ORIGINAL ARTICLE

Frequency of Edentulism and its Associated Factors Among Patients Attending a Tertiary Care Hospital in Karachi

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OBJECTIVE: The purpose of this study was to investigate the frequency of edentulism and its associated factors among patients attending a tertiary care hospital in Karachi.
METHODOLOGY: This cross-sectional study was conducted at Prosthodontics department, Dow University of Health Sciences from June 2022 - May 2023 in which 402 edentulous patients between 50-90 years of age were included by non-probability convenience sampling. The data was collected with the help of a questionnaire that consists of questions inquiring about demographic details and various factors that may have contributed to tooth loss. Data was analyzed using SPSS 23.0.
RESULTS: Out of a total number of 4498 patients who visited the dental OPD at DIKIOHS, DUHS, from June 2022- May 2023, 402 were edentulous. The frequency for edentulism was calculated to be 8.9%, with a mean age of 65.75 ± 7.48 years. There were 217 (54%) females and 185 (46%) males with a mean duration of edentulism of 3 years. Dental caries was the most frequent reason for tooth loss (46.5%) followed by periodontal disease (35.6%).
CONCLUSION: Complete tooth loss indicating poor oral health in elderly can greatly impact the quality of life. Compromised socioeconomic conditions and life style choices, certain habits like smoking and physical activity can also affect tooth loss patterns. As dental caries was reported to be a major reason for tooth loss, oral health measures should focus on prevention of dental disease to decrease prevalence of edentulism.
KEY WORDS: Edentulism, Complete tooth loss, Missing teeth, Oral health.
HOW TO CITE: Lone MA, Mujahid A, Kiran A, Jabeen B, Choudhry Z, Jagirani SA. Frequency of edentulism and its associated factors among patients attending a tertiary care hospital in Karachi. J Pak Dent Assoc 2025;34(1):11-16.
DOI: https://doi.org/10.25301/JPDA.341.11
Received: 30 December 2024, Accepted: 03 April 2025

INTRODUCTION

Edentulism is loss of all teeth and is end stage of burden of oral disease.[1,2] Due to the non-life-threatening nature of tooth loss, it is often disregarded and ignored leading to inclination towards symptomatic treatment only. This chronic dental state leads to compromised masticatory efficiency. Edentulism negatively affects oral health related quality of life (OHRQoL), leading to functional, psychological and social impairment that disrupts day to day life.[3] Edentulous elderly consumes fewer nutrients, as they avoid fibrous food, vegetables and fruits that along with chronic systemic conditions further deteriorate general health.[1,4] This dietary restriction with deteriorating general health make oral condition worse. Therefore, it is necessary to improve our oral healthcare system so that elderly patients can retain as much of their natural teeth as possible for improved general health.[5]

According to data compiled by World Health Organization, incidence of complete edentulism has been estimated between 7 - 69% internationally. Prevalence of edentulism is between 16- 21% in France, Mexico and

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Russia, which is considerably higher compared to 3-9% in China, Ghana and South Africa.[6] Worldwide, edentulism accounts for one third of the burden of oral diseases. The state of complete tooth loss in Pakistani population is estimated to be 4.1% of aged population and it may rise to 9.3% till 2030.[7]

Several factors are associated with tooth loss such as caries, periodontal disease and trauma. These factors lead to progression of disease process and subsequently tooth loss. Advancing age is more closely associated with partial or complete tooth loss.[4] Elderly individual experience reduced salivary flow either as result of ageing or use of multiple medications that further exacerbate the oral condition leading to caries and oral infections. In a study conducted in Nepalese population, association was shown between edentulous state and age, gender, level of education as well as built of participants of study.[8] This possible link is because of lack of knowledge and awareness in less or uneducated patients. Economic status of individuals also influence rate of edentulism since class of low socioeconomic status give less importance to oral health because of financial constraints and lack of awareness.[9] Women of developing countries face considerable barriers to access oral health as a result of cultural and socio-economic barriers. In some studies, occurrence of complete tooth loss is more prevalent in females, reason being limited access to health care facilities and low literacy rate and primary care giving roles towards family.[10] Certain habits like smoking diminishes blood supply to gingiva making gums more susceptible to periodontitis. Harmful chemical by chewing tobacco causes inflammation in gingiva making them vulnerable to gum diseases. These habits such as chewing tobacco, smoking and alcohol consumption are associated with poor oral health and periodontitis which subsequently leads to early tooth loss.[8]

Edentulism as a progressive dental disease is associated with array of chronic illness and the polypharmacy in ageing elderly. Many systemic diseases like cardiovascular disorders, diabetes mellitus, bone and joint diseases, renal disease, gastrointestinal disorders and respiratory distress may all deteriorate oral health and consequently lead to tooth loss. The greater the occurrence and severity of comorbidities, higher the increased likelihood of edentulism.[5,9] In older age there is reduced tendency to combat oral pathogens as a result of decline in immune activity. Lack of physical activity in the elderly also leads to poor oral health, potentially leading towards edentulism.[4] Hence multiple factors can interplay and lead to edentulism in geriatric patients. Even though studies have been conducted in global settings,[8,10] there is lack of epidemiological data in our part of the world pertaining to edentulousness and factors associated with it. To the best of our knowledge, there is paucity of data in our local setting on completely edentate patients. Therefore, the objective of this study was to investigate the frequency of edentulism and its associated factors among patients attending a tertiary care hospital in Karachi.

METHODOLOGY

This cross-sectional study was conducted at Prosthodontics department at DIKIOHS from June 2022 - May 2023 after approval from the Institutional Review Board of DUHS (Ref # 2467). Edentulous patients between 50-90 years of age were included in the study by non-probability convenience sampling. Patients who had lost their teeth as a result of any syndrome, neoplasia or cystic lesion were excluded from the study population.

The data was collected with the help of a questionnaire that was adapted from similar previous researches.[9,10] The questionnaire consists of two parts, section A inquired about demographic details whereas section B consisted of questions inquiring about reasons for tooth loss, chronic systemic diseases, physical function and smoking status of the participants. A few changes in the questionnaire were made by the input of subject specialists in our local context. After these changes, a pilot study was conducted on 20 patients and in light of their input, any unclear and ambiguous questions were rephrased for clarity. These measures were taken to improve the validity and reliability of the questionnaire before it was administered to the rest of the study population.

A sample size of 361 participants was calculated using PASS version 11 software, based on test for one sample proportion with 95% confidence interval, 80% power and 5% margin of error. This number was inflated by 10% to cater for missing data, and therefore the total sample size for the study was 402 participants.

Patients of the study were informed about nature and purpose of study and written informed consent was taken from each participant before including them in the study. To simplify the data collection procedure, the study investigators asked the questions from the patients' themselves and filled in the questionnaires at their chairside.

Data was analyzed using SPSS 23.0. Frequency of edentulism was computed by using the data for total number of patients visiting the dental OPD over a period of one year. Frequency and percentages were computed for categorical variables i.e. gender, level of education, employment status, reasons of tooth loss, chronic systemic diseases and smoking status. Mean and standard deviation were recorded for age and duration of edentulism. To evaluate association between duration of edentulism and sociodemographic factors, and other factors related to edentulism, t-test/ ANOVA was

applied. $p<0.05$ was considered as statistically significant.

RESULTS

Out of a total number of 4498 patients who visited the dental OPD at DIKIOHS, DUHS from June 2022- May 2023, 402 were edentulous. The frequency for edentulism was calculated to be 8.9%. The mean age of the 402 participants included in the study was 65.75 ± 7.48 years, with an age range of 50 to 84 years. There were 217 (54%) females and 185 (46%) males in the study population. The mean duration of edentulism of the study participants was 3 years.

The frequency and percentage for sociodemographic data, systemic diseases, smoking status and physical activity of the patients included in the study is shown in table I and II.

A very small number [70 (17.4%)] of patients had no formal education. Around 97 (24.1%) patients had graduate level education. Among the participants, majority were unemployed [225 (56%)] whereas [114 (28.4%)] were employed. Dental caries was the most frequent reason for tooth loss (46.5%) whereas the second most common cause was periodontal disease (35.6%). Among chronic systemic diseases, more edentulous patients were hypertensive [87 (21.6%)], and diabetic [75 (18.7%)]. Out of a total of 402 edentulous patients, majority were nonsmokers 349 (86.8%). Around 3% patients reported to have declined physical activity.

Table I: Cases distribution according to socio-demographic factors of the study participants

S.No.	Sociodemographic factors	Number of participants n (%)
1.	Education	
	No education	70 (17.4)
	Primary	103 (25.6)
	Sec-Intermediate	132 (32.8)
	Graduation	97 (24.1)
2.	Occupation	
	Employed	114 (28.4)
	Unemployed	225 (56.0)
	Pension	63 (15.7)

A higher prevalence of edentulism was reported in >65 years age group. (51.2%) compared to the patients of less than 65 years of age.

Independent sample t-test/ ANOVA was applied to find association between duration of edentulism and various factors associated with edentulism for the study participants. Results are presented in Table III. The results showed a significant association between years of edentulism and occupation (p- 0.000) and years of edentulism and level of education (p-0.002). All other factors were statistically insignificant.

Table II: Cases distribution according to risk factors associated with tooth loss. n (%)= number of study participants

S. No:	Factors associated with tooth loss	Number of participants n (%)
1.	Reason of tooth loss	
	Caries	187 (46.5)
	Periodontitis	143(35.6)
	Trauma	16 (4.0)
	Caries & Periodontal disease	56 (13.9)
2.	Systemic diseases	
	Hypertension	87 (21.6)
	Diabetes	75 (18.7)
	Cardiovascular Disease	45 (11.2)
	Multi-morbidity	145 (36.1)
	No systematic disease	50 (12.4)
3.	Smoking	
	Non-Smoker	349 (86.8)
	Previous Smoker	38 (9.5)
	Current Smoker	15 (3.7)
4.	Physical Function	
	Normal	390 (97)
	Declined	12 (3)

Table III: Association between duration of edentulism (years) and risk factors associated with tooth loss of the study participants. T-test/ ANOVA was applied. $p< 0.05$ was considered statistically significant

S. No:			*p*-value*
1	Duration of edentulism	Gender	0.396
2	Duration of edentulism	Reason of tooth loss	0.348
3	Duration of edentulism	Occupation	0.000*
4	Duration of edentulism	Level of education	0.002*
5	Duration of edentulism	Smoking	0.517
6	Duration of edentulism	Chronic systemic diseases	0.240
7	Duration of edentulism	Physical function	0.232

DISCUSSION

Tooth loss significantly contributes towards poor general health because of nutritional deficiencies and deterioration of mental health. It has an influence on mastication, speech and esthetics and ultimately the quality of life. It primarily occurs as a result of microbial or genetic diseases, some lifestyle factors such as smoking and consumption of diet rich in carbohydrates. In low- and middle-income countries, other factors including socioeconomic status and literacy

rate can also be associated with tooth loss.[3,9]

The frequency of edentulism reported in our study was 8.9%. In contrast to the findings of our study, prevalence of edentulism in United States among individuals greater than 15 years of age has been reported to be 4.9%.[11] Similarly, frequency of tooth loss in Canada was found to range between 6.4%- 21.7%.[9]

It has been observed that while occurrence of tooth loss has steadily decreased in developed countries, the opposite has been noted in developing countries such as India and Pakistan this was reported in a study by peltzer et al in which the percentage of individuals above 50 years of age exhibiting tooth loss was noted to be 16.3%.[6] This difference in frequency of tooth loss across countries can be attributed to factors such as lifestyle, economic conditions, education and access to dental care.

The mean age of edentulism in this study can be contrasted with reports from other countries which shows both similarities and disparities. In this study the mean age was 65.5±7.0 years which was higher as compared to Mexican elderly, where the mean age was 59.59±9.0 years.[16] In this study data was divided into two groups according to age i.e. group 1 <65 years and group 2 > 65 years. Results showed higher prevalence of edentulism in group 2 that had patients with age of greater than 65 years, similar to a study in Nepal.[8] Age is known to be strongly associated with edentulism and there has been an expansion of elderly population across the World. Thompson and Kreisel in their study conducted in Canada identified a 36.5% increase in older population. Despite this expansion, a decline in tooth loss was noted due to excellent dental care facilities.[12]

In the present study, there was a larger number of female patients (55.3%) compared to males (44.7%), which is in contrast to results of another study conducted in Hyderabad, Pakistan.[13] This male to female proportion is however, similar to that reported in various other populations including Australia,[14] Thailand,[15] Mexico[16] and Finland.[17] Since females of this study were mostly house wives showing their low level of employment status, they may be dependent on male members of the family for accessibility and availability of dental services. The resultant delayed dental treatment or no treatment leads to tooth extraction. Lack of oral health awareness affect care towards maintaining good oral hygiene as a result decrease tendency to visit dental clinics.[4]

Unemployment, economic burden and negative attitude towards dental services greatly impact edentulism. A statistically significant (p-0.000*) and moderately positive correlation (0.317) was present between employment status of participants and duration of edentulism. Most of the study participants were unemployed and therefore this financial constraint could be considered a cause for neglect towards oral care. This is because the inability to afford dental care services can eventually lead to tooth loss. These results are in alignment with a study performed by Elkund and Burt which acknowledges that socioeconomic status is a strong predictor of tooth loss.[11] Similarly, a study conducted in Mexico also report that lower education and limited education are contributory factors for edentulism.[16]

Different treatment choices among lower socioeconomic class may be a contributing factor towards edentulism as they prefer tooth extraction over endodontic treatment in case of toothache, leading to increased and early tooth loss.[18]

A very large proportion 305(75.9%) of the participants were either not educated or had only completed intermediate level of education. Even though, the level of education may not be a direct indicator of the level of awareness and knowledge regarding oral care, a statistically significant (p-0.002*) difference was seen between the level of education and duration of edentulism. These findings can be supported by a study performed in Indonesia which acknowledges that the prevalence of edentulism was significantly higher among people with no formal education.[19] Lack of education may indirectly contribute to the neglect towards oral care and subsequent tooth loss, leading to edentulism.

The most common cause of tooth loss in this study was found to be dental caries comparable to results shown in Nepalese population and other studies.[5,7] Similar evidence has been put forward by Al Hamdan and Fahmy who report dental caries as the most frequent cause of tooth extraction.[9] In contrast to this, periodontal disease has been recognized as the most prominent etiological factor contributing to tooth loss in higher age group among the Greek population.[20] Dental caries either alone or in combination with periodontitis accounted for tooth loss in around 60% of the patients in another study.[21] Periodontitis was the second most common reported cause of tooth loss in this study, alone or in combination with dental caries. Since tooth loss cause dietary changes and transition towards easy diet enriched in simple carbohydrates, the increased intake leads to a vicious cycle that aggravates caries progression.

Hypertension and diabetes have been shown to have an association with tooth loss and eventually edentulism.[22] Similar results were seen in the present study where a very small proportion of participants 50 (12%) had no systemic disease. On the contrary, majority of the study participants had co-morbidities i.e. hypertension (87 [21.6%]), diabetes (75 [18.7%]) or a combination of both (145 [36.1%]). Similar to this study higher prevalence of hypertension among edentulous patients was also reported by Supa and Karl in study conducted in Indonesia.[19] Tyrovolas et al in their study also observed that individuals greater than 50 years of age suffering from diabetes had significantly higher

odds of edentulism (p = 0.005) in comparison to their younger counterparts.[23] It is difficult to identify a direct causal relationship with chronic illnesses and tooth loss. However, it can be proposed that the presence of systemic diseases such as diabetes can contribute to periodontal disease and eventually tooth loss due to presence of inflammation along with damage to large and small vessels. There is a natural process after tooth loss that causes ridges to resorb as a result of absence of chewing forces required for functional stimulation. In older edentulous individual bone density also reduce that further contribute towards ridge resorption. Although residual ridge resorption is multifactorial process with edentulism as its major contributing factor and these resorb ridges compromise support for complete dentures.[25] In this study decline physical activity is also linked with edentulism which is consistent with results of another study conducted in Indonesia that shows their less likelihood of accessing dental care services.[19]

This study provides a comprehensive assessment of frequency of edentulism and its associated factors. However, it is not without limitations. It relies on self-reported data which may have resulted in overstatement of positive behaviors by the respondents. In addition to this, participants may have experienced difficulty to remember tooth loss events that occurred many years ago.

The results of this study help to provide base line knowledge on the frequency of edentulous elderly seeking prosthodontic care. The study highlights that there is an ultimate need for awareness programs and approaches at national level to make oral health care services accessible for aged. Further longitudinal researches should be conducted to evaluate the relationship of tooth loss with knowledge and economic status.

CONCLUSION

Complete tooth loss indicating poor oral health in elderly can greatly impact the quality of life. As dental caries was reported to be a major reason for tooth loss, oral health measures should focus on prevention of dental disease to decrease prevalence of edentulism. Compromised socioeconomic conditions and life style choices can also affect tooth loss patterns. Strategies for enhanced and improved oral health access should be formulated for geriatric population so as to help improve their quality of life.

CONFLICT OF INTEREST

Authors have no conflict of interests and received no grant/funding from any organization.

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