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Association of Edentulism with Systematic Diseases: A Cross-Sectional Study in REU Clinics

Zeeshan Qamar¹, Alkadi Alqahtani², Anjood Khalid Bu Sbait², Fatimah Abdulaziz Al Soliman², Shahzeb Hasan Ansari^{3*}

¹Department of Oral and Maxillofacial Surgery and Diagnostic Sciences, Riyadh Elm University, Riyadh, Saudi Arabia.

²Department of Internship Training, Riyadh Elm University, Riyadh, Saudi Arabia.

³Department of Preventive Dentistry, Riyadh Elm University, Riyadh, Saudi Arabia.

***Corresponding Author**

Abstract: Evaluations of edentulism, or the state of having no teeth, are considered a major world prevalence issue in oral health, especially in areas not served by dentists. These infections cause edentulism have been demonstrated to be related to other systemic diseases, including diabetes, hypertension, and respiratory diseases, thereby showing that the health of the mouth and the health of the body are interrelated. In Saudi Arabia, a limited number of studies address causative factors of edentulism and its effect on systemic diseases of patients attending REU clinics, which this study sought to establish. A survey of 360 patients was made with demographic profile & edentulism data. Partial edentulism exceeded complete edentulism 60% to 40% and systemic diseases such as diabetes 42%, and hypertension 42% affected partially edentulous individuals, while asthma 38% affected completely edentulous people. Most of the diseases and disorders investigated were affected by gender and nationality, with male patients having higher rates of diabetes and asthma, and higher rates of diabetes and cardiac disorders for Saudi clients. These results underscore the importance of multisystem healthcare approaches and preventive dental care to curve the incidence of both oral and major systemic diseases.

Keywords: Systemic diseases, Edentulism, Tooth loss, Oral health

INTRODUCTION

Societal condition known as edentulism or the status of the lack of natural teeth is actually a major global health concern, still affecting the elderly population majorly. Nevertheless, there has been progress in oral health services and technologies in developed countries, but edentulism remains a problem affecting the populations in developing countries, where health facilities, including dental ones, are scarce. For instance, edentulism is still comparatively common in Saudi Arabia in view of dental caries, periodontal diseases, and their neglect. These diseases can be prevented but are common causes of tooth extraction, contributing to the problem of edentulism [1]. In addition to its effects on the oral system, edentulism has been associated with other systemic health disorders, such as diabetes, heart disease, pneumonia, and marasmus [2, 3].

Tooth loss and systemic diseases are two-way, and the association between the diseases is due to a diverse number of factors. Cancer patients find themselves on low diets; hence, they are at a higher risk of being

malnourished and suffering from extra-systemic health consequences [4]. Also, long-term diseases that affect the body's systems, such as diabetes and hypertension, can worsen health and increase the risk of death [5]. Moreover, cultural, demographic, and lifestyle factors seem to be important in influencing the level of edentulism and its consequences. In Saudi Arabia, particularly the KSA, information regarding edentulism and its systemic relationships is scarce; therefore, it is necessary to identify these relationships to comprehend the multifaceted role of oral health in general well-being.

This paper seeks to fill the gap by exploring the relationship between edentulism and systemic diseases among patients seeking treatment at REU clinics. The outcomes will support identification of recommendations for low edentulism rates and the promotion of comprehensive long-term health effects, including better nutrition and reduced prevalence of systemic diseases. Therefore, to enrich the public health agenda and support the development of comprehensive, linked care systems in Saudi Arabia, the relationships described above have been highlighted in this study. Thus, edentulism not only restricts the functional possibilities of a human but is a phenomenon that has psychosocial and economic consequences. Some challenges faced by complete edentulous patients include low self-esteem, communication barriers that affect interpersonal relationships, and job insecurity, which is why integrated dentures are beneficial. Moreover, it is alarming that a high prevalence of the condition in low-income earners implies inequality in using preventive and restorative dental services. The association of edentulism and systemic diseases also supports the need for interrelated universal healthcare approaches. For instance, those strenuous periodontal diseases that are not treated cause major tooth loss and relate to chronic inflammations that increase cardiovascular and metabolic diseases. Furthermore, the trend towards high levels of malnutrition in the edentulous population demonstrates that oral conditions can affect a person's overall health. However, knowledge of these associations has not been enough to trigger more scientific studies on edentulism and systemic diseases in relation to the Saudi Arabian population, including the factors that may predispose Saudis to edentulism. There is, therefore, a pressing need for more research studies that focus on specific regions of the world to guide healthcare initiatives.

Rationale and benefits of the study

There has been limited research exploring the broader systemic health impacts of edentulism in KSA. This is why the present study aims to fill this gap by assessing the relationship between edentulism and systemic diseases among patients receiving treatment at the REU clinics. These findings would add to existing knowledge of oral health status in Saudi Arabia and guide future efforts to improve the nutritional and general health of this population by reducing the prevalence of tooth loss.

Hypothesis

There is no association between edentulism and systemic diseases.

Aim

To determine the prevalence of edentulism among patients with systemic diseases.

Objectives

- To list down the most common systemic diseases associated with edentulism.
- To compare the findings among various demographic variables.

Materials and Methods

Study design: A cross-sectional study using the patients' files in REU clinics.

Sample size: Sample was calculated using www.raosoft.com:

Margin of error: 5%

Confidence level: 95%

Population size: 2500

Response distribution: 50%

Recommended sample size: 334

Methodology: This study was conducted in the REU Namuthijiya clinics using patients' files retrieved with the help of IT personnel. The following inclusion and exclusion criteria were employed:

Inclusion criteria

- Patients with at least one systemic disease
- Patients with complete edentulism
- Patients with complete demographic and relevant information available in their files

Exclusion criteria

- Patients with no systemic disease
- Patients with teeth
- Patients with incomplete information

Data analysis: Data, including the patient's details such as smoking, systemic disease prevalence, gender, and ethnicity, were recorded. Comparisons between groups were carried out using the Chi-square test in SPSS (IBM New York) version 21, with the p-value of less than 0.05.

Results and Discussion

Explanation of tables and figures

Table 1. Gender, Age, Marital Status, and Mean Score

Variables	Frequencies
Gender	Males: 225 (62.5%)
	Females: 135 (37.5%)
Age	Mean 54.324 (SD 6.702)
Nationality	Saudi: 261 (72.5%)
	Non-Saudi: 99 (27.5%)
Type of edentulism	Partial edentulism: 216 (60%)
	Complete edentulism: 144 (40%)
Systemic diseases prevalence	Diabetes mellitus: 99 (27.5%)
	Hypertension: 126 (35%)
	Asthma: 63 (17.5%)
	Cardiac disorder: 28 (8%)
	Kidney/Liver disease: 36 (10%)
	Others: 8 (2%)

A summary of the target population is stated in **Table 1** below. Of the 360 participants, 225 were males, and 135 were females. The mean age of the participants was 54.3 years, signifying middle-aged to elderly persons who are likely to develop tooth loss. Out of the respondents, 72.5% were Saudi and 27.5% non-Saudi. Concerning the type of edentulism, it was revealed that partial edentulism was more common (60%) than complete edentulism (40%), which indicates that even though tooth loss is widespread, people still maintain a certain number of teeth. These demographics give baseline information that helps in explaining the level of prevalence of systemic diseases among the identified sample.

Table 2. Distribution of Systemic Diseases by Gender

	Males	Females	P-value
Diabetes Mellitus	32%	20%	.000*
Hypertension	24%	53%	
Asthma	24%	7%	
Cardiac disorder	14%	6%	
Kidney/liver diseases	12%	7%	
Others	1%	3%	

Table 2 presents the relative shares of systemic diseases by gender. Diabetes mellitus affected more male participants (32%) than their female counterparts (20%). The difference was reversed for hypertension, where female participants were more affected (53%) than males (24%). Asthma also differed by gender, with male frequency standing at 24% while that of females was 7% with all the above-mentioned differences being statistically significant. Such differences may be due to hormonal, lifestyle, or genetic predisposition to systemic diseases having a spatial relationship with gender.

Table 3. Distribution of Systemic Diseases by Edentulism Type

	Partial edentulism	Complete edentulism	P-value
Diabetes Mellitus	42%	6%	.000*
Hypertension	42%	25%	
Asthma	4%	38%	
Cardiac disorder	14%	6%	
Kidney/liver diseases	8%	13%	
Others	0%	3%	

Table 3 also compares systemic diseases of patients with partial and complete edentulism. Partial edentulism had a higher prevalence rate of diabetes mellitus and hypertension at 42%. On the other hand, asthma was significantly higher in participants with complete edentulism (38%), with these differences being statistically significant. These findings further the knowledge of the relationship between the extent of edentulism and other general health consequences.

Table 4. Distribution of Systemic Diseases by Nationality

	Saudis	Non-Saudis	P-value
Diabetes Mellitus	34%	15%	.000*
Hypertension	31%	39%	
Asthma	14%	21%	
Cardiac disorder	13%	6%	
Kidney/liver diseases	7%	18%	
Others	1%	4%	

Table 4 discusses the Saudi and non-Saudi participants' systemic disease distribution. Diabetes mellitus: Saudis 34 %, Cardiac disorders: Saudis 13%, Hypertension: Non-Saudis 39% and Kidney/Liver diseases: Non-Saudis 18%. Such differences may be due to differences in healthcare facility accessibility, diet, and nuclear genes between the two groups, with all the above-mentioned differences being statistically significant.

This study shows there is a correlation between edentulism and systemic diseases among the patients who attended the REU clinics in Saudi Arabia. The findings supplement the studies available in the literature while offering the demographic and cultural characteristics of the Saudi population. This discussion looks at the main findings first, then contrasts them with prior research, and finally, looks at some possible implications of the results.

Frequency and characteristics of edentulism

The present investigation showed that only partial edentulous patients were higher (60%) than the complete denture wearers (40%). These are in line with the findings, as Rustom *et al.* (2022) identified partial edentulism at a higher prevalence in Riyadh, Saudi Arabia, due to delays in continuous dental treatments [6]. Other international studies, including De Marchi *et al.* (2011), indicated that this status was prevalent among the Brazilian elderly, especially those with poor socio-economic status and reduced access to dental care.

This finding indicates that while many people in the study population may be missing several teeth, there is an increasing appreciation of the significance of maintaining at least some of one's natural teeth. But it was also revealed a lot more unmet needs for preventive care that, if met, could prevent worsening of the condition and potential complete edentulism.

Linkage with other systems diseases

Diabetes mellitus

Partially edentulous participants had a higher rate of diabetes (42%) than completely edentulous samples (6%). These results are in line with Bhochhibhoya (2022) and Albluwe (2020), who provided an understanding of the reciprocal interaction between diabetes and oral health [2, 7]. The study also stresses that long-term high blood glucose levels present in diabetic mellitus patients delay the ability of wound healing and make such patients vulnerable to periodontal diseases, which may culminate in tooth loss. On the other hand, the conditions caused by diabetes, such as poor diet and inflammation from periodontal diseases, can worsen tooth loss.

Hypertension & cardiac diseases

Hypertension had a 42% prevalence among the partially edentate patients and 25% among the completely edentulous patients, whereas 14% cardiac patients had partial edentulism and 6% had complete edentulism. This observation tallies with Preethanath (2020), who also reported that cardiovascular diseases, signifying hypertension, were widespread among individuals with poor oral hygiene [3]. As a result of chronic oral infections like periodontitis, which stands as the leading cause of tooth loss, patients develop systemic disease and increased blood pressure.

Asthma

Our study showed a higher prevalence of asthma, with 38% in completely edentulous patients as compared to 4% in partially edentulous patients. This finding is in concordance with Ygnatios *et al.* (2023), who discerned a relationship between respiratory diseases and edentulism [4].

Kidney and liver diseases

Chronic diseases involving the kidney and liver were dominant in those with completely edentulous, 13 %, than among the partially edentulous individuals, 8 %. This is supported by Nascimento *et al.* (2016) in their findings that chronic diseases, including kidney disease, experience worsening, nutritional deficiencies, and systemic inflammation leading to edentulism [5].

Gender disparities

Our findings showed the prevalence of gender differences in systemic diseases. Men had a higher prevalence of diabetes mellitus 32% and asthma 24% but females had a higher prevalence of hypertension 53%. These results are consistent with studies, for instance, Alshammari *et al.* (2018), that observed comparable gender differential

in systemic diseases [8], diabetes, and asthma rates are high among the male population, which might have been influenced by the fact that men are more involved in smoking and less likely to access health facilities. On the other hand, the extent of hormonal changes and stress reactions that are typical of females may be the causative factors for hypertension.

Nationality-based variations

We compared the data collected from both groups, with the Saudi and the rest of the non-Saudi population, and there were multiple differences in the occurrence of systemic diseases. Overall, Saudis had a slightly higher percentage for DM (34%) and CHD (13%), while non-Saudis had higher percentages for hypertension (39%) and kidney/liver disease (18%). These observations relate to Yahya *et al.* (2025), who noted that such differences emanate from differences in diets [9], health care, and socio-economic status. Hence, diabetes prevalence may be attributed to Saudis' historical carbohydrate and sugar consumption practices. On the other hand, higher prevalence of hypertension and kidney/liver diseases among non-Saudis could be due to insufficient health care services or exposure to occupational risk factors. This state of affairs clearly indicates that it is important to take nationality and culture into account when formulating population health interventions [10].

Comparison with previous studies

Altogether, this research's results are comparable to several worldwide and Gulf Cooperation Council studies, which nevertheless underscore interesting characteristics of the Saudi populace. For example, in a study conducted by Ygnatios *et al.* (2023), similar patterns between edentulism and systemic diseases among Brazilian populations were described [4], and the importance of nutritional deficiencies and inflammation was highlighted. However, the observed higher prevalence of diabetes in our study population warrants increased culturally contextualized public health interventions in Saudi Arabia. Al-Rafee (2020) also described the pattern of edentulism among the Saudi population and pointed out that the two main causes were untreated caries and periodontal diseases [1]. Our study supports these findings by showing the relation of tooth loss to other systemic health concerns, as well as promoting the concept of oral systemic health connection. Globally, Bhochhibhoya (2022) and Nascimento *et al.* (2016) have well defined the reciprocal association between tooth loss and systemic diseases that involve dietary limitations and inflammatory systems [2, 5]. Our results are in concordance with these observations, as well as emphasizing the demographical and cultural factors that play a role in Saudi Arabia's disease distribution.

Implications for public health

To summarize, the results of this study bear several policy implications for public health and clinical science. First, they emphasize that promoters and practitioners of preventive dental care have made vast contributions in decreasing the impact of attributable systemic illnesses. Control of edentulism and its consequent pathological findings: systematic dental check-ups, early intervention in periodontal lesions, and health promotion activities.

Second, the study brings into the spotlight the importance of adopting a holistic health-disease model that manages oral and general health at the same time. For example, cases such as diabetes and hypertension can be better managed if care is provided in synergy between dentists and physicians. Finally, the demonstrated demographic differences indicate that work should be done to increase the effectiveness of the interventions according to the characteristics of the target population. For instance, health education about oral health could be based on gender, because male patients have a higher prevalence of diabetes and asthmatic conditions. In a like manner, dietary counseling and management of hypertension could be considered as appropriate to focus more on female and non-Saudi participants.

Strengths and limitations

Perhaps the greatest strength of this study is the specificity of the population from which the data were collected, which directs the reader towards specific issues in healthcare in Saudi Arabia. Systemic disease and edentulism data are accurate because patient files from REU clinics are utilized in the study. However, this study has several limitations; the work is cross-sectional in nature, and thus, we cannot infer causality. Third, the size of the sample used in this study is reasonable but may not be large enough to be generalized to the Saudi population.

Future research

The direction for future research should be case-control studies in order to establish the causal relationship between edentulism and systemic diseases. Another possibility for the improvement of the general knowledge of the relations between socio-economic factors, healthcare accessibility, culture, and oral health would be the implementation of subsequent research regarding the above elements.

Conclusion

With regard to the relationship between edentulism and systemic diseases, this paper underlines the importance of the unity of oral and general body health. A higher frequency of partial edentulism than complete edentulism was observed, which extended the argument for timely intervention to limit the extent of edentulism. Epidemiological diseases, including diabetes, hypertension, and asthma, were highly correlated with various forms of edentulism, including gender and nationality. Men had a higher prevalence of diabetes and asthma, while women had a comparatively high prevalence of hypertension. Diabetes and cardiac disorders were higher among Saudi participants, while high blood pressure and kidney/liver diseases were higher among the non-Saudi participants. These results have implications for future healthcare and public health approaches, which are important to meet detailed demographic needs. Oral health related to preventive dentistry and implementation of oral health in systemic diseases will provide favorable outcomes. More longitudinal analyses should be made to compare the possible causal mechanisms and the efficiency of the combined model of health care.

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