Prevalence of Edentulism in Diabetic and Non – Diabetic Patients in Central India

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1. INTRODUCTION

Oral diseases are viewed as a significant public health concern because of their widespread occurrence and the large number of people they affect. These conditions also have a substantial economic burden on families and healthcare systems. [1,2]. Epidemiological studies have consistently shown that poor oral health is a major health challenge around the world; it has been poorly addressed in general. Globally, there were 3.5 billion cases of oral conditions: 2.3 billion had untreated caries in permanent teeth, 796 million had severe periodontitis, 532 millionhad untreated caries in primary teeth, 267 million had complete tooth loss, and 139 million had other oral conditions in 2017 [3].

There is conflicting evidence about trends and mechanisms leading to increasing and decreasing edentulism rates. Edentulism is generally declining in developed countries, but generally increasing in developing countries. Because of aging and the increasing number of older adults reaching old age, edentulism continues to grow [4]. A recent meta-analysis focused on 45-year-olds and older reported a range of prevalence figures between 1.1% and 70%, with a combined 22.0% prevalence worldwide [5].

According to a national survey in India, approximately 10% of adults between 45 and 54 years old, 25% between 65 and 74 years old, and 30% 65yrears and older, are edentulous [6]. Documenting trends in tooth loss may help in planning dental care services and workforce needs [7]. Edentulism connotes a disability condition that reflects a personal history of severe oral disease and access to dental services throughout life [7,8]; such history is primarily driven by caries and periodontitis [9–11]. Tooth loss and edentulism negatively impact people's nutritional intake. People with more severe tooth loss may consume significantly fewer basic nutrients from fruits and vegetables, dietary fiber, and protein, compared to those without severe tooth loss [8,12–14]. Evidence from observational studies showed that tooth loss and edentulism may be associated with multiple adverse health effects [15]

The most prevalent chronic diseases share some modifiable risk factors with oral diseases and, therefore, may occur in the same patients [2,16–19]. In addition, people with chronic diseases are more likely to have untreated dental disease and periodontitis, which may lead to tooth loss [2,20–24].

Oral diseases and diabetes mellitus are an example of such overlap [25–28]. There are three types of diabetes: type 1, type 2, and gestational [29]. T1DM may occur at any age but tends

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to strike earlier in life. DM is more common in adults and accounts for 90% of all diabetes cases. DM is characterized by elevated blood glucose resulting from insufficient insulin production, inadequate effect of existing insulin, or both [29,30]. India is a country with some of the highest diabetes prevalence rates in the world [31]; survey data have shown their continuous increase [32]. It is estimated that by 2030 the prevalence will reach 12–18% and, by 2050, 14–22% [33]. Under such a scenario, it would be reasonable to expect that edentulism would increase accordingly; that situation calls for greater attention by the health care and the health promotion systems to address potential additional impacts.

The bidirectional link between diabetes and periodontitis has been well established: through various mechanisms, diabetes promotes the destruction of periodontal tissues and periodontal disease negatively affects glycemic control [34]. The prevalence of edentulism in patients with DM is associated with oral problems such as salivary gland hypofunction, periodontitis, root caries, and pulpal involvement after severe carious lesions, as well as being associated with general health factors such as depression, cognitive impairment, and pain [35,36]. With DM increasing worldwide, it is reasonable to expect an increase in dental care needs [36]. Because the association between edentulism and DM has been reported to hold diverse directions and/or strengths [2,37,38], it is plausible that such association is context-specific [35]. Therefore, in order to expand the knowledge base, the present study was undertaken to determine and compare the prevalence of edentulism in diabetic and non – diabetic patients in central India.

2. METHODOLOGY

Patients with completely edentulous maxillary and mandibular arch who reported to the Department of Prosthodontics and Crown & Bridge, Index Institute of Dental Sciences, Indore (M.P) were included in this study. A written informed consent was taken from the patients. Detailed case history was recorded. Glucometer was used for checking the random blood sugar level and patients were divided into two groups.

Group I – diabetic patients (random blood sugar level above 140mg/dl)

Group II – non diabetic patients (RBS less than 140mg/dl).

Patients with psychological disorder and those not willing to undertake test for RBS were excluded from the study.

Statistical Analysis

A univariate analysis was performed: measures of central tendency and dispersion are reported for the continuous variables and frequencies and percentages for the categorical variables.

A binary logistic regression model was used for the bivariate and multivariate analyses. The strength of the association between the dependent variable (edentulism) and the independent variables was expressed as odds ratio (OR) with 95% confidence intervals (95% CI). The variance inflation factor (VIF) test was performed to analyze and, if necessary, avoid multicollcinearity between the independent variables. For those variables in the bivariate analysis showed a value of $p < 0.25$ were taken into account.

3. RESULTS

A total of 338 individuals were included in the present study. Their characteristics are presented in Table 1. The mean age was 53.9 ± 10.8. A previous diagnosis of DM was found in **85.7%** (95% CI = 12.7–15.8) of records. Most were women (64.4%). The prevalence of edentulism in diabetic patients was 8.4% (95% CI = 7.1–9.6). The prevalence of edentulism in patients without diabetic was 1.7%.

Table 1. Descriptive analysis of the study.

VARIABLE	MEAN±SD
AGE	53.91±10.84
	n(%)
MALE	35%
FEMALE	65%
PATIENTS WITH DM	85.7%
PATIENTS WITHOUT DM	14.3%

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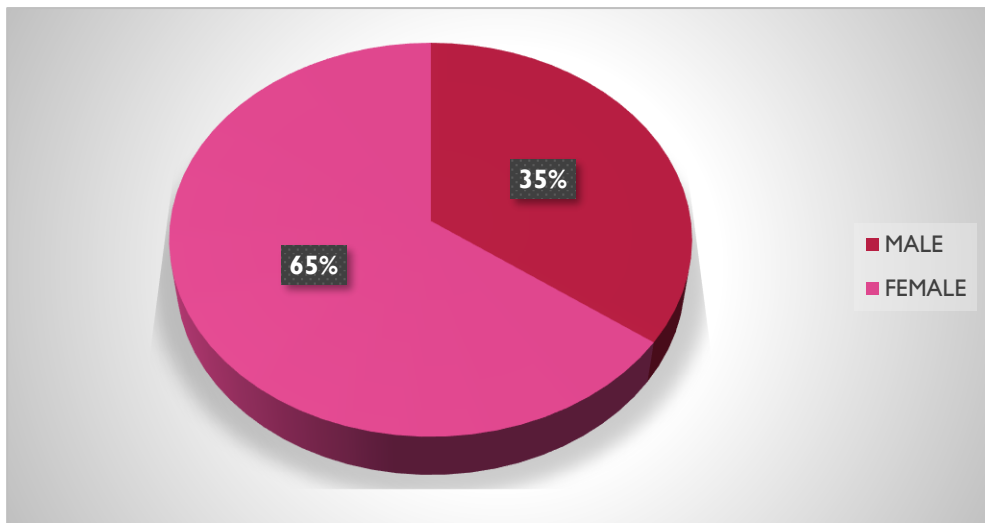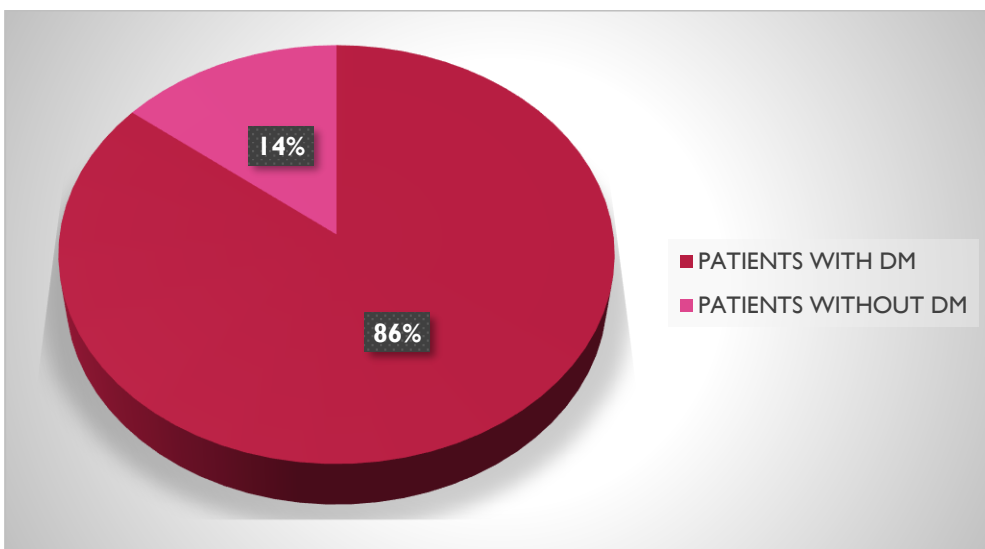
Fig. -1

Fig. -2

Table 2. Multivariate logistic regression model between edentulism and the independent variables

VARIABLE	OR(95%CI)	*p*-Value
PATIENTS WITH DM	1.61(1.03-2.50)	*0.034*
PATIENTS WITHOUT DM	1*	

Hosmer-Lemeshow chi2 (8) = 13.06, $p = 0.1097$. Note: Estimates adjusted for the variables contained in the table, in addition to sex, marital status, and reason for consultation.

The multivariate binary logistic regression model is presented in Table 2; it was observed that a previous diagnosis of DM increased the chance of being edentulous by 61% (95% CI = 1.03–2.50). For each year's increase in age, the likelihood of being edentulous increased by 12% (95% CI = 10–14%).

4. DISCUSSION

The aim of the present study was to determine and compare the prevalence of edentulism between two groups of adults, one

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with a diagnosis of DM and the other without such a diagnosis. The results showed that in the group with DM the prevalence of edentulism was higher than in the group without DM. In a previous study conducted in 20 states of USA [37], a 10.2% prevalence of edentulism was observed in individuals aged 35 years and older, with variations among states ranging from 5.0% to 16.7%. Although the prevalence of edentulism has decreased in several countries, it is estimated that 6.3% (N = 3,437,816) of the population aged 18 years and older are edentulous [6]. In a multi-country study, the overall prevalence of edentulism was 11.7% [38], with India, Mexico, and Russia having the highest prevalence (16.3% to 21.7%)and with China, Ghana, and South Africa (3.0% to 9.0%) having the lowest. In individuals older than 30 years in Iran, prevalence between 3.0% and 78.0% has been reported [43]. These wide ranges can be explained by multiple factors, such as the characteristics of each country studied, the distribution of socioeconomic groups within these countries, the response of the health systems to the oral health needs of the population, the actual access to relevant health services, the age groups included, or the methodology used to collect data (clinical or self-reported). However, it is important to emphasize that quantifying edentulism prevalence in adults is a valuable indicator of treatment needs felt, normative, and met. These evaluations help estimate the proportion of the population that is expected to use dental services in the future, thus providing essential information for dental service planning and human resource training.

Oral diseases such as caries [44–48] and periodontal diseases [49–53] are considered public health problems in our country due to their high prevalence and incidence, as well as the ensuing high treatment needs. India is one of the countries with the highest prevalence and incidence of DM [31,32]. This combination does not foretell the best outcomes for oral health, and it is likely be associated with a high edentulism experience [2,20,21,24]. In the present study, DM was a risk factor for edentulism as reported in other studies [8,9,21,34,36]. In recent years, the connection between oral health and systemic health has been widely recognized by the dental and medical professions. Studies have been conducted revealing that oral health affects systemic health and vice versa, subjected to the influence of inflammatory mechanisms [8], with molecular and immunological basis [22]. These diseases/conditions share common risk factors, so comprehensive promotion of general health and oral health focused on addressing unhealthy behaviors has the potential to reduce both dental disease rates, as well as mortality rates attributed to cardiovascular disease, cancer, and DM [19].

The present study confirmed that older age was associated with edentulism, as previously reported [8,20,21,36]. Tooth loss is considered an accurate marker of the population's oral health and is therefore monitored in many countries. Edentulism reflects not only dental disease but also the attitudes of patients and dentists, the dentist-patient relationship, the availability and accessibility of dental services, and the prevailing philosophies of dental care [7]. Self-care, as behaviors that each individual must deliberately apply in order to maintain good health, may be an ideal component of the approach to ameliorate the impact of risk factors (modifiable and non-modifiable) [54].

The present study has certain limitations. The first is the cross-sectional design and its temporal ambiguity; by measuring cause and effect at the same time, causal relationships beyond statistical associations could not be established.

The future aspects of diabetes mellitus in relation to edentulism (the condition of being toothless to at least some degree) are quite significant, as both conditions have been found to influence each other and overall health. The goal would be to improve quality of life and cognitive function, reduce edentulism, and prevent the progression of conditions. It is important for individuals, especially those with diabetes, to maintain good oral hygiene and seek regular dental care to potentially mitigate these risks.

5. CONCLUSIONS

In this sample of adults aged 40 years and older, edentulism prevalence was 8.4%. A higher prevalence was observed among individuals with DM. Age was also associated with edentulism. This information is useful for dental care providers and health policymakers to improve approaches to preventive care, as well as to be able to characterize more accurately the care needs of the adult and older adult population

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