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Original article

Association Between Complete Edentulism and Comorbidities in Libyan Adults Attending the Removable Prosthodontics Department at the Faculty of Dentistry, University of Benghazi, Libya

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Abstract
Various systemic diseases play an important role in selecting treatment options in dentistry. Almost most of the procedures done in the field of removable prosthodontics need good systemic health or a well-balanced systemic situation. The main objective of this retrospective, cross-sectional study is to investigate the prevalence of systemic disorders among Libyan completely edentulous patients aged 35 years and older attending the removable prosthodontic department at the Faculty of Dentistry, University of Benghazi, Libya. A total of 1317 completely edentulous patients' case sheets were reviewed, out of which 417 case sheets were chosen. Non-Libyan, healthy patients, patients with major mental retardation, and HIV positive patients were excluded. In our study, it was found that male participants were affected more when compared to females. Patients with diabetes mellitus account for 90.5%, 72.5% accounted for patients with hypertension, 38.5%, 31.5%, and 31.2% accounted for rheumatoid arthritis, cardiovascular problems, and liver diseases, respectively. Out of the included participants, 28% were suffering from cancer, 19.7% accounted for renal problems, and 16.7% accounted for rheumatoid fever; a minority of participants (6.3%) reported having epilepsy. The result of the current study, conducted in a representative sample of Libyan edentulous adults, suggests that an association exists between tooth loss and harmful systemic disorders.
Keywords. Completely Edentulous, Systemic Diseases, Tooth Loss, Oral Health.

Introduction

Complete edentulism is defined as the absence of all the permanent teeth. Tooth loss is the result of an interaction of several factors, and it varies by gender, age, education, socioeconomic status, race, and geographic region. [1] Tooth loss can be seen as a marker of oral health and other diseases in the body and, subsequently, an indicator of accelerated aging. [2] Previous observational studies show that missing teeth can be associated with many adverse health effects, including ischemic heart diseases [3], angina pectoris3, peripheral vascular diseases [4], cognitive impairment [5], stroke [5], heart failure [6] diabetes mellitus, and high blood pressure [7,8], cancer [9] and onset of disability and motility in old age [2]. According to the World Health Organization (WHO), completely edentulous individuals are classified as physically impaired, disabled, and handicapped [10,11]. Additionally, WHO's global oral health goals aim to increase the number of people aged 35–44 and 65–74 who maintain a functional dentition with at least 21 natural teeth [12]. A comorbidity refers to the presence of one or more additional disorders alongside the primary condition, such as complete edentulism. The interaction between the primary condition and any comorbidities can significantly influence the overall health of the individual [13].

The main objective of this study is to find out the prevalence of systemic diseases among completely edentulous patients attending the Removable Prosthodontic Department related to the Dental Faculty at Benghazi University.

Methods

Study design and data collection

The study was a retrospective, cross-sectional, longitudinal study. The data was collected from a removable prosthodontic department related to Dental Faculty-Benghazi University's completely edentulous patients' case sheets by reviewing a total of 1317 patients' records. Out of them, 417 case sheets were chosen, while 900 were executed because 493 of them were healthy, 343 had insufficient information within their history sheet, and 59 weren't Libyan. The collected data belongs to the period from May 2018 to December 2023.

Ethical consideration

The study was ethically approved by the Scientific Research Ethics Committee of the Dental Faculty, Benghazi University (Approval No: 0247).

Eligibility criteria

The inclusion criteria were Libyan fully edentulous cases that needed removable complete dentures of both genders aged 35 years and older. Non-Libyan, healthy patients, patients with major mental retardation, and HIV positive patients were excluded.

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Data analysis

The data was analyzed using Statistical Package for Social Science software version 20, which is given by IBM Corporation, Chicago. Descriptive statistics were recorded using frequency and percentages. Differences in proportions were assessed using the Chi-square test. All statistical analyses were performed at a *P*-value less than 0.05.

Results

The collected data were imported into Social Science software version 20, which is given by IBM Corporation for descriptive statistics. The total sample size was 417. Gender distribution showed that 132 patients (31.8%) were female, and 285 patients (68.2%) were male, which is found to be significantly higher (Chi-Square 56.137) (P 0.00001). Furthermore, the maximum number of edentulous patients among the selected sample was seen in the age group above 65 years, 175 patients (41.9%), while the least were seen in the age group 35-45 years. (Table 1).

Table 1. Frequency and distribution of gender and age groups of completely edentulous patients

Age group	Frequency(%)		Total Incidences(%)	Chi-square	*P*-value	Significances
	Males	Females				
	285(68.2)	132(31.8)	417(100)			
35-45	42(10)	7(1.7%)	49(11.7)			
45-55	52(12.6)	13(3.2)	65(15.8)	56.137*	<0.00	Significant
55-65	83(19.9)	45(10.7)	128(30.6)			
Above 65	108(25.8)	67(16.1)	175(41.9)			

** Significant, p < 0.05*

Table 2 & Figure 1 show that the majority of participants were diabetic, 377 (90.5%) patients out of whom 265 were males and 112 were females. The number and percentage of individuals with hypertension were 302 (72.5%) patients, out of which 205 were males and 97 were females. Out of the total number of individuals, 158 (38%), 131(31.5%), and 130 (31.2%) patients were suffering from rheumatoid arthritis (RA), cardiovascular diseases (CVS) problems and liver diseases, respectively. Moreover, 116 (28%) patients were suffering from cancer. Table 2 also presented a small percentage of individuals reported renal problems (19.7%) and rheumatoid fever (16.7%), and a minority of participants (6.3%) reported having epilepsy.

Table 2. Frequency and distribution of evaluated systemic disorders according to gender

Medical illness	Males (N)		Females (N)		Total (N%)	
	Yes	No	Yes	No	Yes	No
Under medical care	285	0	132	0	417(100)	0
Diabetes Mellitus	265	20	112	20	377(90.5)	40(9.5)
Hypertension	205	80	97	35	302(72.5)	115(27.5)
Cardiac problems	78	207	53	79	131(31.5)	286(68.5)
Rheumatoid arthritis (RA)	83	202	75	57	158(38)	259(62)
Liver diseases	73	212	57	75	130(31.2)	287(68.8)
Cancer	48	227	68	64	116(28)	301(72)
Kidney diseases / Renal problems	37	248	45	87	82(19.7)	335(80.3)
Rheumatic fever	55	230	15	117	70(16.7)	347(83.2)
Epilepsy	17	268	9	123	26(6.3)	391(93.7)
Total	285(68.2)		132(31.8)		417(100)	
Chi-square	8466.6139a					
P-value	<0.0001					
Statistic significance	Significant					

** Significant, p < 0.05*

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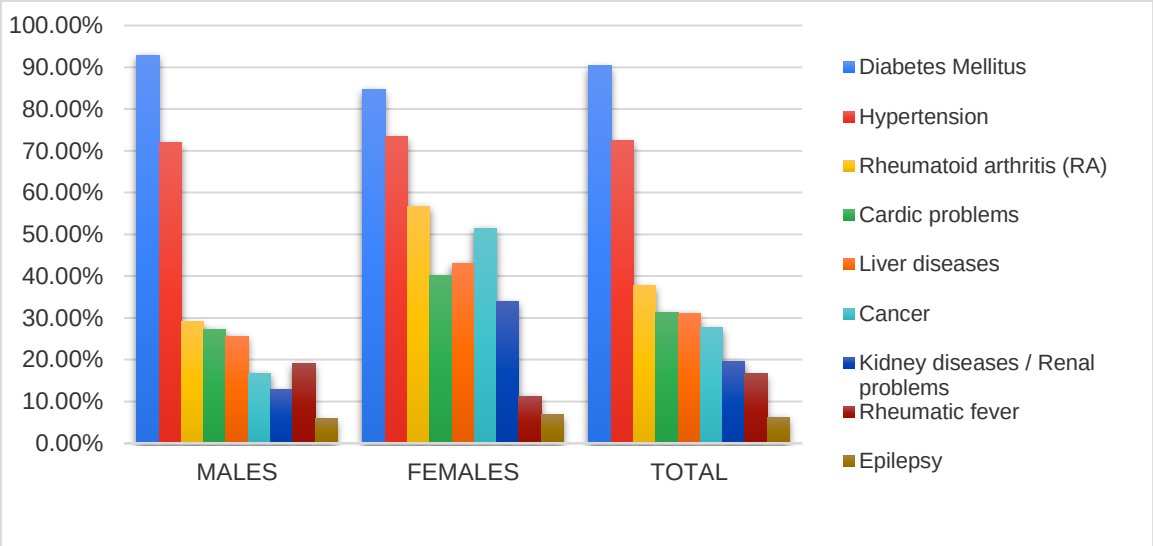

Figure 1. Frequency and distribution of evaluated systemic disorders according to gender

Discussion

Valuating patients through accurate diagnosis and developing appropriate treatment plans are crucial steps for the success of complete denture therapy. Many patients seeking complete dentures experience significant general health impairments. Various systemic diseases can affect the health of the hard and soft tissues that support the prosthesis, thereby influencing the treatment's success [14]. The relationship between loss of teeth and other systemic conditions is multifactorial (comorbid condition). Comorbidity refers to the presence of one or more additional diseases or disorders that occur alongside a primary condition—in this case, complete edentulism. These coexisting conditions can independently affect a patient's health and may influence the management and outcomes of the primary condition [13].

In the present study, it was found that about 37% did not have systemic diseases. Furthermore, male participants were significantly more influenced by systemic diseases compared to females (68.2% and 31.8%, respectively), which is in agreement with many previous studies [7,15]. This could be due to improper maintenance of oral hygiene, stress, and bad habits like smoking. It is also observed that a low percentage of young patients (11.7%) are completely edentulous, which is possibly due to the maintenance of oral hygiene. In our study, the highest percentage (90.5%) of participants had diabetes mellitus compared to other systemic diseases. Several problems associated with diabetes mellitus, which can include abscess formation, periodontal damage, and finally alveolar bone resorption, often make it difficult to adapt to new dentures [16].

The percentage of individuals with hypertension and CVS in this study was 72.5% and 31.5%, respectively. Tooth loss is linked to an increased risk of cardiovascular diseases through several mechanisms. Local chronic infection in the oral cavity, periodontal diseases, may lead to carotid artery plaque formation, endothelial dysfunction, and subsequent risk of hypertension [17-19]. A second reason is confounding variables such as diabetes mellitus or smoking, which may produce an association between tooth loss and vascular diseases [20,21]. A third pathway is the association between tooth loss, quality of diet, nutrient intake, and increased risk of vascular diseases and hypertension [22-24]. In our presented study, 38% of participants were suffering from RA, which is a systemic inflammatory disease affecting numerous joints in the body. In a previous study, it was reported that patients with RA had 2.27 times greater risk of being edentulous than those with remaining teeth [25]. Moreover, another study found that a statistically significant increase in the risk of incident RA among completely edentulous patients compared to those who had lost fewer than five teeth [26]. However, the relation between complete edentulism and RA has not been demonstrated to date [13].

In our study, 31.2% of participants were diagnosed with liver diseases, with the majority experiencing tooth loss due to periodontal issues. Research indicates that oral bacteria such as Porphyromonas gingivalis and Fusobacterium nucleatum are associated with liver disorders [27]. Similarly, liver dysfunction may activate the ongoing pathology within the oral cavity [28]. The results of recent studies indicated that having moderate to severe periodontitis increased the probability of developing liver fibrosis and the incidence of severe liver diseases, or a diagnosis of liver cancer [29,30]. Moreover, other studies reported increased prevalence of non-alcoholic fatty liver disease (NAFLD) and non-alcoholic steatohepatitis (NASH), which was accompanied by higher stages of periodontitis [31,32].

Tooth loss is considered to impact health-related quality of life and increase the risk of cancer in the oral cavity [33], esophagus [34], pancreas [35], stomach [36], lung, and gallbladder [37]. The percentage of

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individuals with cancer in our study was 28%. A meta-analysis of eleven case-control studies and one cohort study gives evidence of increased risk of head and neck cancer (HNC) by 89% among individuals who have >20 teeth lost, which suggests that tooth loss is a significant risk factor for HNC [38]. The causal mechanisms that might explain the relation between esophageal and gastric cancer and tooth loss are that tooth loss would cause individuals to swallow poorly chewed, large boluses that might irritate the esophagus. Recently, it has been postulated that poor oral hygiene and tooth loss overgrowth of bacteria and microorganisms on teeth, leading to transformation of nitrates into nitrites, which combine with amines to form carcinogenic nitrosamines, some of which a gastrointestinal organ-specific carcinogens. The produced nitrosamine, as well as microorganisms, are passed into the stomach and esophagus from the oral cavity during swallowing and drinking [39,40].

Chronic kidney disease (CKD) is a progressive condition characterized by functional or structural abnormalities of the kidney with or without a low rate of glomerular filtration [41]. Hemodialysis is the process of artificial filtration to remove the harmful substances accumulated as a result of CKD [42]. The most common oral problems in patients with CKD are a low salivary flow, xerostomia, candida infection, a higher prevalence rate of periodontal disease, and dental caries. Premature tooth loss and complete edentulism are also frequent in individuals with CKD [42]. According to a systematic review conducted in 2014, one out of every five individuals with CKD is completely edentulous [43]. The results of the present study are in agreement with previous studies conducted with CKD patients aged 32 to 86 years, where the prevalence of edentulism was 22% [43,44]. This finding could be related to a high level of psychological stress and a lack of time to perform proper dental care. Moreover, individuals undergoing dialysis visit a dentist in the presence of pain, and they prefer tooth extraction, which is considered to be less costly and more practical [44]. Another reason may be associated with the lower frequency of visits to the dentist among the CKD group of individuals, which is the refusal to provide dental treatment on the part of dentists, possibly due to the fear of systemic complications [45].

In our study, 16.7% of participants were diagnosed with rheumatic fever, a condition that has been associated with increased rates of dental issues such as rampant caries, gingivitis, and gum infections. These oral health problems may, in turn, exacerbate the severity of rheumatic fever. Maintaining good oral hygiene is essential for individuals with rheumatic fever to help manage their condition effectively [46,47].

In our study, 6.3% of participants were found to have epilepsy. Epileptic patients are often at a higher risk of tooth loss and may experience edentulism at an earlier age compared to the general population [48,49]. This can be attributed to several factors. First, epileptic seizures can lead to dental and jaw injuries [50]. Second, the use of anti-epileptic drugs is associated with gingival hyperplasia and periodontal issues [51]. Additionally, these medications are known to exacerbate xerostomia, increasing the risk of dental caries [51,52]. Lastly, dentists may tend to adopt a more conservative approach to treating epileptic patients, leading to more frequent tooth extractions compared to non-epileptic individuals.

Conclusion

The result of the current study, conducted in a representative sample of Libyan edentulous adults, suggests that an association exists between tooth loss and harmful systemic disorders. It is crucial to assess the extent to which tooth loss impacts systemic disorders, as this will help guide clinical policy-making in public health and provide appropriate recommendations for oral health care. Further research is needed to confirm these findings and explore more precise mechanisms behind the association with tooth loss.

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