

Knowledge and Awareness About the Link Between Diabetes Mellitus and Oral Health: A Survey Among the Dental Students

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Abstract

Objective: Diabetes mellitus (DM), a chronic condition that affects people of all ages worldwide, is one of the major causes of mortality and morbidity. The most prevalent oral consequences of DM include periodontal disease, xerostomia, and dental caries. Systemic health has an impact on oral health, and diabetes mellitus is one of the most prevalent chronic disorders seen in dental practices. Both diabetes and oral infections can exacerbate one another. The aim of this study was to assess the knowledge and awareness among dental students regarding the link between diabetes mellitus and oral health.

Materials and method: The study was conducted among dental students in private dental colleges using a self-administrated, closed-ended questionnaire with 25 questions to assess the knowledge and awareness about the link between diabetes mellitus and oral health.

Result and conclusion: Final years, interns, and post graduates participated in this study. 77% of the students were aware about the bidirectional relationship between diabetes mellitus and periodontal disease. Most of the students were unaware about the acceptable levels of fasting and post prandial level of blood glucose level for extraction in diabetic patient. Only 45% of the students were aware that dental implant can be placed in diabetic patient. The result of this survey concluded that most of the students possess average knowledge about the link between diabetes mellitus and oral health and it highlights the need for improved education and awareness about the link between systemic health and oral health.

Keywords: Diabetes mellitus, Periodontal disease, Xerostomia, Fasting blood glucose level, Post prandial blood glucose level.

Introduction

Diabetes mellitus is a chronic, non-communicable metabolic condition marked by abnormalities in insulin production, action, or both. The metabolism of proteins, fats, and carbohydrates gets messed up when insulin levels are low. Environmental and genetic factors can contribute to the onset of diabetes mellitus. Hyperglycaemia and harmful changes in many organs are eventually caused by a decrease in insulin production, a loss in glucose consumption, or an increase in gluconeogenesis.[1]

The following are the broad categories into which diabetes is divided: a) Type 1 diabetes b) Type 2 diabetes c) Diabetes caused by a variety of reasons, including exocrine pancreatic disease, chemical or drug-induced diabetes, and monogenic diabetes syndrome. (d) Diabetes mellitus during pregnancy.[2]

Systemic health has an impact on oral health, and diabetes mellitus is one of the most prevalent chronic disorders seen in dental practices. Diabetes is a metabolic condition that severely compromises the immune system. Diabetes affects many facets of the systemic immune response, including T-lymphocyte function, bactericidal activity, responsiveness to antigen challenge, and polymorphonuclear leukocyte function (leukocyte adherence, chemotaxis, and phagocytosis) [3,4]. Many studies have demonstrated a clear link between chronic inflammation and the emergence of type 2 diabetes [5,6]. Type 2 diabetes and periodontal disease in particular have a definite relationship, and diabetes can make periodontal disease worse. [7,8]

As the frequency of the disease rises, complications associated with diabetes are expected to have a considerable influence on the economy and society. Diabetes can cause severe hypoglycemia or ketoacidosis as its acute consequences. Retinopathy, neuropathy, cardiovascular disease, and nephropathy are a few examples of chronic disease complications.[9] Chronic hyperglycemia has an impact on various parts of the body, including the oral cavity. Poor neutrophil function, microangiopathy, neuropathy, a decrease in collagen production, and a decrease in collagenase activity are all consequences of diabetes mellitus that affect the oral cavity.[10] More than 90% of diabetic patients, according to research, experienced oral problems.[11] Complications of the oral cavity include tooth decay, gingivitis, oral candidiasis, altered taste, geographic tongue, fissured tongue, dry mouth, the propensity for infection, oral lichen planus, and slow wound healing.[12,13,14]

Uncontrolled diabetes causes the formation of deep pockets and loss of attachment, which affects the prevalence and incidence of periodontal disease. Diabetic patients have a high prevalence rate of periodontitis, which ranges from 34% to 68%. [15,16] Compared to healthy people, uncontrolled diabetes increases the risk of losing alveolar bone by 11 times.[12]

Etiology and pathogenesis of diabetes mellitus

Type 1 diabetes mellitus (T1 DM) and type 2 diabetes mellitus (T2 DM) are the two main kinds of diabetes, respectively. While T2 DM is brought on by increasing cell resistance to endogenous insulin and/or its defective production, T1 DM is caused by the autoimmune destruction of insulin-producing pancreatic β -cells. The production of advanced glycosylation end products (AGEs) and the polyol pathway are two pathways implicated in the etiology of diabetes problems. Aldose reductase is the enzyme that converts glucose to sorbitol in the polyol pathway, which causes tissue damage and many of the symptoms associated with diabetes. When glucose binds to proteins, lipids, and nucleic acids, it changes the way they function and forms AGEs, which are then deposited in organs and cause damage.[17]

Sixth complication of diabetes mellitus

Following the other diabetic complications, periodontal diseases have been suggested as the sixth most common complication of diabetes mellitus.[18] Compared to other oral symptoms like dry mouth and caries, it has been found that it is a more frequent oral consequence of diabetes. When a patient has poor glycaemic control and diabetes, periodontitis occurs more frequently and is more severe. Early detection and/or treatment of these oral symptoms may aid in the early diagnosis of diabetes and improved glycaemic control.[19] Therefore, to properly treat this chronic metabolic condition, diabetic oral

complications must be recognized and taken into account. Since Loe proposed periodontal disease as the sixth complication of DM in 1993, there has been a long-standing link between periodontal disease and diabetes. The relationship between periodontal disease and diabetes has been investigated in several studies over the years (1–5). It is generally acknowledged that periodontal disease is more common and more severe in people with diabetes than in nondiabetic people.[20]

Prevalence of diabetes mellitus

422 million individuals around the world currently have diabetes mellitus. There are 1.6 million fatalities annually that are directly related to diabetes.[21] The International Diabetes Federation has predicted that by the year 2045, there will be roughly 693 million cases of diabetes in people between the ages of 18 and 99, based on data from research conducted around the world.[22]

With over 62 million people in India already living with diabetes, the disease is quickly assuming the position of a possible epidemic.^{1,2} In 2000, India (31.7 million) had the greatest global prevalence of diabetes mellitus, followed by China (20.8 million) and the United States (17.7 million), which ranked second and third, respectively. Diabetes prevalence is expected to double globally from 171 million cases in 2000 to 366 million cases in 2030, with India experiencing the largest increase. According to estimates, up to 79.4 million people in India could have diabetes mellitus by 2030, and the number of people with the condition in China (42.3 million) and the United States (30.3 million) is also expected to rise significantly.[23]

Materials and method

A cross-sectional study was conducted among dental students at private dental institution. One hundred dental students participated in the survey, which was approved by the institutional review board. Self-administered surveys with 25 closed-ended questions were given to the dental students which were distributed through online survey forms, specifically Google Forms. The questions were about the etiology, pathogenesis, and prevalence of diabetes mellitus. It also had questions on treatment.

Inclusion criteria

All the third year, final year and interns who were willing to participate were included in the study.

Exclusion criteria

All first, second- and third-year students were excluded from the study.

Results and discussion

A total of 100 dental students participated in this survey. Gender distribution of the study population was 79% females and 21% male. The survey was responded by 50% of interns, 38% of final year students, 7% of third year and 5% of post graduates. 23% of the students were not aware of the bidirectional relationship between diabetes mellitus and periodontal diseases and definition of periodontal disease. They are in need of increased theoretical knowledge which could help them in understanding the bidirectional relationship between diabetes mellitus and periodontal disease.

31% of students were not aware about the one of the important manifestations of periodontal disease. Knowledge about periodontal disease and its oral manifestation is important as periodontitis is identified as a sixth complication of diabetes mellitus. Most of the students were aware about the age group affected

by type 1 diabetes mellitus but 65% of students were unaware about what is type 1 diabetes mellitus and its cause (56%), Knowledge about diabetes mellitus is important as oral health is influenced by systemic health. Most of the respondents were aware about type 2 diabetes mellitus.

Most of the students were aware about the diagnostic test performed for the diagnosis of diabetes mellitus but unaware about the range of fasting (65%) and post prandial blood glucose levels (61%). Only 49% of students were aware about maximum acceptable level of fasting blood glucose for extraction in diabetic patients and only 39% were aware about the random blood glucose level acceptable for extraction in diabetic patients. Students should have enough knowledge about the acceptable levels of blood glucose level for diabetic patients as they may have complications after or during extraction.

63% of students were aware about what is the HBA1C diabetic level whereas only 29% of the students were aware about the influence of HBA1C level. HBA1C test is an accurate and gold standard test for diagnosis of diabetes, students should have basic knowledge about it.

71% of the respondent were not aware of multiple periodontal abscess as the oral manifestation of diabetes in chronic periodontitis. Students should have knowledge about the oral manifestations of diabetes mellitus as there is strong evidence that diabetes is a risk factor for periodontitis and gingivitis can be found in the current data, and glycaemic management appears to play a significant role in this association. Adults with diabetes have frequently showed increased periodontitis severity and extent in epidemiologic investigations. Across all age groups, the prevalence and severity of attachment loss and bone loss were higher in diabetic people than in non-diabetic control subjects in the Pima Indians of Arizona, a population with the highest incidence of type 2 diabetes worldwide.[24]

Only 45% of the respondent were aware that dental implants can be placed in diabetic patient. Type 1 diabetic patients are more prone for failure of dental implant and only 24% of the students were aware about this. Few studies have shown that type 1 diabetic patients have considerably greater implant failure rates than type 2 diabetic patients. Insulin depletion in tissues may contribute to a higher failure risk in type 1 diabetes, whereas insulin presence in tissues may mitigate the harmful effects of hyperglycaemia in type 2 diabetics.[25]

Impaired bone metabolism and bone strength are two negative outcomes of diabetes mellitus on the body. Inhibition of osteoblastic activity, decrease in collagen formation, increased osteoclastic activity are the effects of diabetes on bone. Poor glycaemic control, which is typically the cause of hyperglycaemia in diabetes mellitus, may decrease bone mineral density (BMD). Only 28% of the respondents were aware about the effects of diabetes on bone.

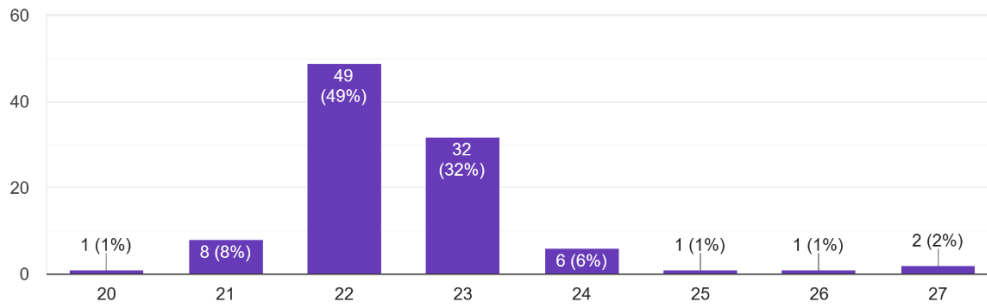
55% of the students were aware that by doing scaling and root planning, there is a decrease in blood glucose level and 64% of students were aware that periodontal therapy will have better impact on type 2 diabetic patient. In the studies conducted by Stewart et al.,[26] Jones et al.,[27] Singh et al.,[28] Kiran et al.,[29] it had been observed that periodontal intervention had resulted in significant glycaemic control. 74% of the respondents were aware that metformin is the most common drug prescribed for type 2 diabetes mellitus.

Students are in need of increased theoretical knowledge regarding the link between systemic diseases and oral health. This will help them to become a better clinician.

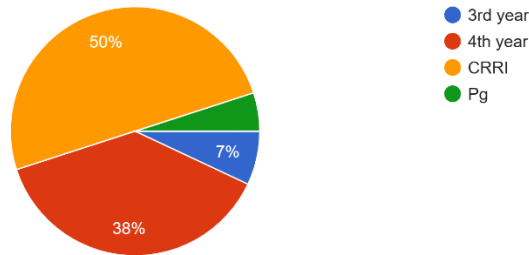
Conclusion

Numerous studies have shown biologically plausible mechanisms by which diabetes raises the risk of periodontal diseases. The evidence that is now available suggests a causal relationship between diabetes

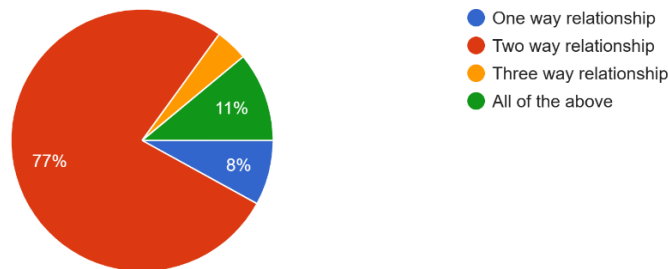
and periodontal diseases, with the influence on the disease process being inversely correlated with the degree of glycaemic control. Evidence suggests a connection between glycaemic status, complications from diabetes, and periodontal inflammation. Evidence from the short term indicates that periodontal therapy may lower haemoglobin A1c levels. Based on the findings of this study it is evident that dental students possess average knowledge about the link between diabetes mellitus and oral health. There is a need to increase the awareness about the link between oral and systemic disease among the students, with added information on advancements in the treatment protocol.



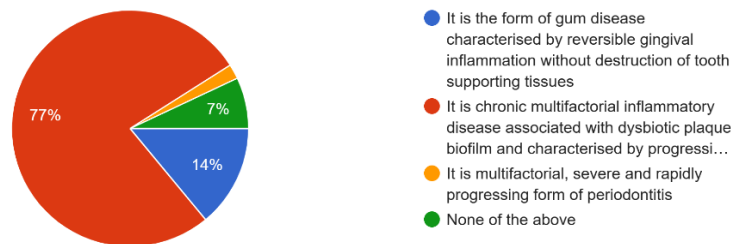
Bar chart representing the age distribution of the participants



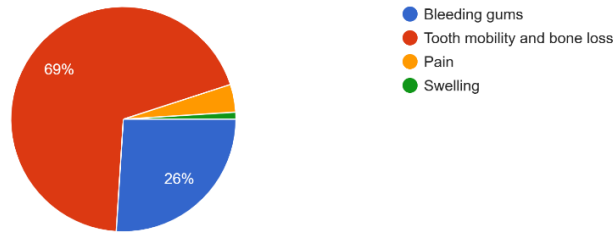
Pie chart representing the year of study



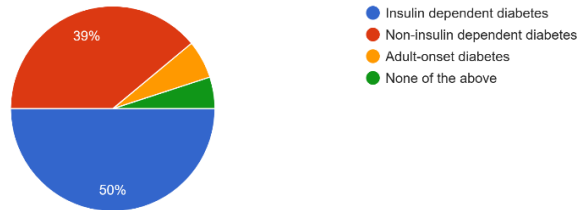
Pie chart representing the link between diabetes mellitus and periodontal disease



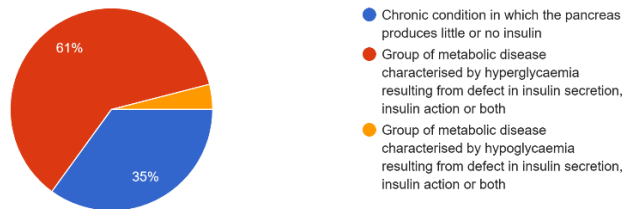
Pie chart representing the awareness of definition of periodontitis



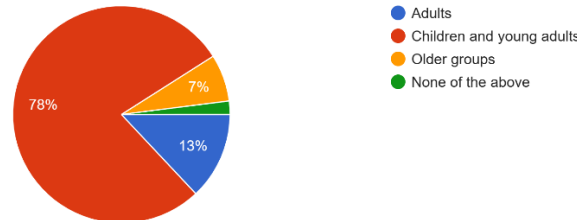
Pie chart representing the one of the manifestations of periodontal disease



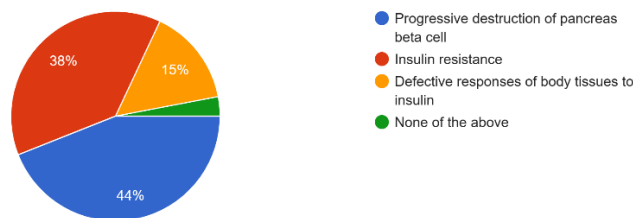
Pie chart representing the other name for type 1 diabetes mellitus



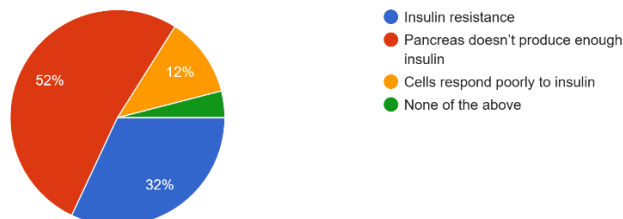
Pie chart representing the awareness of definition of type 1 diabetes mellitus



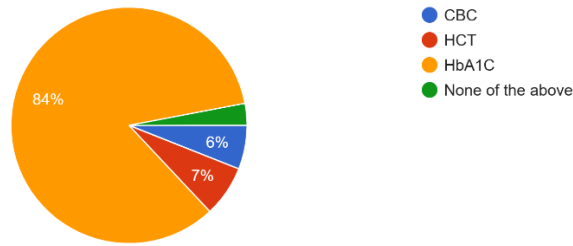
Pie chart representing the age group in which type 1 diabetes mellitus is seen



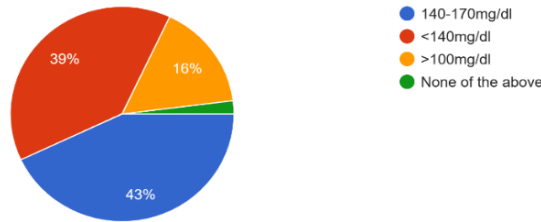
Pie chart representing the cause of type 1 diabetes mellitus



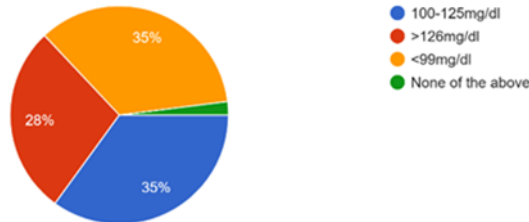
Pie chart representing the cause of type 2 diabetes mellitus



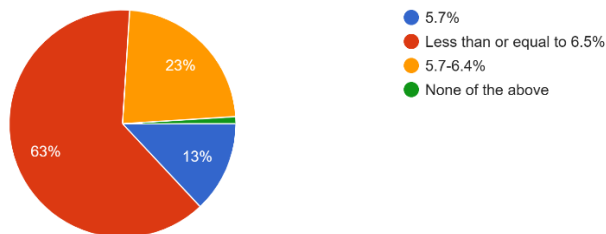
Pie chart representing the diagnostic test used for diagnosis of diabetes mellitus



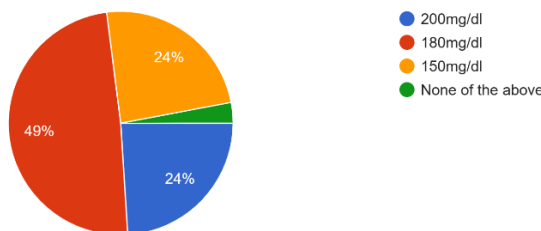
Pie chart representing the awareness of normal range of post-prandial blood glucose level



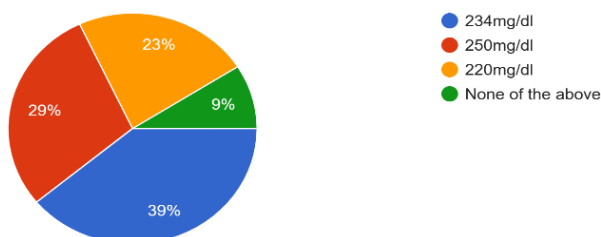
Pie chart representing the awareness of normal range of fasting blood glucose level



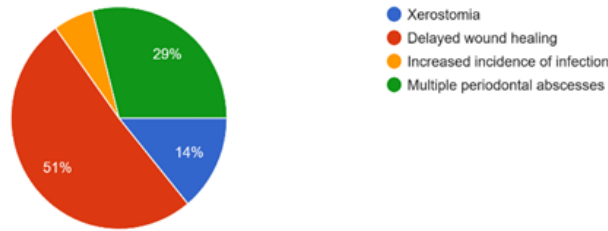
Pie chart representing awareness about what is the HBA1C diabetic level



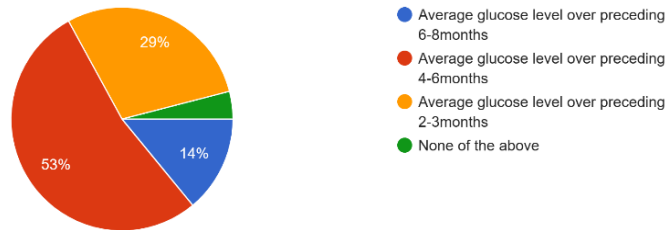
Pie chart representing the awareness about the maximum acceptable level of fasting blood glucose for extraction in diabetic patient



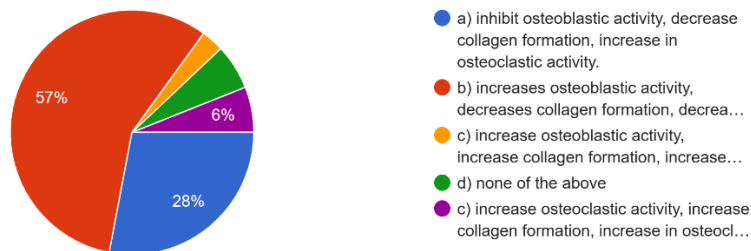
Pie chart representing the maximum acceptable random blood glucose level for extraction in diabetic patient



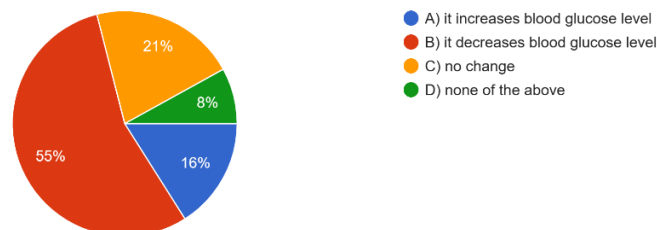
Pie chart representing the oral manifestation of uncontrolled Diabetes in chronic periodontitis



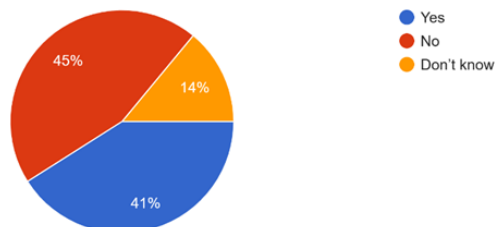
Pie chart representing the knowledge of dental student on what HBA1C level indicates



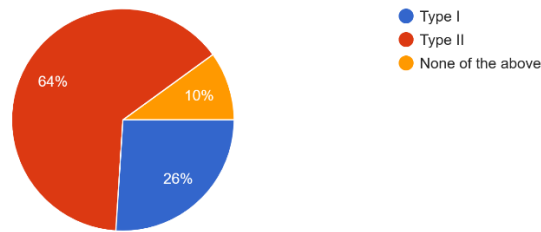
Pie chart representing the effect of diabetes on bone



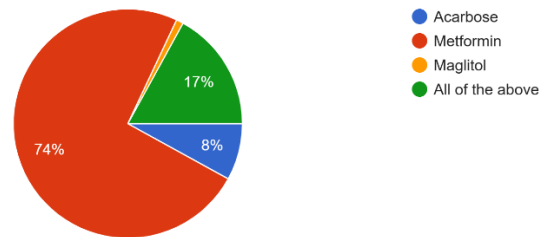
Pie chart representing the knowledge of dental students about the effect of periodontal therapy on blood glucose level



Pie chart representing the knowledge of dental student on placement of dental implant in diabetic patient



Pie chart representing in which type of diabetes mellitus nonsurgical periodontal therapy will have better impact on blood glucose level



Pie chart representing the knowledge of dental students on drug prescribed for type 2 diabetes mellitus

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