Research Article

Burning Mouth Sensation among Saudi Females Removable Partial Denture Wearers

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Abstract

Aim: The aim of the study is to determine the prevalence of burning mouth syndrome and explore the association between BMS and the suggested causative factors in a group of female removable partial denture wearers attending the College of Dentistry King Khalid University. **Methods:** A cross-sectional observational study that included twenty- nine female patients wearing a removable partial denture for three months or more. Patients who suffered from an extra/ intraoral localized trauma or pathological lesion that could cause a burning sensation were excluded from the study. A questionnaire was formulated in English and was translated into the Arabic language and validated to ensure satisfactory understanding and communication with the patients. Detailed medical and dental history was taken; thorough extra and intraoral clinical examination was performed to evaluate the removable partial denture extension, stability and retention. True burning mouth sensation was then diagnosed. **Results:** True burning mouth syndrome was reported in (N= 11, 37.9%) of the study participants. The average age of participants was (49.3) years. The lower ridge was the most affected site with (13.8%) of patients reported it as BMS site. Significant statistical associations were established between the prevalence of BMS and 'too little salivary flow (P=0.006), Difficulty felt while swallowing (P=0.03), Feeling of Dry Mouth (P =0.03) the presence of Candida infection (P=0.006) and lastly 'not Acceptable' RPD Stability (P= 0.03). **Conclusion:** The prevalence of burning mouth sensation among removable partial denture female wearers was found to be 37.9%, Special care should be provided to the patients' immunity status prior to fabrication of the RPD, as Candidal infection was a statistically significant factor in developing burning mouth sensation afterward.

Keywords: Burning mouth syndrome; Removable partial denture; Female; Xerostomia

Introduction

Burning mouth syndrome (BMS) is defined as the constant feeling of burn in the oral mucosa with an apparent lack of physical signs that could be detected by a medical physician or a dentist. [1] In 2004 the International Headache Society had stratified BMS and classified the condition as a distinctive disease. [2] Furthermore, clinicians have referred to BMS as stomatopyrosis, glossopyrosis and oral dysesthesia. [3]

Patients reported complaining of BMS in a solitary as well as multiple sites in the oral cavity. The most affected sites indicated were the tongue, buccal mucosa, and edentulous areas covered by removable or complete dentures. [4]

Published data elucidates that the definitive etiology of BMS is still controversial, complex multifactorial origin. [5] These factors range widely from local causatives like prosthetics, oral infections, [6] allergic reactions to dental materials, diminished salivary flow, and habitual tongue thrust, [7] to systemic factors like underlying comorbidities, e.g., uncontrolled diabetes mellitus, blood disorders and neuropsychological manifestations. [8] The female gender and premenopausal phase have also been linked to increased predisposing hazards to burning mouth syndrome. [9]

Clinical presentation of burning mouth syndrome includes frequent complaints like dry mouth, distorted metallic taste, and numbness. [10] Moreover, patients reported having headaches and mood swings as accompanying complaints to the burning sensation.

Two classification systems of burning mouth syndrome are currently utilized in clinical diagnosis. The first system is based on etiology, where BMS is classified as either primary (idiopathic) with no evident associated organic causes or Secondary BMS where associated local or systemic confounders do exist. [11] The second classification scheme relies on enduring clinical manifestations. In type I BMS (35%), patients are symptomless in the morning and start to feel mild signs during the day. Type II (55%) exhibits a more vigorous course of symptoms throughout

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the day and shows none by reaching night. In contrast, type III BMS (10%) varies in its presentation from days of absent symptoms to others of intense symptomatic complaints. [12]

Hence patients find this oral disorder to be very painful and disturbing and usually suffer hardly to reach a diagnosis and attain suitable targeted treatment; we conducted this study to determine the prevalence of burning mouth sensation among removable partial denture female wearers in Abha city. Moreover, to investigate the association between BMS and the suggested causative factors.

Materials and Methods

This cross-sectional observational study was conducted at the Females Dental Clinics, College of Dentistry, King Khalid University in Abha, Kingdom of Saudi Arabia. Twenty-nine female partial denture wearers participated in this twelve weeks project. All participants were females wearing a removable partial denture for three months or more. The Scientific Research Committee approved the project of the College of Dentistry, King Khalid University (SRC/REG/2017-2018/55). Patients who agreed to take part in this project signed informed agreement consent as well. However, RPD wearers who suffered from an extra/ intraoral localized trauma or pathological lesion that could cause a burning sensation were excluded from the study.

A very comprehensive medical and dental history was taken from each patient, followed by a thorough extra and intraoral clinical examination. The study variables were divided into denture-related factors, i.e., the location of the burning mouth sensation (if present), the degree of stability, extension, and retention of the utilized removable partial denture, type, and duration of the RPD and the vertical dimension.

Furthermore, host-related factors were thoroughly investigated; these included drug history, para-functional habits, i.e., bruxism and tongue thrust. Additionally, the feeling of dry mouth and the amount of salivary flow per minute were checked using the 10% citric acid stimulation method; if the patient produced less than 0.5 ml/min, this was considered too little salivary flow. [13]

Furthermore, we investigated the easiness and difficulty in swallowing, if the patient has suffered from an allergy to the removable partial denture material following delivery and lastly the existence of Candida Albicans infection was determined clinically and was based on recognition of the lesions either as whitish-yellow plaques of a soft and gelatinous consistency which was detached upon rasping, leaving an erythematous zone or as erythematous zones closely related to the base of the denture with smooth reddened appearance.

After completion of the history and clinical examination of the study candidates, “True Burning Mouth Syndrome” was diagnosed, and the number of the selected patients reached 29 in the preplanned time frame of 12 weeks.

Statistical analysis of the data was done using SPSS version 24, Chai square statistical test was performed with a confidence interval of 95%, and a P-value of < 0.05 was considered significant.

Results

The total number of the study participants was twenty-nine; the mean age of the female partial denture wearers was (49.3) years, with the minimum age of twenty-six and the maximum of seventy years old. The prevalence of burning mouth sensation was found to be (37.9%), as eleven patients out of twenty-nine suffered from this condition. Fifty-eight percent of patients stated a positive history of a para-functional habit.

Among the 11 patients who experienced burning mouth sensation, the lower alveolar ridge was the site where the majority of patients complained of (N=4, 37%). The sites of the oral mucosa mostly affected by the burning feeling.

Diabetes Mellitus was the most common co-morbidity present in the study sample constituting a percentage of (20.7%) as shown in Table 1, followed by hypertension and GIT disorders (17.2% and 13.8%), respectively. Positive drug history was present in 65.5% of the RPD wearers as shown in Table 2.

Regarding the removable partial denture specified in our project [Table 3], all dentures were fabricated from the chrome cobalt material. The patients used the denture for an average of (8.6) month. All twenty-nine patients experienced no allergy to the denture material. Twenty-two patients accounting for (75.9%) found the stability and retention of the denture to be acceptable. In contrast, only eight participants (27.6%) complained about an unacceptable denture extension.

Furthermore, nine patients (31%) experienced dry mouth upon wearing the removable partial Denture [Table 4]. Nevertheless, barely four patients (13.8%) showed signs of fungal infection with Candida Albicans. These results were conjugated with four patients suffering from too little salivary flow (13.8%). A small number of patients experienced difficulty in swallowing while

Table 1: Descriptive statistics in relation to sample's medical history.

S. No	Disease	Frequency/Percentage
1	Diabetes Mellitus	6/20.7%
2	Hypertension	5/17.2%
3	Anemia	1/3.4%
4	GIT	4/13.8%
5	Hormonal Imbalance	1/3.4%
6	Hypo/Hyperthyrodism	2/6.9%
7	Psychological disturbances	1/3.4%
8	None	9/31%

Table 2: Descriptive statistics in relation to drug history.

Drug History		No N=10 34.5%	Yes N=19 65.5%
Type of Drug	Metformin		N=3 (10.3%)
	Insulin		N=2 (6.9%)
	Anti HTN		N=4 (13.8%)
	GIT -Bucospasm		N=1 (3.4%)
	Muscle Relaxant		N=1 (3.4%)
	Thyroxine		N=1 (3.4%)
	Multi vitamin -Feroglobin		N=1 (3.4%)
	Non-Specified		N=6 (20.7%)
	None		N=10 (34.5%)

Table 3: Frequency distribution table showing descriptive and inferential statistics related to the denture.

S. No	Variable	Responses	Frequency – No. (%)	P–value (Chi-Square Variates)
1.	**Duration of Denture (RPD) Wearing – (In Month) – Expressed in** (Mean ± SD; Minimum, Maximum, Range, SEM)	8.62 ± 6.03; 1; 24; 23; 1.12		
2	**Type of RPD**	Cobalt Chrome	N=29 (100%)	Cannot be computed
		Acceptable	Not Acceptable	
3.	**Stability/Retention**	N=22 (75.9%)	N=7 (24.1%)	0.03* (4.39)$^{\beta}$
4	**Vertical/horizontal relation**	N=18 (62.1%)	N=11 (37.9%)	0.14$^{\beta}$
5	**Extension**	N=21 (72.4%)	N=8 (27.6%)	0.09$^{\beta}$
6	**Allergy to denture material**	No	Yes	
		N=29 (100%)	N=0	Cannot be computed

Table 4: Frequency distribution table showing descriptive and inferential statistics related to local environment.

S. No	Variable	Responses	Frequency – No. (%)		P–value (Chi-Square Variate)
		Unnoticed	Too Little	Too Much	
1.	**Amount of saliva Flow**	N=25 (86.2%)	N=4 (13.8%)	N=0	**0.006$^{\epsilon}$ (7.59)**
		No	**Yes**		
2.	**Difficulty in swallowing**	N=24 (82.8%)	N=5 (17.2%)		**0.03* (4.54)**
3	**Does your mouth feel dry when eating?**	N=20 (69%)	N=9 (31%)		**0.03* (4.57)**
4	**Candida infection**	N=25 (86.2%)	N=4 (13.8%)		**0.006$^{\epsilon}$ (7.59)**

wearing the removable partial denture accounting for (17.2%) of the study population. In contrast, seventeen female RPD wearers (58.6%) reported practicing a para-functional habit while wearing the RPD.

Chi-Square statistical test was applied at a 95% level of Confidence interval; this test was performed to explore the association between the prevalence of burning mouth sensation and the suggested causative factors. Table 4 illustrates the factors which were shown to have a strong statistical significance with the prevalence of burning mouth sensation. They included the 'too little salivary flow (P=0.006), difficulty felt while swallowing (P= 0.03), Feeling of Dry Mouth (P =0.03), and lastly the presence of Candida infection (P=0.006). Furthermore, Table 3 demonstrates a statistically significant difference in relation to denture stability with the presence of BMS (P=0.03).

Discussion

The prevalence of burning mouth syndrome in this study was estimated to be (37.9%). This finding is higher than comparative studies in the Kingdom of Saudi Arabia [14] illustrated that the prevalence of BMS in Abha city was 7.03% in patients with no particular regard to wearing prosthetics, this suggests a strong significance related to denture wearing has shown a low prevalence of 0.7% in adults. [15] The global prevalence of BMS varies considerably, in the United Kingdom BMS has shown a prevalence of 1-3%, [16] while in Sweden 4.6% of a representative sample of the Swedish population has proved to suffer from condition. [17] In Jordan, 2.3% of complete denture wearers reported having burning mouth syndrome. [4]

The mean age of the study participants was (49.3) years; this was lower than the results obtained by other studies that reported the mean age of BMS to be 61 years. [11] The incidence of BMS was found to rise with age, particularly in females as the ratio of its occurrence in females compared to males was indicated as (5:1). [18]

This finding could be attributed to the dryness of the oral mucosal membranes from hormonal alterations, mainly estrogen and progesterone that accompany the menopausal phase in females at their middle ages. [19] Furthermore, it has been indicated that during menopause, a marked drop in the levels of neuro-protective adrenal steroids results in a concurrent reduction of steroids. As a result, the small nerves of the oral mucosa those are responsible for the oral somatic sensitive innervations degenerate, causing burning sensations. [20]

In our study, significant statistical associations were found between the prevalence of BMS and few suggested causative factors. 'Too little' salivary flow, which is the value below 0.5 ml/minutes, [21] was statistically significant with the prevalence of BMS (P=0.006). This decrease in salivary flow may predispose to various fungal infections, one of which is the Candida Albicans, which was moreover found to have a positive statistical significance with BMS (P=0.006). This finding was in accordance with another study that has illustrated that dry mouth due to low salivary flow consequently causes fungal infections in various oral sites. [22] Patients with burning mouth sensations are more susceptible to oral infections, including Candidiasis, Enterobacter, and Fusobacterium. [12] Brailo et al. have shown that 86% of biopsies taken from the oral mucosa of BMS patients in his study were positive for Helicobacter pylori bacteria. [16]

Furthermore, technical problems in the fabrication process of removable partial denture have a direct impact on burning mouth syndrome, [23] in our study; the stability of the denture had a statistically significant association with the prevalence of BMS (P=0.03). None of the study participants reported experiencing an allergic reaction to the chrome cobalt denture material. Nevertheless, various materials have been shown to cause a severe allergic reaction, mercury, zinc, and sodium sulfate contributes to xerostomia in patients of BMS. [24]

The highest drug intake was amongst hypertensive and diabetic patients in our study cohorts; specific drugs were shown to have an association with the pathogenicity of BMS, vasodilators like Angiotensin-converting enzyme inhibitors increase the level of serine proteases like Kallikrein in saliva resulting in consequential activation of inflammatory mediators that trigger BMS of the oral mucosa. [25]

To conclude, burning mouth syndrome is a multifactorial condition that creates an immense challenge for dentists to diagnose and adequately treat, our study takes in consideration the impact of wearing a removable partial denture as a potential risk factor for the aetiopathogenesis of burning mouth syndrome and careful consideration should be given before fabrication and prosthetic replacement of missing teeth.

Conclusions

This study concludes that:

- The prevalence of burning mouth sensation among removable partial denture female wearers was found to be 37.9%, which is higher than the studies conducted within the surrounding settings.
- Special care should be provided to the patients' immunity status before the fabrication of the RPD, as Candidal infection was a statistically significant factor in developing a burning mouth sensation afterward.
- The quality of life of patients suffering from BMS should be further investigated as the state of stress could have an underlying impact on the occurrence of BMS.

Limitations of the Study

- No blood sample was obtained from RPD wearers to check for their specified complete blood count, T3, and T4 hormones indicating patients' thyroid function, level of B12 hormone.
- The sample size is small therefore a larger sample size with thorough laboratory investigations will illustrate a more unobstructed view of the true causatives of BMS and hence facilitate targeted treatment plans.
- The study was carried out in the females' dental clinics, this justifies including only females in the sample. Further comparative studies are required to investigate the association between BMS and gender.

Conflict of Interest

The authors have disclosed no potential conflicts of interest, financial, commercial or otherwise.

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