"Dental Prosthetic Status, Needs, and Oral Frailty in Aging Population: Insights from a Cross-Sectional Study"

Abstract

Aims This study's objective is to evaluate the current status of dental prosthetics, identify prosthetic needs, and the prevalence of oral frailty within the geriatric population in Egypt.

Instrument & Methods The study recruited 258 community-dwelling adults aged 60 years or older from residential homes in Al-Sharkia Governorate, Egypt. Collected data included demographic information, medical history, oral hygiene, prosthetic status and needs, and scores on the Oral Frailty Index-8 (OFI-8). Statistical analyses, including chi-square tests, t-tests, and multinomial logistic regression, were utilized to evaluate the associations among prosthetic status, prosthetic needs, and oral frailty.

Findings The analysis revealed that a very high percentage (79.8%) of participants were at an elevated risk for oral frailty. More than half the participants needed prosthetic rehabilitation, but many did not have access to suitable dental care. Factors including advanced age, chronic diseases, cigarette smoking, and poor oral hygiene were significantly linked to increased prosthetic needs. In contrast, place of residence and income level were not found to be significant predictors.

Conclusion This study underscores the high prevalence of oral frailty and substantial unmet prosthetic needs among older adults in Egypt. The findings emphasize the need for comprehensive geriatric dental care that incorporates prosthetic treatment. Such interventions are vital for preventing the progression of oral frailty and preserving quality of life in this aging population.

Keywords

Aging Population; Geriatric Nursing; Older adult; Oral frailty; Oral health; Prosthetic needs; Prosthetic status.

Introduction

Oral health status critically influences overall well-being in older populations, yet its deterioration poses a notable public health challenge with cascading effects on nutrition and systemic health [1]. The World Health Organization (WHO) underscores the essential role of oral health as a fundamental component of overall health, highlighting the urgent need to improve dental care access for elderly individuals[2]. Older adults commonly suffer from conditions like periodontitis, oral infections, and loss of teeth, which can lead to chewing difficulties, increased malnutrition risk, and aggravate systemic illnesses such as diabetes and cardiovascular diseases [3]. Furthermore, poor oral health is increasingly linked to physical frailty, reduced social participation, and higher mortality risk, underscoring the necessity of comprehensive geriatric dental care programs[4].

In developing countries, especially in the Middle East and North Africa (MENA) region, the challenge of maintaining oral health among older populations is particularly heightened[5]. A convergence of systemic obstacles, including a shortage of specialized geriatric dental programs, substantial economic and geographical barriers to care, and low public health literacy, collectively impedes timely and effective prosthetic rehabilitation for this vulnerable demographic[6]. Studies on the relationship between frailty and oral health decline in this region remain sparse, with a significant gap in studies focusing on preventive measures and therapeutic interventions[1].

One critical way that poor oral health affects overall well-being is by contributing to oral frailty. This clinical syndrome denotes a decline in oral function, such as reduced chewing ability and swallowing challenges, and is not merely a localized condition but a strong predictor of broader physical frailty, sarcopenia, and increased mortality risk[7]. Prosthetic rehabilitation is therefore the primary clinical response to this issue, crucial for restoring oral function, preventing malnutrition, and improving psychological well-being. Nevertheless, many older adults either lack access to prosthetic care or contend with ill-fitting dentures, exacerbating their health challenges[8]. Factors such as socioeconomic status, awareness of proper prosthetic maintenance, and the availability of dental services are significant determinants of prosthetic needs among elderly individuals[9].

In Egypt, as in many developing nations, geriatric oral health remains understudied and frequently neglected despite its profound impact on overall health[10]. Restricted access to cost-effective prosthetic care and a lack of comprehensive geriatric dental services contribute to high rates of untreated edentulism and oral frailty. Studies of Egypt's older populations have documented substantial deficiencies in oral healthcare, widespread poor hygiene practices, and low utilization of dental services, leading to a progressive decline in oral health[1] . The high cost of treatment, along with cultural perceptions and the absence of structured geriatric dental programs, further exacerbates these challenges [6].

Another critical factor influencing oral health in older adults is nutritional status. Malnutrition, which is common in aging populations, often stems from poor dentition, chewing difficulties, and inadequate intake of essential nutrients[3]. The intricate link between insufficient nutrient intake and deteriorating oral health underscores the need for integrated dietary and oral healthcare strategies[11]. By addressing oral frailty through early prosthetic intervention and improving access to dental care, it is possible to significantly enhance nutritional intake, physical health, and overall quality of life[8].

Nurses play a pivotal role in promoting oral healthcare among older adults. Through health education, they encourage patients to properly use and maintain dentures, thereby supporting both oral and general health. Nursing staff should offer individualized guidance on denture care, demonstrate correct usage, reinforce maintenance routines, and encourage regular assessments of oral and denture conditions. Additionally, nurses are well-positioned to monitor for early signs of oral frailty in the community and to initiate timely, targeted interventions to prevent its onset and progression[12].

This observational study was designed to evaluate prosthetic status, treatment needs, and oral frailty among community-dwelling older adults in the Al-Sharkia Governorate of Egypt. The primary objectives were to determine the prevalence of existing prostheses, identify unmet needs for prosthetic treatment, and examine the association between these prosthetic factors and oral frailty.

Instrument and Methods

Study Design and Population

This cross-sectional study was carried out from November 2023 to August 2024, involving community-dwelling older adults (≥60 years of age) residing in Al-Sharkia Governorate, Egypt. Participants were recruited using a consecutive sampling method from residential homes. To ensure diverse representation, recruitment included individuals from both rural and urban areas.

Inclusion and Exclusion Criteria

Individuals were selected for enrollment in the study if they were adults aged 60 years and older, willing to participate, and capable of providing informed consent. Exclusion criteria encompassed those with cognitive impairment that would hinder their ability to participate, those who were bedridden, and individuals with severe medical conditions that could impact oral health, such as those undergoing active cancer treatment.

Sample Size Determination

Based on a previous study by Kumar et al.[13], which identified a correlation coefficient of 0.315 between prosthetic status in the maxillary arch and oral frailty, the sample size was calculated using G*Power software version 3.1.9.4. (Heinrich-Heine-University Düsseldorf, Düsseldorf, Germany). With a test power (1-β error) of 95% and a significance level (α error) of 0.05, the sample size was determined to be 258 participants for a two-sided hypothesis test. This sample size was targeted to ensure adequate statistical power for the analysis.

Ethical Considerations

The Research Ethics Committee of the Faculty of Nursing at Zagazig University, Egypt, granted ethical approval for this study (Reference No. Zu.Nur.REC#:0037). The nature and objectives of the study were fully disclosed to all participants before enrollment, and individuals were included only after providing signed informed consent. Participant data were anonymized and securely stored to ensure confidentiality, with access limited to authorized research personnel only.

Data Collection Tools

Research Questionnaire

The investigators meticulously designed a comprehensive research questionnaire to facilitate data collection. This tool encompassed various sections, including demographic information (age, sex, education, marital status, and income level), case history, oral hygiene, prosthetic needs, prosthetic status, and Oral Frailty Index (OFI-8).

Prosthetic Need and Status Assessment

The assessment of prosthetic needs and status was conducted using sections from the World Health Organization (WHO) Oral Health Assessment Form. This standardized form provided a reliable framework for evaluating the prosthetic needs and current prosthetic status of the participants. The assessment categorized prosthetic needs and status for both maxillary and mandibular arches.

Oral Frailty Assessment

Oral frailty was assessed using the validated Oral Frailty Index-8 (OFI-8), an eight-item screening questionnaire that evaluates oral health-related behaviors and concepts of oral frailty.[14] Items 1, 2, and 3 were weighed as two points each, while the remaining items were weighed as one point each. To emphasize the most critical indicators of oral frailty, the scores for tooth loss, subjective chewing difficulty, and subjective swallowing difficulty were doubled. The resulting Oral Frailty Index (OFI-8) score ranges from 0 to 11, where higher scores denote poorer oral health. Risk assessment for oral frailty was determined based on the OFI-8 score, with scores ≤3 indicated low to moderate risk, while scores ≥4 signified a high risk of oral frailty.

Data Collection Procedure

The investigators conducted interviews with the participants in a quiet, private setting to ensure confidentiality. Subsequently, each participant had a clinical oral examination performed by a licensed dentist to obtain objective data regarding their oral health status. The examination utilized a standardized armamentarium, which included mouth mirrors, dental probes, and a headlight, ensuring consistency in assessment. The investigators were thoroughly trained, standardized, and calibrated in the administration and recording of the research questionnaire tool to ensure consistency and reliability of the data collected.

Statistical Analysis

Data analysis was conducted using SPSS© Statistics for Windows version 20.0 software (IBM Corp., NY, USA). Descriptive statistics summarized demographic characteristics, prosthetic status, and oral frailty index scores using means and standard deviations for continuous variables and frequencies for categorical variables. Chi-square tests, t-tests, or Mann-Whitney U tests were used to compare prosthetic status, prosthetic need, and oral frailty across demographic groups, while ANOVA or Kruskal-Wallis tests examined differences in continuous variables. Multiple regression analysis was conducted to identify predictors of oral frailty while controlling age, gender, socioeconomic status, and health history.

Findings

Demographic Characteristics

The study comprised 258 older adults, with a mean age of 68.8 ± 8.03 years. Demographic analysis indicated that 60.8% of participants were between 60 and 70 years of age, 56.2% were male, and

57.8% were married. In terms of educational background, 38.8% were illiterate. Although 40.3% of participants reported having been previously employed, 89.1% were not currently engaged in any occupation. The majority (67.4%) resided in rural areas, and 81.8% lived with their families. Regarding economic status, 43.8% stated that their income was sufficient to meet essential needs, *See Table 1*.

Table 1: Frequency distribution of the studied older adults according to their demographic characteristics (n=258).

Demographic characteristics of the studied older adults	No.	%
Age (Years)		
60-<70	157	60.8
70-<80	76	29.5
≥ 80	25	9.7
Range	(60-95)	
Mean ± SD	68.8±8.03	
Gender		
Male	145	56.2
Female	113	43.8
Marital status		
Single	10	3.9
Married	149	57.8
Divorced	20	7.7
Widowed	79	30.6
Educational level		
Illiterate	100	38.8
Read and write	51	19.8
Basic education	38	14.7
Secondary education	20	7.7
High education	49	19.0
Previous occupation		
Employee	104	40.3
Worker	44	17.0
Farmer	26	10.1
Housewife	84	32.6
Current occupation		
Don't work	230	89.1
Working	28	10.9
Place of residence		
Rural	174	67.4
Urban	84	32.6
Living condition		
Living with family	211	81.8
Living alone	47	18.2
Monthly income		
Sufficient for essential needs	113	43.8
Sufficient for essential and compensatory needs	74	28.7
Insufficient for essential needs	46	17.8
Insufficient for essential needs and borrows	5	1.9
Sufficient and save	20	7.8

SD Standard deviation.

Medical, Dental History, and Oral Hygiene

Analysis of medical history indicated that 72.5% of participants had chronic diseases, with hypertension (55.1%) and diabetes mellitus (49.2%) being the most prevalent conditions. Regarding smoking status, 68.2% had no history of smoking, while 17.1% were current smokers and 14.7% were former smokers. Assessment of oral hygiene practices revealed that participants used both hands (43.8%) and toothbrushes (51.9%) for oral cleaning, with 41.1% reporting cleaning their teeth once daily.

An oral health examination revealed that 50.8% of participants exhibited signs of gingival inflammation and bleeding. Additionally, 58.1% reported temporomandibular joint pain, 56.6% had remaining roots and broken teeth, and 68.2% had old dentures or dental implants. A significant proportion (94.6%) had experienced tooth extractions, with dental caries being the primary cause in 79.1% of cases, *See Table 2*.

Table 2: Frequency distribution of older adults in the study according to medical history, dental history, and oral hygiene practices (n = 258)

Items	No.	%
History of chronic diseases		
Yes	187	72.5
No	71	27.5
If yes, what are diseases? (n=187)		
Hypertension	103	55.1
Diabetes mellitus	92	49.2
Cardiac disease	33	17.6
Respiratory disease	28	15.0
Kidney and Renal Disease	9	4.8
Liver disease	19	10.2
Cancer	7	3.7
Osteoarthritis	55	29.4
Smoking		
Currently	44	17.1
Previously	38	14.7
No	176	68.2
Current health condition		
Better than I was a year ago	36	14.0
Almost the same	119	46.1
Worse than I was before	103	39.9
Oral hygiene		
With hands	113	43.8
Teeth brush	134	51.9
None	11	4.3
Times of oral hygiene		
None	11	4.3
Once	106	41.1
Twice	72	27.9
Three	46	17.8
More than three	23	8.9
Signs of inflammation, like red and bleeding gingiva		
Yes	131	50.8
No	127	49.2
TMJ pain and limited mouth opening		
Yes	108	41.9
No	150	58.1
Remaining roots and broken teeth		
Yes	146	56.6
No	112	43.4
Old dentures		
Yes	82	31.8
No	176	68.2
Tooth extraction		
Yes	244	94.6
No	14	5.4
*If yes, what is the reason? (n=244)		
Caries	193	79.1
Gum problems	102	41.8

(*) Responses were not mutually exclusive.

Prosthetic Needs and Prosthetic Status Assessment *(Figure 1)*

Prosthetic Needs (Maxillary Arch)

Just under half of the participants (45.3%) had no prosthetic needs. For the remainder, 24.4% required single-unit prostheses, 22.9% needed multiple-unit prostheses, and 7.0% required a combination of types3. Only 0.4% needed complete prosthetic rehabilitation.

Prosthetic Needs (Mandibular Arch)

Most of the subjects (51.9%) had no prosthetic needs in their lower jaw. The needs were distributed among single-unit (21.3%), multiple-unit (17.4%), and combination-type prostheses (8.5%)6. Complete rehabilitation was needed by only 0.8% of the population.

Prosthetic status (Maxillary Arch)

A significant majority (67.8%) had no prosthetic appliances at all. Among those who did, 11.2% used fixed dental prostheses (bridges), 7.4% had complete removable dentures, 6.6% used a combination of fixed and removable prostheses, and 2.7% used only partial removable dentures.

Prosthetic status (Mandibular Arch)

Concerning the mandibular arch, 68.6% of the geriatric subjects presented without any prosthetic appliances. For those with prosthetics, 7.8% used complete removable dentures, 7.0% had partial removable dentures, and 5.8% had multiple fixed prostheses. The remaining distribution included another 4.3% with multiple fixed prostheses and 2.7% with partial removable prostheses.

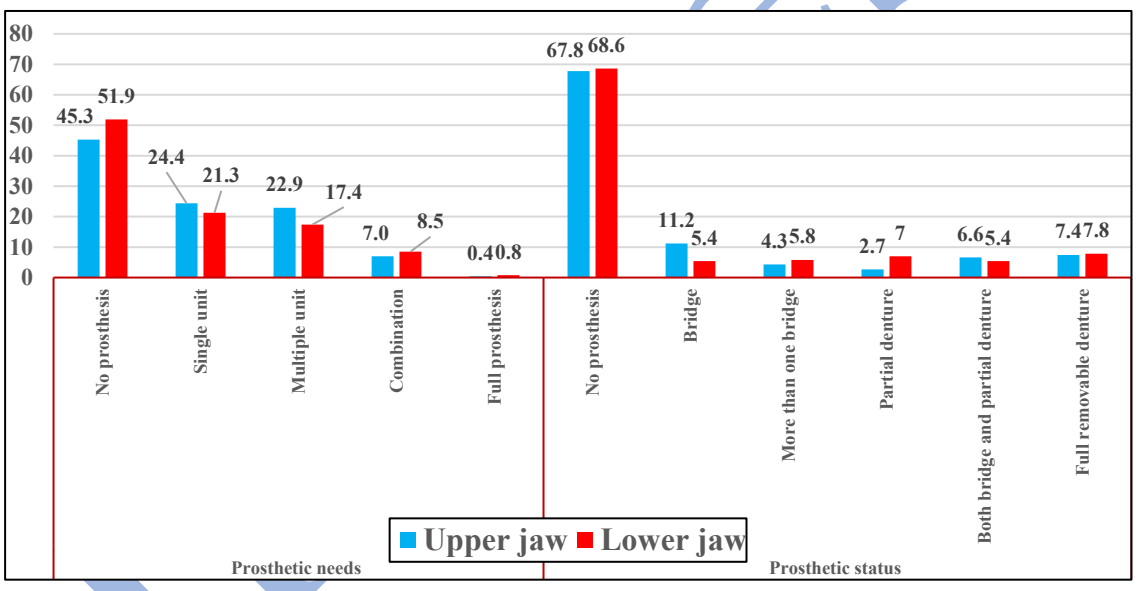

Figure 1: Prosthetic needs and status of the studied participants by type of prosthesis (n=258).

Oral Frailty Assessment

Analysis of the Oral Frailty Index responses yielded a mean total score of 5.97±2.47. The highest percentages of affirmative responses were observed for difficulty eating hard food (74%), xerostomia (55%), less frequent social outings (48.4%), and choking (43.4%). Conversely, the highest percentages of negative responses were observed for denture use (71.7%), regular dental clinic attendance (70.2%), brushing teeth at least twice daily (66.7%), and the ability to chew hard food (65.9%), *see Table 3*. Risk assessment for oral frailty revealed that 79.8% of participants were at high risk, while 20.2% were at low to moderate risk.

Table 3: Distribution of Oral Frailty Index Responses Among Study Participants (n=258).

Items	Yes		No		Mean SD	Median
	No.	%	No.	%		
Harder to eat hard food than half a year ago (Difficult to eat hard food).	191	74.0	67	26.0	1.48±0.87	2

Sometimes choked by tea or soup (Choking).	112	43.4	146	56.6	0.87±0.99	2
Do you use dentures (Using dentures)?	73	28.3	185	71.7	0.57±0.90	2
Feeling about oral dryness (Xerostomia)	142	55.0	116	45.0	0.55±0.49	1
Less frequently going out than half a year ago (Less frequently going out)	125	48.4	133	51.6	0.48±0.50	1
Capable of chewing hard food like pickled radish or shredded and dried squid (Feasible to chew hard food)	88	34.1	170	65.9	0.66±0.47	1
Brushing teeth at least twice a day	86	33.3	172	66.7	0.67±0.47	1
Attending the dentist at least once a year (Regular attendance at the dental clinic).	77	29.8	181	70.2	0.70±0.45	1
Total score					5.97±2.47	6

SD Standard deviation.

Multinomial Logistic Regression Analysis

Multinomial logistic regression analysis for estimating oral frailty risk factors revealed that illiteracy was associated with a -0.626-fold risk of oral frailty (p=0.009). Additionally, temporomandibular joint pain and limited mouth opening were associated with a -4.545-fold risk of oral frailty (p=0.009). Moreover, the risk of developing oral frailty was found to be -4.675 and 3.879 times higher in patients requiring single and multiple units in the mandible, respectively (p=0.012 and p=0.047), *see Table 4.*

Table 4: Multinomial logistic regression analysis estimating odds ratios and 95% confidence intervals for oral frailty scores by selected determinants (n=258).

Independent variables	B	Std. Error	Sig.	Odds ratio	95% confidence interval for Exp(B)	
					Lower	Upper
Age (year)	-.010-	.031	.751	.990	.932	1.052
Gender (Male)	-.456-	.544	.402	.634	.218	1.841
Educational level	-.469-	.178	.009**	.626	.441	.888
History of chronic diseases	.840	.519	.106	2.316	.837	6.405
Smoking						
Currently	.272	.810	.737	1.313	.268	6.420
Previously	.126	.833	.879	1.135	.222	5.801
No	0[b]	.	.	.	.	.
Oral hygiene						
With hands	15.316	8.907	.996	.996	.224	1.998
Teeth brush	.507	.570	.374	1.660	.543	5.075
None	0[b]	.	.	.	.	.
TMJ pain and limited mouth opening	1.514	.578	.009**	4.545	1.464	14.104
Prosthetic need (upper)						
Single unit	-.848-	.596	.155	.428	.133	1.377
Multiple units	.158	.757	.835	1.171	.265	5.166
Combination	13.669	9.180	.995	.669	.118	2.997
Full prosthesis	10.030	.000	.905	.455	.255	2.726
No prosthesis needed	0[b]	.	.	.	.	.
Prosthetic need (lower)						
Single unit	1.542	.614	.012*	4.675	1.404	15.567
Multiple units	1.356	.684	.047*	3.879	1.016	14.812
Combination	15.464	8.835	.993	.993	.097	1.980
Full prosthesis	5.543	2.361	.999	.999	.095	2.007

No prosthesis needed	0[b]	.	.	.	.	.
Prosthetic status (upper)						
Bridge	.116	.873	.894	1.213	.178	8.258
More than one bridge	15.927	2.031	.996	.664	.314	5.888
Partial denture	.132	1.270	.917	1.141	.190	4.629
Both bridge and partial denture	12.415	8.736	.995	0.333	.174	2.500
Full removable denture	.806	0.929	1.000	2.239	2.374	10.28
No prosthesis	0[b]	.	.	.	.	.
Prosthetic status (lower)						
Bridge	16.166	2.395	.995	.125	.037	2.993
More than one bridge	.909	1.008	.368	2.481	.344	10.650
Partial denture	17.552	14.53	.993	.893	.574	6.574
Both bridge and partial denture	16.269	8.245	.995	.578	.109	4.397
Full removable denture	17.761	8.743	.997	.517	.101	4.085
No prosthesis	0[b]	.	.	.	.	.

a. The reference category is low to moderate risk for oral frailty
b. This parameter is set to zero because it is redundant.
B=Multinomial logistic regression coefficient.

Discussion

The present study evaluated prosthetic status, prosthetic needs, and oral frailty among older adults in Al-Sharkia Governorate, Egypt. The results revealed notable patterns in prosthetic need, current prosthetic status, and their relationship with oral frailty. This discussion contextualizes these findings within the broader literature on geriatric dental prosthetic needs and status. The World Health Organization (WHO) Oral Health Assessment Form was employed in this study due to its standardized methodology and proven reliability for assessing prosthetic status and needs in older populations. This comprehensive instrument provides clear criteria for evaluating prosthetic conditions and requirements, ensuring consistent data collection across diverse populations.

The study employed the Oral Frailty Index-8 (OFI-8), a validated assessment tool for oral frailty. Developed in consultation with geriatric dental and public health experts, the OFI-8 consists of eight structured questions assessing key components of oral frailty, such as chewing ability, swallowing function, oral dryness, and denture use. The OFI-8 is widely recognized for detecting early signs of oral function decline and facilitating timely preventive interventions [14].

The present study highlights a high prevalence of unmet prosthetic needs in the geriatric population of Al-Sharkia Governorate: 67.8% of participants lacked any maxillary prostheses, and 68.6% lacked mandibular prostheses, despite needing intervention. These results are consistent with studies from other regions; for example, Chhabra et al. [15] reported that 73.64% of older adults in Wardha, Central India, were without prosthetic devices, and Soh et al. [16] found that 78% of institutionalized edentulous elders in Singapore had no dentures. This consistency across different populations underscores a global pattern of unmet prosthetic needs among older adults.

Among participants who had prosthetic devices, notable variations were observed. In our study, fixed bridges were the most common prostheses in the maxillary arch (11.2%), whereas complete removable dentures predominated in the mandibular arch (7.8%). These findings contrast with those of Sharma et al. [17], who noted gender-related differences in prosthetic status patterns. Such differences may reflect variations in healthcare delivery systems, practitioner preferences, and financial accessibility across regions.

The study also found that 54.7% of participants needed prosthetic intervention in the maxillary arch and 48.1% in the mandibular arch. These proportions are considerably lower than the 79.99% reported by Chhabra et al. [15], suggesting possible differences in population characteristics, oral health education, and access to preventive dental care. Moreover, the proportion of participants requiring complete prosthetic rehabilitation in our study was very low (0.4% for maxillary and 0.8% for mandibular arches) compared to 51.82% reported in the Central Indian population [15]. This substantial discrepancy may be due to variations in tooth retention patterns, extraction practices, or the effectiveness of preventive oral healthcare initiatives in different regions.

The findings emphasize the strong association between prosthetic needs, oral frailty, and overall health outcomes in older adults, reinforcing previous research on aging populations[18]. The high

prevalence of missing teeth, inadequate prosthetic rehabilitation, and oral frailty emphasizes the demand for comprehensive geriatric oral health strategies to mitigate the functional and nutritional consequences of poor oral health [19]. Egypt's aging population remains at high risk for many oral diseases, including dental caries, periodontal disease, and oral infections, which can detrimentally affect their general health, nutrition, and self-esteem [20].

This study showed that over half of the participants required some form of prosthetic intervention, with single-unit and multiple-unit prostheses being the most commonly needed. The limited prosthetic coverage observed may be largely attributed to financial constraints. Supporting this, a study by El-Lassy et al. [1] in Damanhour City, Egypt, reported that 46.7% of older residents in care homes faced barriers to accessing dental services, with the majority (88.6%) citing financial difficulties as the primary obstacle. Additional barriers to accessing dental care for older adults in Egypt include a shortage of qualified practitioners, limited awareness of available dental services, and various mental, physical, or medication-related conditions that can significantly challenge oral health maintenance[21].

Chronic diseases such as diabetes mellitus, cardiovascular disease, and hypertension often lead to significant oral health challenges, including periodontal disease and tooth loss. A significant relationship has been identified between prosthetic needs and oral hygiene methods[22]. These findings align with those of a previous study [3] in Assiut City, Egypt, which reported that chronic illnesses, including diabetes, hypertension, and cardiovascular diseases, are strongly associated with poor oral health and increased prosthetic needs. When considering changes over the past year, 46.1% of participants reported stable health, 39.9% reported a decline, and only 14.0% reported an improvement. This highlights a significant challenge in promoting health and well-being within the aging population.

Our findings revealed a highly significant relationship between the prosthetic needs of the studied older adults and factors such as age, history of chronic diseases, smoking habits, and oral hygiene practices. These results are in line with Sharma et al.[23], who identified age, chronic illnesses, and oral hygiene habits as key determinants of prosthetic status and needs. Additionally, evidence from cross-sectional and cohort studies indicates that smokers tend to have more severe and extensive periodontitis due to smoking[24]. The causal link between smoking and tooth loss is well-established [25], as smoking is widely recognized to significantly increase the risk of periodontitis-associated tooth loss [26].

As people age, multiple systemic conditions and their treatments become more common, which can impair overall health and oral health, thereby affecting older individuals' quality of life[27]. Older adults often underutilize dental services due to factors such as limited awareness, financial constraints, physical or cognitive impairments, and reduced mobility. A reduced concern for aesthetics may also contribute to this underuse. Living in a care facility further reinforces their dependence on external support, which aligns with the high rates of unmet prosthetic needs observed. The presence and continued use of dentures also depend on an individual's ability to adapt, an ability that tends to decline with age[23].

However, the study findings revealed that differences in prosthetic needs between males and females were not statistically significant for either the upper or lower arches. This finding aligns with the observations of AlZarea B [28], whereas Shah et al. [29] reported that males had higher prosthetic needs than females.

A notable finding of this study is the absence of a statistically significant association between the need for dental prosthetics and socioeconomic markers such as monthly income or place of residence. This contrasts with a significant body of literature, including other studies within Egypt, which identifies financial constraints as a primary barrier to accessing dental services[30, 31]. The results from this specific governorate suggest that a complex interplay of non-financial barriers may be more influential. These could include the inequitable distribution of the dental workforce, transportation challenges, and low levels of oral health literacy, which have been documented as significant impediments to healthcare access in the region [32].

This interpretation aligns with international research highlighting the impact of systemic factors. For instance, studies in Brazil have shown that the implementation of a national oral health policy and other health system factors can be more powerful determinants of access to prosthetic services than an individual's financial capacity alone [33]. This suggests that in contexts where such systemic and non-financial barriers are pervasive, they can diminish the relative importance of income as a differentiating factor in the utilization of dental care.

The present study found a high prevalence of oral frailty (79.8%), consistent with Li et al. [7], who also reported that oral frailty is common among older adults and influenced by many variables. Physical

frailty has been significantly associated with oral frailty subdomains such as difficulty eating hard foods, choking, denture use, and inability to chew hard foods[34]. Additionally, a study of Brazilian community-dwelling elders found that edentulous individuals were significantly more likely to be frail, further supporting the link between tooth loss, prosthetic needs, and frailty risk [33].

The study's findings suggest that addressing prosthetic deficiencies may be a critical strategy for preventing oral frailty in older adults. Evidence suggests that prosthetic rehabilitation enhances chewing efficiency, nutritional intake, and overall quality of life[8, 35]. Moreover, maintaining proper prosthesis hygiene and ensuring an optimal fit are essential, as poorly fitting dentures have been associated with lower dietary quality. Poorly fitting dentures may cause individuals to remove them while eating, potentially compromising nutritional intake and overall health[36].

The results of this study highlight the urgent need for improved geriatric dental care programs in Egypt, especially in underserved communities where access to oral healthcare is limited. Numerous global studies have shown that community-based oral health promotion initiatives increase community engagement and improve knowledge, attitudes, and behaviors related to oral health. These initiatives have also been effective in sustaining community involvement in promoting long-term oral health[37]. Moreover, integrating oral frailty screening into routine geriatric health assessments could enhance early detection and intervention. Regular evaluations by healthcare professionals would allow timely identification of oral health deterioration, enabling preventive measures before conditions worsen. This approach aligns with recommendations from previous studies [38, 39], advocating a multidisciplinary approach to frailty management that includes both oral and systemic health factors.

This study has several limitations to consider. First, the cross-sectional design inherently precludes establishing causal relationships between prosthetic status, prosthetic needs, and oral frailty. Furthermore, because the study population was confined to older adults in Egypt, the generalizability of our findings to other demographic or cultural contexts may be limited. Another limitation is that prosthetic status was evaluated solely through clinical examination, without including patient-reported outcomes such as patient satisfaction or the functional adequacy of existing prostheses.

Clinical Implications and Future Directions

The clinical implications of this study are significant. The high prevalence of unmet prosthetic needs across diverse populations reveals a substantial gap in geriatric dental care, necessitating targeted interventions and policy reform. This issue highlights the critical need to integrate oral healthcare into comprehensive geriatric assessment. Furthermore, the strong association between prosthetic needs and oral frailty positions prosthetic rehabilitation as an integral component of geriatric care. Consequently, effective prosthetic interventions are vital not only for preserving oral function but also for mitigating the systemic risks of frailty and enhancing the overall quality of life in older adults.

Future research should build upon these findings by examining the effectiveness of prosthetic interventions in mitigating oral frailty and improving patient-reported outcomes. Longitudinal studies are essential to assess the progression of prosthetic needs and their temporal relationship with oral frailty, providing critical insights to refine clinical guidelines and optimize rehabilitation strategies for aging populations. Additionally, investigations must consider complex psychosocial, behavioral, and healthcare system factors that influence prosthetic needs. Understanding these multifaceted barriers is crucial for developing interventions that effectively dismantle obstacles to dental care among older adults.

Conclusions

This study provides valuable insights into the prosthetic status, prosthetic needs, and their relationship with oral frailty among older adults in Egypt. The findings reveal significant unmet prosthetic needs, consistent with patterns observed in other geographical regions, and highlight the important relationship between prosthetic factors and oral frailty. These results emphasize the need for comprehensive geriatric dental care that addresses prosthetic needs as part of overall strategies to prevent oral frailty and maintain quality of life in the aging population.