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REVIEW ARTICLE

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Prevalence of diabetes mellitus among dental patients undergoing extractions - An institutional study

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ABSTRACT

Diabetes mellitus is a group of metabolic diseases leading to high levels of blood glucose due to insufficient insulin in the body. Uncontrolled diabetes mellitus may pose a medical emergency during dental procedures and modifications in the treatment plan may be required during dental and oral surgical procedures according to the patient's diabetic status. The aim of this study was to evaluate the prevalence of diabetes mellitus among patients undergoing dental extractions at Saveetha Dental college and hospitals. In this retrospective cross-sectional study, digital case records of all patients who underwent extractions in Saveetha dental college and hospital from June 2019 to March 2020 were reviewed. Demographic details of patients and diabetes mellitus status were recorded from digital case records. Retrieved data was analysed using IBM SPSS Software Version 23.0. Descriptive statistics and tests of association of categorical variables by Chi square tests were done and results were obtained. Among 6682 patients who underwent dental extractions, 906 patients (13%) had diabetes mellitus. The prevalence of diabetes mellitus among extraction patients was more in the age group of 39-48 years (39.2%). The proportion of extraction patients with diabetes mellitus was more in males (57.1%) than females (42.9%). The association between age and diabetes mellitus were statistically significant ($p<0.001$). Association between the gender and diabetes mellitus were statistically not significant ($p=0.064$). Within the limits of the study, the prevalence rate of diabetes mellitus among dental patients undergoing extractions was 13%. Diabetes mellitus was predominantly seen in the age group of 39-48 years with male predilection.

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INTRODUCTION

Diabetes mellitus (DM) presently, has become a serious health problem worldwide, affecting 246 million people all around the world. The World Health Organization (WHO) estimated that approximately 333 million people will suffer from DM by 2025. [1],[2],[3] Diabetes mellitus is a metabolic disorder with alterations in carbohydrates, proteins and lipid metabolism leading to chronic hyperglycemia [4],[5],[6] Patients with DM are also presented with impaired functions of polymorphonuclear leukocytes, impaired bacterial activity and alteration in the function of T-lymphocytes. [7],[8]

Diabetes mellitus gives rise to many soft tissue abnormalities in the oral cavity. The common oral manifestations are gingivitis and periodontitis, [9] salivary and taste dysfunction, xerostomia [10] [11]. The chronic complications of diabetes mellitus are neuropathy, nephropathy, cardiovascular diseases, periodontal disease, sialadenosis, burning mouth syndrome, osteoporosis and temporomandibular joint dysfunction. Some patients also report fungal and bacterial infections [12]. Oral mucosal lesions such as stomatitis, geographic tongue, fissured tongue, a traumatic ulcer, angular cheilitis, lichen planus, and lichenoid reaction are also present in diabetes mellitus patients [13],[14],[15],[16].

DM is classified into Type 1 DM (Insulin dependent), Type 2 (Non-Insulin dependent), Gestational DM, genetic associated DM or drug associated DM. [17],[18],[19] A poor glycemic control leads to elevated levels of gingival crevicular fluid interleukin-1β thereby leading to severe periodontal disease especially in patients with uncontrolled type 1 DM.

Tooth should be restored and extraction of teeth should be postponed in poorly controlled DM patients as it may result in postoperative complications like delayed wound healing. Extraction is done only for teeth with a very poor prognosis. Loss of several teeth results in deterioration of oral health related quality of life.[20] Extraction of the permanent teeth could be because of several reasons like dental caries, periodontal disease, impacted teeth, failed dental treatment, orthodontic and prosthodontic purposes. [21],[22],[23]

The consequences of patients with DM include high risk of infections, increased chances of tooth mobility and loss of bone [24],[25],[26]. A hyperglycaemic status synthesizes advanced glycation end-products (AGE) which stimulates macrophages to produce high levels of interleukin (IL)-1β, IL-6, and tumor necrosis factor-α. These products are risk factors for developing periodontal disease. Delayed socket healing due to insufficient insulin which affects the transforming growth (TGF- Beta), vascular endothelial growth factor (VEGF), bone morphogenic protein (BMP) and insulin like growth factor (IGF). [27],[28] Also, for the patients with DM who undergo extraction, it is important to follow certain principles before the treatment. [29],[30] Previously we have focused our research on various invitro and invivo studies. [31–50] We have currently shifted our focus to this retrospective analysis. Thus, the aim of the study was to evaluate the prevalence of diabetes mellitus in patients undergoing dental extractions and to create the awareness of the population on the maintenance of proper oral hygiene.

MATERIALS AND METHODS

Study design and study setting

The department of oral and maxillofacial surgery, Saveetha dental college and hospital, Saveetha university, Chennai, conducted a retrospective cross-sectional study to evaluate the prevalence of Diabetes mellitus in patients undergoing dental extractions from June 2019 to March 2020. The study was initiated after approval from the institutional review board - SDC/SIHEC/2020/DIASDATA/0619-0320.

Study population and sampling

After assessment in the university patient data registry, case records of 6682 patients who underwent dental extractions were included in the study and evaluated. Inclusion criteria for the study were patients who underwent dental extractions and were at least 18 years of age, with a history of Diabetes mellitus. The exclusion criteria were missing or incomplete data. Cross verification of data for errors was done with the help of an external examiner.

Data collection

A single calibrated examiner evaluated the digital case records of the patients who underwent dental extractions from June 2019 to March 2020. Demographic details like age, gender and the patients' Diabetes mellitus status were also recorded. All consecutive case records of patients with DM were included in the study and their data retrieved.

Statistical Analysis

The collected data was validated, tabulated and analysed with Statistical Package for Social Sciences for Windows, version 23.0 (SPSS Inc., Chicago, IL, USA) and results were obtained. Categorical variables were expressed in frequency and percentage; and continuous variables in mean and standard deviation. The chi-square test was used to test associations between categorical variables. P value < 0.05 was considered statistically significant.

RESULTS AND DISCUSSION

In our study, among 6682 patients who underwent dental extractions, 906 patients (13%) had diabetes mellitus. The prevalence of diabetes mellitus among extraction patients was more in the age group of 39-48 years (39.2%) followed by 59-68 years (29.3%), 69-78 years (9.7%), 29-38 years (8.0%), 49-58 years (7.7%), 79-88 years (5.8%), 18-28 (2%) and 89-98 (1%) [Figure 1]. In comparison, this association between age and diabetes mellitus was statistically significant. The prevalence of diabetes mellitus was more among the age group of 39-48yrs and 59-68yrs and the results were statistically significant. Pearson's Chi square value - 912.164, $p<0.001$ (<0.05). [Figure 2]. The prevalence of diabetes mellitus among extraction patients was found to be more in males (57.1%) compared to females (42.9%) [Figure 3]. However, comparing the association between gender and diabetes mellitus, the results were statistically not significant. Pearson's Chi-square value - 5.335; $p=0.064$ (>0.05).[Figure 4].

In our study the prevalence of DM was more in 39-48 years of age group. There was a statistically significant association present between age and diabetes mellitus. It was also seen that DM was more prevalent in males than in females. However, there was no statistically significant association seen between gender and diabetes mellitus. In our study the prevalence rate of diabetes mellitus in patients undergoing dental extraction was found to be 13%.

Studies by Shamishigaran et. al, [51] and Ki.M et.al [52], reported similar findings that the most common age group to be diagnosed with diabetes mellitus was less than 45 years old. They also proved that there was an association between the age of the patients and DM. But, the studies reported by Ko HH et. al, [53] reported that the most common age group to be diagnosed with DM were greater than 55 years. This finding is because at an older age, they tend to ignore the symptoms of DM such as increased perspiration, xerostomia, polyuria and polyphagia. However, some older age groups did have a better glycemic control than adults aged between 35-45 years.

Studies reported by Siddiqui et.al, [54] and Kautzy et.al [55], reported results similar to our study which showed that DM was more prevalent in males than female subjects. This could be due to sex hormones, which have impact on metabolism, vascular function, inflammatory response and body composition. But, the studies reported by Manicardi et.al [56] showed that there was no gender prevalence among the patients with diabetes mellitus. In another study, females less than 50 years old had a higher prevalence than males in the corresponding age range, 34.1% and 25.1%, respectively [57]

According to our study, it was reported that 13% of the patients undergoing dental extractions were diagnosed with diabetes mellitus. Similarly, the study reported by Pouya Saeedi et. al [58] showed that 9.3% of the population had diabetes mellitus and it increased every year.

A proper medical history is mandatory before any dental extraction to rule out systemic conditions like diabetes mellitus, hypertension etc. In a diabetic patient, drug history and their recent blood glucose levels must be evaluated. Dental extractions can be safely performed in patients with well controlled diabetes and precautions must be taken to prevent any hypoglycemic event. In patients with poorly controlled diabetes, prophylactic antibiotic therapy is recommended as they are susceptible to infection. Dental extractions are scheduled in the morning after the patient has taken breakfast and morning medications since the endogenous cortisol levels are higher during this period. Procedures performed during lunch or later can lead to a hypoglycemic event and interfere with eating [59].

DM is predominantly an inflammation mediated disease. A nonsequential release of pro- and anti-inflammatory cytokines, resulting in an imbalance that leads to impaired tissue repair and weakened cellular and humoral immune defense mechanisms occurs in both Type 1 and 2 diabetes. In diabetic foot ulcers there is a decrease in immune cell infiltration leading to alterations in growth factor expression. [60] [61] The limitations of the study included less sample size and geographical limitation, which were to be eliminated in further studies. Thus multicenter study with large sample size should be conducted in the future.

CONCLUSION

Within the limits of the study, the prevalence rate of diabetes mellitus among dental patients undergoing extractions was 13%. Diabetes mellitus was predominantly seen in the age group of 39-48 years with male predilection. Proper patient preparation and the treatment planning for diabetes mellitus patients undergoing dental extractions is important to prevent untoward complications during and after the procedure.

AUTHORS CONTRIBUTIONS

The first author (Palak Mayur Shah) performed the analysis, and interpretation and wrote the manuscript. The second author (Dr. Santhosh Kumar) contributed to conception, data design, analysis, interpretation and critically revised the manuscript. The third author (Dr. Manjari Chaudhary) participated in the study and revised the manuscript. All the three authors have discussed the results and contributed to the final manuscript.

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CONFLICT OF INTEREST

No conflict of interest.

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ETHICAL CLEARANCE

It is taken from "Saveetha Institute Human Ethical Committee" (Ethical Approval Number-SDC/SIHEC/2020/DIASDATA/0619-0320)

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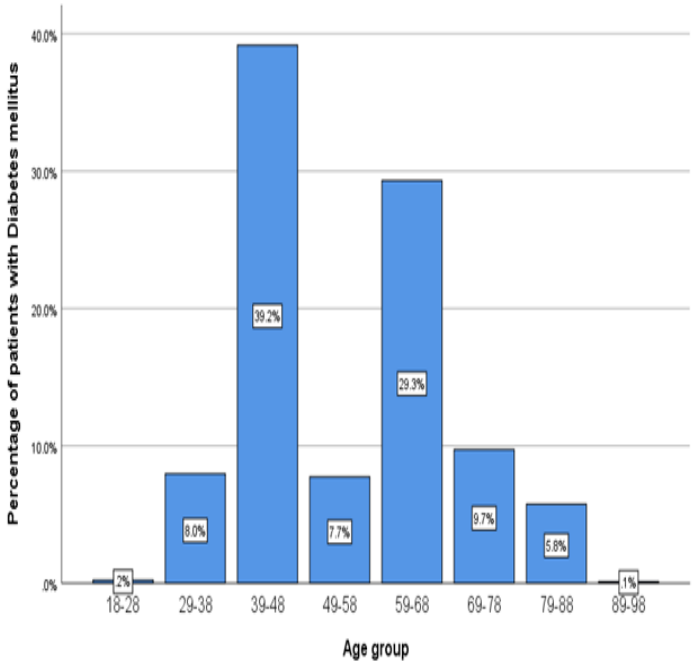

Figure 1: Bar chart depicting age wise distribution of diabetes mellitus among extraction patients with a higher proportion of diabetes mellitus among the age group of 39-48 yrs (39.2%). X-axis represents the age category of patients and Y-axis represents the percentage of extraction patients with diabetes mellitus.

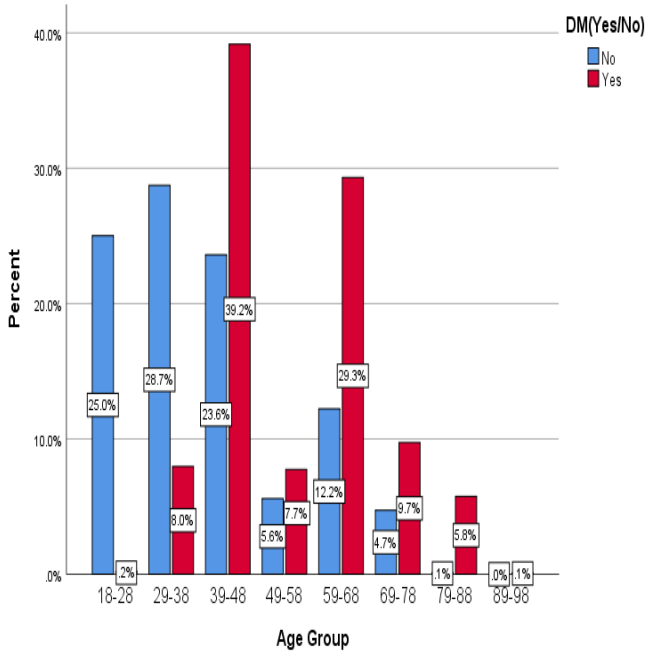

Figure 2: Bar chart depicting association between age and diabetes mellitus. Blue colour denotes patients without Diabetes mellitus and red colour denotes patients with Diabetes mellitus. X-axis represents the age category and the Y-axis represents the percentage of extraction patients with and without diabetes mellitus. The prevalence of diabetes mellitus was more among the age group of 39-48yrs and 59-68yrs and the results were statistically significant. Pearson's Chi square value - 912.164, p<0.001 (<0.05).

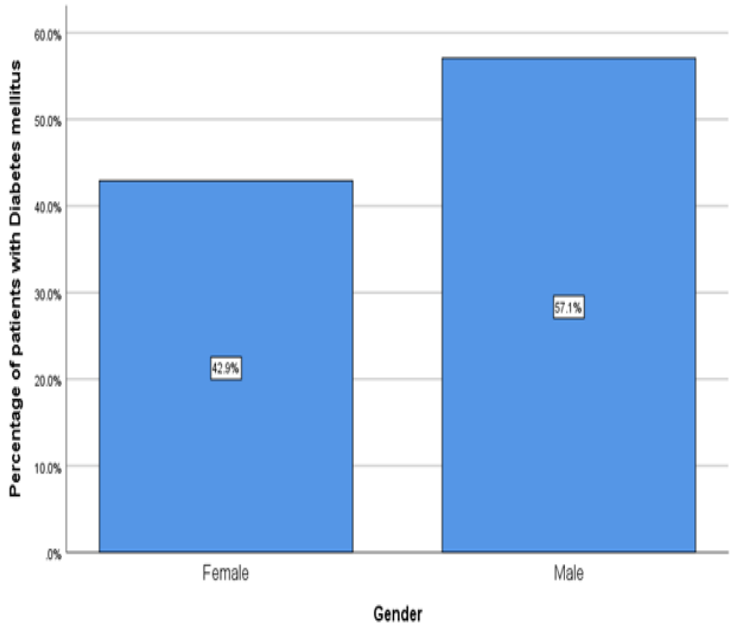

Figure 3: Bar chart depicting an gender distribution of diabetes mellitus among extraction patients with a higher proportion of males (57.1%) affected by diabetes mellitus compared to females (42.9%). X-axis represents gender of the patients and Y-axis represents the percentage of extraction patients with diabetes mellitus.

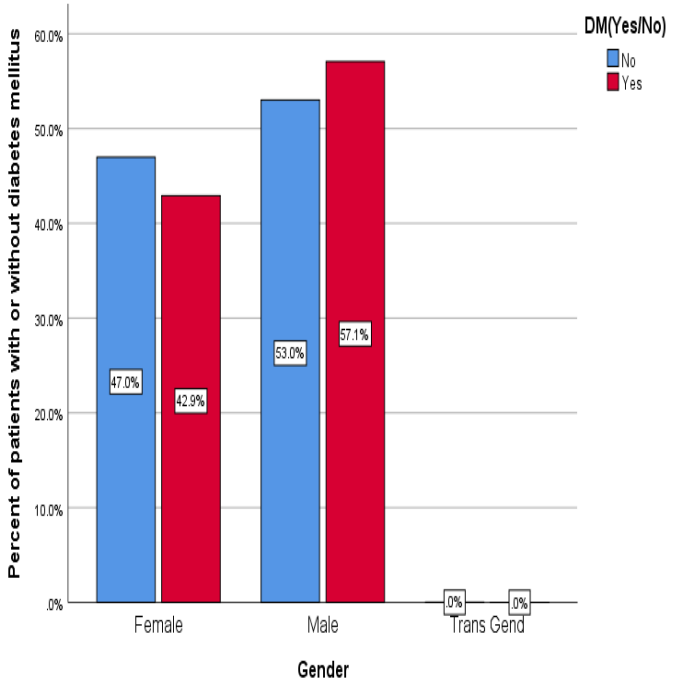

Figure 4: Bar chart depicting association between gender and diabetes mellitus. Blue colour denotes patients without Diabetes mellitus and red colour denotes patients with Diabetes mellitus. X-axis represents gender of the patient and the Y-axis represents percentage of extraction patients with and without diabetes mellitus. The prevalence of diabetes mellitus among extraction patients was found to be slightly more in males compared to females but the results were statistically not significant. Pearson's Chi-square value - 5.335 p=0.064 (>0.05).