

# Association of Impaired Sleep Quality in Patients With Burning Mouth Syndrome: A Case-Control Study

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**Background:** Burning mouth syndrome (BMS) is a chronic burning sensation of the oral cavity, which affects the oral mucocutaneous membranes. It is not usually accompanied by clinical symptoms and signs, and laboratory findings; its etiology is unknown and there are several problems associated with the condition.

**Objectives:** The present study was designed to compare the quality of sleep in patients with burning mouth syndrome and healthy individuals.

**Materials and Methods:** In the present case-control study, 32 subjects with BMS and 31 healthy subjects were enrolled. The subjects filled out the Pittsburgh sleep quality questionnaire. Data were analyzed using the SPSS software version 18. The t-test was used to compare mean sleep quality scores between the two groups. Chi-square test was used to evaluate the presence or absence of sleep disorder in the two groups. Pearson's correlation coefficient was used to evaluate the correlation between the variables. Statistical significance was set at  $P < 0.05$ .

**Results:** The mean age of the subjects in the BMS and control groups were  $49.9 \pm 11$  and  $48.5 \pm 8.3$  years, respectively. The prevalence rates of sleep disorders in the BMS and control groups were 78% and 38.7%, respectively, and the difference between the two groups was significant ( $P = 0.04$ ). The overall sleep quality scores in the BMS and control groups were  $7.4 \pm 4.08$  and  $4.6 \pm 3.2$ , respectively, with statistically significant differences ( $P = 0.009$ ).

**Conclusions:** Based on the results of the present study, patients with BMS had sleep disorders, which should be considered in the clinical evaluation and treatment planning of these patients.

**Keywords:** Burning Mouth Syndrome; Sleep Disorders; Pain

## 1. Background

Burning mouth syndrome (BMS) is a chronic burning sensation that affects oral mucous membranes; it is not usually associated with any clinical symptoms and signs or laboratory findings (1). Although the etiology of BMS is unknown, some studies have reported stress as one of the etiological or exacerbating factors for BMS. In addition, clinical response to low doses of antidepressants or anxiolytic agents has been reported. Sleep disorders might result in chronic pain or exacerbate existing pain. Studies on sleep deprivation show that prolonged sleep disorder periods lower the pain threshold and in some cases might result in hyperalgesia. A decrease in pain threshold results from a decrease in total sleep period. Furthermore, a lowered heat tolerance has been shown after nocturnal sleep deprivation. Sleep deprivation can also lead to mood changes, insomnia and fatigue, affecting pain sensation (2). Patients with known fibromyalgia have a lower nocturnal sleep quality compared to controls and have more

insomnia complaints (3). Animal studies have shown that sleep deprivation results in a lowered pain threshold and its effect might appear immediately after a period of sleeplessness or even after a period of normal sleep (4). The role of sleep disorder in the initiation or exacerbation of BMS is less known. Some reports on patients with BMS show that the symptoms are exacerbated when the patients do not have sufficient sleep during the night. In addition, drugs used by these patients might increase sleep (5). Although the role of mood disorders has been studied in BMS yet a few studies have examined the role of sleep disturbance in onset or exacerbation of BMS. Sleep disorders can be considered as a worsening condition in patients with BMS. Therefore, it is hypothesized that varying and troubled sleep might have a relationship with BMS.

## 2. Objectives

Considering the limited number of studies on the effect

of sleep quality on BMS, the following study was designed to compare the quality of sleep in BMS patients and healthy subjects. This study might initiate further research on BMS.

### 3. Materials and Methods

The protocol of the present case-control study was approved by the Ethics Committee of Zahedan University of Medical Sciences. A total of 32 subjects with BMS and 31 healthy individuals were included in this study. The diagnostic criteria for BMS were as follows: 1) a burning sensation in all or some parts of the oral cavity with or without symptoms, such as changes in taste sensation; 2) normal oral cavity mucosa without any lesions; 3) absence of local or systemic factors that produce the same symptoms.

The exclusion criteria consisted of the following: any known systemic disease, age being under 18, pregnancy, use of systemic corticosteroids during the previous week (because they might affect sleep pattern), use of antidepressants and anxiolytic agents, smoking, and lack of consent to participate in the study. The subjects in the control group were selected based on the above criteria, without any burning sensation in their oral cavity. Control subjects were selected from patients who had referred to the faculty for dental care.

The subjects of the two groups were matched for age and gender, and informed written consent was obtained from all the subjects. All subjects filled out the Pittsburgh sleep quality questionnaire; in case of illiterate subjects, a student of the same sex filled out the questionnaire. Pittsburgh Sleep Quality Index (PSQI) questionnaire is an important tool for evaluation of sleep quality, sleeplessness and sleep patterns of subjects and has been recommended for epidemiological studies. Validity and reliability of the Persian version of the questionnaire have been confirmed (6). The questionnaire makes a distinction between proper sleep and improper sleep during a one-month period by evaluating certain characteristics of the subjects, which include:

- C1: sleep quality based on the subject's opinion
- C2: the duration for a subject to fall asleep
- C3: the length of sleep
- C4: sleep efficacy
- C5: problems during sleep
- C6: use of narcotics
- C7: disturbance of daily activities

The subjects respond by giving a score for each question from zero to three, in which a score of three indicates the most negative answer in the Likert scale. In this system, the respondents determine the degree of their agree-

ment with the subject of the question. The total score of this questionnaire ranges between 0 and 21 and a total score of  $5 \geq$  indicates low sleep quality. The reliability and reproducibility of the Persian version of the questionnaire have been confirmed (7).

The degree of pain was evaluated based on a visual analog scale, where zero indicates no pain and ten is the most severe pain that can be endured. Patients showed the degree of their pain by a ruler. Patients were requested to choose a number from one to ten that expressed their pain intensity.

#### 3.1. Statistical Analysis

Data were analyzed using the SPSS software, version 18. Data were analyzed by Kolmogorov-Smirnov test for checking normality. The t-test was used to compare the mean sleep quality scores between the two groups. The presence or absence of sleep disorder in the two groups was evaluated by the chi-square test. Pearson's correlation coefficient was used to evaluate the correlation between the variables. Statistical significance was set at  $P < 0.05$ .

### 4. Results

A total of 32 subjects with BMS and 31 healthy individuals were included in this case-control study. There were three males in each group and the remainders were female. The mean age of the subjects in the BMS and control groups were  $49.9 \pm 11$  and  $48.5 \pm 8.3$ , respectively, with no significant differences between the two groups ( $P = 0.6$ ). The mean burning sensation score in the BMS group was  $5.9 \pm 1.4$  and the mean duration of affliction with BMS was  $6.6 \pm 2.09$  months.

Table 1 shows the number of subjects with sleep disorders in the two groups. Chi-square test showed a significant difference between the two groups in sleep disorder frequency, with more subjects with sleep disorders in the BMS group ( $P = 0.04$ ).

There was a significant difference in the total sleep quality scores between the two groups, with higher scores in the BMS group ( $P = 0.009$ ). The two groups exhibited differences in sleep quality based on the subjects' opinions, sleep time and use of narcotics, with greater disorders in the BMS group (Table 2).

Pearson's correlation coefficient did not show any correlation between the duration of affliction with BMS and PSQI ( $P = 0.2$ ), between the severity of BMS and PSQI ( $P = 0.8$ ), and between age and PSQI ( $P = 0.5$ ). However, there was a positive correlation between age and the severity of BMS ( $P = 0.02$ ,  $r = 0.4$ ), with an increase in BMS severity with aging.

**Table 1.** The Number of Subjects With Sleep Disorders in the Two Groups <sup>a, b</sup>

	Control (n = 31)	BMS (n = 32)	Chi Square
<b>Sleep disorder</b>			0.04
Yes	12 (38.7)	25 (78)	
No	19 (61.3)	7 (22)	

<sup>a</sup> Abbreviation: BMS, burning mouth syndrome.

<sup>b</sup> Data are presented as No. (%).

**Table 2.** Comparison of Sleep Quality Scores Between the Two Groups <sup>a, b</sup>

	PSQI	C1	C2	C3	C4	C5	C6	C7
<b>BMS</b>	7.4 ± 4.08	1.2 ± 0.9	1.7 ± 1.06	1.1 ± 0.8	0.6 ± 0.9	1.4 ± 0.6	0.8 ± 1.2	0.4 ± 0.7
<b>Control</b>	4.6 ± 3.2	0.6 ± 0.5	1.1 ± 1.09	0.8 ± 0.9	0.4 ± 0.8	1 ± 0.5	0.2 ± 0.7	0.3 ± 0.5
<b>P Value</b>	0.009	0.008	0.57	0.27	0.36	0.02	0.01	0.8

<sup>a</sup> Abbreviations: BMS, burning mouth syndrome; PSQI, pittsburgh sleep quality index.

<sup>b</sup> Data are presented as mean ± SD.

## 5. Discussion

The results of the present study showed that patients with BMS have more sleep disorders compared to healthy subjects. The relationship between sleep and pain has been studied for a long time. Although evidence shows that patients with chronic pain have sleep disorders, the relationship between pain and sleep disorder is complex and unknown.

Sleep is necessary for health and higher quality of life. Inadequate sleep influences health and medical and psychological conditions (chronic pain, forgetfulness and depression) exacerbate existing conditions. Insomnia is the most common sleep disorder and is defined as difficulty falling sleep or remaining asleep, waking up early in the morning or lack of restful sleep in individuals who can have adequate sleep (8). Disturbed sleep, negatively affects mood, pain perception, daily performance and the overall quality of life. Insomnia is often associated with somatic symptoms and pain, and pain can awaken the individual, although its mechanism is unknown (8).

Several studies have been carried out on the quality of sleep in patients with BMS. Chainani-Wu et al. showed that patients with BMS have more sleep disorders compared to healthy subjects, with a significant relationship between BMS and sleep disorders after adjusting for age and use of tranquilizers (1), consistent with the results of the present study. The difference between the above study and the present study might be attributed to the use of different sleep questionnaires.

In another study by Adamo et al. (8) Pittsburgh sleep questionnaire was used, similar to the present study. The results showed that patients with BMS more commonly had sleep disorders compared to healthy subjects. In that study the mean PSQI scores were nine and four for the patient and control groups, respectively, which is almost similar to that of our patients. In addition, a positive relationship was found between sleep and patients' depression and anxiety. No relationship was found between pain severity and PSQI scores, consistent with the results of the present study.

Several studies have evaluated the effect of sleep on chronic pain. Smith (2009) evaluated the concurrence of sleep disorders and pain sensitivity in patients with temporomandibular joint (TMJ) dysfunction. Fifty-three patients with a diagnosis of myofascial pain originating from temporomandibular disorder (TMD) were evaluat-

ed. In total, 43% of the patients had sleep disorders; with insomnia and sleep apnea being the most common problems (9).

Brien carried out two separate studies in 2011 and 2010 and evaluated 135 and 22 women, respectively, with chronic back and facial pains. The patients were asked to fill out the daily sleep questionnaire for two weeks. The results showed a reciprocal relationship between sleep disorder and pain, i.e. disturbed nocturnal sleep increased pain on the next day and vice versa (9-11). Cho et al. (12) evaluated the relationship between disturbed sleep and shoulder pain for more than three months, reporting that 81.5% of subjects with shoulder pain had disturbed sleep, as shown by the Pittsburgh questionnaire. In addition, a positive relationship was shown between pain severity based on VAS and the overall PSQI score, which is not consistent with the results of the present study. In the present study, no relationship was found between burning sensation and PSQI score. In the study carried out by Cho, depression and anxiety rates were higher in subjects who had pain (12).

Covarrubias-Gomez and Mendoza-Reyes used the Pittsburgh sleep questionnaire to evaluate 311 patients with chronic pain with a non-cancerous origin and showed that 89% of patients had sleep disorders. In addition, a linear relationship was found between pain severity and the overall PSQI scores (13). Emery et al. (14) evaluated 60 patients with musculoskeletal pain by asking them to fill out a daily sleep questionnaire. The results showed that 55% of patients had sleep disorders.

Although patients with chronic painful conditions frequently have pain, sleep disorders and affective disorders, it is difficult to determine which of these occur before the others. The present study might be a new guide for future interventional or cause and effect studies on this subject. However, a large number of studies are required to determine the etiological role of sleep disorders in BMS. Sleep disorders should be taken into account in the initial evaluation of patients with BMS, and possibly in their treatment.

The present study had some limitations, including the small sample size and inclusion of only one treatment center. In addition, the present study evaluated only severe pain and the type of pain and its propagation pattern were not evaluated. The present study was a case/

control study and is not suitable for prospective evaluation of the relationship between sleep disorder and BMS. Finally, the psychological status of the patients was not evaluated. It is recommended that in future studies such limitations be eliminated.

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