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ORIGINAL ARTICLE

Risk factors in burning mouth syndrome: a case–control study based on patient records

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Abstract Burning mouth syndrome (BMS) is a multifactorial condition which is still poorly understood. The aim of this study was to evaluate a group of patients with BMS, as compared to a control group, and to describe related local and systemic factors. Records of patients referred to the Oral Pathology Service at the School of Dentistry over a period of 7 years were considered for the study, within which 32 patients with a diagnosis of BMS were found. A randomized group matched for age and gender was also evaluated for the study. Data were analyzed statistically using the SPSS 12.0 for Windows. Prevalence of BMS was 0.99% (32 BMS patients/3,243 records), considering that females were more commonly affected than were males and that the majority of the individuals were in their sixties. The univariate analysis performed comparing the two groups revealed statistical differences concerning the presence of gastrointestinal diseases (p=0.003) and urogenital diseases (p=0.012). The intake of H-2 receptor antagonist and proton pump inhibitor drugs (p=0.015) also proved to be significant. Logistic regression analysis confirmed that gastrointestinal and urogenital problems were indeed risk factors that were solely associated with BMS. Although a diversity of related factors could be identified, gastrointestinal problems were the most prevalent, suggesting that the management of BMS patients requires attention and an appropriate approach to such disorders.

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Introduction

Burning mouth syndrome (BMS) is a chronic condition characterized by burning or painful sensations within clinically normal oral mucosa, at times appearing together with other complaints, such as oral dryness and disturbing taste [1, 2]. This alteration suggests a prevalence rate ranging from 0.7% to 2.6% [3]. BMS mainly affects woman beyond middle age. Although the tongue is the most frequent site affected by burning sensations, more than one site may present symptoms simultaneously [4, 5].

Although the causes of BMS remain open to controversy, local, systemic, and psychogenic factors have been reported as etiological factors [6, 7]. The local factors include candidiasis, bacterial infections, allergies, temporomandibular joint symptoms (TMJ), and dysfunctions of the salivary glands [4]. Some studies have also suggested that BMS could be caused by the metals used in the dental restorations and prostheses, as well by acrylate monomers, although no significant association could be observed between the patients and positive patch test reactions [8, 9].

Systemic factors are most commonly divided into the following groups: deficiencies of different types, hormonal and immunologic disturbances, and the side-effects of drugs. The psychogenic factors describe different mental states which are believed to cause BMS [4].

Consequently, these causes are quite diversified, making it difficult to assess their role in BMS patients when compared with a control group. Many criteria for the classification of BMS have been proposed, but to date none have been validated. Scala et al. [10] proposed a classifi-

cation for BMS in two clinical forms: primary or idiopathic BMS, for which local or systemic causes cannot be identified; and secondary BMS, which can be related to local or systemic pathologic conditions.

Thus, the purpose of this study was to investigate the possible risk factors for BMS in a case–control study, aimed at determining which factors are different in the two groups.

Materials and methods

This study was approved by the Institutional Committee of Bioethics in Research. Case records of patients referred to the Oral Pathology Service at the School of Dentistry, Universidade Federal de Minas Gerais over a 7-year period (1999 to 2006) were considered for the study. Historical records containing diagnoses of BMS were retrieved, and both primary and secondary BMS were considered. Inclusion criteria were formulated as follows: (1) patients with a complaint of burning in the mouth, with or without other subjective symptoms (i.e., xerostomia and taste disturbances) and (2) absence of visible oral lesion. The control group consisted of a randomized group attending the Oral Pathology Service (for other oral mucosal diseases) and matched for age and gender.

Clinical data, information regarding medical history, including the use of medications, habits, oral status, and denture use were collected from both groups of patients. The logs analyzed within the present study presented a limited number of records regarding the number of teeth and restorations. All the data obtained were analyzed statistically in an SPSS 12.0 for Windows program (SPSS Company, Chicago, IL, USA). The chi-squared test was used for univariate analysis. The technique for the selection of variables used within the logistic regression model was that recommended by Hosmer and Lemeshow—2000 [11]. OR (CI 95%) was calculated for each co-variable of the final model. The Hosmer and Lemeshow test was used to verify the adjustment of the final model. A 5% significance level was used for all statistical tests and comparisons.

Results

Among the 3,243 retrieved records, 32 (0.99%) could be classified as BMS patients. The control group consisted of 64 subjects. In the BMS group, 23 (72%) patients were female and nine (28%) were male, with a female/male ratio of 2.5:1. The age ranged from 27 to 87 years with a mean age of 60.9 years. The prevalence of BMS was greater between the sixth and eighth decades of life. Data regarding the affected site, symptoms, and the main related complaints are described in Table 1. The control group consisted of 46 (71.9%) female and 18 (28.1%) male.

Systemic evaluation

A statistical significance could be observed when comparing the groups, which revealed that gastrointestinal and urogenital diseases were more commonly reported by BMS patients than by control group patients. However, no statistical difference could be observed between the BMS group and the control group regarding other systemic diseases (Table 2).

Consumption of drugs

Twenty-one (65.6%) BMS patients reported the use of more than one drug, with a mean of 2.16 drugs per day, 18.8% of which was represented by antihypertensive agents. In the control group, 29 (45.1%) took one or more drugs, 21.8% of which was represented by antihypertensive agents. The most consumed drugs by BMS patients were antihypertensives, antidepressants, analgesics, H2-receptor antagonists and proton pump inhibitors for gastric problems, and anxiolytics. In the control group, a higher consumption of antihypertensives, analgesics, antidepressants, and anxiolytics could be observed. Upon univariate analysis, a statistically significant difference was only observed for the use of drugs for gastric problems, with a higher intake by BMS patients than by control patients ($p=0.015$).

Smoking, dentures, and temporomandibular joint disorder symptoms

The number of smokers, denture wearers, and patients with TMJ symptoms showed no statistical difference between the groups.

Table 1 Symptoms reported by BMS patients and burning sites

Symptoms	Frequency	Percentage
Burning	25	78.1
Burning and dry mouth	5	15.6
Burning and taste disturbances	2	6.3
Total	32	100.0
Site		
Tongue	9	28.1
Other sites	4	12.5
Tongue and other sites	15	46.9
Nor reported	4	12.5
Total	32	100.0

Table 2 Systemic diseases reported by patients from the BMS and control groups

System	BMS patients *N* (%)	Control subjects *N* (%)	Chi square	*p* value
Gastrointestinal	21 (65.5)	22 (34.4)	8.42	0.004
Cardiovascular	19 (59.4)	34 (53.1)	0.33	0.561
Urogenital	19 (59.4)	21 (32.8)	6.19	0.012
Respiratory	12 (37.5)	19 (29.7)	0.59	0.440
Rheumatical	11 (34.4)	17 (26.6)	0.63	0.427
Endocrinal	8 (25.0)	16 (25.0)	0.00	1.000
Neurological	10 (31.3)	18 (28.1)	0.10	0.750
Psychological	11 (34.4)	14 (21.9)	1.73	0.188

Logistic regression analysis

A regression equation including 10 variables (psychological, gastric, and urogenital problems; smoking; medicine for gastric problems and osteoporosis; antidepressants; antiepileptic medicine; vitamins; as well as medicine for cardiac insufficiency) was established by using the logistic regression analysis. Gastrointestinal (OR=3.58) and urogenital (OR=2.93) problems proved to be the main risk factors related to BMS (Table 3).

Discussion

The percentage of BMS patients was referent to approximately 0.99% of all patients from the Oral Pathology Service files assessed. This prevalence is lower than the 3.7% and 5.4% reported in prior literature [6, 12]. However, there is a great variability in BMS prevalence in the literature most likely due to the variety of criteria used for BMS diagnosis [10]. Moreover, the prevalence of BMS is commonly influenced by the referring system. BMS patients tend to seek help from a variety of medical specialists, including general physicians, psychologists, and dentists [13]. Therefore, it is difficult for a single center to gather an expressive number of patients.

Another possible explanation could be related to regional differences between the Brazilian population and individuals of other countries mainly because of the variation of risk factors. For example, in the Brazilian population, there is an increased use of prostheses (most with inadequacies), which is an important factor for the presence of the *Candida* species in oral mucosa, a common etiological factor in BMS [14].

In the present study, the percentage of BMS patients according to gender (female, 72%; male, 28%) is in agreement with other authors, although a higher number of males in this study, as compared to others reports, were actually affected [1, 6, 7, 15–17]. Differences in the mean age among studies may be due to the presence of young patients in the different samples. The mean age of 60.9 years in this study was similar to that observed in other studies [7, 17, 18].

BMS is characterized by a triad of symptoms: burning mouth, dry mouth, and altered taste [19]. Salivary flow rate was not evaluated for patients/controls; however, subjective oral dryness has been reported in BMS patients, with no difference in flow rates between BMS patients and controls [18]. In our sample, dry mouth and altered taste were not commonly reported, affecting only 15.6% and 6.3% of the BMS patients, respectively. However, these complaints were not observed in the control group. Prevalence of dry mouth in BMS patients reported in the literature range from 29.6% to 75.0% [1, 6, 12, 16–18, 20]. Altered taste appears to be less common than dry mouth in BMS patients, as evidenced by the prevalence rates found in the literature which ranged from 11.0% to 69.0% [6, 18, 20, 21]. We believe that the low prevalence of both complaints may be due to the lack of accurate reports regarding these symptoms on the part of the patient, in addition to a lack of careful anamnesis by the dentist. Although most patients complained of a burning sensation in more than one site simultaneously (59.0%, *n*=19), the tongue was involved in 75% (*n*=24) of the cases. Moreover, when only one site was affected, the tongue was the most eligible site. This point is important to emphasize as the tongue is also a common site for many other changes. Thus, the necessity of differential diagnosis must be stressed.

Table 3 Logistic regression analysis regarding BMS risk factors

Variable		BMS patients *N* (%)	Control subjects *N* (%)	*p* value	OR (CI 95%)
Gastrointestinal problems	Yes	21 (65.6)	22 (34.4)	0.007	3.58 (1.42–9.01)
	No	11 (34.4)	42 (65.6)		
Urogenital problems	Yes	19 (59.4)	21 (32.8)	0.021	2.93 (1.17–7.35)
	No	13 (40.6)	43 (67.2)		

The present study has additional findings which demonstrate the complexity of the causes of BMS. The analysis of the medical status revealed that all BMS patients reported one or more systemic diseases. Multiple chronic diseases in BMS patients are in accordance with prior literature [17, 22]. A significant difference regarding the presence of gastrointestinal and urogenital disorders in the BMS group, as compared to the control group, could also be observed.

Concerning the gastrointestinal disorders previously reported in the literature [7, 12, 15, 17, 22], Lamey et al. [7] reported that BMS patients were 3.2 times more likely to have gastrointestinal problems than were healthy individuals. Similarly, our results showed that BMS patients were 3.58 times more likely to have gastrointestinal diseases than were control patients. Gastritis, gastroesophageal reflux, and flatulence are some of the gastrointestinal problems reported as being commonly associated with BMS [12, 15]. In the present sample, gastritis and gastroesophageal reflux were the most commonly reported problems. However, a clear relationship between gastrointestinal problems and BMS has yet to be described [7, 12]. Some authors have observed the occurrence of dry mouth and burning symptoms in the oral mucosa of patients with gastroesophageal reflux disease (GERD). These authors found that xerostomia and oral burning sensation are the most frequent symptoms associated with GERD [23, 24].

Brailo et al. [12] showed that 51.3% of BMS patients exhibited gastritis, while 12.7% of them presented *Helicobacter pylori* infection. *H. pylori* infection in gastric mucosa is always associated with tissue damage and findings of active and chronic gastritis [25]. A search for a possible association of *H. pylori* and BMS, through the PCR technique, found that 17.0% of BMS patients were in fact infected by *H. pylori*, while all samples from healthy volunteers were negative [26]. A relationship between burning sensations, acid taste, halitosis, and lingual hyperplasia with *H. pylori* infection of the mouth was also demonstrated [27]. Although the presence of *H. pylori* infection in the patients was not investigated, our results suggest a reasonable association between gastric disorders and the development of secondary BMS. Thus, a careful gastrointestinal investigation should be performed with BMS patients.

Urogenital diseases were also frequently reported in the BMS group, the most prevalent diseases being urogenital infections and renal calculus. Patients who have acute or chronic renal failure, although rare, are prone to develop uremic stomatitis, a painful condition mimicking BMS; however, there are no cases reported in the literature which can offer an explanation for the association described in the present study.

Self-medication is a common practice in Brazil [28]. Likewise, a high level of medicine intake was described in both groups. A significant difference between the groups regarding the consumption of drugs for the digestive system was also found. This high consumption of H2-receptor antagonists and proton pump inhibitors for gastric problems could be explained by the prevalence of gastrointestinal diseases in the BMS group and therefore reinforces our supposition that in some BMS patients the symptoms could be due to gastrointestinal diseases.

The symptoms of dry and burning mouth are very common in postmenopausal women. The role of hormone replacement therapy is controversial, and the effect of treatment seems to be highly individual [29]. In the present study, three BMS woman (9.7%) and three control group woman (4.68%) underwent estrogen replacement therapy, and no statistical difference could be found.

No differences were found between BMS and control groups regarding the number of individuals wearing dentures. Although some authors [5, 30] have assured that denture users are more prone to develop BMS, the present study did not confirm this finding.

The literature reports that symptoms of burning are commonly correlated with the presence of mandibular dysfunction [31]. Nevertheless, the present study did not show a significant difference between the groups considering TMJ symptoms. Despite the fact that the control group consisted of more smokers, this difference was not significant. Gorsky et al. [32] reached similar results and verified that tobacco abstinence did not change the symptoms in BMS patients.

The results of the present study are in general agreement with those in the literature. The majority of patients could be classified as secondary BMS associated with gastrointestinal problems. The classification of other patients as primary BMS could only be carried out after laboratory exams or therapy probe against diseases that are related to BMS. Even the relationship between BMS and many etiologic factors remains speculative. Satisfactory management of these patients depends on meticulous initial investigation of all cases, with special emphasis placed on investigation into gastrointestinal disorders. Accurate anamnesis, though a less empirical approach, is the most efficient means through which to find factors that are related to BMS. In addition, the association of BMS with urogenital disease calls for further investigation.

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