

## Original Article

# Prevalence of Burning Mouth Syndrome in A sample of Egyptian Patients with Diabetic Neuropathy: A Cross Sectional Hospital-Based Study

Alaa Mahmoud\*<sup>1</sup>, Wesam Abdel Moneim<sup>1</sup>, Marium Fakhr<sup>1</sup>, Shereen Sadik El -Sawy<sup>2</sup>

<sup>1</sup>Department of Oral Medicine and Periodontology, Faculty of Dentistry, Cairo University, Egypt.

<sup>2</sup>Department of Internal Medicine and Endocrinology Faculty of Medicine, Cairo University

Email: alaa.mahmoud@dentistry.cu.edu.eg

Received: 30-1-2019

Accepted: 19-2-2020

## Abstract:

**Background:** Diabetes Mellitus is one of the systemic causes of secondary burning mouth syndrome. Burning sensation in diabetic patients has been attributed to poor glycemic control and regional neuropathy. Diabetic peripheral neuropathy is the most common microvascular chronic complication of diabetes, affecting almost half of the diabetic population. **Aim:** To assess the frequency of burning mouth syndrome in type 2 diabetic patients with peripheral neuropathy. **Methods:** A total number of 250 patients with type 2 diabetes mellitus diagnosed clinically with peripheral neuropathy were recruited. Clinical examination was done to exclude any oral lesions. Oral complaints related to burning mouth syndrome including burning sensation, altered taste sensation, and xerostomia were recorded using dichotomous method. **Results:** The prevalence of burning mouth syndrome in type 2 diabetic patients with peripheral neuropathy was 18.8%. About half of the of the participants (53.2%) had contributing local factors as fissured tongue, oral lichen planus and chronic candidiasis. There is a positive correlation between local factors and burning mouth syndrome, also there is a positive correlation between local factors and metabolic control (p.value<0.05).

**Conclusion:** Burning mouth syndrome in patients with diabetic neuropathy is complicated. The contributing oral factors are associated with poor metabolic control. Good metabolic control should be achieved to prevent effects of hyperglycemia on oral mucosa, also to prevent further deterioration in neuropathic mechanism.

**Keywords:** Oral manifestations, oral candidiasis, oral lichen planus, Diabetes Mellitus.

## Introduction:

Burning mouth is a symptom of other diseases when local or systemic factors are found to be

implicated. However, burning mouth syndrome (BMS) is a term used when there are no

underlying local or systemic factors. The word syndrome is used as many patients also have xerostomia, oral paraesthesia, and altered taste or smell sensation (**Zakrzewska, Forssell and Glenny, 2012**)

Although the International Association for the Study of Pain (IASP) defines BMS as any chronic persistent pain or burning oral sensation (**Merksey, Harold and Bogduk, 1994**), The International Headache Society defined it as a burning sensation in the absence of local or systemic factors and it can be confined only to the tongue. It also may be associated with oral dryness and loss of taste (**Olesen and Steiner, 2004**).

BMS can be classified according to Scala et al, 2003 into primary, secondary and complicated BMS. Primary BMS is idiopathic without apparent local or systemic factors while secondary BMS results from identified precipitating factors. However, the occurrence of overlapping systemic or/and oral mucosal pathologies may cause difficulties in the diagnosis result in complicated BMS (**Scala et al., 2003**).

Clinically BMS may be presented as monosymptomatic or oligosymptomatic. Monosymptomatic BMS include patients with only pain sensation as burning, tingling, scalding, and numbness sensation. However oligosymptomatic include patients with pain and other symptoms as xerostomia and dysgeusia (**Scala et al., 2003**).

The prevalence of BMS reported for the general population varies between 0.7% and 15% depending on the used diagnostic criteria. It increases with age among both sexes and mainly affects postmenopausal females (**Bender, 2018**). Although various theories have been explained in the pathophysiology of BMS, it is well accepted that a combination of processes exist to produce the oral burning sensation including damage in chorda

tympani and small fiber neuropathy (**Grushka and Su, 2017**).

Diabetes mellitus (DM) is one of the systemic conditions associated with secondary BMS (**Balasubramaniam, Klasser and Delcanho, 2009**). Burning mouth sensation in diabetic patients has been attributed to poor glycemic control, metabolic alterations in the oral mucosa, angiopathy and neuropathy. Good metabolic control results in symptoms improvement (**Maltsman-tseikhin, Moricca and Niv, 2007**).

Egypt is listed among the world top 10 countries in the number of patients with DM. In 2013, The International Diabetes Federation (IDF) estimated that 7.5 million individuals are diabetics and around 2.2 million are prediabetics in Egypt (**Hegazi et al., 2015**). Diabetic neuropathy is a life-threatening complication affecting almost half of the diabetic population (**Chawla, Chawla and Jaggi, 2016**). Sensorimotor peripheral neuropathy is the most common type of neuropathy which affects both large and small afferent nerve fibers, resulting in mixed positive and negative symptoms as burning sensation and sensory loss (**American Diabetes Association, 2019**).

The correlation between DM and BMS is still controversial. It has been suggested that type 2 diabetes mellitus (T2DM) plays a role in BMS development. In contrast, other studies report a lack of association between these two conditions. To assess the relation between BMS and T2DM, this cross-sectional study was conducted to determine the prevalence of BMS in a sample of Egyptian patients with T2DM and peripheral neuropathy.

### **Subjects and methods:**

#### **Ethical approval:**

The study was approved from research ethics committee in faculty of dentistry, Cairo university (approval number: 18712). All the participants

signed an informed consent after clear explanation of the purpose of the study.

**Setting:**

This cross sectional study was conducted on 250 type 2 diabetic patients diagnosed with peripheral neuropathy in Diabetes and Endocrinology Clinic in Kasr Al Ainy Cairo University Hospitals over a period of one month since the first of July 2019 to the first of August 2019. The patients were recruited in the study randomly in consecutive order to minimize the selection bias.

**Eligibility criteria:**

Inclusion criteria include Egyptian patients more than 25 years diagnosed with T2DM based on **American Diabetes Association, 2019** criteria. All patients were diagnosed clinically with peripheral neuropathy according to the clinical symptoms (**Boulton, Gries and Jervell, 1998**). Exclusion criteria include patients had any other systemic diseases which may be attributed to BMS as autoimmune conditions, hormonal disturbances, and patients with a history of receiving radiotherapy or chemotherapy.

**Data collection:**

All the participants were subjected to a questionnaire and comprehensive oral examination. Demographic data were recorded in the form of age, sex and address and the medical records were screened for metabolic condition and duration of diabetes. Blood sample was withdrawn from participants without recorded data of HgA1c in the previous month to record the recent metabolic control.

Presence or absence of chronic burning sensation for at least 3 months, dysgeusia, and xerostomia was recorded using dichotomous method. Dental examination was performed using dental instruments and portable light to report any local factors of burning sensation as geographic tongue, oral ulcers, oral candidiasis, and oral lichen planus (OLP). Oral lesions were diagnosed clinically and

recorded for each patient with positive records of burning sensation.

**Statistical analysis:**

Statistical analyses were performed using the statistical software program, SPSS, for Windows version 20.0 (SPSS; Chicago, IL, USA). Numerical data is described as mean and standard deviation or median and range. Categorical data is described as numbers and percentages.

**Results:**

The study participant's age distributions were recorded with 65% of participants between 40-60 years. Female participants were more than males with percentage of 76.4% to 23.6% respectively (3:1). Regarding residence, participants were found to live in urban areas more than in rural ones with percentage of 52.4% to 47.6%.

The metabolic control was recorded, 178 of the study participants showed poor metabolic control ( $HbA1c > 7$ ) with percentage of 71.2% and 72 of the study participants were with good metabolic control ( $HbA1c < 7$ ) with percentage of 28.8%. there is no significant correlation between BMS and metabolic control as shown in table 1.

As regards the duration of diabetes, participants who had T2DM for more than 10 years (42%) were fewer in number than those who had the same condition for less than or equal to 10 years (58%).

The prevalence of BMS was 18.8%. Patients were complained from BMS as monosymptomatic or oligosymptomatic with xerostomia and altered taste sensation. Patients with monosymptomatic BMS represented only 13%. While patients with oligosymptomatic BMS were 87%. The prevalence of altered taste sensation with or without burning sensation was 40.4% while the prevalence of xerostomia was 25.6%.

The frequencies and percentages of BMS, altered taste sensation, xerostomia, and oral lesions were shown in table 2.

Regarding the presence of local factors, 53.2% of the participants who reported burning sensation had one or more local factors as OLP, oral ulcers and oral candidiasis. The other 46.8% didn't have any

local factors. Some participants didn't report burning sensation but after clinical oral examination, they were diagnosed clinically with one or more oral lesions. Positive correlation between BMS and contributing local factors was shown in table 3. Also there is positive correlation between local factors and metabolic control as shown in table 4.

**Table 1: Correlation between BMS and metabolic control**

	Metabolic control		Total	Chi squared	P Value
	good	poor			
<b>Patients with BMS</b>	9	38	47	2.6292	.104916
	19.1%	80.9%			
<b>Patients without BMS</b>	63	140	203		
	31%	69%			
<b>Total</b>	72	178	250		
	28.8%	71.2%			

**Table 2: The frequencies and percentages of oral finding**

Oral finding	Frequency (N)	Prevalence (%)
Burning sensation	47	18.8%
Altered taste sensation	101	40.4%
Xerostomia	64	25.6%
Fissured tongue	87	34.8%
Geographic tongue	8	3.2%
Oral lichen planus (OLP)	15	6%
Oral candidiasis	12	4.8%
Oral ulcers	16	6.4%

Table 3: Correlation between BMS and local factors

	Local factors		Total	Chi squared	P Value
	Yes	No			
<b>Patients with BMS</b>	25	22	47	50.55	.00001
	53.2%	46.8%			
<b>Patients without BMS</b>	19	184	203		
	9.3%	90.7%			
<b>Total</b>	44	206	250		
	17.6%	82.4%			

Table 4: Correlation between local factors and metabolic control.

	Local factors		Total	Chi squared	P Value
	Yes	No			
<b>Good metabolic control</b>	24	48	72	17.2605	.000033
	33.3%	66.67%			
<b>Poor metabolic control</b>	20	158	178		
	11.2%	88.8%			
<b>Total</b>	44	206	250		
	17.6%	82.4%			

\*The p-value is significant at  $p < .05$ .

#### Discussion:

The relationship between oral health and DM has been extensively studied. Higher percentage of oral alterations among patients with DM was reported in the systematic review on oral manifestations of DM performed by **Mauri-Obradors et al., 2017**. Periodontal disease, periapical lesions, altered taste sensation, xerostomia and burning mouth sensation were the most common oral alterations.

Burning mouth sensation in patients with diabetes was attributed to diabetic peripheral neuropathy. Peripheral neuropathy causes pain, dysesthesia, and loss of sensation, whereas autonomic neuropathy may impair the salivary flow rate (**Collin et al., 2000**). A recent study

suggested that about 30%-60% of BMS patients present neuropathic pain, which is strongly associated with the intensity of pain (**Lopez-Jornet et al., 2017**).

Up to the authors' knowledge, the present study is the first cross sectional study in Egypt to assess the prevalence of burning sensation in patients with T2DM having peripheral neuropathy.

In this study, the metabolic control was assessed by ADA guidelines 2019 (HbA1c  $>7$  considered as poor control and HbA1c  $\leq 7$  as good control). Most of the participants in this study showed poor metabolic control (71.2%). The results were consistent with De Souza Bastos et al., 2011 in Brazil. The proposed explanation is that

Egyptian patients did not follow the strict instructions for the management of DM with a high percentage of patients with poor socioeconomic level and unhealthy life style (**Hegazi et al., 2015**).

The prevalence of burning sensation in this study was 18.8%. It is similar to the results reported by Collin *et al.*, 2000 who found that 17.8% of diabetic patients had burning sensation and Arap *et al.*, 2010 in Brazil who found that 17.2% of patients with painful peripheral diabetic neuropathy had burning sensation. Other studies reported burning sensation in patients with T2DM with or without peripheral neuropathy as Ouda and Al-attas, 2009 in Saudi Arabia who reported a higher percentage (39%) and Bajaj *et al.*, 2012 in India who reported only 10%. The conflict in the prevalence of burning sensation can be attributed to the variability in symptomatology, lack of precise diagnostic criteria, and the different population (**Moore, Guggenheimer and Orchard, 2007**).

A high percentage of altered taste sensation was recorded from participants' complaints (40.4%). This result was consistent with the results of Ouda and Al-attas, 2009 (33%) but in a higher percentage than the results of Bajaj *et al.*, 2012 (20%). Taste alteration in patients with DM is explained by the neuropathic mechanism in taste nerves. Duration of diabetes and diabetic neuropathy had the strongest association with altered taste sensation (**Latha GS, DM and Puranik, 2017**) as well as the dryness of mucosa, decreased gustin production, zinc deficiency and coated tongue (**Cicmil et al., 2018**).

The prevalence of subjective oral dryness was 25.6%. This result was similar to the results found by Al-Maweri *et al.*, 2013, Bissong *et al.*, 2015, and Carramolino-Cuéllar *et al.*, 2018 (30.4%, 30.2%, and 27.6% respectively). While De Souza Bastos *et al.*, 2011, and Guinan *et al.*,

2018 reported high prevalence (47.4% & 43.8% respectively). Subjective oral dryness may not be associated with hyposalivation (**López-Pintor et al., 2016**). It may be due to thirst, dehydration, side effects of concomitant drug therapy that is commonly used by diabetic patients as antihypertensive drugs and diuretics (**Gandara and Morton, 2011**).

Regarding presence of local factors, 57.4% of the participants who reported burning sensation had one or more precipitating local factors as OLP, oral ulcers and candidiasis. This result is similar to the results found by Moore, Guggenheimer and Orchard, 2007 (42.8%).

Fissured tongue was reported in this study at percentage of 34.8%. This result was consistent with the results found by Al-maweri *et al.*, 2013 in Malaysia, Ouda and Al-attas, 2009, and Jhugroo *et al.*, 2018 (26.9%, 30.7%, and 25.2% respectively). While De Souza Bastos *et al.*, 2011 found only 17.8%, and Mohsin *et al.*, 2014 found 15.9%.

The prevalence of benign migratory glossitis was 3.2%. This was consistent with the results found by De Souza Bastos *et al.*, 2011, and Al-maweri *et al.*, 2013 (5.4% & 3.6% respectively). However Jhugroo *et al.*, 2018 found a prevalence of 12.4%.

The association between OLP and DM was extensively studied. The meta-analysis by Mozaffari *et al.* concluded a positive association between OLP with DM (**Mozaffari, Sharifi and Sadeghi, 2016**). In the present study, OLP were diagnosed in 6% of the participants. This was similar to the results found by De Souza Bastos *et al.* in 2011 and Trentin *et al.* in 2017 (6.1% & 6% respectively). However Al-maweri *et al.*, 2013 Mohsin *et al.*, 2014 and Jhugroo *et al.*, 2018 found less percentage (0.5%, 1.8% and 3.6% respectively).

The prevalence of oral candidiasis in this study was 4.8%. This result was similar to the results found by Trentin et al., 2017 (6.8%). However De Souza Bastos et al, 2011, Bajaj et al, 2012 and Bissong et al, 2015 found high prevalence of 15%, 24% and 21.5% respectively.

Despite the positive correlation between local factors and BMS, this association should be interpreted carefully due to the inherent limitations of this cross sectional study to establish cause-effect relationships.

Within the limitation of this study, The overall findings indicated that management of oral lesions should be done to control symptoms of burning sensation. Also good metabolic control should be achieved to prevent further deterioration.

### Conclusions:

Burning mouth syndrome in patients with diabetic neuropathy is complicated. The contributing oral factors are associated with poor metabolic control. Good metabolic control should be achieved to prevent effects of hyperglycemia on oral mucosa, also to prevent further deterioration in neuropathic mechanism.

### Conflict of Interest:

The authors declare no conflict of interest

### References:

Al-Maweri, S. A. A. *et al.* (2013) 'Prevalence of Oral Mucosal Lesions in Patients with Type 2 Diabetes Attending Hospital Universiti Sains Malaysia', *Malays J Med Sci*, 20(4), pp. 39–46.

American Diabetes Association (2019) 'Standards of Medical Care in Diabetes', *Diabetes care*, 42(1). doi: <https://doi.org/10.2337/dc19-S002>.

Arap, A. *et al.* (2010) 'Trigeminal pain and

quantitative sensory testing in painful peripheral diabetic neuropathy', *archives of oral biology*, 55, pp. 486–493. doi: 10.1016/j.archoralbio.2010.03.021.

Bajaj, S. *et al.* (2012) 'Oral manifestations in type-2 diabetes and related complications', *Indian Journal of Endocrinology and Metabolism*, 16(5), p. 777. doi: 10.4103/2230-8210.100673.

Balasubramaniam, R., Klasser, G. D. and Delcanho, R. (2009) 'Separating oral burning from burning mouth syndrome: Unravelling a diagnostic enigma', *Australian Dental Journal*, 54(4), pp. 293–299. doi: 10.1111/j.1834-7819.2009.01153.x.

Bender, S. D. (2018) 'Burning Mouth Syndrome', *Dental Clinics of NA*. Elsevier Inc, 62(4), pp. 585–596. doi: 10.1016/j.cden.2018.05.006.

Bissong, M. E. A. *et al.* (2015) 'Oral health Status of diabetic patients in South West ... Oral health status of diabetes mellitus patients in Southwest Cameroon', *Tropical dental journal*, 38(150), pp. 49–57.

Boulton, A. J. M., Gries, F. A. and Jervell, J. A. (1998) 'Guidelines for diagnosis and outpatient management of diabetic peripheral neuropathy', *Diabetes and Metabolism*, 24(SUPPL. 3), pp. 55–65. doi: 10.1002/(sici)1096-9136(199806)15:6<508::aid-dia613>3.3.co;2-c.

Carramolino-Cuéllar, E. *et al.* (2018) 'Salivary flow and xerostomia in patients with type 2 diabetes', *Journal of Oral Pathology and Medicine*, 47(5), pp. 526–530. doi: 10.1111/jop.12712.

Chawla, A., Chawla, R. and Jaggi, and S. (2016) 'Microvascular and macrovascular complications in diabetes mellitus: Distinct or continuum?', *Indian journal of endocrinology and metabolism*. Medknow Publications & Media Pvt Ltd, 20(4),

pp. 546–551. doi: 10.4103/2230-8210.183480.

Cicmil, S. *et al.* (2018) ‘Oral Alterations in Diabetes Mellitus’, *Balkan Journal of Dental Medicine*, 22(1), pp. 7–14. doi: 10.2478/bjdm-2018-0002.

Collin, H. L. *et al.* (2000) ‘Oral symptoms and signs in elderly patients with type 2 diabetes mellitus. A focus on diabetic neuropathy.’, *Oral surgery, oral medicine, oral pathology, oral radiology, and endodontics*, 90(3), pp. 299–305. doi: S1079210400368421 [pii].

Gandara, B. K. and Morton, T. H. (2011) ‘Non-periodontal oral manifestations of diabetes: A framework for medical care providers’, *Diabetes Spectrum*, 24(4), pp. 199–205. doi: 10.2337/diaspect.24.4.199.

Grushka, M. and Su, N. (2017) ‘Burning Mouth Syndrome’, in Ferreira, J. N. A. R., Friction, J., and Rhodus, N. (eds) *Orofacial disorders: Current therapies in orofacial pain and oral medicine*. Springer International Publishing, pp. 223–234. doi: 10.1007/978-3-319-51508-3.

Guinan, J.-C. *et al.* (2018) ‘Analysis of the Relationship between Oral Diseases and Glycemic Control of Diabetes in the West African Context: Survey at the Centre Anti-Diab&#233;tique d’Abidjan (CADA), C&#244;te d’Ivoire’, *Open Journal of Epidemiology*, 08(04), pp. 213–225. doi: 10.4236/ojepi.2018.84017.

Hegazi, R. *et al.* (2015) ‘Epidemiology of and Risk Factors for Type 2 Diabetes in Egypt’, *Annals of Global Health*. Elsevier Inc, 81(6), pp. 814–820. doi: 10.1016/j.aogh.2015.12.011.

Jhugroo, C. *et al.* (2018) ‘Characterization of oral mucosa lesions and prevalence of yeasts in diabetic patients: A comparative study’, *Microbial Pathogenesis*. Elsevier Ltd, 126(October 2018), pp. 363–367. doi: 10.1016/j.micpath.2018.11.028

Latha GS, DM, C. and Puranik, N. (2017) ‘Altered taste threshold in chronic Type 2 diabetes mellitus’, *National Journal of Physiology, Pharmacy and Pharmacology*, 8(4), pp. 569–574. doi: 10.5455/njppp.2018.8.082353007201.

Lopez-Jornet, P. *et al.* (2017) ‘Neuropathic Pain in Patients with Burning Mouth Syndrome Evaluated Using painDETECT’, *American Academy of Pain Medicine*, 18, pp. 1528–1533. doi: 10.1093/pm/pnw304.

López-Pintor, R. M. *et al.* (2016) ‘Xerostomia, Hyposalivation, and Salivary Flow in Diabetes Patients’, *Journal of Diabetes Research*, 2016, pp. 1–15. doi: 10.1155/2016/4372852.

Maltsman-tseikhin, A., Moricca, P. and Niv, D. (2007) ‘Burning mouth syndrome: Will better understanding yield better management?’, *Pain Practice*, 7(2), pp. 151–162. doi: 10.1111/j.1533-2500.2007.00124.x.

Mauri-Obradors, E. *et al.* (2017) ‘Oral manifestations of diabetes mellitus. A systematic review’, *Medicina Oral, Patología Oral y Cirugía Bucal*, 22(5), pp. e586–e594. doi: 10.4317/medoral.21655.

Merksey, Harold and Bogduk, N. (1994) ‘Classification of chronic pain’, *Descriptions of Chronic Pain Syndromes and Definitions of Pain Term IASP press Seattle, Wash, USA*, pp. 59–71.

Mohsin, S. F. *et al.* (2014) ‘Prevalence of oral mucosal alterations in type 2 diabetes mellitus patients attending a diabetic center’, *Pak J Med Sci*, 30(4), pp. 716–719. doi: http://dx.doi.org/10.12669/pjms.304.5220 How.

Moore, P. A., Guggenheimer, J. and Orchard, T. (2007) ‘Burning mouth syndrome and peripheral neuropathy in patients with type 1 diabetes mellitus’, *Journal of Diabetes and its*

*Complications*, 21(6), pp. 397–402. doi: 10.1016/j.jdiacomp.2006.08.001.

Mozaffari, H. R., Sharifi, R. and Sadeghi, M. (2016) 'Prevalence of oral lichen planus in diabetes mellitus: A meta-analysis study', *Acta Informatica Medica*, 24(6), pp. 390–393. doi: 10.5455/aim.2016.24.390-393.

Olesen, J. and Steiner, T. J. (2004) 'The international classification of headache disorders, 2nd edn (ICDH-II)', *Journal of Neurology, Neurosurgery & Psychiatry*, 75(6), pp. 808 LP – 811. doi: 10.1136/jnnp.2003.031286.

Ouda, S. and Al-attas, S. A. (2009) 'Hyperglycemia and Oral mucosal lesions among diabetic patients in Jeddah city', *egyptian dental journal*, 55 No. 2, pp. 1–10.

Scala *et al.* (2003) 'Update on burning mouth syndrome: Overview and patient management', *Critical Reviews in Oral Biology and Medicine.*, 14(4), pp. 257–291. doi: 10.1177/154411130301400405.

de Souza Bastos, A. *et al.* (2011) 'Diabetes mellitus and oral mucosa alterations: Prevalence and risk factors', *Diabetes Research and Clinical Practice*, 92(1), pp. 100–105. doi: 10.1016/j.diabres.2011.01.011.

Trentin, M. S. *et al.* (2017) 'Most frequent oral lesions in patients with type 2 diabetes mellitus', *Journal of Contemporary Dental Practice*, 18(2), pp. 107–111. doi: 10.5005/jp-journals-10024-1999.

Zakrzewska, J. M., Forssell, H. and Glenny, A.-M. (2012) 'Interventions for the treatment of burning mouth syndrome ( Review )', *Cochrane Database of Systematic Reviews*, (1). doi: 10.1002/14651858.CD002779.pub2.www.cochranelibrary.com.

1

S