

A Study on the Oral Health Condition of Adult Diabetic Mellitus Patients: An Observational Study in a Tertiary Care Hospital

Marvi Raza¹, Ambreen Zeeshan², Oam Parkash³, Rehana Saeed⁴, Shaima Sultana Memon⁵, Sobia Khan Nabeel⁶

¹Lecturer, Department of pathology, Ziauddin University Clifton campus

²Lecturer, Department of Biochemistry, Baqai Medical University

³Assistant Professor, Department of Oral and maxillofacial surgery, Baqai Dental College

⁴ Assistant professor, Department of pharmaceuticals, faculty of pharmacy and pharmaceutical sciences, University of Karachi.

⁵Assistant Professor, Pathology, Dow Medical College, Dow University of Health sciences

⁶Lecturer, Department of physiology, Baqai Medical University

Corresponding author: Oam Parkash

Assistant Professor, Department of Oral and maxillofacial surgery, Baqai Dental College

.omparkash64@gmail.com

Abstract

Objective: To assess the oral health of adult diabetic patients.

Methods: This cross sectional observational study was conducted on 146 diabetic patients. Patients were assessed for oral diseases including dental cavities, gingivitis and missing teeth. T-Test was used to assess the association between blood sugar level and oral diseases.

Results: Mean age of the patients was 47.93±15.49 years. Male were 89 (61%) while female patients were 57 (39%). Dental cavities were found in 77.4% patients, gingivitis in 74% patients and missing teeth were seen in 71.9% patients. High blood sugar level was significantly associated with oral diseases.

Conclusion: We concluded that high blood sugar levels are significantly associated with oral diseases.

Keywords: Diabetes, Oral health, Adult population

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Introduction

Hyperglycemia, a clinically abnormal state defined by persistently increased blood glucose levels, is a hallmark of diabetes mellitus (DM), usually known simply as diabetes. Whether due to a defect in insulin production, insulin action, or both, hyperglycemia causes a wide variety of

metabolic disturbances in carbohydrate, lipid, and protein metabolism that persist over long periods of time and are difficult to predict ¹. Type 2 diabetes is characterized by a progressive course, a multifaceted pathophysiology, and a wide range of clinical manifestations². Many organs have their normal functioning disrupted by hyperglycemia and the related dysfunctions in carbohydrate, lipid, and protein metabolism ³. Hyperglycemia and the metabolic abnormalities it causes have detrimental effects on the normal structure and function of micro- and macro-vasculature, which are at the centre of organ structure and function throughout the body, and cause these disruptions gradually over time ⁴.

Complications at both the micro- and macro-vascular levels result from structural and functional changes in the vasculature of organ systems. These issues have a negative impact on the body's organs, most notably the eyes, kidneys, heart, and nerves, causing damage, dysfunction, and ultimately organ failure ⁵. Complications affecting the eyes can cause retinopathy, which can eventually lead to blindness. Renal failure and nephropathy are both possible outcomes of problems affecting the kidneys. Hypertension and coronary heart disease are two examples of issues that can arise from the heart ⁶⁻⁸.

Concern has been raised about the potential for oral manifestations to significantly disrupt metabolic control of the diabetes state, as diabetes is a prevalent condition with simultaneous mouth manifestation that affects dental care ⁹. The significance of slowing the development of these oral problems should not be overlooked by doctors trying to optimize their patients' metabolic management. As a result, it is imperative that doctors and dentists work together on an all-encompassing strategy to improve patients' glycemic management and lessen the impact of these potentially crippling co-morbid illnesses ¹⁰. Negative effects on the mouth and teeth from diabetes are catastrophic. Candida overgrowth, cavities, tooth loss, gingivitis, lichen planus, neurosensory abnormalities (burning mouth syndrome), periodontitis, salivary dysfunction and xerostomia, and taste degradation are all possible oral health issues ^{11, 12}.

Too often, diabetes sufferers neglect their dental health while focusing on managing other complications related to the disease, leading to needless misery and unrecognized morbidity. Therefore, it is important to investigate the condition of diabetics' teeth and gums. The purpose of this research is to assess the state of oral health in individuals with diabetes. It is hoped that by providing evidence-based recommendations for oral health promotion, the study results would help improve the oral health of diabetics by providing a preliminary data of our population.

Material And Methods

This observational cross sectional study was conducted at tertiary care hospital of Karachi. After receiving ethical clearance certificate, we enrolled 146 diabetic patients having age between 20 to 70 years, through non-probability consecutive sampling technique. All the patients were subjected to provide written consent to partake in the study. We explained the benefits and outcome of the study to the patients and their guardians. All the patients were assessed for

diabetes before enrollment in the study. HbA1c > 6.5% were considered diabetic and were enrolled for the study. Patients who were pregnant or who did not have diabetes were excluded. All the patients were assessed for dental cavities, missing teeth (two or more than two teeth missing) and gingivitis. All the data was recorded on a proforma by the researcher. The sample size was calculated using openepi sample size calculator using the previous frequency of gingivitis 83.7%, margin of error 6% and confidence interval 95%.

All the data was analyzed using IBM SPSS 20. We presented the qualitative variables in terms of frequencies and percentages while the quantitative variables were presented as mean and standard deviation. We used T-test for assessing the association between blood sugar level and various oral diseases by keeping $P < 0.05$ as statistically significant.

Results

This study was conducted on 146 diabetic patients. Mean age recorded was 47.93 ± 15.49 years. Mean blood sugar level of the patients at the time of enrollment was 270.78 ± 70.92 mg/dL. Male patients were 89 (61%) while female patients were 57 (39%). There were 76 (52.1%) nonsmokers, those who smoked around 1 to 7 cigarettes a day were 29 (19.9%) and those who smoked more than seven cigarettes a day were 41 (28.1%). Most of the patients had habit of brushing once a day 92 (63%) while 54 (37%) patients reported to brush their teeth twice a day. Majority of the patients belonged to the age group of 61 to 70 years 38 (26.03%), thirty one (21.23%) belonged to the age group of 51 to 60 years, twenty seven (18.49%) patients belonged to the age group of 31 to 40 years and the least no of patients belonged to the age group of 20 to 30 years 24 (16.44%).

Regarding the oral diseases found in our study dental cavities were more prevalent accounting for 77.4% of the patients. Gingivitis was found in 108 (74%) patients and missing tooth were seen in 105 (71.9%) patients. Table 3 depicts the association of blood sugar level with various dental diseases. We found that high blood sugar level was significantly associated with oral diseases in diabetic patients.

Table 1 Basic demographics

Variables		Statistics
Age (Years)		47.93 ± 15.49
Blood sugar (mg/dL)		270.78 ± 70.92
Gender	Male	89 (61%)
	Female	57 (39%)
Smoking habit	No smoking	76 (52.1%)
	1 to 7 per days	29 (19.9%)
	> 7 per day	41 (28.1%)
Brushing habit	Once a day	92 (63%)

	Twice a day	54 (37%)
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Graph 1 Age distribution

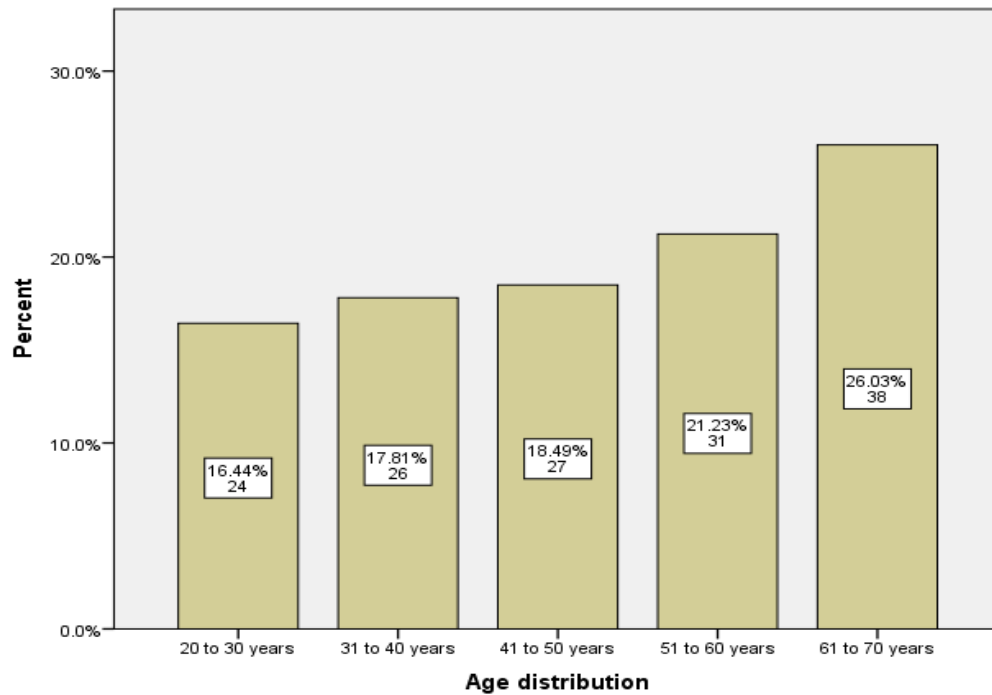


Table 2 Oral diseases

Oral diseases		Frequency	%
Gingivitis	Yes	108	74.0%
	No	38	26.0%
Dental cavities	Yes	113	77.4%
	No	33	22.6%
Missing teeth	Yes	105	71.9%
	No	41	28.1%

Table 3 Association of blood sugar level with oral diseases

Oral diseases		Mean	SD	P value
Gingivitis	Yes	277.91	68.049	0.04
	No	250.53	75.832	
Dental cavities	Yes	278.97	66.292	0.009

	No	242.73	79.761	
Missing teeth	Yes	278.96	69.221	0.02
	No	249.83	71.760	

Discussion

Diabetes mellitus is the most serious disease in the world due to its high prevalence and the metabolic imbalance it represents. A study found that 8.8 percent of the world's population has diabetes mellitus in 2017, with an expected rise to 629 million cases by 2045¹⁴. The oral cavity is just one of many places where diabetes can cause problems, according to a study showing that diabetes mellitus is a chronic condition characterized by hyperglycemia¹⁵.

A study¹⁶ indicated that diabetic oral consequences include pathologies such xerostomia, gingivitis, periodontal disease, tooth loss, dental caries, periapical lesions, and dysfunction of the taste and salivary glands. Another study¹⁷ found that children with type 1 diabetes mellitus are more likely to experience gingivitis and periodontitis, chronic inflammatory illnesses that affect the teeth's supporting structures.

Latti et al.¹⁸ confirmed that diabetic patients' blood sugar, DMFT readings, and dental caries all rise with age. Wiener et al.¹⁹ found in their pilot investigation that a history of having six or more teeth pulled was connected with an increased risk of developing diabetes in adults. Some physicians have concluded that children and adolescents with type 1 diabetes have poor oral hygiene and are at increased risk for developing oral illnesses.

A study has shown that diabetic individuals' oral health issues are among the most serious difficulties affecting their quality of life²⁰. Similarly another study²¹ indicate that people with diabetes mellitus whose blood sugar levels are well managed may experience an improvement in their oral health.

Our study aimed to evaluate the prevalence of oral disorders in patients with diabetes mellitus, namely dental caries, gingivitis, tooth loss and periodontitis. Preliminary studies found that patients with Diabetes Mellitus have a higher prevalence of oral diseases, suggesting that the condition should be examined from its earliest stages²².

Our study was conducted on 146 diabetic participants having age between 20 to 70 years. The mean age of the patients was 47.93±15.49 years. We found that majority of the patients belonged to the male gender. We observed that 61% were male while 39% were female patients. Similar results were reported by a study¹³ which showed that majority of their patients were male. A study found that people with diabetes mellitus were more likely to develop gingivitis¹³. In our study we found that 74% patients had developed gingivitis. In our study gingivitis was more prevalent in male gender as compared to female gender but we did not find any statistical difference. However the aforementioned study¹³ found that gingivitis was significantly more prevalent in the male gender in their study. All periodontal tissues, both soft and hard, are

negatively impacted by hyperglycemia. Poorly controlled diabetes mellitus is associated with increased prevalence, severity, and development of periodontitis, as well as increased tooth loss as compared to persons with normal glucose levels.

Our results showed that 28.1% patients smoked more than 7 cigarettes a day and 63% patients used to brush only once a day. It is evident from a study²³ that excessive smoking and poor dental hygiene are leading factors for developing gingivitis.

Children with type 1 diabetes and persons of all ages with hyperglycemia have similar levels of evidence suggesting a link between hyperglycemia and caries. A study has linked diabetes or high glucose levels in saliva or serum to an increase in caries, whereas others have not found any such link²⁴. We observed that dental cavities were present in 77.4% patients in our study.

Various studies have reported that there is a correlation between diabetes and tooth loss^{13, 24}. Diabetes can lead to tooth loss which is also evident from our results. Our results have shown that 71.9% patients reported missing tooth due to diabetes.

The present study demonstrated a significant relationship between Diabetes Mellitus and dental health. We set out to learn more about how diabetes affects dental health because it is one of the world's most pressing health concerns. The current research confirmed that those with Diabetes Mellitus are more likely to experience dental problems like cavities, gingivitis and tooth loss.

Conclusion

From our study we conclude that diabetes is a leading factor for oral diseases and those patients with higher levels of blood sugar are more at risk of developing oral disease. The most prevalent oral disease found in diabetic patients in our study was dental cavities (77%) which was followed by gingivitis (74%) and then tooth loss (71.9%). We recommend that diabetic patients should be more concerned about their oral health and must consult their dentist in the event of developing oral disease.

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