Oral Health and Oral Health-Related Quality of Life among Elderly People in Iran

Abstract

Background: The study aimed to investigate oral health status and its relationship with oral health-related quality of life in the elderly in Isfahan, Iran, in 2022. **Materials and Methods:** This cross-sectional study was conducted in Isfahan, with 460 elderly participants. During interviews with the participants, their demographic information, their medical and dental history, oral health-related behaviors, self-perceived oral health, and clinical examinations were collected, and the Geriatric Oral Health Assessment Index (GOHAI) was completed. The final conclusions were made using the Generalized Linear Model (GLM) test. **Results:** The mean (sd) scores were 45.05 (8.62) for GOHAI, 5.44 (2.96) for self-perceived oral health, and 18.11 (5.76) for DMFT (Decayed, Missing and Filled teeth). Moreover, the number of remaining teeth on average was 11.78 (11.89), 39.56% of the participants did not brush their teeth, 40% of the elderly had complete dentures, and 27.17% had dental insurance. After adjusting and modifying the variables, the GLM test revealed that strong predictors for higher GOHAI scores were the higher levels of education ($p < .001$), the higher frequency of remaining teeth ($p = 0.002$), more pleasant self-perceived oral health ($p < .001$), and dental insurance ($p = 0.04$). **Conclusions:** According to the findings, the elderly's oral health-related quality of life in Isfahan was low, which was caused by the following factors: edentulism, few numbers of remaining teeth, high DMFT score, elderly' non-adjustment with dentures and their low quality, inappropriate oral health-related behaviors, lack of complementary insurance for dentistry, and non-using dental services, and low levels of education.

Keywords: *Elderly, oral health, oral health-related quality of life*

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Introduction

An increase in the elderly population has been considered one of the main worldwide warnings. The world's elderly population is estimated to grow by 56%, from 901 million people in 2015 to 1.4 billion people in 2030.[1] In Iran, the same concern regarding the explosive growth of the elderly population has been aroused, as the most recent report in 2015 by the National Statistics Center of Iran reflected the aging phenomenon in this country, with about 9.3% of people aged above 60 years.[2]

Aging, as a natural process in human life, is accompanied by some physiological changes that are not considered diseases; however, this phase of life is associated with a decrease in individual abilities.[3] Similarly, there are some changes in oral and dental status, which include xerostomia, oral mucosal disorders, chewing disorders, tooth crown and root recession,

dentin hardening, and gum recession. Non-observance of oral and dental hygiene throughout life, however, causes tooth loss and decay in old age.[4,5] According to the World Health Organization (WHO), about 30% of the elderly aged above 65 years are suffering from edentulism worldwide.[6] A systematic review of 39 studies conducted in different countries reported the prevalence range of tooth decay among the elderly from 8% in Finland to 74% in Brazil. They also showed that the elderly's DMFT scores ranged from 6.9 in Malawi to 29.7 in South Africa.[7] According to a meta-analysis survey study on 4574 elderlies in 13 studies in Iran, 48.7% of the elderly were suffering from edentulism.[8] A national survey on oral health status in Iran in 2012 also indicated that 59% of the elderly aged 65-74 years residing in Isfahan were completely edentulous.[9]

The natural physiological changes of the mouth during elderhood, non-observing oral

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health behaviors, and low oral health literacy[10] have been associated with some adverse outcomes for the elderly, whose consequences are often disregarded. The WHO in 1948 redefined the concept of 'health' as a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity.[11] Since then, the concept of 'Quality of Life' (QOL) has been a hotbed of research among researchers. Oral and dental problems in elderhood change food options, decrease the quality of nutrition,[12] and negatively affect elderlies' appearance, self-esteem, and psychological and social functions,[13] thereby lowering their QOL. Given the critical effect of oral health on individuals' QOL, the concept of 'Oral Health-Related Quality of Life' (OHRQoL) has been developed, which is to measure the effect of oral and dental health on individuals' QOL considering physical, social, and psychological aspects.[14] Recent studies published during the last 30 years have introduced some tools to measure OHRQoL, the most common of which was developed by two American researchers in 1990. The Geriatric Oral Health Assessment Index (GOHAI) is to appraise this factor among the elderly and is psychometrically validated and translated into different languages, including Persian.[15] Many studies have addressed OHRQoL in the elderly using GOHAI in Iran and other countries. For example, Shao *et al.*[16] assessed the Chinese elderlies' OHRQoL using GOHAI and reported that the mean score of OHRQoL was relatively good, and this variable had a significant relationship with the number of remaining teeth and the DMFT score. Another study in Poland also documented that teeth loss was correlated with an unpleasant level of OHRQoL. They also suggested that the relationship was even stronger when the number of teeth decreased by <20.[17] In two other studies by Shaghaghian *et al.*[18] and Tahani *et al.*[19] on the elderly in Iran, the mean score of OHRQoL was not at an optimal level, and a significant relationship was observed between OHRQoL with self-perceived oral health and exhibiting oral health hygiene behaviors. This is while studies in Iran, especially Isfahan, included a limited number of participants. Accordingly, this present aimed to detect the oral health status and its relationship with OHRQoL in the elderly residing in Isfahan, Iran.

Materials and Methods

This cross-sectional study was carried out during the spring and summer of 2022. In this study, the research population encompassed Iranian elderlies aged 60 years and above who had e-files in the Health Integration System of Iran's Ministry of Health and Medical Education and were residing in Isfahan. Cochran's formula (d: 0.05, t: 1.96, p: 0.05, q: 0.05) was used to estimate the sample size, according to which 460 elderlies from all health service centers in Isfahan were included in the study. Inclusion criteria were willingness to participate in the study and the awareness of time, place, and people. Moreover, those

individuals who did not allow clinical examinations or participate in the interviews were partially excluded from this study. The management of health service centers in Isfahan was as follows: 22 centers managed by Isfahan Health Center No. 1 covered 109,634 elderly, and 30 centers managed by Isfahan Health Center No. 2 covered 94,865 elderly. After excluding three rural health service centers, the proportional sampling method was used to select 242 elderly from Center No. 1 and 218 elderly from Center No. 2. To this end. The systematic random sampling method was used as after selecting the first person, and the next person was selected randomly from the list, considering a specific distance. In-person interviews were set via phone calls. If the selected elderly were unwilling to participate in the study or did not meet the inclusion criteria, observing the same specified distance, another person from the list was selected.

In this study, the researchers used a questionnaire to collect data about different oral and dental health dimensions as well as the GOHAI. The oral and dental health form was developed in several sections. The first section addressed demographic information, medical history, and dental history. Oral health behaviors were considered in the second section, and the third section dealt with the elderly's self-perceived oral health. The clinical examination section recorded the number of remaining teeth, DMFT, and the denture status. All clinical examinations were conducted by a geriatric nurse trained by the Public Oral Health Department of Isfahan School of Dentistry professors, using a special mirror, a probe, and normal light on a chair. To validate the developed form, it was submitted to some faculty members of the Prosthodontics Department and Oral Public Health Department of the Isfahan Dental School to check the items in terms of clarity and relevance.

The GOHAI (Atickson and Dolan, 1990) was used to determine OHRQoL.[15] Navabi and Salahi[14] translated this questionnaire into Persian and confirmed its validity and reliability in Iran. This 12-item questionnaire was completed during interviews regarding their conditions over the last three months. The GOHAI addressed the following dimensions: physical (chewing, swallowing, and speaking), psychosocial (satisfaction with the teeth appearance, concerns about the teeth, restrictions in social relationships posed by the mouth appearance, and discomfort to eating food with others), pain, and discomfort (taking medicine for mouth problems and the sensitivity of teeth to cold, heat, and sweets). It was scored on a 5-point Likert scale ranging from 1 to 5. The sum of the scores obtained for each item reflects the individual's satisfaction with OHRQoL, with the lower scores indicating lower OHRQoL and the higher scores showing fewer problems caused by the mouth and teeth in individuals' daily life.[14]

The collected data was imported to SPSS software (Version 22.0, Armonk, NY: IBM Corp; 2013) and analyzed

using Analysis of Variance (ANOVA), independent *t*-test, Pearson correlation, Kruskal–Wallis test, and Generalized Linear Model (GLM). In this study, $p < 0.05$ was set as the significance level.

Ethical considerations

This study was part of a thesis approved by the Ethics Committee of the Isfahan University of Medical Sciences (Approval Id: IR.MUI.NUREMA.REC.1400.208 and Project NO. 400868). Needless to note that the elderly participated in this study voluntarily, and they were allowed to withdraw from the study at any phase if they wished. In this regard, the research objectives were first explained to the elderly, and informed consent was obtained from all individuals. Then, they were asked to answer the interview questions.

Results

Of the 460 elderlies, 226 (49.13%) persons were male, and their age range was 60-94 years, with the mean (SD) age of 69.61 (6.86) years. Moreover, 339 (73.60%) persons were married, 186 (40.43%) persons had undergraduate education, and 125 (27.17%) persons were illiterate. Furthermore, there were 443 (96.30%) persons with medical insurance and 335 (72.82%) persons with no dental insurance. The most frequent underlying diseases were blood pressure, diabetes, cardiovascular diseases, and digestive problems, respectively. Regarding the GOHAI, the mean (sd) score was 45.05 (8.62), with 22.66 (5.03) for the physical dimension, 14.93 (3.24) for the psychosocial dimension, and 7.45 (1.93) for the pain-discomfort dimension. Regarding self-perceived oral health, 103 (22.39%), 295 (64.13%), and 62 (13.47%) persons described it as high, moderate, and poor, respectively, with a mean (sd) score of 5.44 (2.96). The mean (sd) score of DMFT was 18.11 (5.76), and the number of remaining teeth on average was 11.78 (11.89).

As presented in Table 1, the independent *t*-test shows a significant difference in the OHRQoL scores between the two age groups of the elderly, with individuals aged 75 years and above having lower OHRQoL scores than those aged 60-74 years. The independent *t*-test results, however, reveal no significant difference in the OHRQoL score between the males and the females. However, one-way ANOVA test results indicate a significant difference in the OHRQoL scores regarding the individuals' level of education, suggesting that the elderly with academic education have the highest scores. Furthermore, the participants with supplementary dental insurance compared to those with no supplementary insurance have higher OHRQoL scores, and the independent *t*-test results report their difference to be significant.

As presented in Table 2, the one-way ANOVA test reports a significant difference between the OHRQoL score and the frequency of brushing teeth as such, the elderly with daily brushing had higher OHRQoL scores. Regarding the last dental visit, the one-way ANOVA test results suggest that those with more recent dental visits have significantly higher OHRQoL scores.

As presented in Table 3, there is a significant relationship between the DMFT index and the OHRQoL score; hence, the DMFT score decreased as the OHRQoL score increased. The mean score of OHRQoL was higher in the elderly with ≥20 remaining teeth compared to the elderly with <20 remaining teeth. In this regard, the independent *t*-test results report their difference to be significant. Regarding different dental conditions, the Kruskal–Wallis test results showed significant differences among the elderlies' OHRQoL scores in the following four dental conditions: complete dentures, partial dentures, above 20 remaining teeth without denture, under 20 remaining teeth without denture, of which the elderlies with ≥20 remaining teeth without denture received the highest score.

As presented in Table 4, there is a significant relationship between the elderlies' self-perceived oral health and the OHRQoL score, with those having more pleasant self-perceived oral health receiving a higher OHRQoL score.

As presented in Table 5, after adjusting the variables using the GLM test, higher levels of education, more remaining

Table 1: Mean Geriatric Oral Health Assessment Index of the participants in relation to socio-demographic variables

Variable	Group	*n* (%)	Mean (SD)	95% CI	*p*
Age	60-74	364 (79.13)	45.57 (8.41)	44.71, 46.44	<0.05*
	≥75	96 (20.86)	43.07 (9.17)	41.21, 44.93	
Gender	Male	226 (49.13)	45.29 (8.43)	44.19, 46.40	>0.05*
	Female	234 (50.86)	44.82 (8.82)	43.68, 45.96	
Education	Illiterate	125 (27.17)	40.08 (8.85)	38.52, 41.65	<0.001**
	High school	186 (40.43)	45.89 (8.04)	44.73, 47.06	
	Diploma	81 (17.60)	46.71 (6.76)	45.22, 48.21	
	University education	68 (14.78)	49.91 (7.51)	48.09, 51.73	
Dental insurance	Yes	125 (27.17)	48.28 (6.94)	47.04, 49.51	<0.001*
	No	335 (72.82)	43.85 (8.89)	42.89, 44.80	

*Independent *t*-test. **One-way ANOVA.

Table 2: Mean Geriatric Oral Health Assessment Index of the participants in relation to oral health-related behaviors variables

Variable	Group	*n* (%)	Mean (SD)	95% CI	*p*
Brushing habits	Never	182 (39.56)	43.21 (8.82)	41.92, 44.50	<0.001**
	Several times a week	58 (12.60)	42.60 (7.84)	40.54, 44.66	
	Daily habit	220 (47.82)	47.22 (8.15)	46.14, 48.31	
Last visit to the dentist	Over the past year	116 (25.21)	48.32 (8.67)	46.73, 49.92	<0.001**
	Last one to two years	95 (20.65)	45.77 (6.99)	44.35, 47.20	
	The last three to five years	220 (47.82)	43.01 (8.79)	41.84, 44.18	
	Over the past five years	23 (5.00)	45.52 (8.62)	41.79, 49.25	
	Never visited a dentist	6 (1.30)	43.33 (4.76)	38.33, 48.32	

**One-way ANOVA

Table 3: Mean Geriatric Oral Health Assessment Index of the participants in relation to oral clinical variables

Variable	Group	*n* (%)	Mean (SD)	95% CI	*p*
DMFT	0-14	88 (19.13)	49.37 (6.48)	48.00, 50.74	<0.001*
	≥15	181 (39.34)	43.78 (9.61)	42.37, 45.19	
Number of natural teeth	≥20	170 (36.95)	48.58 (7.24)	47.48, 49.67	<0.001*
	<20	290 (63.04)	42.98 (8.71)	41.98, 43.99	
Dental status	Complete denture	184 (40.00)	44.19 (7.94)	43.03, 45.34	<0.001***
	Above 20 remaining teeth without denture	154 (33.47)	48.70 (7.08)	47.57, 49.83	
	Under 20 remaining teeth without denture	79 (17.17)	40.30 (9.65)	38.14, 42.46	
	Partial denture	43 (9.34)	44.41 (9.37)	41.53, 47.30	

*Independent *t*-test. ***Kruskal–Wallis test. DMFT: only those with teeth, *n*=269. Edentulous without denture, *n*=7

Table 4: Mean Geriatric Oral Health Assessment Index of the participants in relation to subjective health conditions variables

Variable	Group	*n* (%)	Mean (SD)	95% CI	*p*
Self-rated oral health	Good	103 (22.39)	51.99 (5.98)	50.82, 53.15	<0.001**
	Moderate	295 (64.13)	44.66 (7.38)	43.81, 45.50	
	Weak	62 (13.47)	35.41 (7.85)	33.42, 37.41	

**One-way ANOVA

teeth, more pleasant self-perceived oral health, and dental insurance could predict the higher GOHAI score.

Discussion

This study aimed to detect the oral health status and its relationship with OHRQoL in the elderly residing in Isfahan, Iran. Measuring OHRQoL would be effective in improving the elderly's oral and dental health status. In this study, the mean score (SD) of GOHAI was 45.05 (8.62), indicating unpleasant OHRQoL in the participants. The GOHAI indices were 45.8[20] and 48.2[16] for the elderly in Mexico City in Mexico and Sichuan Province in China, respectively. Using the GOHAI, Farokhnezhad[21] and Ahmadi[22] reported the OHRQoL score for the elderly in Tehran, Iran, to be 43.04 and 37.44, respectively. These findings reflect the unpleasant level of OHRQoL among the elderly in Iran and worldwide.

According to the GLM results regarding the demographic variables, the participants' age had no significant relationship with the mean score of OHRQoL. This finding is consistent with the findings of studies on Iranian[21] and Korean[23] elderlies. Furthermore, the elderly women obtained lower OHRQoL scores than the elderly men. This might be caused by their complaints and dissatisfaction with the appearance of their teeth and their lower self-confidence as a result of the negative effect of the low status of teeth health on their appearance. However, the difference was not significant. The findings about gender are inconsistent as some studies concluded that higher OHRQoL in men,[24] some others reported the opposite,[12] and several studies observed no relationship between gender and the OHRQoL score.[25] In the present study, a direct and significant relationship was noticed between higher levels of education and OHRQoL, suggesting that the elderly with higher levels of education had higher oral health literacy and enjoyed more pleasant OHRQoL[26] and were further concerned with oral health behaviors and used dental services more frequently. Similar findings were obtained for the elderly in Mexico and China.[12,16] According to the results, the elderly with dental insurance had higher OHRQoL scores than those with no dental

Table 5: Generalized linear model identifying the variables that influenced the Geriatric Oral Health Assessment Index

Variable	Group	β (95%CI)	p
Age	-	0.02 ((-0.08, .13)	0.651
Gender: (ref.: Female)	Male	0.59 (-0.79, 1.97)	0.402
Education: (ref.: University education)	Illiterate	-5.34 (-7.69, -2.99)	<0.001
	High school	-1.86 (-3.88,.16)	
	Diploma	-1.27 (-3.55,.99)	
Number of natural teeth	-	0.24 (0.09,.40)	0.002
Self-rated oral health: (ref.: Good)	Medium	-5.44 (-7.17, -3.72)	<0.001
	Weak	-12.95 (-15.59, -10.32)	
Dental insurance: (ref.: yes)	No	-1.54 (-3.04, -0.05)	0.043
Brushing Habits: (ref.: daily habit)	Never	0.69 (-1.01, 2.39)	0.078
	Several times a week	-1.78 (-3.89,0.32)	
Dental status: (ref.: complete denture)	Above 20 remaining teeth without denture	-4.82 (-9.14, -0.50)	0.151
	Under 20 remaining teeth without denture	-2.74 (-5.42, -0.07)	
	Partial denture	-2.56 (5.64,0.51)	
DMFT* (only those with teeth, *n*=269)	-	Not applicable	Not applicable

*DMFT: Decayed, Missing and Filled teeth

insurance, and the elderly with higher OHRQoL scores had earlier dental visits. These findings are in line with those reported by Kotzer *et al*. in Canada.[27] The findings imply that using dental services would be more frequent and more accessible with dental insurance and that increased dental health care is directly correlated with the elderly's more pleasant perception of OHRQoL.[28]

The results of the GLM test for the clinical variables in this study revealed an insignificant difference in the OHRQoL scores under different dental conditions. In conclusion, compared to the elderly having teeth, those with complete denture or partial dentures, affected by the dissatisfaction of natural tooth loss, revealed no significant difference in their OHRQoL score compared to others. This is while there were restrictions and discomforts after replacing the lost teeth with dentures. Accordingly, the research findings revealed that the elderly with complete and partial dentures received lower OHRQoL scores, which was mainly caused by the elderly's incompatibility with dentures. The interviewed elderlies with dentures referred to their difficulties in chewing and biting food. Another reason was the low quality of dentures as the elderly experience pain and discomfort or sore gums when eating and complain of their looseness when they are talking or eating. In Isfahan, Khadem *et al*.[29] also concluded that partial dentures did not improve the elderly's OHRQoL; however, they decreased it. Faezi *et al*.[30] studied the elderly in Tehran and reported that those with complete or partial dentures received lower scores of GOHAI compared to those with above 20 remaining teeth. In their study on the British elderly, Masood *et al*.[31] introduced dentures as a strong predictor of low OHRQoL levels, mainly because of the poor quality of prostheses, incompatibility with dentures, and their improper fixing in the mouth. In the present study, a significant and inverse relationship was observed

between the OHRQoL score and DMFT, and there was a significant and direct relationship between the OHRQoL score and the frequency of remaining teeth. These findings were in line with those reported by Khatmi Nasab *et al*. in Ardabil,[32] Navabi and Salahi in Kerman,[14] Malicka *et al*. in Poland,[33] and Salunke *et al*. in India.[34] To sum up, the loss of teeth and their decay and an increase in the DMFT score result in restrictions in chewing and eating food and a feeling of pain and discomfort and have a negative effect on the individuals' facial appearance and self-confidence.

The GLM results for oral health behaviors showed no significant relationship between the OHRQoL score and the frequency of brushing teeth; however, those individuals who brushed their teeth daily had higher OHRQoL scores. In this regard, oral health behaviors such as brushing affect the OHRQoL by increasing the frequency of remaining teeth, improving the DMFT score, preventing tooth decay, and decreasing the number of lost teeth. Such behaviors should be internalized from childhood for individuals to have more remaining teeth in elderhood. This implies that conclusions about the relationship between oral health behaviors and the OHRQoL score in the elderly need further studies to evaluate their oral health habits throughout their lives. Similarly, Tahani *et al*.[19] and Shao *et al*.[16] reported higher OHRQoL scores for the elderly brushing and washing their teeth daily.

A direct and significant relationship between self-perceived oral health and the OHRQoL score is reported in many studies. Shao *et al*.[16] in China and Ha *et al*.[35] in Korea also confirmed such a relationship. In the present study, the elderly with more pleasant self-perceived oral health had higher OHRQoL scores. Note that individual expectations have remarkable effects on individuals' satisfaction or dissatisfaction with their oral and dental health.[36] For

example, a small problem in the mouth and teeth of an elderly with pleasant oral and dental health may have significant negative effects on his/her self-perceived oral health or even QOL because of his/her high expectations.[27]

Conclusion

According to the findings, edentulism, fewer remaining teeth in elderhood, high DMFT scores, incompatibility with dentures and their low quality, lack of oral health behaviors, lack of supplementary dental insurance, few dentist visits, and low level of education mainly result in lower OHRQoL scores. To improve the existing situation, proper planning for oral and dental health is needed for individuals before they reach elderhood. Moreover, training the elderly to exhibit oral health behaviors, using functional dentures, increasing the quality of dentures, and providing sufficient facilities to offer more dental services among the elderly should be considered.

Acknowledgments

Conflicts of interest

Nothing to declare.

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