Sleep Quality Evaluation Using Self-Reported Questionnaires in Patients with Burning Mouth Syndrome

Jung-Yong Jin¹, Kyung-Eun Lee¹,², Bong-Jik Suh¹,²

¹Department of Oral Medicine, School of Dentistry, Chonbuk National University, Jeonju, Korea
²Institute of Oral Bioscience, School of Dentistry, Chonbuk National University, Jeonju, Korea

Purpose: Burning mouth syndrome (BMS) is ambiguous and enigmatic oral condition. Sleep disturbance is one of the most prevalent complaints of patients with chronic pain. The aim of this study was to estimate general sleep characteristics and propensity in patients with BMS.

Methods: A total of thirty BMS patients and thirty healthy control subjects were investigated. Self-reported measures of sleep quality were conducted using two widely used methods; the Pittsburgh Sleep Quality Index (PSQI) and Epworth Sleepiness Scale (ESS). Data were analyzed with one-way ANOVA, chi-square, Fisher’s exact test, Kruskal-Wallis test, Holm method with 95% confidence interval and p<0.05 significant level.

Results: BMS patients showed more poor sleepers than those in control subjects in both ESS and PSQI test. BMS patients also showed statistically significant poorer sleep quality compared with control subjects in both test. When BMS group were divided into three groups on the basis of numeric rating scale, the higher score subjects had, the more mean rank they had in the PSQI.

Conclusions: BMS patients showed up poor sleep characteristics and propensity than control group, and they also showed the more severe the pain was, the worse the sleep quality was.

Key Words: Burning mouth syndrome; Epworth Sleepiness Scale; Pittsburg Sleep Quality Index

INTRODUCTION

Burning mouth syndrome (BMS) is chronic pain syndrome that occasionally affects middle-aged women with tongue or other oral sites.¹ Etiopathogenesis of BMS is still unknown and has controversy among studies. Although, there are many studies about this syndrome, a universally accepted definition of this syndrome still is lacking.²,³ According to International Association for the Study of Pain, BMS is chronic oral mucosal pain or discomfort that has no identifiable causative lesions and is not caused by any other condition or disease.⁴ The 10th version of International Classification of Diseases of the World Health Organization uses the term glossodynia (K14.6) which describes painful sensations in tongue.⁵

A major problem in diagnosing BMS is that this syndrome is defined by symptoms that can arise from other local or systemic disease, and it makes difficulties in exact diagnosis and appropriate management of BMS. Prevalence of BMS had been large range from 0.7% to 4.6% in previous study.⁶ However, Scala et al.⁷ reported that this syndrome was more widespread than was estimated around the world.

BMS patients have sensory symptoms that represent by burning sensation, a foreign body sensation, and oral dryness involving tongue, lips, hard palate, cheeks, and floor of the mouth. Some patients can experience other symptoms, such as dysgeusia, chemo-sensory abnormalities and mood
changes while they awake. However, clinicians cannot find clinical problems in oral cavity at ordinary circumstances.\textsuperscript{7} The symptoms tend to continue for at least 4-6 months, and it ranges from minimal that just feel discomfort to severe that recognized all or almost all day long and that may significantly affect the patient’s quality of life.\textsuperscript{6}

It was suggested that causes of BMS were consisted of local, systemic, and psychological factors, such as hyposalivation, hormonal change, somatization, and so on.\textsuperscript{7} However, multifactorial intervention, involving the interaction between biological and psychological factors, was estimated to be best-described.\textsuperscript{8} According to recent studies, Sleep disturbance was identified as one of powerful factor in aggravating pain, and those suggested that BMS patients had shown poor sleep quality and had suffered more depression and anxiety than healthy groups.\textsuperscript{6,5,10}

It is well known that pain and sleep disorders are related to each other in many studies. Any painful condition disturbs sleep and impact on patient’s mood, energy and behavior.\textsuperscript{9} Previous studies reported that people with pain suffered difficulties in initiating and maintaining sleep and this disturbance of sleep condition could make patients undergo daytime-sleep and sleep break.\textsuperscript{11,12} Though the precise functions of sleep remained a mystery, on the other way, it was thought that lack of sleep might be associated with increasing of pain sensitivity by peripheral and central nervous system changes.\textsuperscript{13} It was also suggested that the possibility that sleep disturbances could make preexisting pain worsen.\textsuperscript{14,15} Patients with BMS often reported that the pain interfered with their ability to fall asleep.\textsuperscript{16} Therefore, authors wondered that whether the relationship between BMS and sleep was or not.

In this study, authors investigated sleep quality in BMS patients by using relatively well-known self-questionnaires. The aim of this study was to estimate general sleep characteristics and propensity in BMS patients.

**MATERIALS AND METHODS**

1. Patients Selection

This study sample was composed of thirty patients diagnosed with BMS at the Department of Oral Medicine, Chonbuk National University Hospital (Jeonju, Korea) from August 2015 to July 2016.

Diagnostic criteria of International Classification of Headache were used for diagnosis of BMS. In the clinical criteria included the following conditions: 1) the presence of an intraoral burning sensation or dysaesthetic sensation; 2) the absence of any abnormalities from clinical examination; and 3) any type of oral symptom that can be persistent or intermittent with possible phase of remission/exacerbation during the day and state of being symptomatic is persistent typically more than 3 months. Patients with a local or systemic disorder known to attribute to secondary burning sensation were excluded. These disorders were the following diseases: candidiasis, lichen planus, medication-induced, anemia, deficiencies of vitamin B12 or folic acid, and unregulated diabetes.\textsuperscript{17}

Control group was composed of thirty patients attending the department of prosthodontics for implant treatment or patients’ companions during the study period. The inclusion criteria for control subjects were 1) the absence of oral mucosal lesion; 2) the absence of oral pain; 3) no history of psychiatric disorders; and 4) no dental disease to be treated. Conversely, the exclusion criteria encompassed 1) patients with unstable medical conditions or debilitating pathologies, such as cancer or autoimmune disease and 2) patients regularly treated with anxiolytic, antidepressants, anticonvulsants, and/or psychotropic drugs.

2. Data Collection

A total of thirty patients with BMS and thirty control subjects who fulfilled the inclusion criteria were investigated. BMS patients and healthy controls were assessed in accordance with the following evaluation battery scales for self-reported measures of sleep quality, disturbance and propensity: the Pittsburgh Sleep Quality Index (PSQI)\textsuperscript{18} and the Epworth Sleepiness Scale (ESS)\textsuperscript{19} for sleep disturbance.

1) The Pittsburgh Sleep Quality Index (PSQI)

The PSQI is considered an essential measure of sleep and insomnia symptoms in treatment research. It is a self-report questionnaire assessing sleep quality and disturbances and is designed to be used in clinical populations. This instrument comprises 19 items, generating seven component scores: subjective sleep quality, sleep latency, sleep
duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. Sleep pattern data (e.g., bed time, wake time, sleep onset latency, and sleep quantity) are also provided. Each item is scored from 0 to 3, with higher scores indicating poorer sleep or more frequent sleep problems. Items are combined to yield the 7 components (scores ranging from 0 to 3) and the sum of the score ranging from 0 to 21. Global scores above 6 distinguish poor sleepers from good sleepers with a high sensitivity (90% to 99%) and specificity (84% to 87%). The PSQI has been translated into 48 languages and has been used in a wide range of population-based and clinical studies. In this study, Korean version of the PSQI was used.

2) The Epworth Sleepiness Scale (ESS)

The ESS is simple, self-administered questionnaire that provides a measurement of the subject’s general level of day-time sleepiness. It comprises eight items assessing the propensity for sleep in eight common situations. Subjects rate their likelihood of dozing in each situation on a scale of 0 to 3. A score of 0 is ‘no dozing’, 2 is ‘slight chance of dozing’, 3 is ‘moderate chance of dozing’, and 3 is ‘high chance of dozing’.

The ESS score is the sum of the eight items. The ratings can be added together to form a total score of 24. A score of 0-9 is considered normal. A score of 11-15 indicates the possibility of slight to moderate sleep apnea, while a score of over 16 indicated severe sleep apnea or narcolepsy. Total score over 11 distinguish poor sleepers from good sleepers. The ESS has been translated into 52 languages and also been used in a wide range of population-based and clinical studies. In this study, Korean version of the ESS was used.

3. Data Analysis

At First, Mean scores of each seven component of the PSQI were calculated for comparison of sleep quality and disturbance in both BMS patients and control group. Subjects of each group were classified to good sleeper (ESS <11) and poor sleeper (ESS ≥11) according to cutoff recommended in the ESS and calculated the numbers of good and poor sleeper.

At third, BMS patients were divided into three groups on the basis of numeric rating scale (NRS) and evaluated relationship between NRS and the PSQI score and between NRS and the ESS score. The one group was that range of NRS was 1 to 3 (mild). Another group was that NRS was from 4 to 6 (moderate), while the other group was NRS was from 7 to 10 (severe).

4. Statistical Analysis

Statistical test was done at the 5% significant level. Statistical calculations were performed with the IBM SPSS Statistics version 20.0 (IBM Co., Armonk, NY, USA).

The one-way ANOVA was used for comparison of mean scores of seven components in the PSQI and of eight items in the ESS between BMS and control group. The chi-square test was used for comparison of good sleeper and poor sleeper in the PSQI and Fisher’s exact test was for that in the ESS. The Kruskal-Wallis tests were used to examine the association of between NRS and the PSQI score and between NRS and the ESS score. The post-hoc test was obtained from Holm method.

RESULTS

The characteristics of each group were showed. The subjects were 29 women and 1 man with a mean age of 67.6±11.5 years in BMS group; 25 women and 5 men with a mean age of 57.2±9.5 years in control group (Table 1).

Table 1. Demographic findings in BMS and control groups

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>BMS patients (n=30)</th>
<th>Control subjects (n=30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y)</td>
<td>67.6±11.5</td>
<td>57.2±9.5</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>29 (96.6)</td>
<td>25 (83.3)</td>
</tr>
<tr>
<td>Male</td>
<td>1 (3.3)</td>
<td>5 (16.7)</td>
</tr>
</tbody>
</table>

BMS, burning mouth syndrome.
Values are presented as mean±standard deviation or number (%).
of the PSQI in both BMS and control group. The results showed that scores differed between the groups and those of BMS group presented high score in subjective sleep quality, use of sleep medication and day time dysfunction components among seven components of PSQI with statistically difference in comparison with the control group. The PSQI global index score was also higher in BMS group than in control with statistically difference (Table 2).

BMS patients and control subjects were classified into good sleeper and poor sleeper according to cutoff score recommended in the PSQI (6 points and over). Poor sleepers in BMS patients were more than those in control subjects. Out of thirty BMS patients, the incidence of poor sleeper (66.7%, 20 persons) was higher than that of good sleeper (33.3%, 10 persons). Conversely, the incidence of poor sleeper (40.0%, 12 persons) was lower than that of good sleeper (60.0%, 18 persons).
persons) in control group. BMS group also showed statistically significant poor sleeper compared with control in the PSQI (p=0.038) (Table 3).

The scores of eight items in ESS were showed. BMS group had higher scores than control, especially in 6th and 7th items. Total mean index of items presented high score in BMS group than in control with statistically difference (Table 4).

BMS patients and control subjects were classified into good sleeper and poor sleeper according to cutoff score recommended in the ESS (11 points and over). Out of thirty BMS patients, the incidence of poor sleeper (30.0%, 9 persons) was lower than that of good sleeper (70.0%, 21 persons). The incidence of poor sleeper (3.3%, 1 persons) was also lower than that of good sleeper (96.7%, 29 persons) in control. Although incidence of poor sleeper was lower than that of good sleeper in using the ESS, the BMS patients also showed statistically significant poor sleeper compared with control subjects in ESS (p=0.012) (Table 5).

When BMS group were divided into three groups on the basis of NRS, the higher score subjects had, the more mean rank they had in the PSQI (Table 6).

### DISCUSSION

The authors investigated general characteristics between two groups. The mean age of the subjects with the BMS was 67.6 years old and 96.6% were females (Table 1). These results were similar with previous studies in the literature which reported the predilection of BMS for females of middle and advanced ages.\(^{22,23}\) In this study, five component scores of BMS group, except sleep latency and sleep duration, were higher and total score also was significant higher than control group in the PSQI (Table 2). BMS group showed higher scores in almost items and significant higher total score than control group in the ESS (Table 4). BMS group also showed statistically significant poor sleeper compared with control in both the PSQI and the ESS (Tables 3, 5). Therefore, it was thought that BMS patients had poorer sleep quality and sleep disturbance and propensity of day-time sleepiness. This study suggested that BMS patients exhibited more sleep disorders compared with the healthy groups.

These results were similar with previous studies.\(^{6,10,24}\) Adamo et al.\(^{6}\) showed that BMS patients reported a greater degree of sleep disorders as compared with controls, and sleep disorders could influence quality of life of BMS. Chainani-Wu et al.\(^{10}\) demonstrated that BMS patients...
reported a greater degree of sleep problems and suggested that sleep dysfunction could be a risk factor for BMS. Lee et al.24 investigated the correlations between BMS patient and sleep disorders by cohort study and described that sleep disorder might be risk factors of BMS.

Smith and Haythornthwaite25 suggested that there were aspects of the pain and sleep disturbance relationship, which might be specific to degree of pain. In this study, the group with severe pain tended to have a significantly lower quality of sleep than other groups in the PSQI (Table 6) but ESS result was different (Table 7). It is thought that active treatment of sleep disturbance might affect the improvement of pain, as they suggested.25

As BMS patient tend to be chronic pain and to have the biopsychosocial changes often, treatments and study had been described with the aim of minimize symptoms.26 Therefore, multifaceted efforts including sleep quality evaluation also needed to establish treatment plan, in addition to behavioral modification therapy, relaxation programs, exercise programs and self-management strategies.27,28

The instruments that evaluate the quality of sleep are utilized to measure the effects of poor sleep in subjects and to better understand how sleepiness interferes with day time activities, identifying specific strategies for the management of these individuals.21,29 Self-reported questionnaires methods have benefit to demand less time and effort for reply than other complex methods. The most of subjects in this study did not show difficulty in responding to the questionnaires, and they spend time from 5 to 10 minutes to reply. Two methods in this study are widely used in many previous studies to evaluate sleep quality.18,20,30 However, authors had some obstacles by low understanding and cognitive ability of subjects when these questionnaires were used to older subjects (over 65 years old). Also this study had limitation with a little of population in test. Therefore, there are necessary of other studies with larger samples to clarify this result, and further studies should try to understand relationships between sleep disturbances and physiological information of BMS.

Study of sleep disturbance in BMS patients is important to understand the effect of this syndrome on the essential activity.31 By this way, clinicians can approach patients from more multiple sides. This study confirmed the correlation of sleep disturbance and BMS patients. Based on the methods used in this study, it can be concluded that: 1) BMS patients showed up poor sleep quality than control group; 2) BMS patients had more propensities in sleep medication use and daytime dysfunction in the PSQI test; 3) BMS patients had more experienced about day-time sleepiness in the ESS; and 4) The more pain the patients felt, the lower quality of sleep they had.

Therefore, we suggest that BMS patients were thought to have poor sleep propensity, and evaluation of sleep disturbance should be encouraged to undermine and minimize the symptoms of BMS.

**CONFLICT OF INTEREST**

No potential conflict of interest relevant to this article was reported.

**REFERENCES**

2. Scala A, Checchi I, Montevettolini M, Marini I, Giamberardino MA. Update on burning mouth syndrome: overview and patient man-


