

PREVALENCE OF ORAL MUCOSAL LESIONS IN PATIENTS WITH DIABETES MELLITUS ATTENDING A TERTIARY HEALTH CENTER IN KATHMANDU

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ABSTRACT

Diabetes mellitus is associated with several oral complications due to impaired tissue repair and altered immune responses. Oral mucosal lesions are common among diabetic patients, yet data on their prevalence in Nepal are limited. This study aimed to assess the prevalence and distribution of oral mucosal lesions in diabetic patients attending a tertiary health center in Kathmandu. A cross-sectional observational study was conducted among 221 diabetic patients attending the outpatient dental department of Nepal Medical College Teaching Hospital for a period of 19 months (April 2024-October 2025). Patients above 18 years with a known history of diabetes for at least six months were included. Extraoral and intraoral examinations were performed, and oral hygiene, gingival, and periodontal status were recorded. Data were analyzed using frequency statistics in SPSS v21. The mean age of participants was 54.88 ± 12.45 years, with a mean disease duration of 7.84 ± 5.84 years. Of the participants, 129 (58.4%) were female. The most commonly affected anatomical site was the buccal mucosa 135 (43.5%), followed by the dorsum of the tongue 78 (25.2%). The most prevalent oral lesions were melanin pigmentation 84 (27.1%), oral ulcers 48 (15.5%), and lingual varicosities 36 (11.6%). Other lesions included fissured tongue, coated tongue, hyperkeratosis, and linea alba. Oral mucosal lesions are common in diabetic patients, particularly affecting the buccal mucosa and tongue. Routine oral examinations in diabetic care may facilitate early detection and management of these lesions, contributing to improved oral and systemic health.

KEYWORDS

Diabetes mellitus, lesion, oral, prevalence

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INTRODUCTION

Diabetes mellitus is a major non-communicable disease which is associated with well-established common modifiable risk factors.¹ If inadequately managed, it can significantly impair the quality of life and in severe cases may even lead to patient's death.² The disease disrupts normal tissue repair mechanisms and adversely affect the oral health.³ As a result it predisposes individuals to oral infections, neoplastic changes in oral mucosa and other oral complications.^{2,4,5}

The global prevalence of diabetes has increased due to rising life expectancy, genetic predisposition, unhealthy dietary patterns, sedentary lifestyle, and increased obesity.⁶ Furthermore, improved diagnostic methods and management and, consequently reduction in premature mortality have also contributed to the rising number of cases.⁷ Documenting the prevalence and characteristics of oral mucosal lesions among diabetic patients is essential for the planning, prevention and reducing burden of these lesions.⁸ Early recognition and/or management of the oral manifestations may facilitate early diagnosis of diabetes and contribute to improved glycemic control.⁹

Thus, the present study was conducted to assess prevalence of oral mucosal lesions in patients with diabetes mellitus attending a Tertiary Health Center in Kathmandu.

MATERIALS AND METHODS

A cross-sectional observational study was carried out among patients attending the outpatient department of the Dental Department at Nepal Medical College and Teaching Hospital. The study was conducted over a period of 19 months (April 2024- October 2025). Ethical approval was obtained from the Institutional Review Committee of the college (Ref. No.: 57-080/081).

Written informed consent was obtained from all participants using a standardized consent form approved by the ethical committee. Patient with a known history of diabetes; requiring investigation of blood glucose level as part of various dental treatment procedures and those undergoing routine blood sugar monitoring were included in the study.

Extraoral and intraoral examinations were performed under overhead dental lights using a mouth mirror, tweezers, gauze, and a wooden tongue depressor. The number of natural teeth and the presence of partial or complete

edentulism were recorded. Oral hygiene status was assessed using the Simplified Oral Hygiene Index.¹⁰ After the examination, patients presenting with diabetes-associated oral lesions were instructed and referred for appropriate treatments.²

Patients above 18 years of age with a known history of diabetes at least for the past 6 months were included in the study group. Patients were considered as diabetic when:¹¹

- Fasting glucose ≥ 126 mg/dl (7.0 mmol/l). Fasting is defined as no caloric intake for at least 8 h, OR
- 2-h plasma glucose ≥ 200 mg/dl (11.1 mmol/l) during an oral glucose tolerance test. The test should be performed as described by the WHO, using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water, OR
- In a patient with classic symptoms of hyperglycemia or hyperglycemic crisis, a random glucose ≥ 200 mg/dl (11.1 mmol/l)

Patients with deleterious oral habits, any obvious oral mucosal lesions, presence of clinically evident nutritional deficiencies (especially anemia) and patient under any medications other than for diabetes were excluded from the study.

The sample size was calculated using the formula,

$$n = \frac{z^2 pq}{e^2}$$

n = calculated sample size, $Z=1.96$, $p=10.25\%$ ¹⁰, $q=(1-p)$, $e=5\%$ (margin of error). The calculated sample size (n) was 220.87. Therefore, the minimum sample size taken was 221. Participants were recruited using the purposive sampling technique.

Data were entered, coded, and edited using Microsoft Excel 2016. The data were then transferred to SPSS-21 for further analysis. Frequency statistics were performed.

RESULTS

A total of 221 patients with diabetes were examined in this study. The mean age of the participants was 54.88 ± 12.45 years, and the mean duration of diabetes was 7.84 ± 5.84 years. Of the total, 129 (58.4%) were females and 92 (41.6%) were males. Most participants reported no family history of diabetes (81.4%), while 18 (8.1%) reported a paternal of diabetes history, 19 (8.6%) a maternal history, and 4 (1.8%) a history from both parents. Medication

Table 1: Demographic and clinical profile diabetic patients

Variables	n (%)
Gender	
Female	129 (58.4)
Male	92 (41.6)
Family history of diabetes	
Both	4 (1.8)
Father	18 (8.1)
Mother	19 (8.6)
Absent	180 (81.4)
Medications	
Yes	200 (90.5)
No	21 (9.5)
Type of medication	
None	21 (9.5)
Oral hypoglycemics	188 (85.1)
Insulin	6 (2.7)
Combination	6 (2.7)
Dentition status	
Dentulous	138 (62.4)
Partially edentulous	81 (36.7)
Edentulous	2 (0.9)
Oral hygiene status	
Good	25 (11.3)
Fair	112 (50.7)
Poor	84 (38)
n: frequency, %: percentage	

use was common, with 200 patients (90.5%) receiving treatment. Oral hypoglycemics were the primary therapy (188; 85.1%), while 6 (2.7%) were on insulin and 6 (2.7%) on combination therapy; 21 (9.5%) were not on any medication. Regarding dentition status, 138 (62.4%) were dentulous and 81 (36.7%) were partially edentulous, while only 2 (0.9%) were completely edentulous. Oral hygiene status showed overall good hygiene with the poor hygiene of only 84 (38%) participants (Table 1).

Based upon the anatomical site the buccal mucosa was the most affected site, 135 (43.5%), followed by the dorsum of the tongue 78 (25.2%). The most prevalent lesion was melanin pigmentation 84 (27.1%), which was primarily located on the buccal mucosa and attached gingiva. Other common lesions included oral ulcers 48 (15.5%) and lingual varicosities 36 (11.6%). Lesions such as fissured tongue 28 (9%) and coated tongue 25 (8.1%) were most commonly seen on the dorsum of the tongue. Additionally, hyperkeratosis and linea alba were frequently observed on the buccal mucosa. The distribution of oral mucosal lesions by anatomical site is presented in Table 2.

Table 2: Distribution of oral mucosal lesions by anatomical site among diabetic patients

Lesion	Site of lesion								n (%)
	Attached gingiva	Buccal mucosa	Dorsum of tongue	Hard palate	Lateral border of tongue	Lingual floor	Lip	No specific site	
Atrophic glossitis	0	0	1	0	0	0	0	0	1 (0.3)
Candidiasis	0	0	4	0	0	0	0	0	4 (1.3)
Coated tongue	0	0	25	0	0	0	0	0	25 (8.1)
Fissured tongue	0	0	28	0	0	0	0	0	28 (9)
Fordyce's granule	0	23	0	0	0	0	2	0	25 (8.1)
Geographic tongue	0	0	2	0	0	0	0	0	2 (0.6)
Hyperkeratosis	4	14	1	0	0	0	0	0	19 (6.1)
Linea alba	0	14	0	0	0	0	0	0	14 (4.5)
Lingual varicosities	0	0	0	0	0	36	0	0	36 (11.6)
Melanin pigmentation	23	33	14	11	0	0	3	0	84 (27.1)
Mucocele	0	1	1	0	0	0	0	0	2 (0.6)
Oral lichen planus	0	9	1	0	0	0	0	0	10 (3.2)
Oral ulcer	1	41	1	0	3	0	2	0	48 (15.5)
Petechiae	0	0	0	1	0	1	0	0	2 (0.6)
Pyogenic granuloma	3	0	0	0	0	0	0	0	3 (1)
Xerostomia	0	0	0	0	0	0	0	7	7 (2.3)
n (%)	31 (10)	135 (43.5)	78 (25.2)	12 (3.9)	3 (1)	37 (11.9)	7 (2.3)	7 (2.3)	310 (100)
n: frequency, %: percentage									

DISCUSSION

In this cross-sectional study, the mean age of the participants was 54.88 ± 12.45 years. This was similar to the study conducted on diabetic patient which reported the mean age of 53.84 ± 11.52 .¹² Female predominance was observed in the study which is consistent with findings from epidemiological studies.^{13,14} The high rate of medication use, 200 (90.5%); mostly on oral hypoglycemics indicates that most of the participants were under active diabetes management. However, recent evidence suggests that non-compliance to medication against diabetes remains high (56.3%), particularly among individuals living in rural areas. Illiteracy, poverty, and limited access to healthcare in the rural regions have been considered major contributing factors.¹⁵

A positive family history is known to increase the risk of developing diabetes.¹⁶ The relatively low proportion of patient with a positive family history in this study suggests that the disease is influenced more by the environmental factors rather than the hereditary factors.¹⁷

The mean duration of diabetes was 7.84 ± 5.84 years, denotes the presence of greater oral complications. The duration of diabetes is a strong predictor of neuropathy; the chronicity of disease is linked to chronic hyperglycemia and sustained metabolic damage.¹⁸ Prolonged hyperglycemia is also associated with hyperplasia and increased glycogen deposits in cells of the oral epithelium.¹⁹

Patients with diabetes are at increased risk of periodontal diseases which is considered as the major contributor for tooth loss. Previous study has reported a significant correlation between diabetes and completely edentulous condition.²⁰ However, in the present study; only 81 (36.7%) were partially edentulous, and only 2 (0.9%) were completely edentulous. Diabetes increases inflammatory activity in periodontal tissue, impairs new bone formation, and elevates receptor activator of nuclear factor- κ B ligand expression in response to a bacteria-induced challenge, ultimately leading to periodontal destruction and tooth loss.²¹

Previous studies indicate that patient with diabetes generally exhibit poorer oral hygiene than non-diabetic individuals.^{10,22} However, our study demonstrated overall good hygiene with poor hygiene observed in only 84 (38.0%) participants. This finding is supported by other study where only 1 (3.3%) patient showed poor oral health status.² A high proportion (90.5%) of the patient in the study were receiving medical

therapy, which may have contributed to their good oral hygiene. Additionally, variations in the oral hygiene practices and access to the oral health facilities could further explain these differences.

Melanin pigmentation was the most prevalent oral lesion observed, affecting 84 (27.1%), primarily on the buccal mucosa and attached gingiva. This is consistent with a study by Sinha *et al*,²³ which reported melanin pigmentation as the second most alteration, following coated tongue. Persistent hyperglycemia in Type 2 diabetes mellitus promotes the continuous formation of advanced glycation end (AGE) products within skin tissues. These advanced glycation end products interact with their receptor in AGE (RAGE) expressed on various cell types, including melanocytes. The AGE-RAGE interactions activate signaling pathways that elevate proinflammatory cytokines, growth factors, and matrix metalloproteinases, leading to oxidative stress, extracellular matrix degradation, and chronic inflammation. These inflammatory mediators, particularly interleukins and TNF- α , stimulate melanocytes and promote melanin synthesis, contributing to post-inflammatory hyperpigmentation.²⁴ However, the metabolic control of the participants was not assessed in this study.

Oral ulceration was the second most common lesion, observed in 48 (15.5%) participants. Delayed vascularization, reduced blood flow, diminished innate immunity, decreased growth factor production, and psychological stresses in diabetic patients may contribute to the prolonged wound healing.²⁵

The oral varicose veins have been associated with several medical conditions.²⁶ A study on sublingual varices identified hypertension as the most common risk factor, followed by denture wearing and diabetes mellitus.²⁷ A recent study further highlighted diabetes as the most frequent underlying systemic condition.²⁸ In this study, lingual varicosities were identified in 36 (11.6%) patients.

In conclusion, management of patient with diabetes require comprehensive understanding of how diabetes affects oral health. Diabetes significantly influences the development and progression of oral lesions, therefore, appropriate diagnosis, treatment planning, and management are essential to minimize complications and improve patient's quality of life.² Identification and management of oral complications should be integrated into routine diabetes care to more effectively address this chronic metabolic condition.

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