Case Study

PREVALENCE OF PARTIAL EDENTULISM AND COMPLETE EDENTULISM AMONG ADULTS RESIDING IN RIYADH, SAUDI ARABIA; A CROSS-SECTIONAL STUDY

Randa Rustom[1], Sameer Abdullah AlThumairy[2], Rakan Rafdan Alhujhuj[3], Saad Ghazi Alshaiban[4], Nada Saad Alghamdi[5], Renad Mohammed Al-Ibrahim[6], Maha Mezeid[7]*

[1]*Department of General Dentistry, King Saud Medical City Hospital, Riyadh, Saudi Arabia. randa.a.rustom@gmail.com*
[2]*Department of Dental Public Health, King Khaled Hospital, Ministry of Health, Alkharj, Saudi Arabia.*
[3]*Department of General Dentistry, King Abdulaziz Hospital, Ministry of National Guard-Health Affairs, Alhasa, Saudi Arabia.*
[4]*Department of General Dentistry, Ghornatha Medical Center, Riyadh, Saudi Arabia.*
[5]*Department of General Dentistry, King Saud University Dental Hospital, Riyadh, Saudi Arabia.*
[6]*Department of General Dentistry, Aseer Central Hospital, Aseer, Saudi Arabia.*
[7]*Department of Prosthodontic, College of Dentistry, Riyadh Elm University, Riyadh, Saudi Arabia.*

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ABSTRACT

The study aimed to evaluate the prevalence of partial and complete edentulism in the population of Riyadh, Saudi Arabia. A cross-sectional study was conducted at multiple dental care facilities in Riyadh, Saudi Arabia. A total of 422 subjects aged 35 and older were selected using a convenient sampling method, and information regarding edentulism was collected by clinical examination and through a questionnaire. Frequency distribution and percentages were calculated for categorical variables. The Chi-square test was used to determine the relationship between the categorical variables. Of the total sample, 259 (61.4%) were males, and 163 (38.6%) were females. In the overall assessment of edentulism, it was found that the majority of the subjects, 407 (96.4%), had one or more teeth missing. Among these, 7.1% were completely edentulous. The tooth loss did not significantly differ across age, gender, and educational levels ($p>0.05$). A high percentage of adult patients have missing teeth, and complete edentulism was found primarily in elderly people 55 years and above.

Key words: Complete edentulism, Edentulism, Partial edentulism, Prevalence, Adults, Tooth loss.

Introduction

Tooth loss affects the quality of life at social, psychological, and biological levels. Tooth loss is identified by an edentulous site, a space in the oral cavity usually occupied by one tooth or more. Partial edentulism refers to an oral cavity with the loss of a few teeth, while complete edentulism is the loss of all teeth in one or both arches [1, 2]. Partial edentulism is usually caused by dental caries, periodontal diseases, supernumerary teeth, and traumatic injuries, which lead to occlusal changes such as tilting and drifting of adjacent teeth, supra-eruption of opposing teeth, altered speech, mastication, and esthetics [2-5].

Previous studies on the prevalence of partial edentulism have revealed that most adults in the United Kingdom had at least one missing tooth, and only 5.6% were devoid of any missing teeth [6]. It was found in another study that tooth loss was most common between the ages of 65 -74 in India, with 50.39% of adults in that age range missing at least one tooth.

However, the prevalence of complete edentulism varies both country-wise and region-wise [7]. A large-scale survey conducted by Peltzer *et al*. (2014) to assess complete edentulism amongst the old population (50 years and above) in six countries showed the overall Prevalence of edentulism of 11.7%, with the highest prevalence rates seen in Mexico (21.7%) and the lowest prevalence rate in Ghana (3%) [8]. Similarly, an Indonesian study found a 7.2% prevalence rate of edentulism among individuals aged 50 years and older [9].

Past studies in Saudi Arabia have reported that 69% have missing teeth and 2.6% complete edentulism among adults aged 35 and above in Riyadh city [10]. Conferring with this, Almutairy and Mohan found a high percentage of missing teeth among females in the AlQassim region [11]. In addition, a higher percentage of edentulism was noted among females than males in Hail, Saudi Arabia [12]. Despite these reported studies, there is a paucity of data with regard to partial and complete edentulousness in Saudi Arabia. Hence this study was undertaken to assess both tooth loss and the prevalence of partial and complete edentulism in Riyadh city, Saudi Arabia. This study's findings may help to design oral health services for the edentulous patients in Riyadh city.

Materials and Methods

Ethical approval

The study proposal was submitted to the research and innovation center of Riyadh Elm University, Riyadh, Saudi Arabia, and a formal ethical approval was obtained, (IRB# SRP/2022/107/782/747).

Informed consent to participate in the study was obtained from each participant before the commencement of the study.

Study design

This was a descriptive cross-sectional study carried out among Saudi dental patients seeking dental care in various dental clinics located in different regions of Riyadh city. A questionnaire survey and clinical examination of each patient were performed within the clinics. Data collection was carried out from April to June 2022.

Criteria

Inclusion criteria

The subjects with permanent dentition were included in the study.

Saudi adults aged 35 years and above.

Exclusion criteria

The third molar was excluded from the study.

Non-Saudi.

Saudi aged below 35 years.

Sample size

The sample size was estimated based on the following formula:

$$n = \frac{z_{\alpha}^2 p \cdot q}{E^2} \quad (1)$$

Where, $Z\alpha = 1.96$; $p = 69\%$ (prevalence of tooth loss derived from the past study) [10]; $q = 31(100 - 69)$; Confidence interval = 95%; Power = 95%; Level of significance = 5%; E (allowable error) = P = 4.41. The sample size estimation yielded 422 subjects to be part of the study. Convenience sampling methodology was employed to select the study sample. The selection of private dental health care and university hospitals was made using systematic random sampling from each of the main five regions of Riyadh (East, West, North, South, and Central).

Study questionnaire

A structured, close-ended questionnaire developed in English was translated into Arabic to collect the information. The questionnaire consisted of 3 sections. The first section was related to sociodemographic factors, including age, gender, educational level, city, nationality, occupation, and medical condition. The second section was concerned with regular health habits. The third section was related to the utilization of oral health services. The face validity of the questionnaire was established by taking the expert opinion on the questionnaire items. A pilot study was conducted among 30 dental patients to assess the reliability of the questionnaire. A Cronbach's alpha value of 0.85 was obtained, suggesting the adequate reliability of the questionnaire.

Examination of tooth loss and edentulism

A single trained examiner performed all the clinical examinations to assess tooth loss and edentulism. Additionally, patients were also asked for the reasons for tooth loss. The investigator asked for and filled out the questionnaire, and the oral examination of subjects was done as described by the WHO Oral Health Survey, Basic Methods, 2013.

A disposable plain mouth mirror, a WHO-specified periodontal probe, tweezers, cotton rolls and gauze, mouth masks, and a yellow gown were utilized during the oral examination. During examining study participants, the researcher utilized appropriate infection control measures. The participants to be examined were seated in a dental chair with a high backrest while the examiner was positioned behind it. All oral examinations were performed using the dental chair's headlight. The instruments were placed within the examiner's reach according to the resources available in the examination areas. The assistant stood near the examiner to record the scores as they were read aloud. The examiner could also view the data as it was being entered. The examination area was designed to avoid congestion and noise. The average time for examination and data recording was 15 minutes per patient.

Statistical analysis

Descriptive statistics of frequency distribution and percentages were calculated for the categorical variables. Chi-square and Fisher's exact tests were applied to determine the relationship between demographic variables and the edentulousness of the study participants. A p-value of <0.05 was considered significant for all the statistical tests. All the data was analyzed using Statistical Package for Social Sciences (IBM-SPSS version 25, Armonk, NY, USA).

Results and Discussion

A total of 422 subjects participated in the study, of which 61.4% were males, and 38.6% were females. Most of them were in the age group 35-45, with bachelor's degrees and above. The participants were further sub-grouped based on occupation and region of residence, as presented in **Table 1**.

Table 1. Sociodemographic data of the study participants (N=422)

Variables	Level	n	%
Gender	Male	259	61.4

	Female	163	38.6
Age	35-45	170	40.3
	45-54	123	29.1
	55 or more	129	30.6
Educational level	High school and less	188	44.5
	Bachelor's degree and above	234	55.5
Occupation	Unemployed	150	35.5
	Employee	199	47.2
	Housewife	73	17.3
Region	Center	208	49.3
	North	37	8.8
	South	36	8.5
	East	128	30.3
	West	13	3.1

The medical condition of the participants is shows that 40.8% of participants were diagnosed with chronic diseases. Among these participants, 27% were diagnosed with diabetes, 23.5% were diagnosed with hypertension, 2.1% were diagnosed with angina, 1.4% were diagnosed with arthritis, 3.6% were diagnosed with asthma, 4.5% were diagnosed with a heart problem, 0.2% diagnosed with depression, and only 0.5% diagnosed with a stroke, as it is shown in **(Figure 1)**.

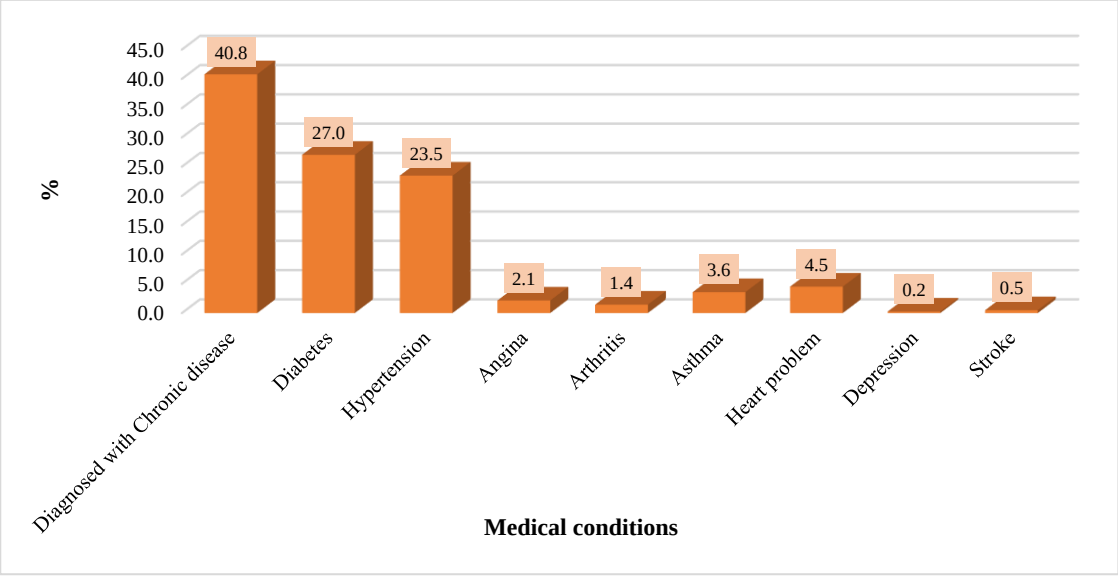

Figure 1. Medical conditions of the study participants

Regarding the oral hygiene practices of the participants, the majority (83.6%) admit cleaning their teeth. Nearly 67.7% cleaned their teeth once a day, and 82% cleaned them using toothpaste. Out of the total sample, only 10.4%, 20.9%, and 9.5% used dental floss, miswak, and mouthwash, respectively. Of all participants involved 31% had their last dentist visit in more than a year, 55.9% within the last 6 months, and 13% in 6-12 months. Around 61.1% stated the reason for the visit as treatment or follow-up. The average rating of their gums and teeth was given by 33.2% and 30.6% of the study participants. Regarding the smoking habit, 77.3% never smoked in their lives, 9% were smokers in the past, and 13.7% are current smokers, 14.5% smoke more than five times a day.

Of the total study sample, 96.4% were found to have one or more missing teeth indicating edentulism. Among these participants, 7.1% were found to be completely edentulous, and the remaining 89.3% were partially edentulous. Nearly 79.9% of the participants agreed that dental caries is the main cause of their teeth loss, followed by periodontal disease 10.4%, and 10% by trauma and other reasons **(Table 2)**.

Table 2. Number of missing teeth with partial and complete edentulism

Variables	Level	n	%
Presence of missing teeth	Yes	407	96.4
	No	15	3.6
Dentulous	0	15	3.6
Partially edentulous	1	48	11.4
	2	62	14.7
	3	38	9.0
	4	48	11.4
	5	35	8.3
	6	19	4.5
	7	10	2.4
	8	20	4.8
	9	11	2.6

	10	18	4.3
	11	3	0.7
	12	9	2.1
	13	7	1.7
	14	6	1.4
	15	4	1.0
	16	14	3.3
	18	1	0.2
	19	6	1.4
	20	9	2.1
	21	3	0.7
	22	1	0.2
	23	2	0.5
	24	2	0.5
Completely edentulous	≥28	30	7.1
Reason for missing teeth	Dental caries	337	79.9
	Periodontal disease	44	10.4
	Trauma	13	3.1
	Other reason	28	6.6

The current use of removable prostheses was assessed among the study participants, and it was observed that 14% of the total study sample was using removable prostheses regardless of partial or complete edentulism **(Table 3)**.

Table 3. Status of use of removable prosthesis among study participants

Variables	n	%
Yes, I use them	59	14.0
No, it is hurting me	13	3.1
No, it is broken	4	0.9
No, it is missing	7	1.7
No, It is not stable anymore	17	4.0
No, there is no use for it	122	28.9
No, others	200	47.4
Total	422	100.0

When the presence and absence of missing teeth were compared between males (95.8%) versus females (97.5%), an insignificantly higher teeth loss was observed in females than in males (p=0.333). Similarly, participants aged 45-54 (97.6%) demonstrated higher teeth loss, followed by participants in age groups of 55 or more (96.1%) and 35-45 (95.9%), suggesting a higher percentage of teeth loss in advanced ages. However, no statistically significant difference was observed when teeth loss was compared among the different age groups (p=0.725). In addition, study participants with a high school (97.9%) level of education showed insignificantly higher teeth loss than those with a bachelor's (95.3%) educational level (p=0.123). The teeth loss was highest in the central (100%) and northern (100%) regions of Riyadh, followed by the south (97.2%), east (90.6%), and west (84.6%). When teeth loss was compared across various regions of Riyadh city, a statistically significant difference was found (p<0.001). The relationship between demographic factors and edentulism is shown in **(Table 4)**.

Table 4. Relationship between sociodemographic factors and edentulism

Variables	Level	Yes		No		*P*
		N	%	N	%	
Gender	Male	248	95.8%	11	4.2%	0.333
	Female	159	97.5%	4	2.5%	
Age	35-45	163	95.9%	7	4.1%	0.725
	45-54	120	97.6%	3	2.4%	
	55 or more	124	96.1%	5	3.9%	
Education	High school	184	97.9%	4	2.1%	0.123
	Bachelors	223	95.3%	11	4.7%	
Region	Center	208	100.0%	0	0.0%	<0.001
	North	37	100.0%	0	0.0%	
	South	35	97.2%	1	2.8%	
	East	116	90.6%	12	9.4%	
	West	11	84.6%	2	15.4%	

One of the major handicaps in the elderly age groups is tooth loss, affecting mastication, dietary intake, and nutritional status (Al Hamdan and Fahmy 2014). Tooth loss results from oral diseases and exhibits the patient's perception, availability, and accessibility of dental care and their socioeconomic levels. In the overall assessment of edentulism, it was found that the majority of the subjects, 407(96.4%), had at least one missing tooth. In a similar study by Almusallam and AlRafee, it was found that most participants (69%) had at least one missing tooth [10]. Another study in the AlQassim region observed a similar rate of missing teeth (62.5%) [11].

Nevertheless, another study by Heidari *et al*. showed a higher rate of edentulism, where 94.4% of their study population had at least one missing tooth [6]. In contrast, Atieh reported that the Prevalence of tooth loss at the individual level was 40.9% [13]. Kim *et al*. examined the association between tooth loss and sugar-sweetened beverage intake among young adults in the U.S. and reported that at least one missing tooth was observed in 25.6% of participants [14].

This study observed complete edentulousness in 7.1% of the total sample. This edentulousness is higher than that of Almusallam and Alrafee, where the Prevalence of complete edentulism was 1.8% of the studied sample. This variation could be due to the inclusion of different age groups in the study. Our finding is in line with the previous studies in which edentulism is associated with older age groups [15-17].

In our study, the Prevalence of partial and complete edentulism between male and female patients did not differ significantly, showing agreement with other similar studies [5]. Similarly, previous studies have shown an insignificantly higher prevalence of edentulism among male patients than female patients [15, 18, 19]. In contrast, Peltzer *et al*. reported higher edentulism among females than males without any statistically significant difference after studying edentulism in six countries [8].

In this study, patients aged between 35-55 years and above were included to assess the influence of age on tooth loss. The age 45-54 has shown the highest tooth loss indicating a significant correlation between age and edentulism. It could be explained by the fact that tooth loss is a consequence of the cumulated destructive effects of dental decay and periodontal disease [20]. This finding is in line with the previous studies in which edentulism is linked to increasing age [8, 21, 22]

The Prevalence of missing teeth varied at different levels of education. The participants with high school and lower education levels had higher tooth loss with edentulism compared to their bachelor-level counterparts. The results indicate a higher percentage of edentulism in the subjects with lower educational levels. It could be explained that the higher prevalence of tooth loss among less educated may be due to a lack of oral health knowledge, awareness, and attitude toward their dental treatment because of the lesser utilization of oral health services [23, 24].

In this study, nearly 40.8% of the study participants were diagnosed with different chronic diseases. These diseases could have directly or indirectly affected edentulism. This finding is supported by Peltzer *et al*., who reported that having asthma, arthritis, angina, and hypertension were associated with edentulism [8]. In addition, the limited access to dental care, and in some cases reduced cooperation and poorer oral hygiene, increases the risk of caries and periodontal diseases which cause the loss of teeth [25]. This leads to a higher prevalence of edentulism compared to the general population [26].

Utilization of oral health services and oral health behaviors could have a detrimental effect on the dentition [27]. In the current study, it was noticed that there was no significant relationship between missing teeth and participants' previous visits to the dental office and the rationale for their prior visits. It was also evident that current smokers have higher missing teeth than non-smokers. This finding is consistent with other studies [8, 10].

Limitations of the study

The study's cross-sectional nature and the inclusion of dental patients in the study could have affected the results of the study. Moreover, the study findings are limited to Riyadh City alone; hence caution should be taken while generalizing the findings to the larger Saudi Arabian population. Further epidemiologic studies with a larger sample and broader coverage must confirm the current study results.

Conclusion

Within the current study's limitations, it was concluded that a high percentage of adult patients have missing teeth, and complete edentulism was found predominantly among elderly adults. Dental professionals should take appropriate rehabilitation measures for edentulous patients to improve oral functions and aesthetics. The general public should be educated about the factors affecting tooth loss.

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Conflict of interest: None

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Ethics statement: The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Research and Innovation Center of Riyadh Elm University (SRP/2022/107/782/747).

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