Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Oral Health-Related Quality of Life and Associated Factors Among Care-Dependent Older Residents in Integrated Medical and Nursing Care Institutions

Tiantian Wang
Nanjing University
Xin Yang
Nanjing University
Xueting Wang
Nanjing University
Weijing Chen
Nanjing University
Chao Peng
Nanjing University
Yuxing Tian
Nanjing University
Hongyuan Dai
dai.hongyuan@outlook.com

Nanjing University

Article

Keywords: Oral health-related quality of life, Care-dependent older residents, Integrated medical and nursing care, Caregivers, Influencing factors

Posted Date: November 5th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-10946555/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: No competing interests reported.

Abstract

Objective

This study aimed to assess the status of oral health-related quality of life (OHRQoL) and to explore its associated factors among care-dependent older residents in integrated medical and nursing care institutions, including caregiver-related factors.

Methods

A cross-sectional study was conducted from May to November 2025. A convenience sample of 150 care-dependent older patient-caregiver dyads was recruited from two institutions in Nanjing. OHRQoL was assessed using the Geriatric Oral Health Assessment Index (GOHAI). Data were collected via face-to-face examinations and questionnaires, including patient demographics, systemic and functional status (Barthel Index, Mini-Mental State Examination, Mini Nutritional Assessment Short-Form), oral clinical conditions (DMFT index, Gingival Index), and caregiver factors (knowledge, attitudes). Multiple linear regression was used to analyze the independent associations of various factors with OHRQoL.

Results

The mean GOHAI score was 39.04 ± 9.29. Multiple linear regression analysis showed that nutritional status (B = 1.516, 95% CI: 0.910 to 2.121, $p < 0.001$), activities of daily living (B = 0.222, 95% CI: 0.136 to 0.308, $p < 0.001$), education level (primary school: B = -2.862, 95% CI: -4.678 to -1.046, $p = 0.002$; illiteracy: B = -4.334, 95% CI: -6.755 to -1.912, $p = 0.001$), and prosthetic status (non-ideal: B = -4.554, 95% CI: -6.762 to -2.347, $p < 0.001$) were significantly associated with OHRQoL. Caregivers' oral health knowledge (B = 0.118, 95% CI: -0.330 to 0.565, $p > 0.05$) and attitude scores (B = 0.003, 95% CI: -0.094 to 0.101, $p > 0.05$) showed no significant association.

Conclusion

Lower OHRQoL in care-dependent older residents was associated with poorer nutritional status, lower functional ability, lower education level, and non-ideal prosthetic status. Caregiver-related factors, including knowledge and attitudes, were not significantly associated with OHRQoL. These findings suggest that attention to nutritional support, functional maintenance, and appropriate prosthetic rehabilitation may be relevant to improving OHRQoL in this population, although further research is needed to confirm these associations.

1 Background

- The phenomenon of global population aging presents a significant public health challenge in the twenty-first century[1]. Within this framework, integrated medical and nursing care institutions have become critical hubs for post-acute rehabilitation and long-term care[2]. The older residents who are care-dependent or semi-dependent constitute a particularly vulnerable health subgroup[2–3]. There is an urgent need to transition the assessment of health outcomes for this population from traditional metrics centered on disease and disability to a more comprehensive focus on health-related quality of life (HRQoL). HRQoL encompasses an individual's subjective experiences across dimensions of physical function, psychological well-being, and social participation[4–5], thereby offering an essential perspective for understanding the authentic lived experiences of older adults[4].
- Within the multifaceted realm of health, OHRQoL constitutes a vital yet frequently undervalued component[6]. OHRQoL transcends conventional clinical metrics, such as dental caries and periodontal disease, by emphasizing the subjective repercussions of oral health conditions on an individual's daily activities, comfort, and social interactions[7–9]. In the context of this population, diminished OHRQoL not only reflects challenges such as masticatory pain and compromised nutritional intake but is also intricately associated with social isolation, heightened risk of depression, and diminished overall life satisfaction[7, 9]. Importantly, unlike community-dwelling older adults who are capable of self-care, care-dependent residents lack the ability to maintain their own oral health. As a result, their OHRQoL is closely related to the care they receive[6, 8, 10].
- The interplay between oral health and nutritional status is both bidirectional and intricate. Deterioration in oral health, evidenced by tooth loss, diminished occlusal force, or oral discomfort, can impair masticatory function and diminish meal enjoyment, leading to limited dietary choices and insufficient nutrient intake, and may be associated with an increased risk of malnutrition[11]. Conversely, malnutrition, especially deficiencies in proteins, vitamins, and minerals, may be associated with changes in oral mucosal integrity, immune defense, and tissue repair capacity, and may be associated with periodontal inflammation and dental caries[12]. This cyclical interaction between oral health and nutrition has been demonstrated to be significantly associated with OHRQoL in older populations[13]. For care-dependent older residents, who frequently experience multiple comorbidities and functional limitations, this bidirectional relationship may be particularly pronounced, as they may be at greater risk of both oral health deterioration and nutritional decline[14].
- Building on this perspective, recent evidence has established a connection between OHRQoL and unfavorable body mass index (BMI) in older adults. Dibello et al. (2023) demonstrated that diminished OHRQoL, particularly in domains concerning physical pain and functional limitation, is significantly associated with an increased risk of being underweight or obese in a community-dwelling older population[15]. This finding implies that the oral health–nutrition interface extends beyond mere nutrient intake, encompassing systemic vulnerabilities such as weight dysregulation. Integrating these findings positions the oral health of these individuals within a comprehensive

geriatric health framework, where oral conditions are not only local issues but also markers of overall physiological imbalance.

- Existing research has begun to delineate a complex, multi-layered framework of influences. The objective oral clinical status serves as the biological foundation; untreated dental caries, painful periodontal diseases, and ill-fitting dentures have consistently been associated with low scores on geriatric oral health assessment indices[16–17]. For individuals who are functionally dependent, regular daily oral hygiene is essential for preventing complications[18]. Moreover, when oral health issues arise, the prompt utilization of professional dental services is essential for arresting disease progression and enhancing quality of life[16]. However, this population encounters substantial barriers in accessing such services, with utilization rates that are lower than those observed in the general population[17, 19].
- Caregivers' knowledge and attitudes toward oral health are considered important potential factors associated with the quality of care provided to dependent residents. At the individual level, caregivers' knowledge of oral health is significantly related to their comprehension of appropriate care practices, while their attitudes play a key role in shaping the motivation and priority assigned to oral care tasks[20]. However, empirical evidence on the direct association between caregiver cognitive factors and residents' OHRQoL in institutional settings remains limited and inconclusive[21–22].
- The selection of variables in this study was guided by Andersen's Behavioral Model of Health Services Use, which conceptualizes health outcomes as a function of predisposing characteristics, enabling resources, and need factors[23]. Accordingly, patient-related variables—including functional status, cognitive function, nutritional status, and oral clinical conditions—were considered as need factors, while caregiver-related variables—knowledge and attitudes—were treated as enabling resources associated with care delivery and, ultimately, OHRQoL in this vulnerable population. Given the limited research specifically targeting OHRQoL among care-dependent older residents in integrated medical and nursing care institutions in China, this study was primarily exploratory in nature. The selection of these variables was further guided by a comprehensive review of the literature on factors associated with OHRQoL in older populations, as well as clinical observations in long-term care settings. Accordingly, this study sought to: (1) evaluate the current state of OHRQoL among care-dependent older residents within integrated medical and nursing care institutions; and (2) explore factors associated with OHRQoL, with a particular focus on patients' oral health status, functional capacity, and the role of caregiver-related factors. The anticipated findings aim to furnish evidence-based insights to inform the development of more comprehensive and contextually tailored oral health promotion strategies in institutional environments.

2 Method

2.1 Study design and participants

This study employed a cross-sectional survey design, with participants recruited from two integrated medical and nursing care institutions located in Nanjing, China. Utilizing a convenience sampling approach, all care-dependent older residents who met the specified criteria between May and November 2025 were screened. The inclusion criteria for participants were as follows: (1) age of 60 years or older; (2) a Barthel Index score of 60 or less, indicating a dependent or semi-dependent status; (3) an anticipated hospital stay of at least 7 days; and (4) provision of informed consent by the patient or their legal guardian. In this study, "care-dependent" was operationally defined as a Barthel Index score of 60 or less, indicating moderate to severe functional dependence. This cutoff is consistent with established criteria in geriatric research, where scores of 60 or below are commonly used to classify individuals as requiring significant assistance with activities of daily living[24–25]. Exclusion criteria encompassed: (1) patients in the terminal stage of illness or with unstable vital signs; (2) patients with severe communication barriers who could not provide valid information through their primary caregiver (e.g., severe aphasia); (3) patients with a history of severe mental illness; and (4) patients who had participated in other interventional clinical studies within the preceding three months. Ultimately, the study included 150 pairs of care-dependent older patients and their primary caregivers. All data were collected through face-to-face interviews and clinical examinations, with trained research assistants verifying questionnaire completeness in real time.

2.2 Study variables and measurement tools

2.2.1 Outcome variable

The assessment of oral health-related quality of life was conducted utilizing the Chinese version of the Geriatric Oral Health Assessment Index (GOHAI)[26]. This instrument consists of 12 items aimed at evaluating the associations of oral health issues on physiological function, pain or discomfort, and psychosocial function in this population. The cumulative score spans from 12 to 60, with elevated scores indicating better OHRQoL. The reliability and validity of this Mandarin Chinese version have been confirmed within the older adult demographic in China, demonstrating excellent internal consistency (Cronbach's α = 0.81), a split-half reliability coefficient of 0.80, and satisfactory construct validity[26–27]. For participants who were able to cooperate with the assessment, including those with mild to moderate cognitive impairment, the GOHAI was administered through face-to-face interviews by trained research assistants, who read each item aloud and verified responses in real time. As specified in the exclusion criteria, individuals with severe communication disorders, severe cognitive impairment, or severe mental illness who could not provide valid information were not enrolled in the study.

2.2.2 Core variables

The patient systemic and functional factors:

1. Functional status was assessed using the Chinese version of the Barthel Index (BI)[28]. This scale measures ten basic daily living activities, such as feeding, bathing, dressing, toileting, and walking, with scores ranging from 0 to 100. Higher scores indicate more independence. Disability levels were

categorized as severe dependence (≤ 40 points), moderate dependence (41–60 points), mild dependence (61–99 points), and full independence (100 points). The Barthel Index has shown good internal consistency (Cronbach's α > 0.80) in studies[28–29].

2. Cognitive function was evaluated with the Chinese version of the Mini-Mental State Examination (MMSE)[30]. The MMSE yields a total score ranging from 0 to 30. To enhance the precision of cognitive impairment identification, MMSE scores were adjusted for educational attainment in accordance with established Chinese norms[31]. The following cutoff scores were applied: ≤17 for individuals without formal education, ≤ 20 for those with primary education (up to 6 years of schooling), and ≤ 24 for individuals with secondary education or higher (more than 6 years of schooling). Scores at or below these specified thresholds were indicative of cognitive impairment. The MMSE has demonstrated robust internal consistency, with Cronbach's alpha values ranging from 0.780 to 0.908, and exhibits satisfactory item discrimination[30, 32].

(3) The nutritional status of participants was evaluated utilizing the Mini Nutritional Assessment Short-Form (MNA-SF)[33]. This instrument consists of six components, including a decline in body mass index, weight loss, acute disease or psychological stress, mobility, neuropsychological issues, and reduced food intake or anorexia, yielding a total score ranging from 0 to 14. Nutritional status was classified based on the following scoring criteria: malnutrition (≤ 7 points), at risk of malnutrition (8–11 points), and normal nutritional status (12–14 points). The MNA-SF is a widely employed nutritional screening tool, with its validity and reliability extensively established and corroborated in numerous studies involving older adults, effectively differentiating between various nutritional statuses[34–35].

The oral clinical factors:

(1) For the assessment of dental caries status, the Decayed, Missing, and Filled Teeth (DMFT) index was employed[36]. This index quantifies the total number of decayed, missing due to caries, and filled teeth per patient, with each tooth categorized exclusively as decayed (D), missing (M), or filled (F), yielding a total score between 0 and 32. A higher score indicates a more severe cumulative history of dental caries.

(2) Periodontal status was evaluated using the Gingival Index (GI)[37]. The condition of the gingival tissue around each scorable tooth was scored on a scale of 0 to 3 (0 = healthy gingiva, 1 = mild inflammation, 2 = moderate inflammation, 3 = severe inflammation), and the mean score across all scorable teeth was calculated to reflect the overall level of gingival inflammation. A higher mean score indicates more severe gingival inflammation. The GI was assessed only for participants with at least one scorable natural tooth. For edentulous participants, the GI could not be calculated, and these individuals were excluded from analyses involving this variable.

(3) Prosthetic status was recorded and categorized into "Ideal status" (functioning and well-fitting prostheses, such as dentures or fixed bridges) and "Non-ideal status," which included two subtypes: "Present but not in use" (prostheses that exist but are not worn by the patient) and "Not restored" (missing teeth without any prosthetic replacement).

Caregiver-related factors:

1. Knowledge and attitudes: These were assessed using the "Oral Health Knowledge and Attitudes Questionnaire for Caregivers of Dependent Older Adults," which was revised based on the framework and key findings of China's Fourth National Oral Health Epidemiological Survey[38–39]. The knowledge section consisted of true/false items, with 1 point awarded for each correct answer and 0 points for incorrect or uncertain responses. The total knowledge score ranged from 0 to 8, with higher scores indicating better oral health knowledge. The knowledge section demonstrated acceptable internal consistency in this sample (Cronbach's α = 0.721). The attitude section included 8 items rated on a 5-point Likert scale, with items 4 and 7 being reverse-scored. The total attitude score ranged from 8 to 40, with higher scores reflecting more positive attitudes toward maintaining oral health in this population. The attitude section showed good internal consistency in this sample (Cronbach's α = 0.763).

2.2.3 Covariates

Sociodemographic characteristics included age, sex, and education level. Health status was assessed using the Charlson Comorbidity Index (CCI) score and the number of medications.

2.3 Statistical Analysis

The data analysis was performed using SPSS version 26.0. Continuous variables were presented as mean ± standard deviation, while categorical variables were expressed as frequencies and percentages. To preliminarily identify variables associated with GOHAI scores, univariate analyses including t-tests, analysis of variance (ANOVA), and correlation analyses were conducted. Variables that were statistically significant in the univariate analyses were entered into a multiple linear regression model to assess their independent associations with GOHAI scores. Continuous variables were directly entered into the model, and categorical variables (e.g., education level) were converted into dummy variables prior to entry. Regression results are reported as unstandardized coefficients (B) with 95% confidence intervals and p-values, with the significance level set at α = 0.05 (two-tailed).

3 Results

3.1 Basic characteristics of the study participants (Table 1.)

The study comprised 150 care-dependent older residents. As detailed in Table 1, the participants had a mean age of 82.66 years (SD = 8.15), with 45.3% being male. In terms of educational attainment, 13.3% were illiterate, 39.4% had completed primary education, and 47.3% had attained junior high school education or higher.

The participants demonstrated a substantial burden of chronic diseases and functional impairments. The mean CCI score was 5.01 (SD = 0.95), and participants were taking an average of 7.02 medications (SD = 1.13). Functional assessment using the Barthel Index revealed severe dependency, with a mean score of 34.57 (SD = 6.36). Cognitive impairment was present in 68.7% of the sample, with a mean MMSE score of 17.94 (SD = 6.45). Nutritional assessment indicated that 63.3% of participants were either malnourished or at risk of malnutrition, with a mean MNA-SF score of 10.47 (SD = 2.29).

Oral health status was predominantly suboptimal. The mean DMFT score was 25.17 (SD = 5.04), indicating a substantial cumulative burden of dental caries. Among the 150 participants, 11 (7.3%) were edentulous and were excluded from GI-related analyses. The mean Gingival Index was 1.39 (SD = 0.73), suggesting mild to moderate gingival inflammation. Regarding prosthetic status, only 22.7% of participants had prostheses in ideal condition, whereas the remaining 77.3% had non-ideal prostheses, including those that were damaged or not in use.

Table 1
Characteristics of the Study Population: Frail Elderly Inpatients and Associated Caregiver Factors (N = 150)

Characteristic	**Mean ± SD / n (%)**
Patient sociodemographics	
Age, years	82.66 ± 8.15
Male sex	68 (45.3%)
Education level	
Illiteracy	20 (13.3%)
Primary school	59 (39.4%)
Junior high or above	71 (47.3%)
Patient systemic and functional factors	
Charlson Comorbidity Index (CCI)	5.01 ± 0.95
Number of medications	7.02 ± 1.13
Barthel Index (BI) score	34.57 ± 6.36
MMSE score	17.94 ± 6.45
Presence of cognitive impairment	103 (68.7%)
MNA-SF score	10.47 ± 2.29
Malnourished or at risk	95 (63.3%)
Patient oral health status	
DMFT Index	25.17 ± 5.04
Gingival Index (GI)	1.39 ± 0.73[#]
Prosthetic Status, n (%)	
Ideal condition	34 (22.7%)
Non-ideal condition	116 (77.3%)

[#]For the Gingival Index (GI), 11 edentulous participants were excluded from the analysis; therefore, the descriptive statistics for GI are based on 139 participants

3.2 Cross-sectional comparison of GOHAI scores among care-dependent older residents (Table 2.)

In this study, the average total GOHAI score for care-dependent older residents was 39.04 ± 9.29. Previous studies have reported mean GOHAI scores ranging from 49.0 to 53.3 in community-dwelling populations and from 50.0 to 53.3 in institutionalized populations[10, 40–42]. Direct comparisons between studies should be made with caution, as differences in sample characteristics, care settings, cultural context, and measurement conditions may contribute to the observed variations.

Table 2
Comparison of Oral Health-Related Quality of Life (GOHAI Scores) Between the Present Sample and Selected Reference Populations

Reference Population (Source)	**Key Sample Characteristics**	**Sample Size (N)**	**GOHAI Total Score** **Mean ± SD**
Present Study Sample	Mean age 82.79, care-dependent	150	39.04 ± 9.29
Community-dwelling older adults			
Fukuda M (2025, China)	Mean age 76.4, independent	143	49.0 ± 4.0
İnal Özün Ö (2025, Turkey)	Mean age 73.76, independent	152	52.1
Institutionalized older adults			
Bianco A (2021, Italy)	Mean age 82.7, care-dependent	288	53.3 ± 6.3
Najla Chebib (2025, Switzerland)	Mean age 88.5, care-dependent	23[#]	50

Note: Values from reference populations are presented as reported in the original studies. Comparisons are descriptive only; no statistical tests were performed due to the absence of raw data from reference samples.

[#] The sample size of control group at baseline in the original study.

3.3 Univariate analysis of patient-related factors and OHRQoL (Table 3.)

The systemic health and functional status of patients emerged as the most significant factors associated with GOHAI scores. The Barthel Index, which assesses activities of daily living, demonstrated the strongest positive correlation ($r = 0.807$, $p < 0.001$). Similarly, enhanced cognitive function, as measured by the MMSE score ($r = 0.680$, $p < 0.001$), and improved nutritional status, as indicated by the MNA-SF score ($r = 0.796$, $p < 0.001$), were also strongly associated with higher GOHAI scores. In contrast, the Charlson Comorbidity Index ($r = -0.250$, $p = 0.002$) and the number of medications ($r = -0.206$, $p = 0.012$) exhibited negative correlations with GOHAI scores.

Oral clinical conditions also demonstrated significant associations with GOHAI scores. There were notable negative correlations between caries experience, as measured by the DMFT index ($r = -0.583$, $p < 0.001$), and gingival inflammation, as assessed by the GI index ($r = -0.320$, $p < 0.001$). Furthermore, participants using non-ideal dentures had significantly lower GOHAI scores compared to those with ideal dentures (36.39 ± 8.65 vs. 48.09 ± 4.46; $p < 0.001$).

Among sociodemographic variables, the level of education showed a particularly significant association, with GOHAI scores increasing substantially with higher educational attainment. In contrast, age and sex did not show a significant association with GOHAI scores.

Table 3
Univariate Analysis of Patient-Related Factors Associated with GOHAI Score*

Characteristics	Value/Categories	Association with GOHAI	*P*-value
Continuous variables		*r*	
Age (years)		-0.100	0.221
Charlson Comorbidity Index (CCI)		-0.250	0.002
Number of medications		-0.206	0.012
Barthel Index score		0.807	<0.001
MMSE score		0.680	<0.001
MNA-SF score		0.796	<0.001
DMFT Index		-0.583	<0.001
Gingival Index (GI)		-0.320	<0.001
Categorical variables		Mean ± SD	
Sex	Male	39.72 ± 8.77	0.416
	Female	38.48 ± 9.72	
Education level	Illiteracy	34.64 ± 8.28	<0.001
	Primary school	36.82 ± 9.00	
	Junior high or above	42.04 ± 8.89	
Prosthetic Status	Ideal Condition	48.09 ± 4.46	<0.001
	NonI-deal Condition	36.39 ± 8.65	

*For continuous variables, correlation coefficient (r) is reported. For categorical variables, GOHAI score (Mean ± SD) is reported. *P*-values are from correlation analysis (continuous), t-test (dichotomous), or ANOVA (categorical). Significant results are in bold ($P < 0.05$). For the Gingival Index (GI), 11 edentulous participants were excluded from the analysis; therefore, the descriptive statistics for GI are based on 139 participants.

3.4 Univariate analysis of caregiver-related factors and OHRQoL (Table 4.)

An analysis of caregiver-related factors, as presented in Table 4, indicated that there was no significant correlation between caregivers' levels of oral health knowledge (r = -0.069, p = 0.398) or their attitude scores (r = 0.100, p = 0.223) and the GOHAI scores of patients.

Table 4
Correlation of Caregiver Knowledge and Attitudes with GOHAI Score*

Characteristics	Association with GOHAI	*P*-value
Continuous variables	*r*	
Oral health knowledge score	-0.069	0.398
Oral health attitude score	0.100	0.223
*Correlation coefficients (r) and *P*-values are from correlation analysis.		

3.5 Regression analysis of factors associated with OHRQoL (Table 5.)

Multiple linear regression analysis was conducted to identify factors independently associated with GOHAI scores. Variables that were statistically significant in the univariate analyses were entered into the regression model. The results showed that education level, Barthel Index, MNA-SF score, and prosthetic status were significant independent correlates of GOHAI. Compared with participants with junior high school education or above, those with primary school education had significantly lower GOHAI scores (B = -2.862, 95% CI: -4.678 to -1.046, p = 0.002), and those who were illiterate had even lower scores (B = -4.334, 95% CI: -6.755 to -1.912, p = 0.001). Higher Barthel Index scores were associated with higher GOHAI scores (B = 0.222, 95% CI: 0.136 to 0.308, p < 0.001). Similarly, higher MNA-SF scores were associated with higher GOHAI scores (B = 1.516, 95% CI: 0.910 to 2.121, p < 0.001). Regarding prosthetic status, participants with non-ideal prostheses had significantly lower GOHAI scores compared to those with ideal prostheses (B = -4.554, 95% CI: -6.762 to -2.347, p < 0.001).

Table 5
Multiple Linear Regression Analysis of Factors Associated with GOHAI Score

Characteristics	B (95% CI)	*P*
Education (Ref: Junior high or above)		
Primary school	-2.862(-4.678,-1.046)	0.002
Illiteracy	-4.334(-6.755,-1.912)	0.001
Barthel Index score	0.222(0.136,0.308)	<0.001
MNA-SF score	1.516(0.910,2.121)	<0.001
Prosthetic Status (Ref: Ideal)	-4.554(-6.762,-2.347)	<0.001

4 Discussions

This study evaluated OHRQoL among care-dependent older residents within the specific framework of integrated medical and nursing care institutions in China, incorporating an analysis of multidimensional

influencing factors from both patient and caregiver perspectives. The principal findings are as follows: Firstly, the OHRQoL level of patients in this study was lower than that observed in community-dwelling and even some institutionalized older adult populations, both domestically and internationally[10, 40–42]. Secondly, regression analysis revealed that patients' nutritional status, activities of daily living, education level, and prosthetic status were significantly associated with their OHRQoL. In contrast, caregivers' oral health knowledge and attitudes did not demonstrate a significant independent association.

The reduced OHRQoL scores identified in this study indicate a pronounced aggregation of various vulnerabilities within the oral health domain. The study cohort, with a mean age surpassing 82 years, exhibited a high prevalence of multiple chronic conditions, moderate to severe functional dependency, and increased risks of cognitive impairment and malnutrition. This constellation of features collectively represents a "high-risk" physiological background that may be associated with health deterioration and a decline in quality of life[43–44]. Within this context, oral health issues—often regarded as "non-life-threatening"—are prone to being overlooked or deferred by patients, family members, and busy clinical staff[45]. Consequently, minor discomfort may become a persistent stressor that is associated with eating, social interaction, and comfort, and ultimately with a significant reduction in overall OHRQoL.

A comparison with existing literature provides additional context for interpreting the GOHAI scores observed in this sample. The mean GOHAI score in this study was 39.04, compared with 53.3 reported for Italian nursing home residents[42] and 50.0 for Swiss nursing home residents[10] in previous studies. These comparisons are descriptive and should be interpreted with caution, as differences in sample characteristics, care settings, cultural context, oral health service systems, and measurement conditions may explain the observed differences. Additionally, the present sample was drawn from institutions characterized by “integrated medical and nursing care,” where residents tend to have more complex medical needs and higher levels of dependency[46]. This finding highlights the importance of acknowledging heterogeneity across institutional settings and considering the specific characteristics of particularly vulnerable subgroups when evaluating and enhancing the oral health of institutionalized older adults[47].

Regression analysis showed that nutritional status was significantly associated with OHRQoL in care-dependent older residents, with each one-point increase in MNA-SF corresponding to a 1.516-point increase in GOHAI score. This finding underscores the importance of adequate nutrition as a foundational condition for sustaining health and quality of life in later years. Adequate nutrition provides the physiological basis for maintaining oral mucosal integrity, saliva secretion, and immune defense, which are closely linked to oral disease resistance and repair capacity[48–49]. These findings suggest that nutritional assessment and support should be integrated into routine care for this population to maintain oral and general health.

In addition, education level emerged as a significant factor associated with OHRQoL. Participants with lower educational attainment—particularly those who were illiterate or had only primary school education—had significantly lower GOHAI scores compared to those with junior high school education or

above. This association may reflect the broader influence of health literacy on oral health behaviors and healthcare utilization[50]. Individuals with higher education levels are more likely to possess greater health awareness, adopt preventive oral hygiene practices, and seek timely professional dental care. The cumulative advantage of higher education across the life course may also contribute to better health outcomes in later life, including oral health[51]. These findings suggest that socioeconomic factors, such as education, should be considered in understanding OHRQoL in this vulnerable population.

Prosthetic status also demonstrated a significant independent association with OHRQoL. Compared with participants who had ideal prostheses, those with non-ideal prostheses had significantly lower GOHAI scores (B = -4.554, 95% CI: -6.762 to -2.347, $p < 0.001$). This finding is consistent with previous research demonstrating the importance of well-fitting, functional prostheses for oral health-related quality of life in older populations[52]. Poorly fitting or non-functional dentures can compromise masticatory efficiency, leading to dietary restrictions and reduced enjoyment of meals, which may in turn affect nutritional status and overall well-being[53]. Additionally, ill-fitting prostheses may cause oral discomfort, mucosal irritation, and social embarrassment, all of which can negatively impact OHRQoL[54]. These findings underscore the need for regular dental assessments and timely prosthetic maintenance or replacement to ensure optimal oral function and quality of life among care-dependent older residents[55].

The activities of daily living reflect the patient's overall health status and degree of care dependency. Diminished ability in ADLs signifies an increased reliance on external care, thereby linking the patient's OHRQoL more closely to the efficacy of the external care system[56]. However, the regression analysis indicated that caregivers' individual scores on oral health knowledge and attitudes did not exhibit a significant independent association with OHRQoL. This suggests that, in this population, caregiver cognitive factors alone may not directly translate into improved resident outcomes. It is possible that the relationship between caregiver factors and resident OHRQoL is more complex or indirect, potentially operating through other unmeasured mediators such as caregiver behaviors or institutional support systems[57–58]. Nevertheless, the absence of a direct association in this study highlights the need for further investigation into how caregiver-related factors may influence OHRQoL in institutional settings.

This study is subject to several limitations that warrant consideration when interpreting the findings. Firstly, the cross-sectional design limits the ability to infer causality. The significant associations observed between patient factors and OHRQoL necessitate further validation through longitudinal studies to elucidate the underlying causal pathways and directions. While our variable selection was guided by the conceptual framework that patient functional, cognitive, and nutritional status, as well as caregiver-related factors, influence OHRQoL, we acknowledge that the cross-sectional design precludes confirmation of this assumed causal direction. In particular, given the strong association observed between nutritional status and OHRQoL, the possibility of reverse causation cannot be ruled out, that is, poorer OHRQoL may contribute to nutritional decline, rather than solely the other way around. Secondly, the generalizability of the results may be constrained. Participants were recruited via convenience

sampling from two integrated medical and nursing care institutions in Nanjing, China. Both institutions cared for older adults with moderate to severe functional dependence, adopted differentiated staffing ratios based on residents' functional status, and had nursing staff trained in standardized basic oral care. Neither institution had an on-site dental department or a dedicated dentist, with professional dental services relying on external referral, a configuration commonly seen across many similar facilities in China. However, differences in ownership structure, service scale, and resource capacity between the two institutions may introduce unmeasured heterogeneity and limit the applicability of our findings to the full diversity of long-term care facilities in China. Third, the instruments for assessing caregiver-related factors lacked formal construct validity testing, which is a major limitation that may affect the precision of the measurements. Although the items were adapted from a national authoritative framework and contextualized for the study population through consultation with clinical experts, formal psychometric evidence remains unavailable. Finally, several important potential confounding factors were not fully controlled for, including the severity of specific diseases, detailed medication profiles that may be associated with xerostomia, and institutional-level differences in resources and policies. In the absence of readily accessible tools specifically tailored for this population, this study endeavored to attain an optimal balance between scientific rigor and feasibility in measuring core concepts. These limitations highlight directions for future research, including the implementation of multicenter longitudinal designs and the incorporation of a more comprehensive array of confounding variables, to enhance the understanding of the mechanisms affecting OHRQoL among institutionalized populations.

5 Conclusions

This study identifies the factors associated with OHRQoL in care-dependent older residents in integrated care facilities, including nutritional status, functional status (ADL), prosthetic status, and education level. These findings suggest that comprehensive geriatric assessments incorporating oral health—with attention to nutrition, functional capacity, and oral rehabilitation—may be relevant to understanding OHRQoL in this population. The observed associations highlight potential directions for future research. Longitudinal studies are needed to further explore these relationships over time.

Declarations

Author Declarations

Ethics approval and consent to participate

This study was approved by the ethics committee of Nanjing Stomatological Hospital (NJSH-2023NL-015), and conducted in accordance with the ethical principles of Declaration of Helsinki. Informed consent was obtained in written form from all individual participants or their legally authorized representatives (e.g., next of kin) prior to their inclusion in the study.

Consent for publication

Not applicable.

Declaration of Competing Interest

The authors declare that they have no conflicts of interest.

Data Availability

The datasets generated and/or analyzed during the current study are not publicly available due to institutional policies and patient confidentiality but may be available from the corresponding author upon reasonable request and subject to approval by the institutional ethics committee.

Funding Information

This study was funded by the “3456” Cultivation Program For Junior Talents of Nanjing Stomatological Hospital, Medical School of Nanjing University (0226N402), Nanjing Health Education Association Research Project (NHEAsfp-2024-008), Nanjing Preventive Medicine Research Project (NJYFKT202406), Nanjing Municipal Association for Science and Technology Soft Science Research Project.

The funder had no role in the study design, data collection and analysis, interpretation of data and writing the manuscript.

Author Contributions

Tiantian Wang: Conceptualization, Methodology, Data curation, Writing – original draft, Software, Validation, Writing – review & editing. **Xin Yang:** Conceptualization, Methodology, Data curation, Writing – original draft, Validation. **Xueting Wang**: Data curation, Writing – original draft, Validation. **Weijing Chen:** Data curation, Writing – original draft, Validation. **Chao Peng:** Data curation, Writing – original draft, Validation. **Yuxing Tian:** Data curation, Writing – original draft. **Hongyuan Dai:** Data curation, Conceptualization, Methodology, Writing – review & editing, Supervision.

Acknowledgements

The authors would like to express their sincere gratitude to the staff of all participating medical-care institutions for their invaluable assistance and cooperation throughout this study. We are also deeply thankful to the families and caregivers of the participants for their support and dedication, without which this research would not have been possible.

Copyright Notice

The study team previously used an unauthorized version of the Chinese MMSE without permission. This issue has now been rectified with PAR. The MMSE is a copyrighted instrument and may not be used or reproduced in whole or in part, in any form or language, or by any means without the written permission of PAR (www.parinc.com).

References

1. Xi JY, Liang BH, Zhang WJ, Yan B, Dong H, Chen YY, et al. Effects of population aging on quality of life and disease burden: A population-based study[J]. Global health research and policy, 2025; 10(1):2. doi:10.1186/s41256-024-00393-8
2. Sukenova D, Nikolic D, Izekenova A, Nurbakyt A, Izekenova A, Macijauskiene J. Ageing and quality of life in older adults: Updates and perspectives of psychosocial and advanced technological interventions[J]. Healthcare, 2026; 14(2):217.
3. Bally ELS, Korenhof SA, Ye L, van Grieken A, Tan SS, Mattace-Raso F, et al. Factors associated with health-related quality of life among community-dwelling older adults: The appcare study[J]. Scientific reports, 2024; 14(1):14351. doi:10.1038/s41598-024-64539-x
4. Qiao Y, Chen S, Tan J, Chen S, Li Q, Zhu Y, et al. Health-related quality of life and unmet care needs among older adults in medical and nursing care integrated institutions[J]. Geriatric Nursing, 2025; 64:103403. doi:https://doi.org/10.1016/j.gerinurse.2025.103403
5. Silva WP, Freitas M, Janizello G, De Oliveira LC, Cardoso A, Monteiro BC, et al. Standardizing health-related quality of life assessment for older adults: Integrating sf-36 and icf codes for improved healthcare management[J]. Brazilian Journal of Physical Therapy, 2025; 29. doi:10.1016/j.bjpt.2025.101317
6. Koenig A, Porzelt S, Behrens-Potratz A, Stratmeyer P, Schellhammer S, Schmage P, et al. Assessing oral health-related quality of life among older people in home-based care - survey results of the insemap study in germany[J]. BMC oral health, 2024; 24(1):734. doi:10.1186/s12903-024-04500-6
7. Andersen C, Jespersen AP, Ekstrand K, Øzhayat EB. Prediction of oral diseases in care dependent older people[J]. BMC oral health, 2025; 25(1):60. doi:10.1186/s12903-024-05261-y
8. Rani H, Azizan AA, Walad NIA, Hassan SAA, Dom TNM, Yeoh DSH, et al. Challenges and recommendations for oral healthcare of older adults in a long-term care facility[J]. Healthcare (Basel, Switzerland), 2025; 13(20). doi:10.3390/healthcare13202642
9. Schoebrechts E, de Almeida Mello J, Vandenbulcke PAI, van Hout HPJ, De Lepeleire J, Declercq A, et al. Insights into associations between oral and general health outcomes of nursing home residents based on interrai data: Cross-sectional study[J]. JMIR aging, 2025; 8:e72308. doi:10.2196/72308
10. Chebib N, Rotzinger S, Maccarone-Ruetsche N, Sioufi R, Mojon P, Müller F. The impact of a personalized oral health instruction form on oral health indices in institutionalized older adults: A randomized, controlled, single-blinded clinical trial[J]. BMC oral health, 2025; 25(1):1769. doi:10.1186/s12903-025-07102-y
11. Nishio K, Yoshida T, Arai Y, Ito T, Okada S, Ikeda T, et al. Relationship between malnutrition according to the global leadership initiative on malnutrition criteria and oral health among community-dwelling elderly aged 85 years and older: A cross-sectional study[J]. BMC oral health, 2024; 24(1):887. doi:10.1186/s12903-024-04568-0

12. Varela-López A, Bullon B, Gallardo I, Quiles JL, Bullon P. Association of specific nutritional intake with periodontitis[J]. BMC oral health, 2024; 24(1):640. doi:10.1186/s12903-024-04384-6
13. Zhu Z, Xu J, Lin Y, Chai K, Zhou Y, Jia R, et al. Correlation between nutritional status and oral health quality of life, self-efficacy of older inpatients and the influencing factors[J]. BMC geriatrics, 2022; 22(1):280. doi:10.1186/s12877-022-02830-0
14. Asaad WA, Abdu SA, Li W, Li Y, Lin Y, Yang C, et al. Associations between oral health parameters and nutritional status in geriatric populations: An umbrella review with meta-analysis[J]. Jpn Dent Sci Rev, 2025; 61:264-279. doi:10.1016/j.jdsr.2025.10.002
15. Dibello V, Lobbezoo F, Sardone R, Lozupone M, Castellana F, Zupo R, et al. The relationship between oral health-related quality of life and body mass index in an older population from southern italy: The salus in apulia study[J]. Journal of personalized medicine, 2023; 13(9). doi:10.3390/jpm13091300
16. Wongiam N, Praditpornsilpa K, Vacharaksa A. Comprehensive geriatric assessment for oral care in older adults: A focus group study[J]. BMC geriatrics, 2025; 25(1):232. doi:10.1186/s12877-025-05854-4
17. Cosoroabă RM, Talpoş Ş, Dinu Ş, Liga S, Tănase AD. Oral health care for institutionalized elderly in romania: Needs, barriers, and legislative gaps[J]. Dentistry journal, 2025; 13(11). doi:10.3390/dj13110527
18. Bellander L, Angelini E, Andersson P, Hägglin C, Wijk H. A preventive care approach for oral health in nursing homes: A qualitative study of healthcare workers' experiences[J]. BMC geriatrics, 2024; 24(1):803. doi:10.1186/s12877-024-05396-1
19. de Jong MHS, Jerković-Ćosić K, van der Veen MH, Hollaar VRY, Weening-Verbree LF, Kragt L, et al. Improving oral health care for frail, community-dwelling older people: Exploring barriers and facilitators for interprofessional collaboration[J]. International dental journal, 2026; 76(2):109346. doi:10.1016/j.identj.2025.109346
20. Chen M, Weng Y, Zhang J, Gu L, Chen W, Qiao M, et al. Factors associated with nurses' attitudes for providing oral care in geriatric care facilities: A cross-sectional study[J]. BMC oral health, 2023; 23(1):801. doi:10.1186/s12903-023-03517-7
21. Sullivan ML, Claiborne DM, Shuman D. Oral health literacy inventories for caregivers of preschool-aged children: A systematic review[J]. J Dent Hyg, 2022; 96(6):34-42.
22. Reed R, Broder HL, Jenkins G, Spivack E, Janal MN. Oral health promotion among older persons and their care providers in a nursing home facility[J]. Gerodontology, 2006; 23(2):73-78. doi:10.1111/j.1741-2358.2006.00119.x
23. Andersen R, Newman JF. Societal and individual determinants of medical care utilization in the united states[J]. Milbank Mem Fund Q Health Soc, 1973; 51(1):95-124.
24. Martín Moreno V, Martínez Sanz MI, Martín Fernández A, Guerra Maroto S, Sevillano Fuentes E, Pérez Rico E, et al. Proposal for a revised barthel index classification based on mortality risk assessment in functional dependence for basic activities of daily living[J]. Frontiers in public health, 2024; 12:1478897. doi:10.3389/fpubh.2024.1478897

25. Bernabeu-Wittel M, Díez-Manglano J, Nieto-Martín D, Ramírez-Duque N, Ollero-Baturone M. Simplification of the barthel scale for screening for frailty and severe dependency in polypathological patients[J]. Rev Clin Esp (Barc), 2019; 219(8):433-439. doi:10.1016/j.rce.2019.04.005
26. W AD, Jun-Qi L. Factors associated with the oral health-related quality of life in elderly persons in dental clinic: Validation of a mandarin chinese version of gohai[J]. Gerodontology, 2011; 28(3):184-191. doi:10.1111/j.1741-2358.2009.00360.x
27. Qiao Y, Chen S, Tan J, Chen S, Li Q, Zhu Y, et al. Health-related quality of life and unmet care needs among older adults in medical and nursing care integrated institutions[J]. Geriatric nursing (New York, NY), 2025; 64:103403. doi:10.1016/j.gerinurse.2025.103403
28. HOU D-z, ZHANG Y, WU J-l, LI Y. Study on reliability and validity of chinese version of barthel index[J]. Clinical Focus, 2012; 27(3):219.
29. Zhang YM, Zhang X, Ma Y, Weng S. Assessments of reliability of barthel index in patients after acute stroke[J]. Chinese Nur Manag, 2007; 7(5):30-32.
30. Huan G, Heyong S. Longitudinal invariance and construct validity of the chinese version of the mini-mental state examination across 10 years in the elderly population[J]. J Nurs Meas, 2024; 32(1):4-17. doi:10.1891/jnm-2021-0102
31. Zhang Z, Hong X, Li H. The mini-mental state examination in the chinese residents population aged 55 years and over in the urban and rural areas of beijing[J]. Chinese Journal of Neurology, 1999; 32:149-153.
32. Andersson B, Luo H. The mini-mental state examination in a chinese population: Reliability, validity, and measurement invariance. Innov Aging. 2023 Dec 21;7(Suppl 1):385. doi: 10.1093/geroni/igad104.1275. eCollection 2023 Dec.
33. Simsek H, Sahin S, Ucku R, Sieber CC, Meseri R, Tosun P, et al. The diagnostic accuracy of the revised mini nutritional assessment short form for older people living in the community and in nursing homes[J]. The journal of nutrition, health & aging, 2014; 18(8):725-729. doi:10.1007/s12603-014-0460-1
34. QU Z, ZHANG H-M, GUO X, GUAN Y-J. Validation of the revised mini nutritional assessment short-forms in geriatric internal medicine patients[J]. Parenteral & Enteral Nutrition, 2018:20-23.
35. Bauer JM, Kaiser MJ, Anthony PS, Guigoz Y, Sieber CC. The mini nutritional assessment--its history, today's practice, and future perspectives[J]. Nutrition in clinical practice : official publication of the American Society for Parenteral and Enteral Nutrition, 2008; 23 4:388-396.
36. Anaise JZ. Measurement of dental caries experience--modification of the dmft index[J]. Community dentistry and oral epidemiology, 1984; 12(1):43-46. doi:10.1111/j.1600-0528.1984.tb01408.x
37. Löe H. The gingival index, the plaque index and the retention index systems[J]. J Periodontol, 1967; 38 6:Suppl:610-616.
38. China NHaFPCotPsRo.(2015).Oral health surveys: Basic methods (ws/t 472-2015)[S].Standards Press of China.

39. Gao YB, Hu T, Zhou XD, Shao R, Cheng R, Wang GS, et al. Dental caries in chinese elderly people: Findings from the 4th national oral health survey[J]. Chin J Dent Res, 2018; 21(3):213-220. doi:10.3290/j.cjdr.a41077
40. Fukuda M, Izuno H, Sawada M, Ujihashi T, Takano H, Hori S, et al. Association between oral function and oral-related quality of life in independent community-dwelling elderly people in taiwan[J]. Healthcare (Basel, Switzerland), 2025; 13(11). doi:10.3390/healthcare13111332
41. İnal Özün Ö, Demirdel S, Ün Yıldırım N, Naharci M. Dysphagia and oral health in older adults with motoric cognitive risk syndrome[J]. Dysphagia, 2025. doi:10.1007/s00455-025-10849-9
42. Bianco A, Mazzea S, Fortunato L, Giudice A, Papadopoli R, Nobile CGA, et al. Oral health status and the impact on oral health-related quality of life among the institutionalized elderly population: A cross-sectional study in an area of southern italy[J]. International journal of environmental research and public health, 2021; 18(4). doi:10.3390/ijerph18042175
43. Khanagar SB, Al-Ehaideb A, Shivanna MM, Ul Haq I, Al Kheraif AA, Naik S, et al. Age-related oral changes and their impact on oral health-related quality of life among frail elderly population: A review[J]. J Contemp Dent Pract, 2020; 21(11):1298-1303.
44. Gu L, Zhang J, Chen W, Weng Y, Chen L, Zhang L. Feasibility of an oral health promotion program among older people in geriatric care facilities, shanghai, china: A pre/post-implementation study[J]. BMC geriatrics, 2024; 24(1):272. doi:10.1186/s12877-024-04870-0
45. Csikar J, Edwebi S, Vinall-Collier K, Griffiths AW, Devi R, Wright J, et al. Oral health interventions and strategies delivered by care workers to older people living in care homes: An overview of systematic reviews[J]. BMC oral health, 2025; 25(1):1574. doi:10.1186/s12903-025-06943-x
46. Saarela RKT, Hiltunen K, Kautiainen H, Roitto HM, Mäntylä P, Pitkälä KH. Oral hygiene and health-related quality of life in institutionalized older people[J]. Eur Geriatr Med, 2022; 13(1):213-220. doi:10.1007/s41999-021-00547-8
47. Tapager I, Westergaard CL, Øzhayat EB. Health status, care dependency and oral care utilization among older adults: A register-based study[J]. Gerodontology, 2024; 41(4):526-534. doi:10.1111/ger.12748
48. Salminen KS, Suominen MH, Soini H, Kautiainen H, Savikko N, Saarela RKT, et al. Associations between nutritional status and health-related quality of life among long-term care residents in helsinki[J]. The journal of nutrition, health & aging, 2019; 23(5):474-478. doi:10.1007/s12603-019-1182-1
49. Hsu YH, Chou MY, Chu CS, Liao MC, Wang YC, Lin YT, et al. Predictive effect of malnutrition on long-term clinical outcomes among older men: A prospectively observational cohort study[J]. The journal of nutrition, health & aging, 2019; 23(9):876-882. doi:10.1007/s12603-019-1246-2
50. Reda SM, Krois J, Reda SF, Thomson WM, Schwendicke F. The impact of demographic, health-related and social factors on dental services utilization: Systematic review and meta-analysis[J]. Journal of dentistry, 2018; 75:1-6. doi:10.1016/j.jdent.2018.04.010

51. Genderson MW, Sischo L, Markowitz K, Fine D, Broder HL. An overview of children's oral health-related quality of life assessment: From scale development to measuring outcomes[J]. Caries Res, 2013; 47 Suppl 1(0 1):13-21. doi:10.1159/000351693
52. Wnorowska K, Dębkowska K, Borawska Z, Samietz S, Bagińska J, Kamińska I, et al. Prosthetic status, removable prostheses and quality of life in older adults: A retrospective cross-sectional analysis within a population-based study[J]. Dentistry journal, 2025; 14(1). doi:10.3390/dj14010007
53. Demirekin ZB, Erten E. Association between prosthetic rehabilitation type, nutritional status, and oral health-related quality of life in completely edentulous adults: A cross-sectional study[J]. BMC oral health, 2026; 26(1). doi:10.1186/s12903-026-08805-6
54. D'Amico C, Fiorillo L, Galletti C, Gargari M, Rosa A, Martelli M. Oral health-related quality of life and prosthetic rehabilitation in patients with mild cognitive impairment and early dementia: A systematic review[J]. Psychol Health Med, 2025:1-14. doi:10.1080/13548506.2025.2565524
55. Manav TY, Kesim B. The effect of prosthetic and dental status on oral health-related quality of life in community-dwelling older population: A cross-sectional study[J]. Community Dent Health, 2025; 42(3):64-73. doi:10.1177/0265539x251357104
56. Hyejin L, Bumjo O, Sunyoung K, Kiheon L. Adl/ iadl dependencies and unmet healthcare needs in older persons: A nationwide survey[J]. Arch Gerontol Geriatr, 2021; 96:104458. doi:10.1016/j.archger.2021.104458
57. Reed R, Broder HL, Jenkins G, Spivack E, Janal MN. Oral health promotion among older persons and their care providers in a nursing home facility[J]. Gerodontology, 2006; 23(2):73-78.
58. Sharkiya SH, Ohana I, Sabbah M, Lipovetski O, Awawdi K. The relationship between the awareness of nursing staff in geriatric institutions and the dental health of residents: A systematic review[J]. SAGE Open Nursing, 2026; 12:23779608261434362.