



Awareness of Diabetes Mellitus and Its Oral Health Implications among First-Year Dental Students: A Cross- Sectional Study

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ABSTRACT

Background Diabetes mellitus (DM) is a common metabolic disease with significant systemic and oral health implications. Dental professional is instrumental in identifying oral manifestations and providing preventive counselling and supporting management of diabetes. Therefore, adequate knowledge in dental students is important for future clinical practice.

Objectives: To assess the level of awareness of diabetes mellitus and its oral health consequences among first year Bachelor of Dental Surgery students and to find its association with selected demographic variables.

Materials and Methods: A descriptive cross-sectional questionnaire-based study was conducted among 112 first-year BDS students following Institutional Ethics Committee approval and written informed consent. A prevalidated questionnaire containing 21 multiple-choice questions assessed knowledge of diabetes, risk factors and prevention, diagnosis and monitoring, oral manifestations, and glycemic control in dental care. Knowledge was categorized using Bloom's cut-off criteria. Analysis was done using SPSS software 25.0, considering $p < 0.05$ to be statistically significant.

Results and Discussion Mean score of awareness was 15.80 ± 2.96 out of 21. Good, moderate, and poor knowledge were observed in 61.6%, 32.1%, and 6.3% of students, respectively. The highest domain-wise awareness was for glycaemic control and preventive dental care (89.3%) and the lowest was for oral manifestations (58.2%). Significantly higher awareness was seen among urban students ($p=0.034$) and students with family history of diabetes ($p=0.018$). No significant association was found with gender ($p=0.203$).

Conclusion: Awareness about Diabetes Mellitus was satisfactory among first year BDS students. However, deficiencies in knowledge about oral manifestations, diagnosis and monitoring indicate the need for focused undergraduate teaching and inter-disciplinary learning.

Keywords: Diabetes Mellitus; Oral Health; Dental Students; Health Knowledge,

it is extremely important to educate patients, detect diabetes early and work toward preventing it.¹⁻³

Diabetes can significantly affect oral health.. People who do not manage their diabetes effectively are more likely to experience problems like periodontal disease, dry mouth, tooth decay, fungal infections in the mouth, slow healing of mouth wounds, a burning sensation in the mouth, and other oral infections.² Due to the reciprocating relationship between diabetes and periodontal inflammation, periodontal disease

Introduction

Diabetes mellitus (DM) is one of the most common chronic metabolic diseases worldwide and seriously endangers public health. This is characterized by persistent hyperglycemia due to defects in insulin secretion, insulin action or both. According to the International Diabetes Federation (IDF), 589 million adults aged 20 to 79 worldwide had diabetes in 2024, and this number is expected to grow in the coming years. India has one of the highest rates of diabetes in the world, and



has been identified as the sixth complication of diabetes.⁴ While periodontal infection may negatively impact glycemic control, poor glycemic control exacerbates periodontal disease.^{5, 6} As a result, oral health professionals are crucial to the early detection, education, referral, and treatment of diabetic patients.^{2,6}

Dental students are future oral healthcare providers and need to be well informed about diabetes and its oral manifestations. Understanding the association between diabetes and oral health enables dental professionals to recognize early signs, provide preventive counselling, modify dental treatment appropriately, and work with other healthcare providers. Nonetheless, research on undergraduate dental students has revealed varying degrees of understanding about diabetes and its effects on oral health, underscoring the necessity of ongoing evaluation and educational initiatives..

Considering the growing prevalence of diabetes and the critical role of dentists in its management, the present study was undertaken to assess the awareness of diabetes mellitus and its oral health implications among first-year dental students.

Materials and Methods

This descriptive cross-sectional study utilizing a questionnaire was carried out among students of first year Bachelor of Dental Surgery (BDS) program following the approval from the Institutional Ethics Committee. Every participant gave written informed consent before beginning the study. The final analysis included 112 first-year dental students who willingly agreed to participate and successfully filled out the questionnaire. Students who declined to participate or submitted incomplete questionnaires were excluded. Demographic data were collected from the participants by using a prevalidated structured questionnaire. The questionnaire was prepared after thorough literature search. The questionnaire was divided into two parts. The first part gathered demographic details such as age, gender, residence location, and family history related to diabetes mellitus. The second part included 21 multiple-choice questions designed to evaluate awareness of diabetes mellitus and its oral health implications, covering basic knowledge of diabetes, risk factors and prevention, diagnosis and monitoring, oral manifestations (such as gum disease, dry mouth, slow healing of mouth wounds, Fungal infections, and tooth decay) as well as the importance of glycemic control in dental care. Each correct answer was scored one point, while incorrect or missing answers received no points, resulting in a maximum achievable score of 21. Based on Bloom's cut-off criteria, participants' knowledge levels were categorized as poor (<50%; <11 marks), moderate (50–74%; 11–15 marks), and good ($\geq 75\%$; 16–21 marks).

Statistical analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 25. Continuous variables were expressed as mean $\pm$ standard deviation (SD), while categorical variables were summarized as frequencies and percentages. Independent-samples *t*-test was used to compare mean

awareness scores between groups (gender, residence, and family history of diabetes). Chi-square test was used to assess associations between categorical variables wherever appropriate. A *p*-value <0.05 was considered statistically significant.

Table 1. Demographic Characteristics (n = 112)

Variable	n	%
Gender		
Female	73	65.2
Male	39	34.8
Residence		
Urban	92	82.1
Rural	20	17.9
Family history of diabetes		
Yes	66	58.9
No	46	41.1

Table 2. Overall Awareness Score

Statistic	Value
Sample size	112
Maximum possible score	21
Mean $\pm$ SD	15.80 $\pm$ 2.96
Median	16
Interquartile range	14–18
Minimum	6
Maximum	21

Table 3. Knowledge Level (Based on Bloom's cut-off criteria)

Knowledge level	Score	n	%
Poor	<11	7	6.3
Moderate	11–15	36	32.1
Good	16–21	69	61.6

Poor: <50% ; **Moderate:** 50–74% ; **Good:** $\geq 75\%$

Table 4: Comparison of mean awareness scores according to participant characteristics

Variable	Group	n	Mean Awareness Score $\pm$ SD	t-value	p-value
Gender	Male	39	15.38 $\pm$ 3.27	1.28	0.203 NS
	Female	73	16.03 $\pm$ 2.79		
Residence	Urban	92	16.86 $\pm$ 3.12	2.15	0.034 S
	Rural	20	15.55 $\pm$ 2.19		

Family history of diabetes	Yes	66	16.35 ± 2.49	2.39	0.018 S
	No	46	15.02 ± 3.42		

Data are presented as mean ± standard deviation (SD).

Independent-samples *t*-test was used for group comparisons. Statistical significance was considered at $p < 0.05$.

A total of 112 completed questionnaires were used in the analysis. The results showed a generally satisfactory level of awareness, with an average awareness score of 15.80 ± 2.96 out of a maximum possible score of 21. (Table 2) Most participants (61.6%) demonstrated good knowledge, while 32.1% had moderate knowledge and only 6.3% had poor

knowledge. (Table-3) Female students demonstrated slightly higher mean awareness scores than male students; however, the difference was not statistically significant ($p = 0.203$). The mean awareness score was significantly higher among students from urban areas than among those from rural areas ($t = 2.15$, $p = 0.034$). Likewise, participants with a family history of diabetes showed significantly greater awareness compared with those without a family history ($p = 0.018$). (Table-4)

Table 5 . Domain-wise awareness analysis

Domain	Correct Responses	Total Responses	Awareness (%)	Interpretation
Basic knowledge of Diabetes Mellitus	365	448	81.5%	Good awareness
Risk factors & Prevention	280	336	83.3%	Good awareness
Diagnosis and Monitoring	234	336	69.6%	Moderate awareness
Oral Manifestations	391	672	58.2%	Lowest awareness
Prevention and importance of Glycemic Control in Dental Care	400	448	89.3%	Excellent awareness

The domain-wise analysis revealed varying levels of awareness among first-year BDS students. The highest awareness was observed regarding the importance of glycemic control and preventive dental care (89.3%), followed by risk factors and prevention (83.3%) and basic knowledge of diabetes mellitus (81.5%). Awareness regarding diagnosis and monitoring of diabetes was moderate (69.6%). The lowest level of awareness was noted for oral manifestations of diabetes (58.2%), indicating limited knowledge of periodontal disease, xerostomia, candidiasis, delayed wound healing and other oral complications associated with diabetes. (Table-4) These findings suggest that while students possess satisfactory general knowledge of diabetes, greater emphasis should be placed on its oral health implications during undergraduate dental education.

Discussion

In this study, we assessed the knowledge of first year Bachelor of Dental Surgery (BDS) students about diabetes mellitus (DM) and its effect on oral health. The results indicated that students generally had a satisfactory level of awareness, with an average score of 15.80 ± 2.96 out of a maximum of 21. According to Bloom's cut-off criteria, 61.6% of the participants had good knowledge, 32.1% had moderate knowledge, and only 6.3% had poor knowledge. These results indicate that, even at an early stage in their professional education, the majority of first-year dental students have a good knowledge of diabetes and its association with oral health.

Diabetes mellitus is currently considered an important public health problem as evidenced by increasing incidences and in terms of complications linked with systemic and local health conditions such. Oral care providers play an integral role for their diabetic patients in terms of educational material, long term preventative strategies, diagnosis of undiagnosed diabetes. Consequently, information concerning diabetes should be imparted to the students during first year at dentistry school at earliest stage^{7,8,9}

According to the current study, most students showed a solid understanding of the general features of diabetes mellitus. Comparable results have been observed among undergraduate dental students in Saudi Arabia, India, and Malaysia, where students demonstrated adequate knowledge about the causes, risk factors, and prevention of diabetes. However, their understanding of the oral complications associated with the condition was less comprehensive.^{10,11,12,13} The relatively high awareness observed in the present study may be attributed to increasing public awareness campaigns, greater exposure to diabetes through digital media, and the inclusion of diabetes-related topics during preclinical teaching.

Of the five domains assessed, the highest level of awareness was found in understanding the importance of glycemic control in dental care, with 89.3% of participants demonstrating this knowledge. This was followed by awareness of risk factors and prevention, which had a score of 83.3%, and then basic knowledge of diabetes, which was noted at 81.5%. These findings are encouraging because

glycemic control is fundamental for successful dental treatment planning, wound healing, and prevention of oral infections in diabetic patients.^{8,14} The increasing emphasis on preventive healthcare in undergraduate curricula may have contributed to better awareness in these domains.

In contrast, awareness regarding the oral manifestations of diabetes was the lowest (58.2%). Many students were less familiar with complications such as periodontal disease, xerostomia, candidiasis, delayed wound healing, burning mouth syndrome, and increased susceptibility to dental caries. Similar deficiencies have been documented by previous investigators, who reported that dental students often recognize diabetes as a systemic disease but fail to appreciate its diverse oral manifestations.^{11,12,15} Since periodontal disease has been described as the "sixth complication" of diabetes and there exists a well-established bidirectional relationship between diabetes and periodontal disease, improving knowledge in this domain should be considered a priority during undergraduate dental education.^{8,16}

The present study also demonstrated moderate awareness regarding diagnosis and monitoring (69.6%), suggesting that students possess only partial knowledge about diagnostic criteria, blood glucose monitoring, glycated hemoglobin (HbA1c), and screening strategies. Early-year dental students' poor understanding of diabetes diagnosis has been documented in earlier research, underscoring the need to improve teaching related to laboratory diagnosis and interpretation of glycemic parameters.^{10,13}

Comparison of awareness scores according to demographic characteristics revealed no statistically significant difference between male and female students ($p = 0.203$). Comparable observations have been reported in several studies where gender had little influence on diabetes-related knowledge among healthcare students.^{12,17} This suggests that educational exposure rather than gender is the major determinant of awareness.

In contrast, students residing in urban areas demonstrated significantly higher awareness scores than those from rural backgrounds ($p = 0.034$). This finding may reflect greater accessibility to healthcare facilities, educational resources, internet-based information, and public health awareness programmes in urban settings.¹⁸ Similar urban-rural disparities in health literacy have been documented in studies evaluating awareness of diabetes and other chronic diseases among healthcare students and the general population.¹⁹

Additionally, students who had a family history of diabetes showed noticeably higher awareness than those who did not. ($p = 0.018$). Personal exposure to diabetes within the family likely increases opportunities to observe disease management, lifestyle modification, dietary practices, and long-term complications, thereby improving knowledge.²⁰ Similar results have been documented in earlier research where improved diabetes awareness was found to be independently predicted by family history.²¹

The results of this study have significant implications for dental education.. Although the majority of students possessed satisfactory general knowledge, deficiencies in understanding the oral manifestations and diagnosis of diabetes indicate the need for targeted educational interventions. Early integration of diabetes-related clinical case discussions, problem-based learning, interdisciplinary teaching involving oral medicine, periodontology, physiology, and biochemistry, together with community-based screening activities, may further enhance students' competency in managing patients with diabetes.^{9,14,16}

The present study has certain limitations. It was conducted in a single institution and included only first-year BDS students, thereby limiting the generalizability of the findings. Furthermore, awareness was assessed using a self-administered questionnaire, which may be influenced by recall bias and does not necessarily reflect actual clinical competence. Future multicentre longitudinal studies involving students from different academic years are recommended to evaluate changes in knowledge following structured educational interventions.

Conclusion

The study found that most first-year BDS students had a good overall understanding of diabetes mellitus and its oral health implications, with more than half achieving a good knowledge score. Students showed strong awareness regarding the importance of glycemic control, diabetes prevention, and general disease knowledge. However, knowledge about the oral manifestations of diabetes and its diagnosis and monitoring remained inadequate. Residence and family history of diabetes were significantly associated with awareness levels, whereas gender was not. These findings highlight the need to strengthen undergraduate dental education by incorporating focused teaching on diabetes-related oral complications, interdisciplinary learning, and early clinical exposure. Improving awareness in the early years of dental training will better prepare future dentists to contribute effectively to the prevention, early detection, and comprehensive management of patients with diabetes mellitus.

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