

# Research Paper: Comparison of burning mouth syndrome prevalence between diabetes mellitus and hypothyroidism patients



Seyed Javad Kia<sup>1</sup>, Mohammad Samami<sup>2\*</sup>, Fariba Aslani<sup>3</sup>

<sup>1</sup>Associate Professor, Dental Sciences Research Center, Department of Oral and Maxillofacial Medicine, School of Dentistry, Guilan University of Medical Sciences, Rasht, Iran

<sup>2</sup>Assistant Professor, Dental Sciences Research Center, Department of Oral and Maxillofacial Medicine, School of Dentistry, Guilan University of Medical Sciences, Rasht, Iran

<sup>3</sup>General dentist, Rasht, Iran

Use your device to scan  
and read the article online



**Citation:** Kia SJ, Samami M, Aslani F. Comparison of burning mouth syndrome prevalence between diabetes mellitus and hypothyroidism patients. Journal of Dentomaxillofacial Radiology, Pathology and Surgery. 2021; 10(3):1-5. <http://dx.doi.org/10.32598/3dj.7.4.145>

<http://3dj.gums.ac.ir>



## Article info:

**Received:** 2021/07/01

**Accepted:** 2021/08/11

## Keywords:

Burning Mouth Syndrome  
Diabetes Mellitus  
Hypothyroidism

## ABSTRACT

**Introduction:** Due to the high prevalence of type 2 diabetes and hypothyroidism and the fact that the complication of burning mouth syndrome is seen in both of these diseases, we compared the frequency of burning mouth syndrome in patients with diabetes mellitus type 2 and patients with hypothyroidism referred to Rasht dental school in 1399.

**Materials and Methods:** In this cross-sectional study, 196 patients with type 2 diabetes mellitus and 196 patients with hypothyroidism were included in the study. Each participant in the study was assessed by asking the patient about the presence of burning pain in the oral mucosa. In cases with burning pain, the visual analogue scale criterion was used to measure the severity of pain.

**Results:** Burning mouth syndrome was significantly higher in patients with diabetes mellitus ( $P = 0.022$ ). There was no significant relationship between the mean level of FBS, HbA1C and TSH with burning mouth syndrome, while there was a significant relationship between the mean level of free T4 with burning mouth syndrome ( $P = 0.004$ ). The mean level of free T4 was higher in patients with burning mouth syndrome. It was also found that aging has a positive correlation with the severity of burning pain ( $p < 0.001$ ).

**Conclusion:** According to the results of the present study, it is necessary to prevent the occurrence of diabetes mellitus and consequently the development of this complication in the mouth. It is also important to monitor patients with diabetes mellitus and control their oral complications in collaboration with the medical team.

## \* Corresponding Author:

**Mohammad Samami.**

**Address:** Department of Oral and Maxillofacial Medicine, School of Dentistry, Guilan University of Medical Sciences, Rasht, Iran

**Tel:** 098-9128837044

**E-mail:** m\_samami@alumnus.tums.ac.ir

## Introduction

Burning mouth syndrome (BMS) is a chronic neuropathic pain that occurs without any evidence of oral lesions such as atrophy, erosion and ulcers (1, 2). Studies have shown that endocrine disorders such as diabetes mellitus and hypothyroidism can play a role in the development of BMS (3, 4). Diabetes mellitus is the most common endocrine disorder and a major public health concern. The prevalence of type 2 diabetes is still increasing worldwide and is sometimes considered a pandemic (5, 6). It is estimated that the annual growth rate of diabetes in Iran will reach the second place in the region by 2030 after Pakistan (7, 8). Diabetes causes metabolic changes in the oral mucosa, as well as diabetic neuropathy and angiopathy, all of which contribute to BMS (9, 10). Hypothyroidism is the most common endocrine disease after diabetes and obesity. The role of thyroid hormone in the maturation and development of fungal papillae is well known. Therefore, defects in the development of papillae and consequent loss of taste perception can cause a burning sensation in patients with hypothyroidism (3, 4, 11).

Considering the high prevalence of type 2 diabetes mellitus and hypothyroidism and the occurrence of BMS in both diseases, which affects the quality of life of patients, this study was performed to determine and compare the frequency of BMS in patients with type 2 diabetes mellitus and patients with hypothyroidism.

## Methods and materials

**Study population:** In this cross-sectional study, 196 patients with type 2 diabetes Mellitus (group 1) and 196 patients with hypothyroidism (group 2) who were referred to school of dentistry affiliated to Guilan University of Medical Sciences, were selected based on inclusion criteria. Conscious consent was obtained from patients and patients were included in the study. In this study, inclusion criteria were: age over 18 years, patients with diabetes mellitus type 2, patients with hypothyroidism. Exclusion criteria were: oropharyngeal can-

didiasis; periodontal disease; atrophic; erosive and ulcerated areas in the oral mucosa; menopause; psychological disorders; diuretic and drug abuse; deficiency of vitamin B12, folic acid, Iron and zinc; Other systemic and autoimmune diseases and co-occurrence of both hypothyroidism and diabetes mellitus (2, 12-14).

**Collecting data:** In order to rule out BMS due to deficiency of hematinic factors such as folic acid, iron, zinc and vitamin B12, the last test of all patients, which was performed during the last week, was evaluated. Also, by reviewing the medical records of patients and asking patients for a history of psychological diseases, other systemic diseases and autoimmunity were rejected. After receiving informed consent from patients, the first part of the questionnaire on demographic information was completed using patient records. The patients' oral mucosa was then carefully examined by a senior dental student trained for candidiasis lesions, any atrophic, erosive, and ulcerative areas to rule out pain or burning sensation induced by these lesions. Each participant in the study was assessed by asking the patient about the burning pain in the oral mucosa. In cases where the patient expressed pain, the visual analogue scale (VAS) criterion was used to measure the severity of pain by asking the patient to rate his pain between 0 and 10. Number 0 indicates no pain and number 10 indicates the most severe pain the patient has ever experienced in life(15). Then, the obtained values for each patient were recorded in the second part of the questionnaire. The thyroid-stimulating hormone (TSH), thyroxine hormone (free T4) and HbA1C levels were obtained using a test performed during the last week and fasting blood glucose (FBS) levels were obtained using a test performed during the last two days and were recorded in the checklist. The duration of having diabetes mellitus and hypothyroidism were also recorded using patient records.

### *Data analysis:*

In this study, Kruskal Wallis test was used to evaluate the relationship between age and VAS with the study groups and Pearson Chi-Square test was used to investigate the relationship be-

tween gender and BMS with the study groups. The relationship between the mean level of free T4 and the prevalence of BMS was examined by Mann-Whitney test and the relationship between the mean level of FBS, HbA1C and the prevalence of BMS was examined by the Independent Samples Test. The relationship between age, gender and group variables with BMS was assessed using logistic regression test.

## Results

In this study, the mean age of patients with diabetes was  $63.42 \pm 11.97$  and the mean age of patients with hypothyroidism was  $55.55 \pm 15.12$ . In the diabetic group, 115 patients (58.7%) and in the hypothyroidism group 99 patients (50.5%) were male and the rest were women. In the diabetes group 51 patients (26%) and in the group of hypothyroidism 29 patients (14.8%) had BMS. According to the results of this study, the mean VAS level of patients with diabetes was  $3.60 \pm 1.23$  and the mean VAS level of patients with hypothyroidism was  $2.96 \pm 0.98$ . In the group with diabetes mellitus, the mean FBS level was  $141.19 \pm 92.49$  mg/dl, the mean HbA1C level was  $7.00 \pm 13.74$  mg and the mean duration of having diabetes was  $4.62 \pm 2.48$  years. In the group with hypothyroidism, the mean TSH level was  $4.2 \pm 20.08$   $\mu$ IU/mL, the mean level of FreeT4 was  $4.2 \pm 93.77$  IU/mL and the mean duration of having hypothyroidism was  $4.47 \pm 2.05$  years. Based on the obtained results, it was found that there is a significant relationship between BMS and the groups ( $P= 0.022$ ), so that BMS was significantly higher in patients with diabetes mellitus.

the mean of VAS in the two groups was not significantly different. There is no significant relationship between the mean level of TSH and T4 with BMS. There is no significant relationship between the mean level of FBS and HbA1C with BMS.

Table 1 summarizes the results of determining the simultaneous effect of demographic variables on the severity of BMS (VAS). the severity of BMS significantly increases with age ( $P=0.010$ ).

The effect of age ( $p <0.001$ ) and group ( $p <0.001$ ) on BMS was significant. With increasing age, possibility of developing BMS increases by 1.05 (Table 2).

Table 1. Simultaneous effect of demographic variables on the severity of BMS (VAS)

P-value	Beta	Standard deviation	B	variable	
	Age	0.02	0.008	0.33	0.01
	Gender	0.09	0.19	0.04	0.617
	Diabetes mellitus	0.16	0.29	0.07	0.579
	Hypothyroidism	0.53-	0.33	0.21-	0.12

Table 2. Simultaneous effect of demographic variables on BMS

variable	B	Standard deviation	P-value	OR	CR
Age	-	0.04	0.009	<0.001	1.05 1.1 - 03.07
Gender	female	-	-	-	1 -
	male	-0.38	0.21	0.071	0.68 0.1 - 45.03
Group	hypothyroidism	-	-	-	1 -
	Diabetes mellitus	0.45	0.27	0.097	1.56 0.2 - 92.65

## Discussion

In epidemiological studies, diabetes has been suggested as one of the causes of BMS. The prevalence of this problem in previous studies has been reported between 6% to 18% (16-19). According to our study, 26% of patients with diabetes had BMS. The prevalence of BMS has been reported to be lower in other similar studies. In the study by Salehi et al , The prevalence of BMS was 7.2% (18). In the study of Rabiei et al., The prevalence of BMS was reported as 6.2%(19). This discrepancy can be attributed to the different target population of these studies or other factors influencing the development of BMS such as high levels of stress and anxiety (20, 21) . Considering that the present study was conducted during the Covid-19 pandemic, in which the level of stress and anxiety in the community especially in systemic patients was very high, a higher prevalence of BMS, in compare of previously reported, may be expected (22, 23). According to the results of our

study, the highest VAS score in diabetic patients was 6. This finding is in line with the findings of Salehi's study and different from Rabiei's study, which reported the highest VAS score of 8 and 2, respectively (18, 19). Differences in the highest VAS score in studies may be explained by differences in disease control, years of having diabetes, and the presence of adverse factors such as differences in stress levels.

It was found that there was no significant relationship between the mean levels of FBS and HbA1C with BMS. Inconsistent with the results of the present study in the study of Rabiei et al., the level of HbA1C was effective on BMS(19). The results of the study by Salehi et al., As in previous studies, emphasize the finding that in cases of poor glycemic control, these symptoms will occur significantly(18). It seems that the differences in the inclusion and exclusion criteria as well as the demographic characteristics of the patients are the reasons for the differences in the results.

In our study, the risk of BMS increased 1.06 with aging. Consistent with the results of our study in the study of Salehi et al., BMS increased significantly with increasing age. In the study of Rabiei et al. And the study of Rad et al., As in our study, the duration of diabetes has been shown to affect BMS(18, 19, 24).

According to this study, there is no significant relationship between mean T4 and TSH level and BMS. The role of thyroid hormones in the maturation and development of fungiform papillae is well known, so it is expected that as the level of free T4 decreases, the growth rate of these papillae decreases and symptoms of BMS appear (25, 26). Inconsistent with the results of our study, in the study of Talattof et al., there was a significant relationship between TSH levels and the incidence of BMS in patients with Hashimoto's thyroiditis (4).

## Conclusion

The frequency of BMS is higher in patients with diabetes mellitus than in patients with hypothyroidism. Therefore, first of all, the occurrence

of diabetes and consequently this complication in the mouth should be prevented by identifying patients with risk factors for developing diabetes mellitus. It is also very important that endocrinologists refer these patients to oral medicine specialists for routine oral examination after a definitive diagnosis of diabetes mellitus. Scheduling more frequent follow-up appointments is very important to evaluate the oral status of diabetic patients and control BMS in these patient, which improves their quality of life.

## References

1. Currie CC, Jääskeläinen SK. Burning mouth syndrome: a review. *Oral Surgery*. 2020;13(4):379-88. <https://doi.org/10.1111/ors.12456>
2. Jääskeläinen SK, Woda A. Burning mouth syndrome. *Cephalalgia*. 2017;37(7):627-47. <https://doi.org/10.1177/0333102417694883>
3. Femiano F, Lanza A, Buonaiuto C, Gombos F, Nunziata M, Cucurullo L, et al. Burning mouth syndrome and burning mouth in hypothyroidism: proposal for a diagnostic and therapeutic protocol. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology*. 2008;105(1):e22-e7. <https://doi.org/10.1016/j.tripleo.2007.07.030>
4. Talattof Z, Dabbaghmanesh MH, Parvizi Y, Esnaashari N, Azad A. The Association between Burning Mouth Syndrome and Level of Thyroid Hormones in Hashimotos Thyroiditis in Public Hospitals in Shiraz, 2016. *Journal of Dentistry*. 2019;20(1):42.
5. Zimmet PZ, Magliano DJ, Herman WH, Shaw JE. Diabetes: a 21st century challenge. *The lancet Diabetes & endocrinology*. 2014;2(1):56-64. [https://doi.org/10.1016/S2213-8587\(13\)70112-8](https://doi.org/10.1016/S2213-8587(13)70112-8)
6. Rowley WR, Bezold C, Arikan Y, Byrne E, Krohe S. Diabetes 2030: insights from yesterday, today, and future trends. *Population health management*. 2017;20(1):6-12. <https://doi.org/10.1089/pop.2015.0181>
7. Javanbakht M, Mashayekhi A, Baradaran HR, Haghdoost A, Afshin A. Projection of diabetes population size and associated economic burden through 2030 in Iran: evidence from micro-simulation Markov model and Bayesian meta-analysis. *PloS one*. 2015;10(7):e0132505. <https://doi.org/10.1371/journal.pone.0132505>
8. Zhang P, Zhang X, Brown J, Vistisen D, Sicree R, Shaw J, et al. Global healthcare expenditure on diabetes for 2010 and 2030. *Diabetes research and clinical practice*. 2010;87(3):293-301. <https://doi.org/10.1016/j.diabres.2010.01.026>
9. Kia SJ, Samami M, Irani A. Comparison of oral mucosal soft tissue lesions prevalence in diabetic patients



- and healthy subjects. *Journal of Dentomaxillofacial*. 2019;8(1):49-52.
10. Mauri-Obradors E, Estrugo-Devesa A, Jané-Salas E, Viñas M, López-López J. Oral manifestations of Diabetes Mellitus. A systematic review. *Medicina oral, patología oral y cirugía bucal*. 2017;22(5):e586.<https://doi.org/10.4317/medoral.21655>
  11. Taylor PN, Albrecht D, Scholz A, Gutierrez-Buey G, Lazarus JH, Dayan CM, et al. Global epidemiology of hyperthyroidism and hypothyroidism. *Nature Reviews Endocrinology*. 2018;14(5):301.<https://doi.org/10.1038/nrendo.2018.18>
  12. Aljanobi H, Sabharwal A, Krishnakumar B, Kramer JM. Is it Sjögren's syndrome or burning mouth syndrome? Distinct pathoses with similar oral symptoms. *Oral surgery, oral medicine, oral pathology and oral radiology*. 2017;123(4):482-95.<https://doi.org/10.1016/j.oooo.2017.01.005>
  13. Chiang C-P, Wu Y-H, Wu Y-C, Chang JY-F, Wang Y-P, Sun A. Anemia, hematinic deficiencies, hyperhomocysteinemia, and serum gastric parietal cell antibody positivity in 884 patients with burning mouth syndrome. *Journal of the Formosan Medical Association*. 2020;119(4):813-20.<https://doi.org/10.1016/j.jfma.2019.10.013>
  14. Agha-Hosseini F, Samami M, Tavakol F, Ghazemzadeh Hoseini E. Oral lichen planus or oral lichenoid reaction? A literature review. *Journal of Islamic Dental Association of Iran*. 2019;31(1):40-57.<https://doi.org/10.30699/jidai.31.1.7>
  15. Khatri A, Kalra N. A comparison of two pain scales in the assessment of dental pain in East Delhi children. *International Scholarly Research Notices*. 2012;2012.<https://doi.org/10.5402/2012/247351>
  16. Collin H-L, Niskanen L, Uusitupa M, Töyry J, Collin P, Koivisto A-M, et al. 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 Endodontology*. 2000;90(3):299-305.<https://doi.org/10.1067/moe.2000.107536>
  17. Minguez Sanz MP, Salort Llorca C, Silvestre Donat FJ. Etiology of burning mouth syndrome: a review and update. 2011.<https://doi.org/10.4317/medoral.16.e144>
  18. Salehi M, Akha O, Mousavi J, Ziaee M, Molania T. Frequency of burning mouth and subjective xerostomia in patients with diabetes mellitus type 2. *The Journal of Qazvin University of Medical Sciences*. 2017;21(5):11-8.
  19. Rabiei M, Mohtasham Amiri Z, Kalantari S, Hassannia H. Oral Soft Tissue Pathologies among Diabetic Patients in Rasht-2005. *SSU Journals*. 2007;15(3):46-52.<https://doi.org/10.1111/j.1740-8709.2007.00065.x>
  20. Sikora M, Verzak Ž, Matijević M, Včev A, Šiber S, Musić L, et al. Anxiety and depression scores in patients with burning mouth syndrome. *Psychiatria Danubina*. 2018;30(4):466-70.<https://doi.org/10.24869/psyd.2018.466>
  21. Abetz LM, Savage NW. Burning mouth syndrome and psychological disorders. *Australian dental journal*. 2009;54(2):84-93.<https://doi.org/10.1111/j.1834-7819.2009.01099.x>
  22. Xiong J, Lipsitz O, Nasri F, Lui LM, Gill H, Phan L, et al. Impact of COVID-19 pandemic on mental health in the general population: A systematic review. *Journal of affective disorders*. 2020.<https://doi.org/10.1016/j.jad.2020.08.001>
  23. Salari N, Hosseini-Far A, Jalali R, Vaisi-Raygani A, Rasoulpoor S, Mohammadi M, et al. Prevalence of stress, anxiety, depression among the general population during the COVID-19 pandemic: a systematic review and meta-analysis. *Globalization and health*. 2020;16(1):1-11.<https://doi.org/10.1186/s12992-020-00589-w>
  24. Suga T, Watanabe T, Aota Y, Nagamine T, Toyofuku A. Burning mouth syndrome: the challenge of an aging population. *Geriatrics & gerontology international*. 2018;18(12):1649-50.<https://doi.org/10.1111/ggi.13548>
  25. Femiano F, Gombos F, Esposito V, Nunziata M, Scully C. Burning mouth syndrome (BMS): evaluation of thyroid and taste. *Medicina Oral, Patología Oral y Cirugía Bucal (Internet)*. 2006;11(1):22-5.
  26. Hsu J-C, Watari I, Funaki Y, Kokai S, Ono T. Unilateral nasal obstruction induces degeneration of fungiform and circumvallate papillae in rats. *Journal of the Formosan Medical Association*. 2018;117(3):220-6.<https://doi.org/10.1016/j.jfma.2017.04.013>