Prevalence of dental caries in patients with type II diabetes mellitus

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ABSTRACT

Diabetes mellitus, a common disease of the 20th century, has been linked with a higher risk of incidence of caries, gingivitis and periodontal disease. The aim of the study was to evaluate the prevalence of dental caries in patients with type II diabetes mellitus and to compare them to those recorded in a control group with no systemic illnesses. Eighty-six thousand patient records were reviewed between June 2019 to March 2020. A total of 200 diabetic patients and 200 control group patients (without any systemic illness) with age group between 30-60 years were included in the study. Cross verification of data was done using RBS values and the patient's medical history. The collected data were tabulated using Microsoft Excel and analysed using SPSS. Incomplete data were excluded from the study. Statistical analysis was done using a chi-square test. In our study, we observed that diabetic individuals had a higher number of caries than control groups. (p<0.05) Individuals above 50 years of age had a higher number of active caries compared to other groups. (p>0.05) The males affected were higher in number than females. (p>0.05) Most individuals with active caries fell in the RBS range of 200-250 mg/dl. Within the limits of the study, diabetic patients showed an increased number of active caries when compared to the control group. There was no significant association between age, gender and RBS values.

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INTRODUCTION

Diabetes ranks fifth as the leading cause of death in the 65 to 74-year-old population, and the incidence of diabetes mellitus rises with age. The prevalence rate of diabetes mellitus in the 65 years or older-aged population is 88.2 per 1000 (Adams and Benson, 1989). In the present-day, diabetes mellitus is a global health challenge. India ranks second with around 66.8 million diabetics in 2014 after China, which has the largest number of diabetics in the world, with about 96.2 million being affected. The International Diabetes Federation reports that more than 387 million people worldwide currently suffer from diabetes and is expected to rise to 592

million by the year 2035 (Fernandes, 2016). An essential element of general health and overall quality of life is oral health (Subashri and Maheshwari, 2016). Pain is an unpleasant subjective experience having implications on both the physical and mental well-being (Chaitanya, 2018). Neuropathic pain is common with predisposing conditions such as diabetes, Guillain-Barre syndrome, cancer, carpal tunnel syndrome, sciatica, multiple sclerosis, kidney disorders, chronic alcoholism, HIV, etc. (Subha and Arvind, 2019). Various anomalies affecting the hard tissues, including the teeth, are often encountered in regular dental practice (Patil, 2018). Specific mechanisms exist in the periodontal region from preventing the mineralization of the periodontal ligament, and the cells of periodontal ligament produce factors that inhibit the resorption of mineralized tissue and control the formation of bone and cementum (Choudhury, 2015). Some studies showed that Uncontrolled type II diabetes was associated with a pronounced increase in the development of dental caries prior to the development of insulin. The occurrence of caries has possibly been reduced by insulin therapy and by the restriction of sugar intake. In rare instances, it has been found that therapeutics not only help in curing diseases but sometimes therapy for a particular disease itself could induce a new disease. (Muthukrishnan et al., 2016).

Dental caries is a multifactorial disease attributed to many factors. For most developed countries, it remains a significant public health issue affecting 60–90 percent children and most of the adults. For diabetic patients, it has been found to be more prevalent and more severe than in healthy individuals (Kuo et al., 2008). Also, Saliva plays the role of various protective mechanisms. These include salivary pH level, calcium, fluoride, and phosphate with an optimum flow rate. Salivary diagnostics is least invasive, although there is a technical difficulty in storing and handling saliva (Venugopal and Maheswari, 2016; Maheswari, 2018). The organic acid formed in the dental plaque is believed to be a predisposing factor for caries, but this is not completely acceptable because it is a complex combined effect of low pH, calcium, fluoride and phosphate that results in the dissolution of minerals in the teeth. (Misra, 2015; Muthukrishnan and Kumar, 2017) The continuous increase of fluoride levels at low concentration in plaque fluid and saliva is important for caries control (Hicks and Flaitz, 2000; Rohini and Kumar, 2017). Poor sugar level control of diabetes has been associated with mouth-dryness due to salivary dysfunction, which predisposes to dental caries. It has been reported that properly-controlled diabetics had shown better results in decayed, missed, and filled teeth (DMFT) index, rate of salivary flow, and pH levels than those with poor control diabetic patients (Jawed, 2011). The high content of flavouring agents and sweetening agents in tobacco-containing products also contribute to tooth decay (Warnakulasuriya and Muthukrishnan, 2018). Excellent oral care should be emphasized, which includes brushing the teeth twice daily, flossing on a daily basis, scaling every 3–6 months (Dharman and Muthukrishnan, 2016). If dental caries progresses from a superficial lesion to a deep lesion, pain starts developing. This could lead to an unpleasant state for the patient. The total amount spent on pain management per annum was greater than the amount spent on heart diseases, cancer, and diabetes (Chaitanya, 2017).

The aim of the study was to evaluate the prevalence of dental caries in patients with type II diabetes mellitus and to compare them to those recorded in a control group with no systemic illnesses.

MATERIALS AND METHODS

This is a university hospital-based retrospective, cross-sectional study was conducted in the private dental institution, Chennai with approval from the Institutional Review Board. Data collected was reliable, and with evidence, during the period from June 2019 to March 2020, the case record of 86000 patients was reviewed and a total of 200 diabetic patients and 200 control group patients (without any systemic illness) between the age group of 30-60 years were included in the study. Cross verification of data was done using RBS values and patient history. Data were reviewed by an external reviewer. To minimize sampling bias, all the available data were included in the study.

A customized examination form was used to collect the data, and a unique table for data collection was prepared. The data collected were classified according to age, gender, number of caries affected teeth and the RBS levels. Patients in the age group of 30-60 years with type II diabetes mellitus with available RBS values were included in the office. The patients with active caries and other systemic diseases were eliminated from the study.

Data collected included name, age, gender, systemic illness, number of active dental caries and RBS values. The collected data were tabulated using Microsoft Excel and analysed using SPSS. Incomplete data were excluded from the study. Statistical analysis was done using a chi-square test.

RESULTS AND DISCUSSION

In this study, we observed that diabetic individuals had a higher number of caries than control groups
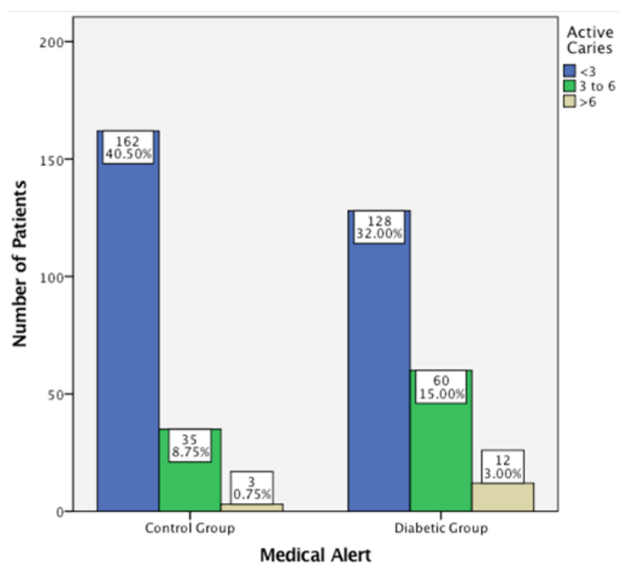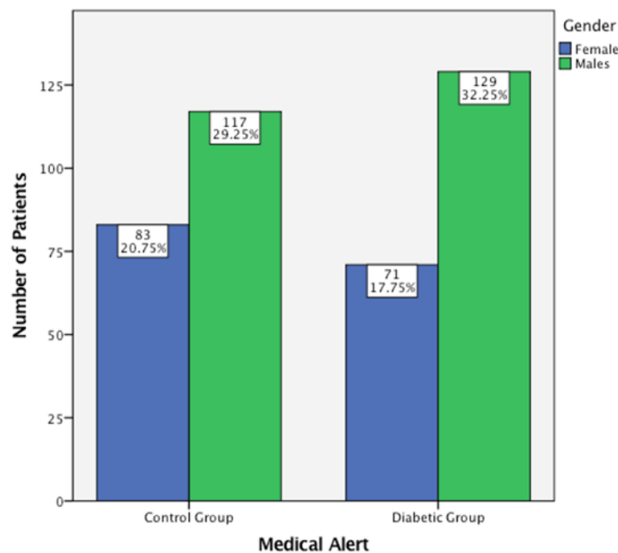

Graph 1: Bar graph showing the association between the number of active caries in the control group and the diabetic group

($p<0.05$ - statistically significant) (Graph 1). Pearson's Chi-square value =32.896, df = 10, p value 0.00 (<0.05).

Individuals above 50 years of age had a higher number of active caries compared to other groups. ($p>0.05$ - statistically not significant) There were a higher number of affected males than females ($p>0.05$ - statistically not significant) (Graph 2). Pearson's Chi-square value = 1.520, df = 1, p value 0.218 (>0.05).

Most individuals fell in the RBS range of below 300 mg/dl. (Graph 3) 35% of individuals in the diabetic group had three or more caries, whereas only 20% of individuals in the control group had three or more caries. 55% of diabetic individuals had RBS values of less than 300 mg/dl. Pearson's Chi-square value =65.886, df = 10, p value 0.617 (>0.05).

Over the last two decades, a paradigm change in health care education and its research has taken place with a change in time and process-based educational frameworks to a skill-based system. Diabetes mellitus is a chronic metabolic disease of great prevalence with multiple systemic and oral manifestations. Dental caries, salivary dysfunction, oral mucosal and other oral infections, taste and neurosensory disorder, gingivitis, periodontitis, etc. This study evaluates the prevalence of dental caries in patients with type II diabetes mellitus.

Graph 2: Bar graph showing an association between gender and presence or absence of diabetes
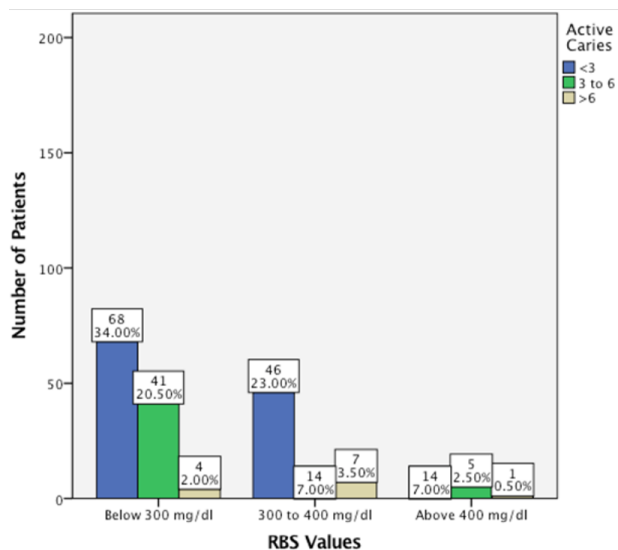
Graph 3: Bar graph showing the association between RBS levels and number of active caries

In our study, the number of active caries in the control group was lesser than in the diabetic group. Higher number of individuals with no dental caries was seen in the control group. In the diabetic group, 35% of the individuals had three or more active caries, and 16% of the individuals had five or more caries. In contrast, in the control group, only 20% of the individuals had three or more caries, and only 6% had five or more caries. The age range between 50-60 years reported with the highest incidence of dental caries in type II diabetes mellitus patients. Males reported with a higher incidence of dental caries.

With regards to RBS values, 55% of the individuals

had RBS values of 300 mg/dl or lesser. Only 10% of the individuals had RBS values of 400 mg/dl or above, but no correlation was found between RBS values and number of active caries.

Previous studies on diabetes mellitus and dental caries show varying results. (Twetman *et al.*, 1990) reported higher mean value levels of HbA1C among subjects with dental caries which are active when compared to subjects who were caries-free (7.8% vs 6.5%) during a follow-up study. (Karjalainen *et al.*, 1997) have recorded a higher mean HbA1C in dental caries and/or fillings relative to intact teeth (14.1% vs 11.7%). Lower level of caries has been recorded in adolescents and children with diabetes relative to the non-diabetic control group. Another study showed no statistically significant result in the DMF (Decayed, Missing, Filled) and DMFS (Decayed, Missing, Filled Surfaces) indices and also in the number of initial caries lesions between the age group of 12 to 18-year-old diabetics and age and gender-matched controls. (Swanljung *et al.*, 1992). (Jones, 1992) found that, despite reporting higher levels of oral self-care, caries was more prevalent in the diabetic population than in the general population.

 (Kenneth *et al.*, 2014) found that there was a drop in pH of saliva and an increased presence of dental caries relative to the control group in participants with uncontrolled diabetes. From their analysis, it found that levels of HbA1c were also determined in diabetic patients of type 2 and control groups, and a strong association was identified between levels of HbA1c and serum glucose in diabetic and control groups, respectively. In a research conducted by (Majbauddin *et al.*, 2019) patients with uncontrolled glycemic rates reported higher numbers of decayed teeth, missing teeth and DMFT index values than those with regulated glycemic rates which is consistent with our study findings.

The limitations of our study were that it was an institutional-based study and the duration of cases taken into account was only one year. Our study only included active caries lesions which does not include previously restored teeth, extracted teeth due to caries, etc. Future scope includes taking a more extensive population into account, populations from different geographical variations, checking for reliable indicators to compare dental caries incidence in type II diabetes mellitus patients.

CONCLUSION

Within the limits of the study, diabetic patients had an increased number of active caries than the control group. There was no significant difference between age, gender and RBS values. Close collabo-ration between the patient, the healthcare unit, and oral health professionals could be a way of improving diabetic patient's general and oral health.

Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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