



Oral Manifestations among Diabetic Patients: A Cross-Sectional Study

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INTRODUCTION: Diabetes, ranked as the ninth most common disorder has the potential to greatly affect the oral health of a person if not taken care of on a routine basis.

AIM: To assess the prevalence of oral manifestations in diabetic participants of Sunder Nagar town, Himachal Pradesh, India.

MATERIALS AND METHOD: This online, questionnaire based cross-sectional study was conducted using a combination of convenience and snowball sampling among diabetics. The questionnaire was pre-tested and pre-validated, contained 16 questions which included self-reported oral health status of the people. The student's t-test and Pearson's correlation were applied to find out significant associations, if any. Data was analysed using SPSS version 21.0 and significance (p) was kept significant at ≤ 0.05 .

RESULTS: Out of a total of 180 complete responses, 8.3% were type 1 diabetics, 72.8% were type 2 diabetics and the rest 18.9% didn't know their diabetic status. 71.7% of patients experienced bad breath, out of which 66.7% experience it early in the morning, 16.1% during the daytime, 5% every time, 12.2% never ($p=0.02$). 24.4% of the participants experienced burning mouth sensation, while 57.8% of participants experienced dry mouth (less salivation). 20.6% of the participants reported white patches over their tongue while 8.3% reported having white patches over the inner cheeks (buccal mucosa) and was found to be statistically significant ($p=0.01$). 58.9% of the diabetics were found to be non-smokers while 21.7% were occasional smokers and 11.1% were chain smokers.

CONCLUSION: There is a need to educate diabetics regarding the effects of this disease on their oral health and the need to maintain proper hygiene.

KEYWORDS: Diabetes, Oral, Manifestations

INTRODUCTION

Humankind has always tried to emphasize on the fact that "the greatest wealth is health". This is further strengthened by the definition of health by the World Health Organization (WHO), which states that "Health is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity." Over the last several decades, our diets have become unhealthy, our lifestyles sedentary and many of us still use tobacco and abuse alcohol which has resulted in an ever-increasing prevalence of lifestyle diseases. As per WHO estimates, Noncommunicable Diseases (NCDs) kill 41 million people each year, which is equivalent to 71% of all deaths globally. Among these NCDs, one such disease is diabetes which is ranked as the ninth most common disorder amassing a 68% increase between 1990 to 2010.

Experts believe that between the years 2010 and 2030, the number of adults with Diabetes Mellitus (DM) in developing countries is expected to increase by a whopping 69%.¹ Diabetes is a major cause of blindness, kidney failure, heart attacks, stroke and lower limb

amputation. According to WHO, in the year 2019, diabetes was the ninth leading cause of death causing an estimated 1.5 million deaths as a result of this disease.²⁻⁴

Diabetes is a chronic, metabolic disease characterized by elevated levels of blood glucose (or blood sugar). Two main types Type 1 diabetes (Lack of insulin) and Type 2 diabetes (ineffective insulin).¹ According to WHO, 422 million people worldwide have diabetes, particularly in low-and middle-income countries and Diabetes is one of the leading causes of death.⁵ A healthy diet, regular physical activity, maintaining a normal body weight and avoiding tobacco use are ways to prevent or delay the onset of type 2 diabetes. It can be treated and its consequences avoided or delayed with the aid to proper diet, regular physical activity, medication and regular screening for complications at regular intervals. Diabetics who smoke are at an even higher risk, of up to 20 times to develop thrush and periodontal disease as compared to their non-smoking counterparts. Among diabetics, smoking has been found to impair blood flow to the gums, thus affecting



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wound healing in this tissue area.⁶

Oral health has been identified as a key indicator of one's overall health, general well-being and assessing one's quality of life. As per the Global Burden of Disease Study (2017), oral diseases has been found to affect 3.5 billion people across the globe.^{1,2,6} The International Agency for Research on Cancer, has reported that cancers pertaining to the lip and oral cavity are among the top 15 most common cancers, with nearly 180,000 deaths each year across the world.^{6,7} It is a well-documented fact that most oral diseases and conditions share alterable risk factors with leading noncommunicable diseases and a variety of oral health conditions are largely preventable and can be treated in their early stages through proper screening or regular dental check-ups.

As per scientific evidence, the oral manifestations are among diabetics ranges from periodontal diseases, caries/periapical periodontitis, tooth loss, peri-implantitis, dry mouth (xerostomia), candidiasis, taste disturbances, burning mouth syndrome and cancer.^{8,9} Due to a paucity of data, the present study was carried out with the aim to assess the prevalence of oral manifestations in diabetic participants of Sunder Nagar town, Himachal Pradesh, India.

MATERIALS AND METHOD

An online, cross-sectional study was conducted on diabetic participants of Sunder Nagar town through a combination of convenience and snowball sampling. The study was conducted for a period of one month in the month of July, 2021. Data was collected using a pre-tested and pre-validated questionnaire containing 16 questions which included self-reported oral health status of the people. The questionnaire was available in both Hindi and English languages, and willing participants were first directed to a page explaining the study objectives as well as a button, which upon clicking signified their consent to participate in the study. A pilot study was conducted amongst fifteen subjects to validate the questionnaires and make subsequent adjustments. The data of these subjects was analysed with the main study participants and not included in the final analysis.

Participants were free to leave the questionnaire in between and only complete responses were accepted for analysis. Upon submission of the form, if a participant failed to answer ≥ 1 question(s) it was removed from the analysis.

Data was tabulated and the student's t-test and Pearson's correlation were applied to find out significant associations, if any. Data was analysed using SPSS version 21.0 and significance (p) was kept significant at ≤ 0.05 .

RESULTS

The age and diabetic status of the participants is depicted in table 1. Out of a total of 180 complete responses, 7.18% were above 15 years and below 39 years, 72.38% were above 40 years and below 63 years and the rest 19.89% were above 64 years and below 81 years. Out of these 180 participants, 8.3% were Type 1 diabetic, 72.8% were Type 2 diabetic and the rest 18.9% didn't know their diabetic status.

n, %	
Age (In years)	
15-39	13(7.18%)
40-63	131(72.38%)
>64 years	36(19.89%)
Diabetic status	
Type 1	15(8.3%)
Type 2	131(72.8%)
Don't know	34(18.9%)

Table 1. Age and Diabetic Status of the Participants

Table 2 reveals the self-reported oral manifestations of the participants. It was reported that 71.7% of participants experienced bad breath, out of which 66.7% experience it early in the morning, 16.1% during the daytime, 5% every time, 12.2% never and the difference was found to be significant ($p=0.02$). A total of 24.4% of the participants experienced burning mouth sensation, while 57.8% of participants experienced dry mouth (less salivation). Among these participants, 20.6% had white patches over their tongue while 8.3% reported having white patches over the inner cheeks (buccal mucosa), which was found to be statistically significant ($p=0.01$).

Table 3 reveals the self-reported dental health of the participants, and it was found that 20% out of them reported having swollen gums while 23.9% experienced it sometimes. A majority of the participants (70.5%) had a teeth count ranging from 23 to 32. 45% of participants had good oral hygiene and didn't experience any pain while eating, drinking, and

Oral Manifestations	Responses				p-value
Bad breath If yes, when	Yes- 129(71.7%) Early morning- 86 (66.7%) Daytime- 20(16.1%) Every time- 7(5%) Never- 16(12.2%)	No- 22(12.2%)	Sometimes- 27(15%)	Never-2 (1%)	0.02*
Burning mouth Sensation	Yes- 44(24.4%)	No- 90(49.4%)	Sometimes- 44(24.4%)	I don't know- 2(1%)	0.08
Dry mouth (less salivation)	Yes- 105(57.8%)	No- 40(22.2%)	Sometimes- 33(18.3%)	I don't know- 2(1%)	0.05
White patches over Tongue	Yes- 37(20.6%)	No- 122 (67.8%)	Maybe- 15(8.3%)	I don't know - 6(3.3%)	0.87
White patches over Inner cheeks	Yes- 15(8.3%)	No- 142(78.9%)	Maybe- 11(6.1%)	I don't know- 12(6.7%)	0.01*

Table 2. Self-Reported Oral Manifestations of the Participants

brushing, while 17.8% did so. A total of 21% of participants experienced sensitivity while eating/drinking and brushing, while 27.2% of participants experienced intermittently bleeding from the gingiva. Upon statistical analysis, none of the responses were found to be statistically significant.

Habits of the participants in relation to smoking and alcohol consumption is depicted in table 4, and it was observed that 58.9% were non-smokers, 21.7% were occasional smokers and 11.1% were chain smokers, while 60% of the respondents reported never drinking alcohol.

Table 5 reveals the self-reported oral hygiene practices of the participants. Regarding their dental check-up

status, 43.3% were regular visitors, while 37.2% of participants had 'never visited' a dental facility. The relationship between oral hygiene practices and dental visit status was found to statistically significant(p=0.01).

Analysis of relationship between diabetes and other variables using the Pearson's correlation coefficient revealed a positive, linear relationship with the scores of oral manifestation (r:+0.66, p=0.02) and oral hygiene (table 6).

DISCUSSION

Based on the results of the present study, it can be concluded that over half of the participants have

Self-Reported Dental Health	Responses				P value
Swollen gums	Yes- 36(20%)	No- 97(53.9%)	Sometimes- 43(23.9%)	Every time- 4(2.2%)	0.66
Total number of Teeth present	(0-10)- 25(13.73%)	(11-22)-28(15.5%)	(23-32)- 127(70.5%)		0.76
Pain in gums/teeth	While eating/drinking- 32(17.8%)	While brushing- 32(17.8%)	Both- 35(19.4%)	None- 81(45%)	0.65
Sensitivity in gums/teeth	While eating/drinking- 42(23.3%)	While brushing- 30(16.7%)	Both- 38(21.1%)	None- 70(38.9%)	0.88
Bleeding gums	Yes- 27(15%)	No- 99(55%)	Sometimes- 49(27.2%)	Every time- 5(2.8%)	0.87

Table 3. Self-Reported Dental Health of the Participants

Habits				
Smoke cigarettes/tobacco	Daily- 20(11.1%)	Occasionally- 40(21.7%)	Never- 105, (58.9%)	Stopped- 15,(8.3%)
Drink alcohol	Daily- 8(4.15%)	Occasionally- 57(31.7%)	Never- 108,(60%)	Stopped- 7,(4.15%)

Table 4. Habits of the Participants in Relation to Smoking and Alcohol Consumption

practices found to be statistically adequate oral health knowledge related to diabetes.

While reporting their oral manifestations, 71.7% of participants experienced bad breath, out of which 66.7% experienced it early in the morning, while 16.1% experienced it during the daytime, 5% experiencing it every time, and 12.2% never reported having bad breath. These findings are higher as compared to a study where halitosis was reported only in 23.3% of their diabetic patients.^{10,11} Modification in diet is often advised for participants with diabetes to prevent these and other symptoms associated with diabetes as the restricted consumption of carbohydrates may have a non-cariogenic effect as it has been reported that the anti-microbial defence capacity of saliva is not weakened in diabetes.^{2,3,9}

Self-reported dental examination revealed a prevalence of swollen gums in 20% (36) among the participants, with 23.9% of them experiencing it sometimes, while 27.2% of the participants experience d intermittent bleeding from their gingiva. These findings are in agreement to Bissong M et al, who reported 23.5% of their diabetic patients suffering from. Overall in their study, gingivitis, periodontitis and oral candidiasis was significantly higher in diabetics as compare to their non-diabetic counterparts.¹² An encouraging fact was that 45% of the participants with good oral hygiene didn't experience any pain while eating, drinking, and brushing.

In the present study, 58.9% of the diabetics were found to be non-smokers with 21.7% of them being occasional

are in agreement to Thresia CU et al.¹³, who reported that a significant proportion (59%) of diabetes patients in their study were tobacco consumers prior to their diagnosis and alarmingly, more than half of them continued to use tobacco on a daily basis even after their diagnosis.

Oral health care is conventionally disease-oriented, curative, and serves limited people due to high costs. Given the burden of unmet dental care needs and their association with systemic conditions, it is propagated that these services should primarily be based on education to increase awareness and influence the attitude of the people in seeking oral health care. Our study is among the few studies in its region to have followed a comprehensive approach by integrating oral health with NCDs.^{10,12}

This study is prone to certain limitations. The first being the self-reported nature of the data collected, however, keeping the pandemic in mind, patients might be apprehensive to get their oral screening done. The second limitation being the inadvertent over/under reporting of information by respondents. To counter this, no personal data was collected by the participants and hence, the results of the present study can be generalized.

CONCLUSION

Based on the results, it can be concluded that there is a need to educate diabetics regarding the effects of this disease on their oral health and the need to maintain proper hygiene. This can be achieved through individual patient care among those visiting dental clinics for treatment or through various community based programmes.

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Oral hygiene					p-value
Dental checkup	Yes- 78(43.3%)	No- 67(37.2%)	May be- 15(8.3%)	Sometimes- 20(11.1%)	0.01*
Tooth brushing	Once a day- 133(73.9%)	Twice a day- 40(22.2%)	After every meal- 5(2.9%)	Never- 2(1%)	0.98
Mouth washing	Yes- 27(15%)	No-96(53.3%)	Sometimes- 48(26.7%)	Never- 9(5%)	0.44

Table 5. Self-Reported Oral Hygiene Practices of the Participants

Relationship between diabetes and	r value	p-value
Age	+0.54	0.34
Oral Manifestations	+0.66	0.02*
Dental Health	+0.23	0.98
Habits	+0.77	0.78
Oral hygiene practices	+0.46	0.01*

Table 6. Analysis of relationship between diabetes and other variables using the Pearson's correlation coefficient

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