Journal of
Oral Health and Oral Epidemiology

https://johoe.kmu.ac.ir
10.34172/johoe.2502.1709
JOHOE.2025;14:2502.1709

Original Article

Multimorbidity and polypharmacy in older adults, and their impact on oral health-related quality of life

Ariana Rezaei Majd[1], Simin Mouodi[2], Seyed Reza Hosseini[2], Ali Bijani[2], Fatemeh Sayyadi[3*]

[1]Student Research Committee, Babol University of Medical Sciences, Babol, Iran
[2]Social Determinants of Health Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, Iran
[3]Oral Health Research Center, Babol University of Medical Sciences, Babol, Iran

***Corresponding Author:** Fatemeh Sayyadi, Email: f.sayyadi90@yahoo.com

Abstract

Background: The term oral health-related quality of life (OHRQOL) was used since the early 1980s. This research examines the relationship between multimorbidity, polypharmacy, and oral health-related quality of life (OHRQOL) among older adults.

Methods: This cross-sectional research was conducted among older adults (≥60) living in Amirkola, northern Iran. Demographic characteristics, the number of drugs consumed, and the presence of comorbid disorders were collected through direct interviews. Consuming five or more drugs was defined as polypharmacy, and the simultaneous presence of three or more chronic diseases was recorded as multimorbidity. Dental specialists examined the older adults, and the Geriatric Oral Health Assessment Index (GOHAI) was used to assess the OHRQOL.

Results: A total of 800 older adults, including 433 (54.1%) men and 367 (45.9%) women, with a mean age of 69.30±7.03 years, were included. The mean number of comorbidities was 3.74±2.27, and the mean number of consumed drugs was 3.74±3.09. The average OHRQOL score was 51.36±7.25. Multivariable regression analysis revealed that the effect of multimorbidity on OHRQOL was significant (adjusted OR=1.803; 95% CI=1.239-2.622; *P*=0.002). However, polypharmacy had no such significant effect (Adjusted OR=1.016; 0.697-1.482, *P*=0.934).

Conclusion: Considering that 66.1% of older adults had multimorbidity, which significantly impacted oral health-related quality of life, health service providers must pay attention to maintaining and improving the oral health of older people.

Keywords: Aging, Multimorbidity, Oral health, Quality of life

Citation: Rezaei Majd A, Mouodi S, Hosseini SR, Bijani A, Sayyadi F. Multimorbidity and polypharmacy in older adults, and their impact on oral health-related quality of life. *J Oral Health Oral Epidemiol*. 2025;14:2502.1709. doi:10.34172/johoe.2502.1709

Received: February 4, 2025, **Accepted:** May 24, 2025, **ePublished:** July 22, 2025

Introduction

Oral health greatly influences older adults' general health and quality of life. Any disruption in the oral health condition of older individuals can affect their nutritional status and ingestion pattern, change their physical condition, and affect their appearance, self-confidence, psycho-social functioning, and quality of life.[1] Some recent papers reported unsatisfactory oral health behaviors among the Iranian population.[2-4] Oral and dental health among Iran's older population is poor. A recent meta-analysis found the mean pooled decayed, missing, and filled teeth (DMFT index) among older adults aged 65 and older in Iran to be 26.84.[5]

Quality of life is a multi-dimensional and complex concept. It represents a person's perception of their life situation, and is expressed in the context of each person's beliefs.[6] The quality of life related to oral health (OHRQOL) has been introduced since the early 1980s, approximately 20 years after the phrase "general health-related quality of life (HRQOL)" was announced. OHRQOL is a multidimensional concept defined as: "people's comfort when they eat, sleep, and participate in social communication and their self-confidence and their satisfaction with their oral health". In this sense, OHRQOL is associated with 1) functional, 2) psychological, 3) social, and 4) experience of pain or discomfort.[1,7] Various instruments have been designed to examine OHRQOL.[8,9]

Aged people are at increased risk of developing chronic disorders. The term multimorbidity was initially defined as "simultaneous existence of two or more chronic diseases or long-term physical and mental disorders that can only be controlled with drugs or other treatments." However, recent publications emphasize the coexistence of three or more comorbidities for the definition of multimorbidity in the older population.[10] Multimorbidity is a significant health challenge in older adults and is associated with

increased frailty, other significant physical, mental, social, and functional complications, and decreased quality of life.[11-14]

Simultaneous occurrence of various disorders in older adults necessitates receiving different treatments. The term polypharmacy refers to the administration of five or more medications. Although polypharmacy is not specific to older people, its frequency increases with age.[15] Polypharmacy has many adverse effects on health. It leads to frequent visits to health centers, increases health care and treatment expenditure, and subsequently, increases the risk of drug interactions and side effects and non-adherence to prescribed treatment regimen.[16]

Multimorbidity can be seen as both a challenge and an opportunity for oral health. Multimorbidity is more common in women, and women more frequently visit health-providing centers. This can be considered as an opportunity to examine oral health status and physical and mental health.[17] Previous studies have primarily focused on the association between multimorbidity and oral health-related quality of life (OHRQOL) or examined the factors influencing OHRQOL.[18,19] However, there has been limited research on the simultaneous effects of multimorbidity and polypharmacy on the OHRQOL of community-dwelling older adults.

In Iran, a recent study reported a low level of OHRQOL among older people of Isfahan. It provided evidence for the benefits of measuring OHRQOL in improving the elderly's oral and dental health.[20] Another study showed that 80.2% of older people in southern Iran had multimorbidity. It recommended a comprehensive assessment of determinant factors of multimorbidity to implement proper strategies for preventing its consequences.[13] However, to our knowledge, no research has addressed both OHRQOL and multimorbidity and medication use in the Iranian elderly population. This research investigated the relationship between multimorbidity and polypharmacy and their effects on oral health-related quality of life (OHRQOL) among older adults.

Methods

Study design and setting

This cross-sectional research was conducted based on the data available in the Amirkola Health and Aging Cohort Project (AHAP). All older adults aged 60 years and over living in Amirkola, north of Iran, were invited for free examination. The profile of this cohort project provides more details about how the participants were examined.[21]

Participants

Inclusion criteria included: 1. individuals aged 60 years and older; 2. consent to participate in the study; 3. residing in Amirkola. Exclusion criteria included: 1. existence of severe or debilitating physical or mental diseases that prevented older individuals from undergoing a complete physical examination; 2. incomplete information in the AHAP cohort database.

Variables and measurement

Direct interviews obtained demographic characteristics, including age, gender, level of education, marital status, and occupation, as well as the number of drugs the participant consumed and comorbidities. Based on the medical documentation and medications the participant was taking, twenty-five physical or mental disorders and diseases were recorded in the AHAP cohort database. These disorders are presented in Supplementary file. Only the number of these comorbidities was reported in the current research.

To determine the status of polypharmacy, the number of drugs used was recorded. Taking five or more drugs was considered polypharmacy,[15] and multimorbidity was defined as having three or more concurrent chronic diseases or long-term physical or mental disorders.[10]

Dental specialists examined all participants, and the research data sheet recorded the information related to their oral and dental conditions. The Geriatric Oral Health Assessment Index (GOHAI) examined oral health-related quality of life. This questionnaire is practical and straightforward for the elderly. Each question has five options (always, often, sometimes, rarely, and never). A score of 57 to 60 is considered good OHRQOL, and a score of 56 and below is classified as poor. This 12-question tool examines the quality of life related to the oral health of older people in three areas: physical functioning, psychosocial functioning, and pain or discomfort during the last three months. This questionnaire has been previously translated in Iran, and its validity and reliability have been confirmed for use among older people.[22]

Trained staff collected the data to ensure consistency and accuracy and minimize bias risk. Age, gender, and occupation were potential confounders, and multivariable logistic regression was used in data analysis to compare the crude and adjusted odds ratios of these confounders.

Study sample

With a confidence level of 95%, study power of 90%, and assuming $r = 0.15$ for the correlation between the OHRQOL score, the number of drugs consumed, and the number of comorbidities, the sample size was estimated at 800. Eight hundred eligible people whose information was complete were included in the research. The participants were selected from the AHAP databank using simple random sampling with computer-generated random numbers.

Statistical methods

Data was analyzed using SPSS version 22 statistical

software. The analysis employed both t-tests and chi-square tests to assess the data. The Pearson correlation coefficient was used to determine the correlation between the study variables, and multivariable logistic regression analysis was performed to assess the effect of different variables on the participants' OHRQOL. Following analysis of the crude impact of each research variable on OHRQOL, the variables with a P-value less than 0.3 were entered in a regression model with the "Enter" method. P-values ≤ 0.05 was considered significant.

Results

Eight hundred older adults, including 433 (54.1%) men and 367 (45.9%) women, with a mean age of 69.30 ± 7.03 years, were included in the research. Baseline information of the participants is presented in Table 1. This table shows that the largest age group was 65-69 years old, which accounted for 31.2% of the participants, followed by 60-64 years old (28.2%). Most participants were married (83.4%) and illiterate (57.7%). Five hundred and seventy participants (71.3%) were housekeepers or without a specific occupation. The mean number of comorbid disorders was 3.74 ± 2.27. The mean number of drugs was 3.74 ± 3.09, and the mean GOHAI score was 51.36 ± 7.25.

Table 2 presents the association between demographic characteristics, polypharmacy, and multimorbidity with the GOHAI score in older adults. This table shows that 529 individuals (66.1%) had multimorbidity. Moreover, a significant association was observed between OHRQOL, multimorbidity ($P = 0.001$), and marital status ($P = 0.004$). However, age ($P = 0.593$), gender ($P = 0.200$), level of education ($P = 0.387$), occupation ($P = 0.052$), and polypharmacy ($P = 0.071$) did not show such a significant association.

The Pearson correlation coefficient test was conducted to evaluate the relationship between various study variables, such as age, the number of medications taken, and the number of comorbid disorders, and the GOHAI score. The results revealed a significant inverse correlation between the number of medications (r = -0.069; $P = 0.05$) and the number of comorbid disorders (r = -0.163; $P < 0.001$) with oral health-related quality of life (OHRQOL). However, age did not show such a significant correlation (r = -0.009; $P = 0.793$) (Figures 1 and 2).

Table 1. Baseline demographic characteristics of the older adults participating in this research

Characteristics		Number	Percent
Age (year)	60-64	226	28.2
	65-69	250	31.2
	70-74	151	18.9
	75-79	98	12.3
	80-84	54	6.8
	≥85	21	2.6
Level of education	Illiterate	462	57.7
	Primary school	182	22.8
	Secondary school	101	12.6
	Academic education	55	6.9
Occupation	Housekeeper or without a specific job	570	71.3
	With a specific occupation	230	28.7
Marital status	Married	667	83.4
	Single, divorced, or widowed	133	16.6

Logistic regression analysis explored the effect of demographic characteristics, the number of comorbid disorders, and multimorbidity on OHRQOL (Table 3). The results showed that among the examined variables, only multimorbidity (at least three co-existing chronic disorders) had a significant adjusted effect on OHRQOL (adjusted OR = 1.803; 95% CI = 1.239-2.622, $P = 0.002$). Being single (crude OR = 0.490; $P = 0.004$) significantly affected OHRQOL in the initial analysis. However, when other predictors were considered, its impact on OHRQOL was not significant (adjusted OR = 0.668; $P = 0.23333$). Polypharmacy showed an effect size of 1.368 (0.984-1.900) on OHRQOL, but the crude ($P = 0.071$) and adjusted odds ratio ($P = 0.934$) were not statistically significant.

In this logistic regression model, age, gender, level of education, occupation, and marital status did not significantly affect the OHRQOL of older adults.

Discussion

Our findings revealed the significant impact of multimorbidity on oral health-related quality of life among older adults, even after considering the effects of age, gender, level of education, occupation, marital status, and polypharmacy. Given the high correlation between multimorbidity and polypharmacy, our results showed that multimorbidity was a better predictor of OHRQOL than polypharmacy. This can be attributed to the fact that polypharmacy is usually a consequence of multimorbidity. The higher the number of diseases a person has, the more drugs they need to take.

In the study of Mirhosseini et al in Tehran, Iran, 171 people over 65 years old were evaluated using the Oral Health Impact Profile Scale (OHIP-14) and GOHAI-12 questionnaire for the quality of life related to their oral health. The findings indicate that, based on OHIP-14 and GOHAI-12 results, the quality of life of Iranian older people can be influenced by cardiovascular disease, hypertension, dry mouth, and the number of teeth. The number of natural teeth, improved salivary flow, and better sweet and sour perception were all associated with a higher quality of life. At the same time, increased dry mouth, decreased salivary flow, and poor taste perception were associated with decreased overall well-being.[23]

Another study in the Indian population demonstrated that adults with physical multimorbidity had a higher risk of oral morbidity, and people with only oral morbidity

Table 2. The association between demographic characteristics, polypharmacy, and multimorbidity with the GOHAI score.

Characteristics		OHRQOL		*P* value (Chi-square)
		GOHAI ≤ 56 number (percent)	GOHAI > 56 number (percent)	
Age (year)	60-64	166 (73.5)	60 (26.5)	0.593
	65-69	183 (73.2)	67 (26.8)	
	70-74	103 (68.2)	48 (31.8)	
	75-79	76 (77.6)	22 (22.4)	
	80-84	41 (75.9)	13 (24.1)	
	≥85	17 (81.0)	4 (19.0)	
Gender	Male	309 (71.4)	124 (28.6)	0.200
	Female	277 (75.5)	90 (24.5)	
Level of education	Illiterate	339 (73.4)	123 (26.6)	0.387
	Primary school	132 (72.5)	50 (27.5)	
	Secondary school	79 (78.2)	22 (21.8)	
	Academic education	36 (65.5)	19 (34.5)	
Occupation	Housekeeper or without a specific job	429 (75.3)	141 (24.7)	0.052
	With a specific occupation	157 (68.3)	73 (31.7)	
Marital status	Married	475 (71.2)	192 (28.8)	0.004
	Single, divorced, or widowed	111 (83.5)	22 (16.5)	
Multimorbidity	No	178 (65.7)	93 (34.3)	0.001
	Yes	408 (77.1)	121 (22.9)	
Polypharmacy	No	349 (70.9)	143 (29.1)	0.071
	Yes	237 (76.9)	71 (23.1)	

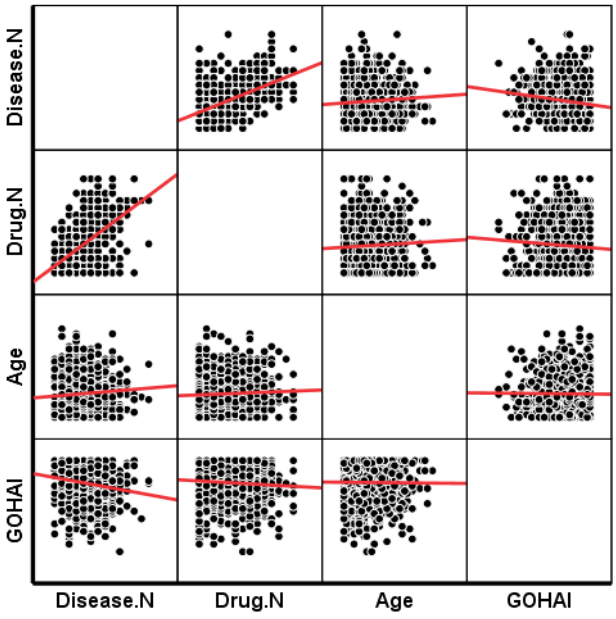

Figure 1. Correlation of the number of comorbid disorders, the number of consuming medications, and age with OHRQOL of older people. Disease.N = the number of comorbid disorders; Drug.N = the number of consuming drugs; GOHAI: Geriatric Oral Health Assessment Index.

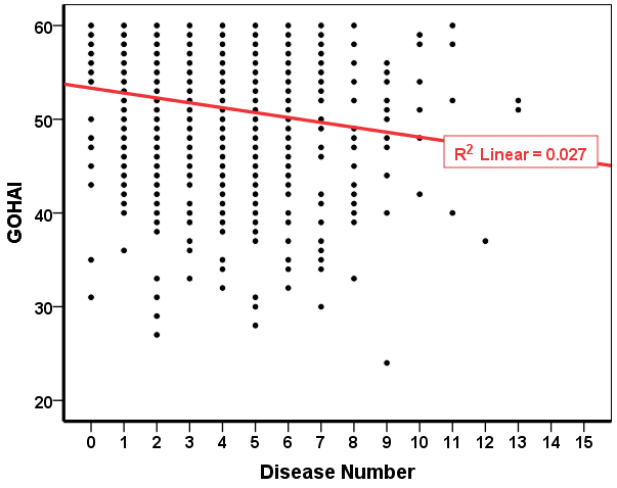

Figure 2. Correlation of the number of comorbid disorders with OHRQOL of older people

reported better health compared to those with both physical multimorbidity and oral morbidity.[24] It appears that with the increase in the number of chronic and long-term disorders in older people, their oral health deteriorates. This can be attributed to various factors, including poor oral and dental health, the accompanying physical and mental diseases, and medications. These conditions impact the state of taste, saliva, gums, and other parts of the mouth and teeth. They can decrease the frequency of visits to the dentist and ultimately cause a decline in oral health-related quality of life.

In the current study, the average number of comorbidities in the participants was 3.74, and older people used an average of 3.74 medications. Moreover, 66.1% of the participants had three or more concurrent

Table 3. The effect of demographic characteristics, the number of comorbid disorders, and multimorbidity on OHRQOL.

Characteristics		Crude OR (95% CI)	*P*-value	Adjusted OR (95% CI)	*P* value
Age (year)	60-64	Reference			
	65-69	0.987 (0.657-1.483)	0.951	0.948 (0.620-1.450)	0.805
	70-74	0.776 (0.493-1.219)	0.271	0.661 (0.407-1.073)	0.094
	75-79	1.249 (0.714-2.183)	0.436	1.020 (0.556-1.869)	0.950
	80-84	1.140 (0.572-2.273)	0.710	0.949 (0.452-1.993)	0.889
	≥85	1.536 (0.497-4.748)	0.456	1.132 (0.346-3.698)	0.838
Gender	Male to female	1.235 (0.900-1.694)	0.200	0.839 (0.537-1.311)	0.440
Level of education	Illiterate	Reference			
	Primary school	0.958 (0.652-1.408)	0.827	1.001 (0.666-1.505)	0.997
	Secondary school	1.303 (0.778-2.182)	0.314	1.474 (0.839-2.587)	0.177
	Academic education	0.687 (0.380-1.244)	0.215	0.741 (0.377-1.455)	0.384
Occupation	Without a specific occupation, to have a particular job	0.707 (0.505-0.990)	0.052	0.781 (0.500-1.222)	0.279
Marital status	Not-married to married	0.490 (0.301-0.798)	0.004	0.668 (0.344-1.297)	0.233
Multimorbidity	Yes/No	1.762 (1.276-2.432)	0.001	1.803 (1.239-2.622)	0.002
Polypharmacy	Yes/No	1.368 (0.984-1.900)	0.071	1.016 (0.697-1.482)	0.934

long-term disorders. A national cohort study in Sweden aiming at mapping the pattern of chronic diseases and hospitalizations in older people who were cared for in their homes and received publicly funded Swedish home care reported that they had a more complex disease pattern in comparison with older adults who received services other than home care. The findings of this study showed that 57% of the participants had more than five chronic disorders.

Hypertension and ophthalmic diseases were the most commonly reported diseases in the study participants. Home care (HC) recipients had a higher prevalence of nearly all chronic diseases compared to non-HC recipients.[25] Another study in China examined the multimorbidity in people aged 65 and over and reported that 91.89% of the participants had two or more long-term diseases, and the average number of comorbidities was 4.68. Also, the average number of drugs consumed by the participants was 5.4, and 55.42% of them took more than five medications.[12] A cohort study in Iran also reported 80.2% prevalence of multimorbidity in 2426 older people (average age 69 years), and concluded that a large proportion of Iran's older population has multimorbidity.[13] Studies conducted in different regions of the world and Iran reported different results about the number of chronic diseases, the average number of drugs the people were consuming, and the frequency of multimorbidity and polypharmacy, which can be attributed to different research characteristics, study population, tools, and definitions. In addition, in the studies where the older group received integrated and government-financed care and screening programs, the probability of identifying physical and mental disorders was higher, and a higher frequency of multi-morbidity was reported.

In this study, the average score of OHRQOL of older people was 51.36, and based on the GOHAI score, 73.3% had a poor oral health-related quality of life. A study conducted on non-hospitalized older people aged 60 years and over in Malaysia reported that the average overall GOHAI score was 48.38 ± 9.33, which indicates poor OHRQOL. Multivariate regression analysis showed no significant association between OHRQOL and factors such as ethnicity, living alone, or a higher level of education. The study's findings showed that demographic and social characteristics had a minimal impact on the Oral Health-Related Quality of Life (OHRQOL) of older adults.[26] In another study in Malaysia among the population aged 60 and over, the average GOHAI score for older people was reported as 51.83,[27] which was similar to the findings of our study. In another study in India, in which an older population was examined, the findings showed that 39% of the participants had never visited a dentist, and 48% had no financial income. In this study, the average GOHAI score of the participants was reported as 26.69 (median = 25, interquartile range = 23-27), which was lower than that in our study.[28] Different results might be attributed to varying characteristics of the study populations.

In our study, a significant inverse correlation was found between OHRQOL and the number of drugs the participants were consuming. However, after logistic regression analysis and considering the effect of other variables, the effect of polypharmacy on OHRQOL was not significant, and the impact of multimorbidity was more pronounced than that of polypharmacy. Several studies have examined the association between polypharmacy and older people's overall quality of life. However, studies that have addressed the oral health-related quality of life are sparse. Ye et al.'s study assessed the correlation

between polypharmacy and the risk of complications related to the use of these drugs among older people living in the European region (including the Netherlands, Greece, Croatia, Spain, and the United Kingdom). The results highlighted the negative impact of polypharmacy on quality of life. Lifestyle, overweight, multimorbidity, and frailty in old age increased the risk of polypharmacy among older people.[29]

Another study in Saudi Arabia evaluated the association between dental anxiety and OHRQOL among older people. In this study, the prevalence of dental anxiety was 90.5%. In fact, a significant association was observed between the dental anxiety of older people and their OHRQOL, and it was concluded that dental anxiety was common among older adults living in rural areas, and was a poor predictor of OHRQOL.[30] A study in Taiwan also highlighted the association between denture satisfaction and oral health-related quality of life. In this study, 2128 people aged 65 and over completed the research questionnaires before and approximately six months after receiving a complete denture. Six dimensions of participants' satisfaction with dentures were examined. The findings showed that the most significant improvement in OHRQOL after treatment was among those who were quite satisfied.[31] Polypharmacy can occur due to various diseases and chronic conditions in older adults, and each drug has unwanted side effects that can affect various aspects of the quality of life and older people's satisfaction with their health condition.

Systematic review studies indicate that older adults generally do not have a good OHRQOL profile. Particularly, with multi-morbidity, the oral health-related quality of life deteriorates. Given the importance and necessity of oral hygiene and its effect on public health care, paying more attention to oral and dental health in senior adults is critical.[6] Comprehensive and integrated oral health care strategies are necessary to improve the OHRQOL of older people, especially those who do not have access to public facilities such as nursing homes or supported care. Interdisciplinary collaboration between mental health professionals, geriatricians, and oral health care providers is crucial to improve oral health and related quality of life among older people.[23]

The most important limitation of this study was the global recording of the number of chronic disorders. Analysis of the effect of each of the comorbidities (such as diabetes, hypertension, vision disorders, depression, malignancies) separately, as well as a specific analysis of the impact of oral morbidities, such as oral pain, oral ulcers, bleeding, gingivitis, tooth loss and decay alone and together with physical multimorbidity, could provide a more comprehensive picture of the impact of concurrent diseases on OHRQOL of the. Also, the study's cross-sectional design can be mentioned as another limitation, making it difficult to establish a causal relationship between research variables.

For future research, longitudinal studies are recommended to evaluate the impact of physical and oral comorbidities on older people's oral health-related quality of life.

Conclusion

Considering that 66.1% of older adults had multimorbidity, which significantly impacted oral health-related quality of life, health service providers must prioritize the oral health of older individuals.

Acknowledgments

We would like to acknowledge the Research Deputy of Babol University of Medical Sciences, Iran for supporting this research.

Authors' Contribution

Conceptualization: Seyed Reza Hosseini, Ali Bijani, Fatemeh Sayyadi.
Data Curation: Ariana Rezaei Majd, Simin Mouodi, Seyed Reza Hosseini, Ali Bijani, Fatemeh Sayyadi.
Investigation: Ariana Rezaei Majd, Simin Mouodi, Seyed Reza Hosseini, Ali Bijani, Fatemeh Sayyadi.
Formal Analysis: Ali Bijani.
Methodology: Simin Mouodi, Seyed Reza Hosseini, Ali Bijani, Fatemeh Sayyadi.
Project Administration: Ariana Rezaei Majd, Simin Mouodi, Seyed Reza Hosseini, Ali Bijani, Fatemeh Sayyadi.
Supervision: Fatemeh Sayyadi, Seyed Reza Hosseini.
Software: Ali Bijani.
Resource: Simin Mouodi, Seyed Reza Hosseini, Ali Bijani, Fatemeh Sayyadi.
Validation: Fatemeh Sayyadi, Seyed Reza Hosseini.
Visualization: Ariana Rezaei Majd, Simin Mouodi, Seyed Reza Hosseini, Ali Bijani, Fatemeh Sayyadi.
Writing- Original Draft: Ariana Rezaei Majd, Simin Mouodi, Seyed Reza Hosseini, Ali Bijani, Fatemeh Sayyadi.
Writing- Review & Editing: Ariana Rezaei Majd, Simin Mouodi, Seyed Reza Hosseini, Ali Bijani, Fatemeh Sayyadi.

Competing Interests

The authors declare that no conflict of interest exists.

Data Availability Statement

Academic researchers who want to have data and materials of this study should send a requesting email to the corresponding author (with the email address: f.sayyadi90@yahoo.com) to receive more information.

Ethical Approval

The research protocol was approved by the Ethics Committee of Babol University of Medical Sciences, Iran with identification number IR.MUBABOL.REC.1401.152.

Funding

Babol University of Medical Sciences, Iran supported this research.

Supplementary File

Supplementary File. Twenty-five physical or mental disorders/ diseases assessed in Amirkola Health and Ageing cohort Project (AHAP) by past medical history taking and medical documentations

References

1. Ferrillo M, Migliario M, Agostini F, Marotta N, Santilli G, Boffano P, et al. Oral health-related quality of life in elderly: an umbrella review of systematic reviews from a multidisciplinary

rehabilitation point-of-view. Clin Ter. 2024;175(1):73-82. doi: 10.7417/ct.2024.5036.
2. Dahmardeh A, Yazdani R, Pakdaman A, Shamshiri AR. Oral health literacy and oral health behaviors of disadvantaged women residing in the slum area of Zahedan, Iran: a cross-sectional study. J Oral Health Oral Epidemiol. 2024;13(3):127-32. doi: 10.34172/johoe.2312.1604.
3. Tahani B, Baghban AA, Kazemian A. Determinants of oral health status: an ecological study in Iran. BMC Oral Health. 2023;23(1):910. doi: 10.1186/s12903-023-03557-z.
4. Ravaghi V, Kazemian A. Rethinking dental care in Iran. J Oral Health Oral Epidemiol. 2022;11(1):1-4. doi: 10.22122/johoe.2022.197262.1462.
5. Shoaee S, Sharifi F, Ghavidel Parsa P, Sobhaninejad S, Heydari MH, Sofi-Mahmudi A. Dental caries among the elderly in Iran: a meta-analysis. Med J Islam Repub Iran. 2024;38:11. doi: 10.47176/mjiri.38.11.
6. Azami-Aghdash S, Pournaghi-Azar F, Moosavi A, Mohseni M, Derakhshani N, Alaei Kalajahi R. Oral health and related quality of life in older people: a systematic review and meta-analysis. Iran J Public Health. 2021;50(4):689-700. doi: 10.18502/ijph.v50i4.5993.
7. Wong FM, Ng YT, Leung WK. Oral health and its associated factors among older institutionalized residents-a systematic review. Int J Environ Res Public Health. 2019;16(21):4132. doi: 10.3390/ijerph16214132.
8. Deana NF, Pardo Y, Ferrer M, Espinoza-Espinoza G, Garin O, Muñoz-Millán P, et al. Evaluating conceptual model measurement and psychometric properties of oral health-related quality of life instruments available for older adults: a systematic review. Health Qual Life Outcomes. 2024;22(1):5. doi: 10.1186/s12955-023-02218-7.
9. Navabi N, Hashemi NS, Hashemipour MA, Samierad S, Salari H, Gandjalikhan-Nassab A. Quality of life associated with oral health in smokers and non-smokers. J Oral Health Oral Epidemiol. 2021;10(3):168-74. doi: 10.22122/johoe.v10i3.1165.
10. Torres-Vanegas M, Cardona-Arango D. Oral health-related quality of life in older adults in a health program in Envigado, Colombia, 2018. Rev Fac Odontol Univ Antioq. 2020;32(1):36-47. doi: 10.17533/udea.rfo.v32n1a4.
11. Chen S, Wang S, Jia W, Han K, Song Y, Liu S, et al. Spatiotemporal analysis of the prevalence and pattern of multimorbidity in older Chinese adults. Front Med (Lausanne). 2021;8:806616. doi: 10.3389/fmed.2021.806616.
12. Gao S, Sun S, Sun T, Lu T, Ma Y, Che H, et al. Chronic diseases spectrum and multimorbidity in elderly inpatients based on a 12-year epidemiological survey in China. BMC Public Health. 2024;24(1):509. doi: 10.1186/s12889-024-18006-x.
13. Marzban M, Jamshidi A, Khorrami Z, Hall M, Batty JA, Farhadi A, et al. Determinants of multimorbidity in older adults in Iran: a cross-sectional study using latent class analysis on the Bushehr Elderly Health (BEH) program. BMC Geriatr. 2024;24(1):247. doi: 10.1186/s12877-024-04848-y.
14. The Academy of Medical Sciences. Multimorbidity: A Priority for Global Health Research. 2018. Available from: https://acmedsciacuk/file-download/82222577.
15. Masnoon N, Shakib S, Kalisch-Ellett L, Caughey GE. What is polypharmacy? A systematic review of definitions. BMC Geriatr. 2017;17(1):230. doi: 10.1186/s12877-017-0621-2.
16. Kurczewska-Michalak M, Lewek P, Jankowska-Polańska B, Giardini A, Granata N, Maffoni M, et al. Polypharmacy management in the older adults: a scoping review of available interventions. Front Pharmacol. 2021;12:734045. doi: 10.3389/fphar.2021.734045.
17. Watt RG, Serban S. Multimorbidity: a challenge and opportunity for the dental profession. Br Dent J. 2020;229(5):282-6. doi: 10.1038/s41415-020-2056-y.
18. Gill B, Harris A, Tredwin C, Gill P. Multimorbidity and oral health: need for new models of care. Fam Med Community Health. 2020;8(4):e000387. doi: 10.1136/fmch-2020-000387.
19. Ramírez L, Sánchez I, González-Serrano J, Muñoz M, Martínez-Acitores ML, Garrido E, et al. Factors influencing xerostomia and oral health-related quality of life in polymedicated patients. Gerodontology. 2024;41(3):424-32. doi: 10.1111/ger.12724.
20. Jamalinasab A, Tahani B, Maracy MR, Keshvari M. Oral health and oral health-related quality of life among elderly people in Iran. Iran J Nurs Midwifery Res. 2024;29(2):217-23. doi: 10.4103/ijnmr.ijnmr_16_23.
21. Bijani A, Ghadimi R, Mikaniki E, Kheirkhah F, Mozaffarpur SA, Motallebnejad M, et al. Cohort profile update: the Amirkola Health and Ageing Project (AHAP). Caspian J Intern Med. 2017;8(3):205-12. doi: 10.22088/cjim.8.3.205.
22. Nikbin A, Bayani M, Jenabian N, Khafri S, Motallebnejad M. Oral health-related quality of life in diabetic patients: comparison of the Persian version of Geriatric Oral Health Assessment Index and Oral Health Impact Profile: a descriptive-analytic study. J Diabetes Metab Disord. 2014;13(1):32. doi: 10.1186/2251-6581-13-32.
23. Mirhosseini N, Shoorgashti R, Lesan S. The evaluation of clinical factors affecting oral health impacts on the quality of life of Iranian elderly patients visiting dental clinics: a cross-sectional study. Spec Care Dentist. 2024;44(4):1219-27. doi: 10.1111/scd.12980.
24. Kanungo S, Ghosal S, Kerketta S, Sinha A, Mercer SW, Lee JT, et al. Association of oral health with multimorbidity among older adults: findings from the longitudinal ageing study in India, wave-1, 2017-2019. Int J Environ Res Public Health. 2021;18(23):12853. doi: 10.3390/ijerph182312853.
25. Schmidt-Mende K, Arvinge C, Cioffi G, Gustafsson LL, Modig K, Meyer AC. Profiling chronic diseases and hospitalizations in older home care recipients: a nationwide cohort study in Sweden. BMC Geriatr. 2024;24(1):312. doi: 10.1186/s12877-024-04796-7.
26. Ramien AS, Azmi AA, Ravichandran S, Wai Li TT, Ravendran S, Kyaw Soe HH, et al. Oral health-related quality of life among non-institutionalized elderly in Malaysia: a teaching hospital-based survey. Cureus. 2024;16(3):e56202. doi: 10.7759/cureus.56202.
27. Mohamad Fuad MA, Yacob H, Mohamed N, Wong NI. Association of sociodemographic factors and self-perception of health status on oral health-related quality of life among the older persons in Malaysia. Geriatr Gerontol Int. 2020;20 Suppl 2:57-62. doi: 10.1111/ggi.13969.
28. Chahar P, Mohanty VR, Aswini YB. Oral health-related quality of life among elderly patients visiting special clinics in public hospitals in Delhi, India: a cross-sectional study. Indian J Public Health. 2019;63(1):15-20. doi: 10.4103/ijph.IJPH_316_17.
29. Ye L, Yang-Huang J, Franse CB, Rukavina T, Vasiljev V, Mattace-Raso F, et al. Factors associated with polypharmacy and the high risk of medication-related problems among older community-dwelling adults in European countries: a longitudinal study. BMC Geriatr. 2022;22(1):841. doi: 10.1186/s12877-022-03536-z.
30. Hassan BH, Abd El Moniem MM, Dawood SS, Alsultan AA, Abdelhafez AI, Elsakhy NM. Dental anxiety and oral-health-related quality of life among rural community-dwelling older adults. Int J Environ Res Public Health. 2022;19(13):7643. doi: 10.3390/ijerph19137643.
31. Teng CJ, Lin SC, Chen JH, Chen Y, Kuo HC, Ho PS. The association between denture self-satisfaction rates and OHRQoL - a follow-up study. BMC Oral Health. 2020;20(1):140. doi: 10.1186/s12903-020-01119-1.