	0.75
≥40	1.05 (0.71-1.56)	0.78	1.01 (0.67-1.53)	0.93
Oral health literacy scores				
0-9	1.00 (reference)		1.00 (reference)	
10-11	1.26 (0.90-1.77)	0.16	1.26 (0.88-1.81)	0.20
12-17	1.40 (1.04-1.87)	0.02	1.56 (1.13-2.15)	0.007

*By simple regression analysis, †Adjusted OR. OR: Odds ratio, CI: Confidence interval

Those among the study participants with higher education reported consuming more sugary drinks

Table 4: The use of dental services (≤6 months) according to sociodemographic backgrounds and oral health behavior scores among adults (*n*=1031) in Tehran, Iran				
	OR (95% CI)*	P	OR (95% CI)†	P
Age	1.00 (0.99-1.01)	0.35	1.00 (0.99-1.01)	0.29
Gender				
Male	1.00 (reference)	0.27	1.00 (reference)	0.79
Female	1.15 (0.89-1.48)		1.03 (0.78-1.36)	
Years of education				
<12	1.00 (reference)	0.02	1.00 (reference)	0.20
≥12	1.39 (1.04-1.86)		1.24 (0.88-1.75)	
Living area (m²/p)				
<20	1.00 (reference)		1.00 (reference)	
20-39	1.35 (0.99-1.84)	0.05	1.26 (0.92-1.74)	0.14
≥40	2.24 (1.51-3.33)	<0.001	2.05 (1.37-3.09)	0.001
Oral health literacy scores				
0-9	1.00 (reference)		1.00 (reference)	
10-11	1.89 (1.35-2.65)	<0.001	1.91 (1.33-2.74)	<0.001
12-17	1.66 (1.22-2.24)	0.001	1.59 (1.15-2.21)	0.005

*By simple regression analysis, †Adjusted OR. OR: Odds ratio, CI: Confidence interval

and snacks than the less educated did. While adults on higher social levels consumed more sugar, Ghasemi *et al*.[30] reported that Iranian dentists held poor attitudes toward sugar consumption as well. These findings raise great concern about this common unhealthy cultural habit. Authorities, health, and oral health partners appear to have good enough cause to offer a multidisciplinary common risk-factor approach,[33] to increasing public awareness about the disadvantages of high sugar consumption.

Adjusting the model, however, revealed that age and OHL scores predict one's consumption of sugary drinks and snacks (<1/day between meals). This result indicates that all adults, and especially youngsters and those with limited literacy skills, should have access to easily understood messages about oral healthy diet.

Dental visit

Although the utilization of oral health services is based on specific individual needs and risk factors,[34] regular dental visits can be considered a part of preventive oral health interventions.[23,35] The present findings confirmed that a large percentage of the adult participants in this study visit the dentist infrequently, especially those with low economic status.

Similarly, Bayat *et al*.[35] found a low rate of dental check-ups among Iranian adults and identified a positive relationship between socioeconomic status, having insurance, and dental care utilization. Therefore, providing primary health care or nationally subsidized public services, especially to deprived individuals that emphasize on preventive dental care such as regular dental check-ups in countries with developing oral health-care systems (e.g., Iran), might prove beneficial.

In line with the results of previous studies,[4,8,9] the present study revealed a significant association between OHL scores and the use of dental services. This significant association remained even after adjusting for sociodemographic background factors, thus suggesting that the use of dental services may be an outcome related to OHL.

OHL and socioeconomic and demographic background factors predicted the study participants' OHB and use of dental services. While changing individuals' demographic and socioeconomic status poses an enormous challenge in all societies, increasing individuals' OHL level appears to offer great promise in improving OHB. Media and schools are two important settings for providing programs and interventions to improve the lay population's OHL. Research has found that individuals who received oral health information from multiple sources had higher OHL.[36]

Limitations
Social desirability in response to the self-assessment questions[37] may have led to overestimation in tooth brushing frequency and use of dental services and to underestimation in reporting the consumption of sugary snacks and drinks in the present study. Consequently, one should exercise cautious when interpreting the results relating to self-reported health behavior.

CONCLUSIONS

Our study shows that OHL associated significantly with OHB and the use of dental services. We also found that Iranian elders consume fewer sugary snacks and drinks, women and the more highly educated report brushing their teeth more frequently, and those enjoy higher economic status tend to visit the dentist most often. In addition to multiple social determinants of OHB, OHL reveals an opportunity to improve individuals' OHB. Therefore, the health-care system and oral health-care providers should address individuals with low OHL to reduce their barriers

to care, particularly in countries with developing health-care services.

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Conflicts of interest
There are no conflicts of interest.

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