

Original Paper

Oral Health Status in the Iranian Elderly: The Role of Nutrition Status and Health Literacy



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ABSTRACT

Introduction: Oral health plays an important role in determining food intake patterns, meeting nutritional needs, and consequently keeping the health of the elderly and their quality of life. Health literacy is also one of the biggest determinants that significantly impacts disease prevention in the elderly.

Objective: This study aimed to determine oral health status and the relationship between health literacy and nutritional status in the elderly referring to health centers in Tabriz City, Iran.

Materials and Methods: This research is a cross-sectional analytical study performed on 300 older people in Tabriz in 2020. Data collection tools included the geriatric oral health assessment index, seniors in the community: risk evaluation for eating and nutrition, health literacy for Iranian adults, and demographic information questionnaire. To analyze the data, descriptive statistics were used to sort out the data. The Shapiro-Wilk test was used to check the data normality, and then simple and multiple linear regression analyses were performed to evaluate the relationship between variables and control the effect of intervening variables. The level of significance in this study was considered less than 0.05.

Results: The Mean±SD age of the elderly was 69.7±6.7 years. The number of men and women participating in this study was equal. A total of 257 people (85.7%) were married. The results showed that the oral health status of 51% of the elderly was below mean, 65.33% of the elderly were illiterate, and 69.33% were severely malnourished. Based on the results of multiple regression, the nutritional status of the individuals was a predictor of the oral health score of the elderly (B=-13.5, 95% CI: -11.3, -15.69, P=0.001). So, people with malnutrition, mildly malnourished, and severely malnourished had lower oral health scores than healthy individuals with the control of the other variables. The R² value in this study was 0.59.

Conclusion: According to the study results and the relationship between malnutrition and oral health, it is necessary to conduct studies on the factors affecting malnutrition in the elderly by intervening on the factors affecting malnutrition, changing the oral health status of the elderly, and improving their quality of life.

Keywords:

Aging, Health literacy, Nutritional status, Malnutrition

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Highlights

- Oral health plays an important role in the quality of life of the elderly.
- The oral health status of the elderly understudy was below average.
- Many of the elderly in the study were illiterate.
- Most of the elderly in the study were malnourished.
- The oral health status of malnourished elderly was poor compared to malnourished elderly.

Plain Language Summary

With the growth in the elderly population, the needs and problems of this group of society in the field of personal hygiene, especially oral health, have increased. Poor oral hygiene can increase the risk of cardiovascular diseases, diabetes, and mental illness in the elderly. Health literacy significantly impacts various aspects of elderly health and is a predictor of elderly health. Nutritional status is also one of the most important factors affecting people's health, especially the elderly, and nutritional problems are among the health risks and pathogens in the elderly. This study aimed to determine the oral health status and the relationship between health literacy and nutritional status in the elderly referring to health centers in Tabriz City, Iran. The results showed that the oral health status of the elderly is unfavorable and more than half of the elderly are malnourished, and their health literacy status is inadequate. Malnutrition affects the oral health of the elderly. According to the study results, intervention is necessary to improve the nutritional status of the elderly and the level of oral health.

Introduction

In recent years, the world's population has shifted to aging. The people aged 60 and over are growing faster than any age group. In 2019, the number of people aged 60 and over was 1 billion. This number will increase to 1.4 billion by 2030 and 2.1 billion by 2050. This trend of change will accelerate in the coming decades, especially in developing countries [1]. The population aged 60 and over in Iran will increase to 25% in 2050 [2]. With the increase in the elderly population, the needs and problems of this population in the field of personal hygiene, especially oral health, increase. Therefore, it will affect the use of health care services and the costs associated with it [3, 4]. Oral health plays an essential role in determining food intake patterns, meeting nutritional needs, and consequently keeping the health of the elderly and their quality of life. There is ample evidence that untreated oral disorders not only have a negative impact on a person's general health but also increase the risk of diabetes and cardiovascular diseases. Poor oral hygiene can increase the risk of such diseases by about 20% [5, 6]. Oral problems have a negative impact on nutrition, self-esteem, social relationships, physical and mental health, and the overall quality of life of people, including the elderly [7, 8].

Oral health refers to the health of the oral cavity and related tissues that prepare a person for good eating, talking, and social relationships [9]. Reasons such as insufficient motivation in dental care, forgetfulness, inability to perform individual and daily tasks, financial poverty, and side effects due to the combined use of various drugs affecting the natural physiology of the glands and cells of the oral system, and the amount of saliva secretion can cause poor oral health in the elderly [10]. Meanwhile, health literacy is one of the factors affecting the health and oral health of individuals and is effective in creating higher costs in the health system [11]. Health literacy refers to cognitive and social skills to access, understand, and better use health information and services to promote and maintain health [12]. A review study by Mir Mohammadkhani reports that the level of health literacy of the elderly in Iran is low, and aging is the cause of cognitive problems in the elderly, which can be an obstacle to obtaining information and increasing health literacy of the elderly [13]. Another factor related to oral health is nutritional status. Healthy eating is an essential part of the health of the elderly that has a unique role in promoting their health [14]. In the study of Payahoo et al., more than 50% of the elderly in Tabriz City, Iran, had an unfavorable nutritional status [15]. The result of a study that its research population consisted of adults in Tehran has shown that

two-thirds of the participants consumed sweet drinks and snacks between meals, which can harm the oral health of individuals [16].

On the other hand, in the research studies, different results have been obtained regarding increasing the age of people with increasing or decreasing oral health literacy [17, 18]. In contrast, in the Nezafati's study in Rasht City, Iran, more than 50% of the elderly have sufficient health literacy [19]. According to what was discussed, the present study was conducted to determine oral health status and the relationship between health literacy and nutritional status in the elderly referring to health centers in Tabriz. The results of this study can be used in educational interventions to promote the health of the elderly and the necessary training for elderly caregivers.

Materials and Methods

The present cross-sectional analytical study was performed on the elderly in Tabriz from June to September 2020. According to the study of Ahmadi et al. and the report of adequate oral health status in the elderly at 37.44% [20], taking into account the 95% confidence level and measurement error of 0.05 ($d=0.05$), the required number of samples was calculated to be 242. To compensate for sample loss and incompleteness of the questionnaires, 25% was added to the final sample volume. Therefore, the final sample size was 300. The study participants were collected by a simple random method using household numbers registered in health centers until the sample size was completed. The inclusion criteria included being 60 years and older, being able to speak, lacking memory impairment, having a health record in urban health centers, willingness, and informed consent to participate in the study. The exclusion criteria included incomplete completion of questionnaires.

Montazeri et al. developed the Health Literacy for Iranian Adults Questionnaire (HELIA). It was used to assess health literacy [21]. This questionnaire has 33 items (Likert 5-point criterion) that measures people's health literacy in 5 dimensions: reading, access, comprehension, behavior, evaluation, and decision-making. Criteria for measuring health literacy based on the Likert scale were adjusted so that the subjects expressed their opinions in 5 options (always= 4, often= 3, sometimes= 2, rarely= 1, and never= 0). The raw score of each person in each dimension is obtained from the sum of points, then converted to the range of zero to 100 and into four levels of inadequate (0-50), borderline (50-66), sufficient (66-84), and excellent (84 -100) [16]. In this study, two levels of sufficient and excellent were considered together as suf-

ficient levels (66-100). In the present study, the Cronbach α of the questionnaire was reported as 0.79 based on a pilot study of 30 older adults selected according to the study criteria. These people did not enter the main study.

The Geriatric Oral Health Assessment Index (GOHAI) was used to assess oral health status. Atchison et al. [22] presented this questionnaire in 1990, and Rezaei reviewed its validity and reliability in Iran [23]. The GOHAI questionnaire consists of 12 questions rated on a 5-point Likert-type scale: never, rarely, sometimes, often, and always. The total score of each person is obtained from the sum of the digits related to 12 items, and the digit is between 12 and 60. In this way, a score of 5 and always a score of 1 is given, and the higher the total number of questionnaires, the better the oral health in a person's life. In the present study, the Cronbach α of the questionnaire was reported 0.74.

The SCREEN II (seniors in the community: risk evaluation for eating and nutrition) questionnaire was used to assess the nutritional status of the elderly. This questionnaire was validated by Keller et al. in 2005 and was designed to assess weight changes and the ability to prepare food items [24]. The questionnaire consists of 14 questions that include eating habits, weight changes, food preparation, and diets. The criterion for diagnosis is based on 64 scores in the questionnaire. If the elderly got scores less than 50, they are prone to malnutrition; scores of less than 43 indicate moderate malnutrition, and scores of less than 38 indicate severe malnutrition. Amini et al. investigated the validity and reliability of this questionnaire in the study of older people in Iran [25]. In the present study, the Cronbach α of the questionnaire was reported 0.87.

To collect data after the necessary coordination, the health centers of Tabriz prepared a list of the names of the elderly. They were randomly selected using a table of random numbers and invited to participate in the study by phone. After obtaining written consent from the elderly, the study data were collected through questionnaires obtained from literate seniors or through trained questioners by reading the questions for the elderly and insert their answers based on the available options in the questionnaire.

To describe the data, absolute and relative frequency distribution indices, mean and standard deviation were used. The Shapiro-Wilk test was used to check the normality of the data. Finally, simple and multiple linear regression analyses were used to evaluate the relationship between variables and control the effect of intervention

variables. Based on the leading method, the variables are entered into the model. SPSS version 26 was used to analyze the collected data. Finally, a significance level was considered for all analyzes ($P < 0.05$).

Results

In this study, 300 older people aged 60 years and older living in Tabriz City, Iran, with an Mean±SD age of 69.7±6.7 years under the auspices of urban health centers participated. Other demographic information is reported in [Table 1](#). Frequency distribution of oral health status, health literacy level, and nutritional status among the elderly under study showed that the Mean±SD score of oral health was 40.68±5.66, and oral health status was 153(51%) lower than the average for the elderly. One hundred and ninety-six patients (65.33%) had insufficient health literacy level, and the Mean±SD score of health literacy was 43.12±19.64 and 208 patients (69.33%) were severely malnourished. Only 11 patients (3.67%) did not suffer from malnutrition or were not exposed to malnutrition.

To investigate the relationship between demographic factors, nutritional status, and health literacy with oral health, we used linear regression ([Table 2](#)). The results of linear regression analysis indicate that gender and marital status did not predict the oral health score, while age was a significant variable in predicting the oral health of the elderly. In other words, the oral health score is expected to decrease by 1.2 units for every 10

years of age. Also, with increasing the level of education of the elderly, the oral health status was significantly better. Nutritional status was also a significant predictor of oral health. It is expected that for people with severe malnutrition, the oral health score is 13.6 units lower than for people with healthy nutrition. Adequate and excellent health literacy level was also a predictor of oral health, so it is expected that for people with sufficient and excellent health literacy level, oral health score is 3.26 units higher than people with inadequate literacy level. But when the multiple linear regression model was fitted to the data, only nutritional status significantly predicted oral health. The oral health score of people with severe malnutrition was 13.5 points lower than people with healthy nutrition. The coefficient of determination of the multiple regression model is equal to 0.59; in other words, the studied variables could explain 59% of the changes in the response variable. The results related to multiple regression are reported in [Table 3](#).

Discussion

This study aimed to determine the relationship between oral health and health literacy and nutrition among the elderly in Tabriz. The study results showed that the oral health status of people who are exposed to malnutrition or suffer from moderate and severe malnutrition is lower than mean. The mutual relationship between oral health status and malnutrition, as well as diet status and its impact on oral health, have been shown in different studies and different groups [[16](#), [26](#)].

Table 1. Demographic information of the elderly (n=300)

Variable		No. (%)
Gender	Male	150(50.0)
	Female	150(50.0)
Level of education	Reading and writing	143(47.7)
	Elementary and middle school	103(34.3)
	Diploma	29(9.7)
	College education	25(8.3)
Marital status	Married	257(85.7)
	Single	43(14.3)
How to get health information	Radio and television	95(31.7)
	Ask the doctor	112(37.3)
	Other methods	93(31.0)

Table 2. Results of simple linear regression, fitting of demographic variables, nutritional status, and health literacy on oral health

Variable	B	Standard Error	95%CI		Sig.	R ²	
			Upper	Lower			
Age	-0.12	0.05	-0.23	-0.02	0.015	0.02	
Gender	Female (Reference)	-	-	-	-	0.0001	
	Male	-0.11	0.65	-1.4	1.2		0.863
Education	Reading and writing (reference)	-	-	-	-	0.03	
	Elementary and middle school	1.79	1.14	-0.63	2.2		0.001
	Diploma	3.71	1.21	-0.45	4.0		0.12
	University	1.79	0.72	1.3	6.1		0.002
Marital status	Single (Reference)	-	-	-	-	0.002	
	Married	-0.80	0.93	-1.03	2.6		0.39
Nutrition status	Healthy (Reference)	-	-	-	-	0.57	
	Exposed to malnutrition	-3.9	1.3	-4.67	-1.32		0.003
	Moderate malnutrition	-5.75	1.2	-8.13	-3.36		0.0001
	Severe malnutrition	-13.6	1.1	-15.8	-11.46		0.01
Health literacy	Inadequate (reference)	-	-	-	-	0.05	
	Borderline	-0.07	0.89	-1.8	1.7		0.94
	Adequate and excellent	3.26	0.89	1.5	5.0		0.001

Ziebolz et al. multivariate analysis showed that edentulousness was significantly associated with malnutrition [27]. Teeth loss affects the selectivity, preparation, consumption, and nutritional status of the elderly [28]. Also, teeth loss and chewing disorders are associated with limited consumption of various foods (especially fruits and vegetables), increased consumption of sweet and chewy foods, and less consumption of fiber and vitamins in the diet [29]. In a study of the adult population, it was found that two-thirds of the participants consumed sugary drinks and snacks between meals [15], which endangers their oral health. The Mthethwa's study showed that eating an unhealthy diet predicts tooth decay and its health [30].

In the present study, the oral health status of more than half of the subjects was below mean. In the study of Ahmadi et al. on a sample of older people in Tehran City, Iran, 24% of the participants had poor oral health status [20]. Khatami Nasab's study reported that the oral health status of the elderly covered by the Welfare Organization was very unsatisfactory. In this study, the

oral health questionnaire of the World Health Organization was used [31]. Poor oral health is associated with various diseases such as diabetes, cardiovascular and cognitive impairment, and mental health illnesses [32, 33]. In justifying the poor oral health status of the elderly, we can mention economic factors, access to oral care services, nutritional status, and health status of the elderly [34, 35].

The study results showed that the health literacy status of most of the elderly under study is poor and inadequate. Our study results are consistent with the study results of Mir Mohammadkhani et al. [13]. Restrictions on health literacy increase with age [36]. Also, increasing age may cause cognitive and perceptual problems in the elderly, which can be an obstacle to obtaining information and increasing the health literacy of the elderly [37]. The research results by Lee et al. showed a relationship between good oral health literacy and a healthier and better oral health status [38]. In our study, no correlation was seen after the adjustment of variables. Still, in the simple linear regression model, a rela-

Table 3. The results of the fitting of multiple linear regression of demographic variables, nutritional status, and health literacy on oral health

Variable	B	Standard Error	95%CI		Sig.	R ²
			Upper	Lower		
Age	-0.003	0.04	-0.08	0.07	0.57	
Gender	Female (Reference)	-	-	-	-	
	Male	-0.47	0.45	-1.35	0.42	0.3
Education	Reading and writing (reference)	-	-	-	-	
	Elementary and middle school	-0.63	0.58	-1.77	0.51	0.28
	Diploma	-0.18	1	-2.14	1.78	0.86
Marital status	University	0.05	1.18	-2.27	2.36	0.97
	Single (Reference)	-	-	-	-	-
Married	1.12	0.65	-0.16	2.42	0.08	
Nutrition status	Healthy (Reference)	-	-	-	-	-
	Exposed to malnutrition	-3.83	1.33	-6.44	-1.21	0.001
	Moderate malnutrition	-5.65	1.25	-8.11	-3.19	0.001
	Severe malnutrition	-13.5	1.11	-15.69	-11.3	0.001
Health literacy	Inadequate (reference)	-	-	-	-	-
	Borderline	-0.24	0.73	-1.67	1.18	0.74
	Adequate and excellent	0.92	0.91	-0.87	2.72	0.31

tionship was found between oral health status and oral health literacy. In justifying this finding, we can point to different studied societies, the level of literacy of the people under study, and study tools. In lee study [38], the Carolina oral health literacy questionnaire was used to assess health literacy status. However, in both studies, the health literacy of the elderly is low.

Another factor related to oral health status is education. Based on linear regression, people with higher education have better oral health. Having education leads to more access to information about oral health or care and see a dentist [30]. Oral health status and performing behaviors that promote oral health among women are better than men in some studies [35]. In the study of Ahmadi et al., the oral health status of men was better than women [20], which may be related to the physical condition of women, pregnancy, and childbirth.

Based on the results of multiple regression and fitted model, no significant relationship was observed be-

tween demographic information and oral health. These results contradict the results of Ahmadi et al. [20] and Mthethwa et al. [30], which showed the relationship between demographic characteristics such as age, sex, and educational status with oral health. Oral health may decrease with age due to diseases such as diabetes and cognitive problems. Also, this age group is involved in several general health problems, and therefore oral health is probably less of a priority for them. Coordinating and receiving dental services depends on other people, and they are not aware of many consequences of oral diseases and how to prevent them [39].

This study also had some limitations. The study’s cross-sectional nature did not allow understanding the cause-and-effect relationship between the variables. Also, data collection was self-reported, which may not have reflected the actual performance of individuals. There are also many variables, such as economic status, that may affect oral health and have not been studied in the present study, so it is recommended to be considered

in future studies. Because of the relationship between nutritional status and oral health, it is recommended that interventional studies be conducted to improve the nutritional status of the elderly and its relationship with the oral health of this group of society.

Ethical Considerations

Compliance with ethical guidelines

To observe the ethical principles in the research, the study's objectives were explained to the participants. After assuring them that the obtained information was confidential and the results were published in general, and the questionnaires were anonymous, written consent was obtained from the participants in the study. This research was conducted after receiving the ethical code number IR.TBZMED.REC.2019.221 from the Ethics Committee of Tabriz University of Medical Sciences.

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Author's contributions

Conception and design of the study: Shahab Papi and Zeynab Karimi; Analysis and interpretation of data: Zahra Taheri-Kharameh, Fatemeh Hosseini, and Zeynab Karimi; Collection, assembly, possession of raw data: Manijeh Izadi, Leila Behboodi, and Mahdi Yousefi; Critical revision: Shahab Papi; Final approval of the study: All authors.

Conflict of interest

The authors declared no conflict of interest.

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