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Review

# Diabetic tongue – a review

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## Abstract

Diabetes mellitus is a long standing illness, presenting with severe complications directly proportional to the degree of hypoglycemia affecting all age group of people. Among all the organs of the body, oral manifestations are mostly the initial complication and could even promise an early diagnosis of the disease. Xerostomia due to tumefaction of salivary gland, burning sensation of oral cavity, recurrent ulcers, angular chelitis, oral lichen planus, infections and periodontal disease are all the commonest oral abnormalities detected in the patient with diabetic mellitus. However, there is very minimal literature regarding the tongue lesions associated with diabetes mellitus which are often neglected. Hence, this paper aims to review the literature regarding the tongue lesions and complications associated with diabetic mellitus and possible future prospects.

**Keywords:** candidiasis, diabetes mellitus, glossitis, oral manifestations, tongue

## Introduction

Diabetes mellitus is a metabolic condition with multiple etiological factors resulting in insulin deficiency or tissue resistance to insulin [1]. American Association of Diabetes in 1977 classified diabetes based on the etiological factors as type 1 (juvenile diabetic) and type 2 (acquired diabetic) diabetes mellitus. Type 1 diabetic mellitus is caused due to the blockade of insulin due to pancreatic beta cell destruction which are not caused by viral or autoimmune origin and common amoung 1st and 2nd decade of life. Type 2 diabetes arise as a result of alteration in both molecular and cellular level of insulin receptor [2].

Among type 1 and 2 diabetes mellitus, type 2 is most common which precedes with the symptoms such as polyuria, polydipsia, loss of body weight is the most common form of diabetes mellitus and has symptoms that commonly indicate hyperglycemia are polyuria, polydipsia, weight loss, fatigue, weakness, blurry vision, frequent skin infections, and slow healing of skin lesions after minor trauma [3].

A set of microvascular and macrovascular complications are the substantial cause of mortality and morbidity in diabetes mellitus and may further increase the risk of blindness, kidney failure, myocardial infarction and stroke. Diabetes mellitus shows complicated pathophysiology and has a considerable heterogeneity within the diabetic populations [4].

## Oral Manifestation of Diabetic Mellitus

Besides many other pathophysiological changes, diabetics increase the risk of oral manifestations such as periodontitis which are deliberated as the 6th manifestation of diabetic

mellitus. Xerostomia due to tumefaction of salivary gland, burning sensation of oral cavity, recurrent ulcers, angular chelitis, oral lichen planus, infections and periodontal disease are all the commonest oral abnormalities detected in the patient with diabetic mellitus. Also, there is a decrease in response to infections caused by bacteria, fungal and viral in uncontrolled diabetes patients as a result of hyperglycemia and ketoacidosis. On the other hand, controlled diabetes patients are at low risk though they have good control of glucose level as they are under proper medication and controlled diet [2].

Among the oral manifestations in patient with diabetes mellitus, tongue lesion which is often neglected deserves a special mention. Glossitis, atrophic tongue lesions, median rhomboid glossitis, geographic tongue, coated and fissured tongue, glossodynia and burning mouth sensation, and of taste sensation are the reported abnormalities of tongue manifested with higher incidence among diabetic patients [5, 6]. The intensity of above-mentioned abnormalities are frequently proportional to the hyperglycemic duration and rate [7].

## Glossitis

Glossitis is one of the inflammatory manifestations found in diabetes and are associated with stomatitis, skin rashes, loss of weight, diarrhea, decreased level of hemoglobin and plasma amino acid level have been reported to be found in patients with glucagonoma associated with diabetes mellitus [5].

## Central atrophic glossitis

Central atrophic glossitis or median rhomboid glossitis of the tongue is probably a form of candidiasis as illustrated by Budtz-Jorgensen in 1972 and Cooke in 1975. Long standing central papillary atrophy of the tongue are found to be a common manifestation of the tongue which arise as a result of predisposing factor such as microangiopathy which is s frequent findings seen in patients with diabetic mellitus [8] (Figure 1).

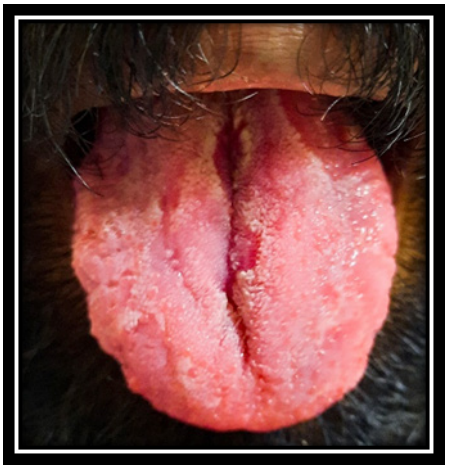

Figure 1: A 32-year-old male, who was known case of diabetes mellitus showing a central area papillary atrophy along the central longitudinal fissure of the tongue.

## Candidiasis of Tongue

Candidiasis in the oral cavity are the earliest and prevalent signs among one fourth of the diabetic population [9]. However, Candida is a normal microbial flora usually present in the oral cavity has some triggering factors such as immune dysfunction, hyperglycemia, and acid production can promote candidal infection in diabetes. Elevated salivary glucose levels and higher candidal colony-forming units in saliva can also stimulate the candidal production and increase the incidence of candidiasis in diabetic patients [10]. Atrophy of the filiform papillae leads to atrophic tongue or smooth tongue which favors a fine environment for the conidial growth [11]. A 3/5th of the candidial glossitis which is also termed as acute atrophic glossitis has a pre-disposing factor such as diabetic mellitus which can also be associated with consumption of board spectrum antibiotics and corticosteroid inhalation [12, 13]. Denture induced stomatitis, angular cheilitis and median rhomboid glossitis which precedes with multiple fungal and bacterial etiology are also associated with candidal lesions [14] (Figure 2).

## Oral Hairy Leukoplakia

Oral hairy leukoplakia (OHL) is a white lesion caused by Epstein Barr virus (EBV). OHL

Figure 2: A 51-year-old female, who was a known case of diabetes mellitus showing curdy white scrapable patches on the dorsum of the tongue, a PAP smear of the tongue revealed candidal hyphae confirming candidiasis.

occurs in the lateral border of the tongue and are often associated with severe immunodeficiency conditions [15]. There are certain OHL cases in patients associated with minor immunosuppression and also in immunocompetent individuals are also reported in the literature. As far as diabetics are concern, incidence of OHL are due to deficient PMNs leukocyte chemotaxis and abnormal phagocytic action by macrophages [16].

## Geographic Tongue

Geographic tongue or benign migratory glossitis (BMG) is an asymptomatic inflammatory condition which exclusively affects dorsum of the tongue [17]. Pathophysiology of geographic tongue in diabetic mellitus may be due to delayed healing and slow tissue repair as a result of hypoxia and oral microvascular disease in patients with diabetic mellitus. Clinically the lesion may appear as single or multiple lesion which is insidious in nature and may present with non-nucleated patches which are denuded of keratin, thus gives a reddish appearance, the adjacent side with a white to cream colored thick margins [18, 19]. In the literature, it has been mentioned that BMG has a genetic pre-disposition exhibiting polygenetic inheritance and increased incidence of tissue type HLA-B15 has also been reported by mark and trait which is more prevalent among type 1 diabetic mellitus population [20]. Bastos et al. found in a study with 146 type 2 diabetic patients with the prevalence of geographic tongue with type 2 diabetic mellitus about 5.4% higher than that of the control group which had an incidence of 0.9% [21]. A cross-sectional study conducted by Saini et al. in 420 diabetic mellitus patients and a control group has shown that patients with diabetic mellitus have shown the incidence of geographic tongue [21]. Another investigation done with 391 type 2 diabetes mellitus patients with oral lesions by Al-Maweri et al. has also shown that there is higher prevalence of BMG than that of the control group [22] (Figure 2).

## Fissured Tongue

Fissured tongue is a developmental or genetic based abnormality of the tongue manifested by abundant furrows or grooves on the dorsal surface of the tongue which is usually asymptomatic, except when there is collection of debris or food in the furrows which may cause discomfort or pain and has a possible chances for infection [23–25]. Fissured tongue with generalized complication associated with double fissure running longitudinally along the dorsum of the tongue, has been reported to occur more

Figure 3: A 29-year-old female patient, who was a known case of diabetic mellitus presented with an irregular smooth erythematous patches on the dorsum of the tongue.


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Figure 4: A 40-year-old female, who was a known case of uncontrolled diabetes showing fissures and grooves in the anterior 2/3 rd of the dorsum of tongue.

frequently in patients with type 1diabetic mellitus [26] (Figure 4).

## Altered Taste Sensation

Altered taste sensation or taste dysfunction have many pre-disposing factor in which endocrine and metabolic disorders were proposed as the major etiological factor. Other than that, salivary gland disorder may also imply altered taste sensation or may elevate the detection thresholds [27, 28]. Uncontrolled diabetic patient has reported more incidence of taste dysfunction than the controlled diabetic patient or healthy individuals [29]. Taste dysfunction may further lead to poor glycemic condition due to lack of diet control and has high threshold in the patients suffering from neuropathy [30].

## Conclusion

Patient with diabetic mellitus disorder is prone to greater alteration in the oral cavity especially tongue shows a popular incidence among the diabetic population which are often neglected by the clinician. There is a clear-cut exposure of diabetic associated with tongue disorders or abnormalities which may cause candida infection, atrophic glossitis, atrophic glossitis with candida infection, oral hairy leukoplakia, geographic tongue, fissured tongue and taste dysfunction even though diabetics has a major association periodontal and gingival complications.

## Conflict of Interest

The authors declare no conflict of interest.

## References


1. American Diabetes Association. (2010). Diagnosis and classification of diabetes mellitus. *Diabetes care* 33(Supplement 1): S62–S69.
2. Vasconcelos, B. C., Novaes, M., Sandrini, F. A., Maranhão, F. A. W., Coimbra, L. S. (2008). Prevalence of oral mucosa lesions in diabetic patients: a preliminary study. *Braz J Otorhinolaryngol*. 74(3): 423–428.
3. Powers, A. C. (2011). Diabetes mellitus. In: *Harrison's Principles of Internal Medicine*. 18th ed. New York: McGraw-Hill. 2968–3002.
4. Akintoye, S. O., Collins, M. T., Ship, J. A. (2008). Diabetes mellitus and endocrine diseases. In: *Burket's Oral Medicine*. New York, NY: PMPH-USA. 513.
5. Ponte, E., Tabaj, D., Maglione, M., Melato, M. (2001). Diabetes mellitus and oral disease. *Acta Diabetol*. 38(2): 57–62.
6. Guggenheimer, J., Moore, P. A., Rossie, K., et al. (2000). Insulin-dependent diabetes mellitus and oral soft tissue pathologies: II. Prevalence and characteristics of Candida and Candidal lesions. *Oral Pathol Oral Radiol Endod*. 89(5): 570–576.
7. Rohani, B. (2019). Oral manifestations in patients with diabetes mellitus. *World J Diabet*. 10(9): 485–489.
8. Farman, A. G. (1977). Atrophic lesions of the tongue among diabetic outpatients: their incidence and regression. *J Oral Pathol Med*. 6(6): 396–400.
9. Bajaj, S., Prasad, S., Gupta, A., Singh, V. B. (2012). Oral manifestations in type-2 diabetes and related complications. *Indian J Endocrinol Metab*. 16(5): 777–779.
10. Balan, P., Gogineni, S. B., Kumari, S., et.al. (2015). Candida carriage rate and growth characteristics of saliva in diabetes mellitus patients: a case-control study. *J Dent Res Dent Clin Dent Prospec*.9(4): 274.
11. Rogers, R. S. (1999). Disease of the tongue. In: Lotti TM, Parish LC, Rogers RS III, eds. Oral Disease Textbook and Atlas. NY: *Springer*, 219–226.
12. Lynch, D. P. (1994). Oral candidiasis. History, classification, and clinical presentation. *Oral Surg Oral Med Oral Pathol*. 78(2): 189–193.
13. Terai, H., Shimahara, M. (2005). Atrophic tongue associated with Candida. *J Oral Pathol Med*. 34(7): 397–400.
14. Al-Maskari, A. Y., Al-Maskari, M. Y., Al-Sudairy, S. (2011). Oral manifestations and complications of diabetes mellitus: A review. *Sultan Qaboos Univ Med J*. 11(2): 179–186.
15. Blomgren, J., Bäck, H. (1996). Oral hairy leukoplakia in a patient with multiple myeloma. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 82(4): 408–410.

16. Milagres, A., Dias, E. P., Tavares, D. D., et al. (2007). Prevalence of oral hairy leukoplakia and epithelial infection by Epstein-Barr virus in pregnant women and diabetes mellitus patients: cytopathologic and molecular study. *Memórias do Instituto Oswaldo Cruz*. 102(2): 159–164.
17. Wysocki, G. P., Daley, T. D. (1987). Benign migratory glossitis in patients with juvenile diabetes. *Oral Surg Oral Med Oral Pathol*. 63(1): 68–70.
18. Huamei, Y., Yu, Z., Xin, Z., Ga, L., Qianming, C. (2015). Research progress on the risk factors of geographic tongue. *W China J Stomatol*. 33(1).
19. Assimakopoulos, D., Patrikakos, G., Fotika, C., Elisaf, M. (2002). Benign migratory glossitis or geographic tongue: an enigmatic oral lesion. *Am J Med*. 113(9): 751–755.
20. Bastos, A. S., Leite, A. R., Spin-Neto, R., Nassar, P. O., Massucato, E. M., Orrico, S. R. (2011). Diabetes mellitus and oral mucosa alterations: prevalence and risk factors. *Diabetes Res Clin Pract*. 92(1): 100–105.
21. Saini, R., Al-Maweri, S. A., Saini, D., Ismail, N. M., Ismail, A. R. (2010). Oral mucosal lesions in non oral habit diabetic patients and association of diabetes mellitus with oral precancerous lesions. *Diabetes Res Clin Pract*. 89(3): 320–326.
22. Al-Maweri, S. A., Ismail, N. M., Ismail, A. R., Al-Ghashm, A. (2013). Prevalence of oral mucosal lesions in patients with type 2 diabetes attending hospital universiti sains Malaysia. *Malays J Med Sci*. 20(4): 39–46.
23. Sonis, S. T., Fazio, R. C., Fang, L. (1995). Principles and Practice of Oral Medicine, 2 edition. Philadelphia, Saunders Co. 394–395.
24. Neville, B., Damm, D. D., Allen, C. M., Bouquot, J. E. (1995). Oral and maxillofacial pathology. *Philadelphia: WB Saunders*. 22: 11–2.
25. Kullaa-Mikkonen, A., Tenovuo, J., Sorvari, T. (1985). Changes in composition of whole saliva in patients with fissured tongue. *Scand J Dent Res*. 93(6): 522–528.
26. Farman, A. G. (1976). Atrophic lesions of the tongue: a prevalence study among 175 diabetic patients. *J Oral Pathol*. 5(5): 255–264.
27. Ship, J. A., Chavez, E. M. (2001). Special Senses: Disorders of Taste and Smell. In: Silverman, S. Jr., Eversole, L. R., Truelove, E. L., (Eds.). Essentials of Oral Medicine. Hamilton, London: BC Decker Inc. 279–280. 61.
28. Negrato, C. A., Tarzia, O. (2010). Buccal alterations in diabetes mellitus. *Diabetol Metab Syndr*. 15: 2–3.
29. Lalla, R. V., D'Ambrosio, J. A. (2001). Dental management considerations for the patient with diabetes mellitus. *J Am Dent Assoc*. 132(10): 1425–1432.
30. Ship, J. A. (2003). Diabetes and oral health: an overview. *J Am Dent Assoc*. 134: 4S–10S.

 https://doi.org/10.46389/rjd-2021-1033 