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RESEARCH ARTICLE

BURNING MOUTH SYNDROME AND ITS ASSOCIATEDSALIVARY BIOMARKERS

Chandrakala S. A[1] , Lakshminrusimhan D K S[2], P M Kaushik[3], M Ruchita[3], V Sackesh Raja[3] and Lavanya Jeya Durga M R[3]

1. Professor and Head, Department of Oral Medicine and Radiology ,RVS Dental College and Hospital, Coimbatore, India.
2. Professor, Department of Oral Medicine and Radiology ,RVS Dental College and Hospital, Coimbatore, India.
3. Interns, Department of Oral Medicine and Radiology ,RVS Dental College and Hospital, Coimbatore, India.

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Abstract

Burning Mouth Syndrome (BMS) is a chronic oral pain condition characterized by a persistent burning sensation of the oral mucosa in the absence of visible clinical abnormalities. It predominantly affects middle-aged and postmenopausal women and has a considerable negative impact on quality of life. The etiology is multifactorial, involving neuropathic, hormonal, psychological, and local contributing factors. Recent studies have highlighted the significance of salivary biomarkers in elucidating the underlying mechanisms of the disorder. Saliva serves as a non invasive diagnostic medium containing hormone s, enzymes, cytokines, and oxidative stress markers that reflect both systemic and local alterations. Changes in salivary composition in individuals with BMS provide insights into disease pathogenesis and hold promise for diagnostic and therapeutic applications. This review presents an overview of Burning Mouth Syndrome with particular emp hasis on the diagnostic and clinical relevance of salivary biomarkers.

Introduction:-

Burning Mouth Syndrome is a chronic disorder characterized by a burning sensation in the oral cavity without any detectable clinical lesions or identifiable cause. The tongue, lips, and palate are the most commonly affected sites, often accompanied by xerostomia and taste disturbances. Despite extensive research, its etiology remains unclear, making diagnosis and management difficult. Increasing evidence supports the classification of BMS as a neuropathic pain disorder involving both peripheral and central mechanisms. Recently, salivary biomarkers have gained attention as a diagnostic tool due to their non-invasive nature and their ability to reflect physiological and pathological states. These biomarkers offer insights into inflammation, oxidative stress, and neuroendocrine alterations associated with BMS (1–3).

Epidemiology:-

Burning Mouth Syndrome is more prevalent among middle-aged and elderly individuals, with a higher incidence in postmenopausal women. Reported prevalence ranges from 0.7% to 5% depending on study criteria. Hormonal changes, particularly reduced estrogen levels, are believed to contribute to this increased prevalence. Psychological

Corresponding Author:-P M Kaushik
Address:-Interns, Department of Oral Medicine And Radiology ,RVS Dental College and Hospital, Coimbatore, India.

conditions such as anxiety, depression, and chronic stress are frequently associated with BMS, indicating a strong psychosomatic component (1,3,11).

Etiology:-
The etiology of BMS is multifactorial and can be classified into primary (idiopathic) and secondary forms. Primary BMS is considered neuropathic, whereas secondary BMS is linked to local, systemic, or psychological causes. Local factors include xerostomia, candidiasis, parafunctional habits, and allergic reactions. Systemic conditions such as diabetes mellitus and nutritional deficiencies (vitamin B12, iron, folate) also play a role. Psychological disturbances, including anxiety and depression, are commonly observed and may exacerbate symptoms (3,5,12).

Pathophysiology:-
The pathophysiology of BMS involves both peripheral and central mechanisms. Peripheral nerve dysfunction, particularly involving small-diameter fibers of the trigeminal nerve, results in altered pain perception. Central mechanisms include dysregulation of pain pathways and dopaminergic dysfunction. Hormonal changes, especially estrogen deficiency, may influence neural activity. Additionally, chronic stress impacts the hypothalamic-pituitary-adrenal axis, leading to altered cortisol levels and increased pain sensitivity (10,14,15).

Clinical Features:-
Patients typically report a burning, tingling, or scalding sensation, most frequently affecting the anterior two-thirds of the tongue. Symptoms are often bilateral and intensify throughout the day. Associated features include xerostomia, dysgeusia, and altered taste perception. Clinical examination usually reveals no visible mucosal abnormalities. The chronic nature of the disease often results in psychological distress and reduced quality of life (4,11).

Diagnosis:-
Diagnosis of BMS is primarily one of exclusion. A thorough history and clinical examination are essential. Laboratory investigations help identify systemic causes such as nutritional deficiencies or endocrine disorders. Salivary analysis is increasingly being utilized as a diagnostic aid due to its ability to reflect biochemical changes. Standardized diagnostic criteria have been proposed to improve diagnostic accuracy (2,6).

Salivary Biomarkers in Bms:-
Saliva is a valuable diagnostic fluid due to its ease of collection and ability to mirror systemic conditions. It contains enzymes, hormones, antibodies, cytokines, and oxidative stress markers that play a crucial role in maintaining oral health. Alterations in salivary composition have been consistently observed in BMS patients, indicating their relevance in disease pathogenesis (6–9).Salivary cortisol is one of the most extensively studied biomarkers in BMS. Elevated cortisol levels have been reported, reflecting activation of the stress response and involvement of the hypothalamic-pituitary-adrenal axis. This supports the role of psychological stress in disease progression (1,8).Pro-inflammatory cytokines such as interleukin-6 and tumor necrosis factor-alpha are also increased in BMS patients, suggesting an underlying inflammatory component (17,24).Oxidative stress plays a critical role, with increased levels of markers such as malondialdehyde and reduced antioxidant capacity. This imbalance leads to cellular damage and contributes to symptom severity (23,25).

Salivary flow rate is often reduced, contributing to xerostomia. Changes in salivary composition may also affect taste perception, leading to dysgeusia. These findings highlight the importance of salivary biomarkers in understanding disease mechanisms and improving diagnostic accuracy (7,9,18).Recent studies have explored their role in monitoring treatment response. Changes in biomarker levels following pharmacological therapy, such as clonazepam, indicate their potential in evaluating therapeutic outcomes. Advances in proteomics and genomics may further enhance biomarker discovery and clinical applications (17,26,27,28).\

Management:-
Management of BMS is complex and requires a multidisciplinary approach. Treatment is primarily symptomatic and includes pharmacological agents such as antidepressants, anticonvulsants, benzodiazepines, and topical clonazepam. Psychological interventions, including cognitive behavioral therapy, are beneficial. In secondary BMS, treatment of the underlying cause is essential. Salivary substitutes may be used to manage xerostomia. Emerging research on salivary biomarkers may lead to more targeted therapies in the future (3,19,20,29).

Summary Points:-

- Burning Mouth Syndrome is a chronic oral pain disorder with no visible clinical findings.
- It predominantly affects postmenopausal women and has a multifactorial etiology.
- Neuropathic mechanisms involving peripheral and central pathways play a key role.
- Psychological factors such as stress, anxiety, and depression significantly influence symptom severity.
- Salivary biomarkers provide a non-invasive method to assess disease mechanisms.
- Elevated salivary cortisol indicates neuroendocrine involvement.
- Increased cytokines suggest an inflammatory component in BMS.
- Oxidative stress markers reflect cellular damage and contribute to symptom progression.
- Reduced salivary flow contributes to xerostomia and altered taste perception.
- Salivary biomarkers show potential in diagnosis, monitoring, and future targeted therapy.

Conclusion:-

Burning Mouth Syndrome is a multifactorial condition that significantly affects quality of life. Although its exact cause remains unclear, neuropathic, hormonal, and psychological factors are strongly implicated. Salivary biomarkers represent a promising, non-invasive approach for understanding disease mechanisms and improving diagnosis. Further research is necessary to validate these biomarkers and integrate them into routine clinical practice.

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