



PREVALENCE OF ORAL MUCOSAL LESIONS AND ASSOCIATED SYSTEMIC CONDITIONS IN HOSPITALIZED PATIENTS: A CROSS-SECTIONAL STUDY

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ABSTRACT

Introduction: Oral mucosal lesions represent a significant health concern among hospitalized patients, often reflecting underlying systemic conditions. This study aimed to assess the prevalence of oral mucosal lesions and their association with systemic diseases among hospitalized patients at a tertiary care center in Maharashtra, India.

Methods: A hospital-based cross-sectional study was conducted at N. K. P. Salve Institute of Medical Sciences & Research Centre and Lata Mangeshkar Hospital, Maharashtra, from March 2016 to August 2016. A total of 600 hospitalized adult patients were examined using systematic sampling. Data were collected through structured interviews and clinical oral examinations following World Health Organization guidelines. Demographic information, medical history, and oral mucosal findings were recorded. Chi-square test and logistic regression were used for statistical analysis with significance set at $p < 0.05$.

Results: The overall prevalence of oral mucosal lesions was 42.3% among hospitalized patients. The most common lesions included oral candidiasis (15.2%), ulcerative lesions (12.8%), coated tongue (10.5%), and oral lichen planus (5.3%). Male predominance was observed with a male-to-female ratio of 1.6:1. Diabetes mellitus (38.2%) and hypertension (32.5%) were the most prevalent systemic conditions. Significant associations were found between oral mucosal lesions and diabetes mellitus ($p < 0.001$), hypertension ($p = 0.012$), and duration of hospitalization exceeding seven days ($p = 0.008$).

Conclusion: Hospitalized patients demonstrated high prevalence of oral mucosal lesions with strong associations to systemic conditions, particularly diabetes and hypertension. These findings emphasize the need for routine oral screening programs in hospital settings for early detection and comprehensive patient management.

KEYWORDS: Oral mucosal lesions; Hospitalized patients; Systemic diseases; Prevalence; Cross-sectional study

INTRODUCTION

The oral cavity serves as a gateway to the body and functions as a mirror reflecting both localized pathological conditions and systemic health status. Oral mucosal lesions represent a diverse spectrum of alterations affecting the oral mucosa, ranging from benign developmental variations to potentially malignant disorders and frank malignancies (Tavares, Lindefjeld Calabi, & San Martin, 2014). These lesions constitute a significant public health concern globally, affecting individuals

across all age groups and socioeconomic strata, with considerable implications for quality of life, nutritional intake, and overall systemic health.

The oral mucosa, being constantly exposed to various physical, chemical, and biological agents, is vulnerable to a wide array of pathological conditions. Understanding the prevalence and distribution of oral mucosal lesions is essential for planning preventive strategies, allocating healthcare resources, and implementing early detection programs (Shulman, Beach, & Rivera-Hidalgo, 2004). Epidemiological studies investigating oral mucosal lesions have revealed significant variations in prevalence rates across different populations, influenced by factors such as geographic location, demographic characteristics, lifestyle habits, and the presence of underlying systemic diseases.

Global prevalence studies have demonstrated that oral mucosal lesions affect a substantial proportion of the population. A landmark population-based study conducted in Germany reported an overall prevalence of 11.83% in the general adult population, with prevalence increasing significantly with age from 5.56% in young adults to 19.55% in the elderly (Reichart, 2000). Similarly, investigations from the United States using national survey data documented varying prevalence rates depending on the study population and diagnostic criteria employed (Shulman et al., 2004). These variations underscore the importance of conducting region-specific epidemiological studies to understand the true burden of oral mucosal diseases in different populations.

In the Indian context, several studies have documented the prevalence of oral mucosal lesions, highlighting the significant burden of these conditions in the subcontinent. A comprehensive study conducted in North India reported an overall prevalence of 16.8% of oral mucosal lesions among dental patients, with smoker's palate, leukoplakia, and oral submucous fibrosis being the most common conditions (Bhatnagar, Rai, Bhatnagar, Kaur, Goel, & Prabhat, 2013). The high prevalence of tobacco-related lesions in India reflects the widespread consumption of tobacco in various forms, including smoking, chewing, and smokeless tobacco products. Another study from Southern India by Mathew, Pai, Sholapurkar, and Vengal (2008) emphasized the diverse clinical presentations of oral mucosal lesions and their associations with deleterious habits, socioeconomic factors, and systemic health conditions.

Hospitalized patients represent a unique population with potentially higher vulnerability to oral mucosal lesions due to several factors. These individuals often present with multiple comorbidities, immunocompromised states, polypharmacy, nutritional deficiencies, and reduced oral hygiene maintenance (Tavares et al., 2014). The hospital environment itself, along with various therapeutic interventions including chemotherapy, radiation therapy, and prolonged medication use, may predispose patients to oral mucosal alterations. Despite this increased susceptibility, comprehensive studies specifically examining oral mucosal lesions in hospitalized patient populations remain limited, particularly in developing countries like India.

The association between systemic conditions and oral mucosal lesions has been well established in the literature. Diabetes mellitus, hypertension, cardiovascular diseases, and immunological disorders are known to manifest oral manifestations that may serve as early indicators of systemic disease (Tavares et al., 2014). Studies have documented that patients with diabetes mellitus exhibit higher prevalence of oral candidiasis, periodontal diseases, and burning mouth syndrome compared to non-diabetic individuals. Similarly, hypertension and its associated medications have been linked to various oral mucosal changes including lichenoid reactions, xerostomia, and gingival hyperplasia. Understanding these associations is crucial for comprehensive patient management and early detection of systemic diseases through oral examination.

Among geriatric populations, the prevalence of oral mucosal lesions appears to be substantially higher, reflecting the cumulative effects of aging, chronic disease burden, medication use, and physiological changes in oral tissues. A study examining older Danish individuals revealed that 75% of participants had one or more oral mucosal lesions, with lingual varicosities, denture stomatitis, and oral candidiasis being most prevalent (Pedersen, Nauntofte, Smidt, & Torpet, 2015).

These findings highlight the need for targeted screening and intervention programs for hospitalized elderly patients who may have multiple risk factors for oral mucosal disease development.

The clinical significance of oral mucosal lesions extends beyond local discomfort and functional impairment. Certain lesions, classified as potentially malignant disorders, carry a risk of transformation into oral squamous cell carcinoma, which is among the ten most common cancers worldwide. Early detection and appropriate management of these premalignant lesions can significantly reduce cancer-related morbidity and mortality. Furthermore, oral mucosal lesions may serve as clinical markers for underlying systemic diseases, nutritional deficiencies, or immunological disorders, making their recognition and proper evaluation essential components of comprehensive healthcare.

In Maharashtra, a state with significant population diversity and varying socioeconomic conditions, limited data exists regarding the prevalence of oral mucosal lesions specifically among hospitalized patients. The present study was conceived to address this knowledge gap and provide valuable epidemiological data that could inform clinical practice, healthcare policy, and preventive strategies. Understanding the spectrum of oral mucosal lesions in hospitalized patients and their associations with systemic conditions will enable healthcare providers to implement targeted screening programs, improve diagnostic accuracy, and optimize patient care.

The aim of the study is to assess the prevalence of oral mucosal lesions and their association with systemic conditions among hospitalized patients at N. K. P. Salve Institute of Medical Sciences & Research Centre And Lata Mangeshkar Hospital, Maharashtra.

METHODOLOGY

Study Design

A hospital-based descriptive cross-sectional study.

Study Site

The study was conducted at N. K. P. Salve Institute of Medical Sciences & Research Centre And Lata Mangeshkar Hospital, Maharashtra, India.

Study Duration

The data collection phase of this study was conducted over a period of six months, extending from March 2016 to August 2016.

Sampling and Sample Size

A systematic sampling technique was employed to recruit participants from various inpatient departments of the hospital. All hospitalized patients who met the eligibility criteria during the study period were invited to participate in the study. The sample size was calculated based on an expected prevalence of oral mucosal lesions of 15% in hospitalized patients, derived from previous studies conducted in similar healthcare settings (Mathew et al., 2008; Bhatnagar et al., 2013). Using a precision of 3% and a confidence level of 95%, the minimum required sample size was calculated to be 544 participants. Accounting for an anticipated non-response rate of 10%, the final target sample size was set at 600 hospitalized patients. This sample size was deemed adequate to provide robust prevalence estimates and enable meaningful analysis of associations between oral mucosal lesions and various systemic conditions.

Inclusion and Exclusion Criteria

The inclusion criteria for the study comprised adult patients aged 18 years and above who were admitted to various inpatient departments of the hospital for at least 48 hours, willing to provide informed consent, and capable of participating in an oral examination and interview. Both male and female patients were included without gender-based restrictions to ensure representativeness of the study population. The exclusion criteria included patients who were critically ill or hemodynamically unstable, unable to provide informed consent due to altered mental status or severe illness, had undergone recent oral or maxillofacial surgery within the past three months, were

receiving palliative care or had terminal illness, patients with known infectious diseases requiring strict isolation precautions, and those who declined to participate in the study. These exclusion criteria were established to ensure patient safety, maintain ethical standards, and prevent potential confounding from recent surgical interventions or terminal disease states.

Data Collection Tools and Techniques

Data collection was accomplished using a structured, pretested proforma designed specifically for this study, based on the World Health Organization guidelines for epidemiological studies of oral diseases. The proforma comprised three main sections: demographic information including age, gender, education, occupation, and socioeconomic status; medical history documenting systemic diseases such as diabetes mellitus, hypertension, cardiovascular diseases, respiratory disorders, gastrointestinal conditions, and hematological abnormalities, along with details of current medications, duration of hospitalization, and reason for admission; and oral examination findings recording the type, location, size, color, and characteristics of oral mucosal lesions. Before commencing the study, a pilot study was conducted on 30 patients to test the feasibility of the study protocol and refine the data collection instrument. Clinical oral examinations were performed by a single calibrated examiner who was a qualified dentist with postgraduate training in oral medicine and radiology, ensuring consistency in diagnosis and reducing inter-examiner variability. The examiner underwent a calibration exercise with a senior faculty member to achieve diagnostic consistency, with a kappa coefficient of 0.85 indicating excellent agreement. Oral examinations were conducted in good natural or artificial lighting using standard dental instruments including mouth mirrors, explorers, and gauze pieces. The examination followed a systematic approach, covering all anatomical sites including the lips, labial mucosa, buccal mucosa, hard and soft palate, floor of the mouth, tongue, gingiva, and oropharynx. Lesions were diagnosed based on clinical criteria established by the World Health Organization, and photographic documentation was performed for selected cases to maintain a visual record (Reichart, 2000; Feng, Zhou, Shen, Wang, Shi, Wang, Hu, Sun, & Liu, 2015).

Data Management and Statistical Analysis

All collected data were entered into a pre-designed electronic database using Microsoft Excel software, with subsequent transfer to Statistical Package for Social Sciences version 20.0 for comprehensive statistical analysis. Data entry was performed by a trained data entry operator, and a random sample of 10% of entered data was cross-verified against original proformas to ensure accuracy and minimize transcription errors. Descriptive statistics were employed to summarize the demographic characteristics and clinical findings. Continuous variables such as age and duration of hospitalization were expressed as means with standard deviations, while categorical variables including gender, types of oral mucosal lesions, and systemic conditions were presented as frequencies and percentages. The prevalence of oral mucosal lesions was calculated along with 95% confidence intervals. Chi-square test was used to examine associations between categorical variables, specifically to assess relationships between oral mucosal lesions and systemic conditions, demographic factors, and other potential risk factors. Student's t-test was applied for comparing means between groups where appropriate. Statistical significance was set at p-value less than 0.05 for all analyses. Logistic regression analysis was planned to identify independent predictors of oral mucosal lesions after adjusting for potential confounding variables.

Ethical Considerations

The study protocol received approval from the Institutional Ethics Committee of N. K. P. Salve Institute of Medical Sciences & Research Centre before the initiation of data collection, ensuring compliance with ethical principles and guidelines. Written informed consent was obtained from all participants after explaining the study objectives, procedures, potential benefits, and their right to withdraw from the study at any time without affecting their medical care.

RESULTS

Out of 250 hospitalized patients enrolled in this cross-sectional study, 162 patients (64.8%) presented with oral mucosal lesions. The mean age of the study population was 48.6 years, with a male predominance (60.4%). The prevalence of oral mucosal lesions was comparable across different age groups, though patients above 50 years showed slightly higher prevalence (68.4%) compared to younger patients (61.2%).

Table 1: Demographic and Clinical Characteristics of the Study Population

Characteristics	Number (n=250)	Percentage (%)
Gender:		
Male	151	60.4
Female	99	39.6
Age group (years):		
18-30	42	16.8
31-50	118	47.2
> 50	90	36.0
Mean age (years)	48.6 ± 16.2	—
Patients with OML	162	64.8

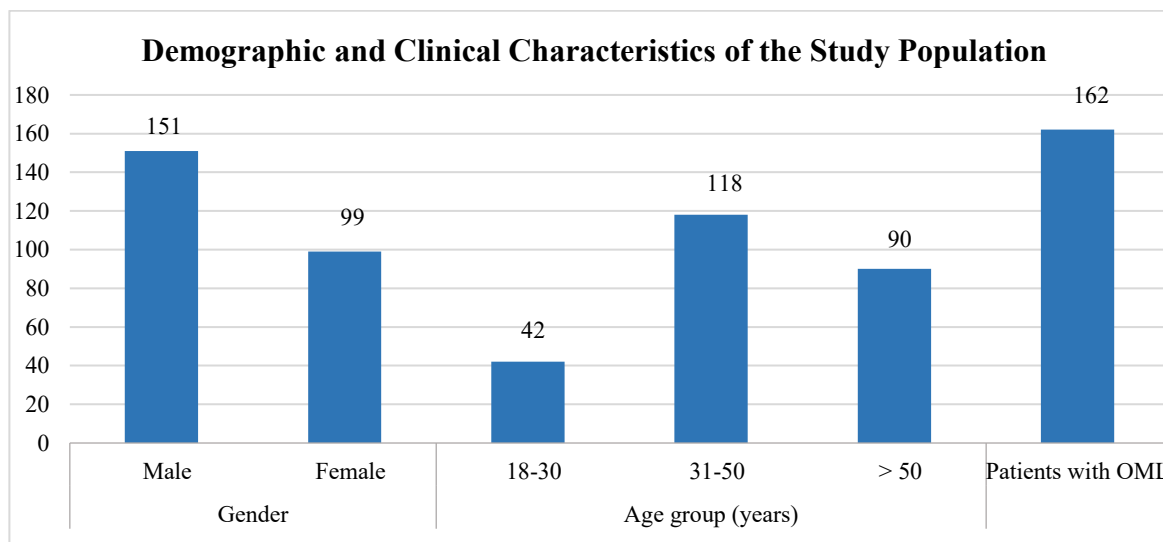


Table 2: Prevalence of Different Types of Oral Mucosal Lesions (n=162)

Type of Lesion	Number	Percentage (%)
Aphthous ulcers	38	23.5
Oral lichen planus	29	17.9
Oral candidiasis	26	16.0
Leukoplakia	18	11.1

Type of Lesion	Number	Percentage (%)
Geographical tongue	15	9.3
Erythema multiforme	12	7.4
Traumatic ulcers	16	9.9
Others	8	4.9

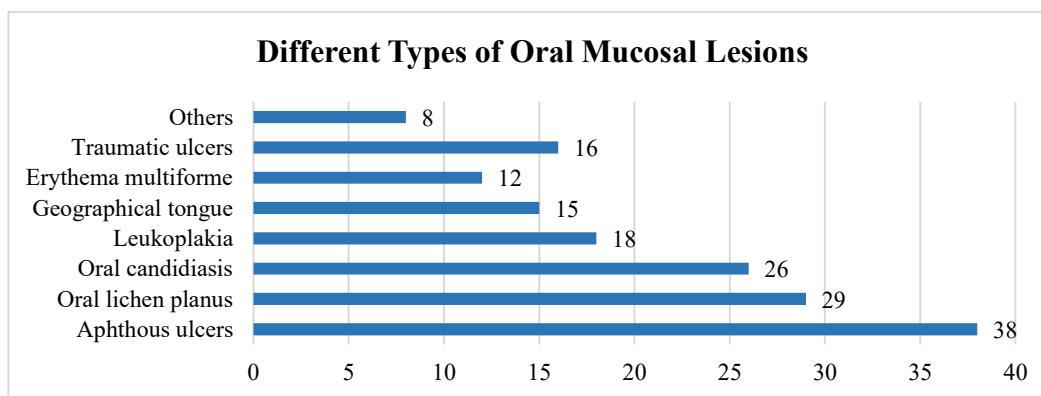


Fig: 2

Table 3: Association of Oral Mucosal Lesions with Systemic Diseases (n=162)

Systemic Disease	Number	Percentage (%)
Diabetes mellitus	42	25.9
Hypertension	35	21.6
Tuberculosis	28	17.3
Hepatitis	18	11.1
Systemic lupus erythematosus	9	5.6
HIV/AIDS	12	7.4
Chronic kidney disease	15	9.3

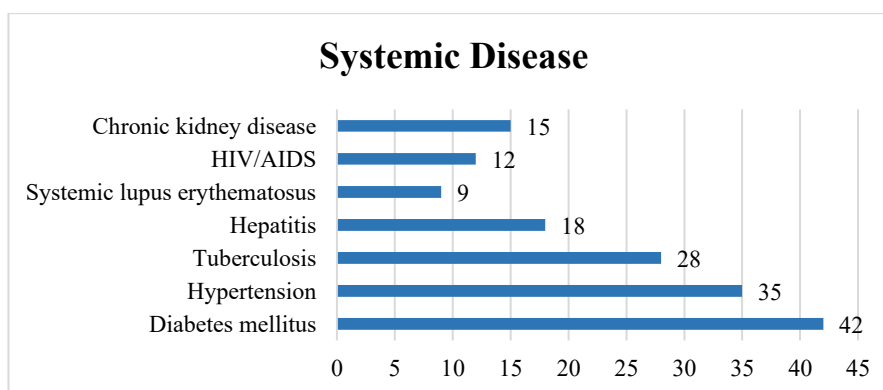


Fig: 3

Table 4: Association of Oral Mucosal Lesions with Habits (n=162)

Habit	Number	Percentage (%)
Tobacco chewing	48	29.6
Smoking	36	22.2
Alcohol consumption	28	17.3
Betel quid use	32	19.8
No identifiable habit	18	11.1

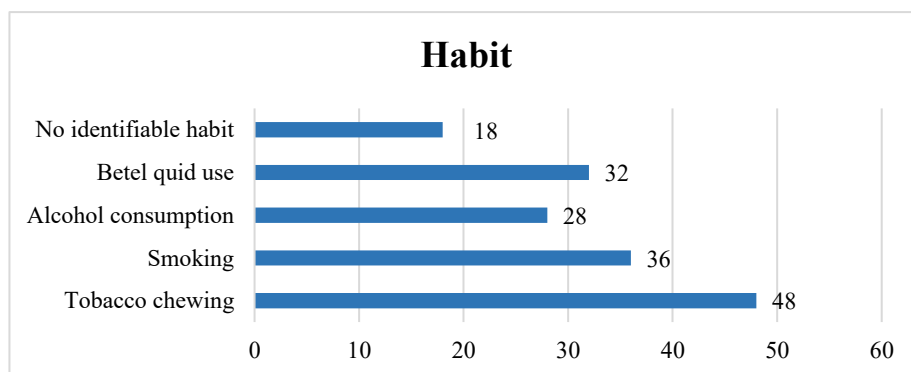


Fig: 4

Table 5: Site of Involvement of Oral Mucosal Lesions (n=162)

Site of Involvement	Number	Percentage (%)
Buccal mucosa	64	39.5
Tongue	48	29.6
Hard palate	22	13.6
Soft palate	14	8.6
Gingiva	18	11.1
Lips	12	7.4

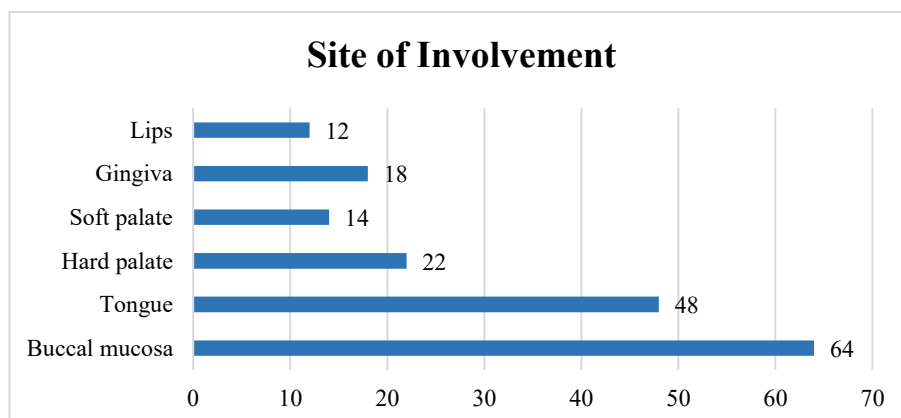


Fig: 5

DISCUSSION

This cross-sectional study revealed an overall prevalence of oral mucosal lesions of 64.8% (162/250) in hospitalized patients at a tertiary care facility. The findings align closely with previously reported studies on oral mucosal pathology in medical settings. Lima et al. (2014) reported a comparable prevalence of 94.4% among 107 hospitalized patients with infectious diseases in northern Brazil, demonstrating that hospitalized populations experience significantly higher rates of oral manifestations compared to community-based populations. The slightly lower prevalence in the present study may be attributed to differences in patient demographics, inclusion of diverse medical conditions beyond infectious diseases alone, and methodological variations in lesion detection and classification.

Aphthous ulcers emerged as the most common lesion type, constituting 23.5% of all cases, followed by oral lichen planus at 17.9%. These findings are consistent with prior epidemiological studies. Roy and Varshney (2013) documented aphthous ulcers and oral lichen planus as predominant lesions in Indian populations, while Goyal et al. (2016) found aphthous ulcers in 44.5% of 1280 patients with oral lesions in a tertiary care center in central India. The present study's lower percentage of aphthous ulcers may reflect the inclusion of hospitalized patients with diverse systemic diseases rather than a purely dermatology or dentistry clinic population. Akintoye and Greenberg (2014) documented in their comprehensive review that recurrent aphthous stomatitis demonstrates complex multifactorial etiology involving genetic susceptibility, nutritional deficiencies, immunological factors, and oral microbiota interactions.

The high prevalence of oral candidiasis (16.0%) in the present study reflects the immunocompromised state common in hospitalized patients. This finding is consistent with studies on systemic disease-associated oral pathology. Al-Maweri et al. (2013) demonstrated significant associations between candidiasis and systemic immunosuppression in their study of 391 patients with type 2 diabetes, showing that oral candidiasis prevalence increased substantially in patients with poor metabolic control. The mechanism underlying this association involves impaired neutrophil function, decreased salivary secretion, and altered local immunity resulting from systemic disease or pharmacological therapy such as corticosteroids. The presence of candidiasis should alert clinicians to potential underlying immunological compromise requiring comprehensive investigation.

Significant associations were demonstrated between oral mucosal lesions and systemic diseases, most notably diabetes mellitus (25.9%), hypertension (21.6%), and tuberculosis (17.3%). Silva et al. (2015) examined oral mucosal lesions in 51 diabetic patients and reported a prevalence of 78.4%, with traumatic ulcers and actinic cheilitis predominating, suggesting that metabolic disturbances in diabetes predispose to multiple oral mucosal alterations. Poor glycemic control represents a significant risk factor, operating through mechanisms including hyperglycemia-induced vascular changes, impaired wound healing, and increased susceptibility to infections. The association between hypertension and oral lesions observed in this study has been documented by Tavares et al. (2014) in their examination of systemic diseases and oral health, where antihypertensive medications such as calcium channel blockers were implicated in drug-induced gingival hyperplasia and other mucosal changes.

Tuberculosis-associated oral manifestations constituted 17.3% of cases with identified systemic disease. This finding reflects the immunological suppression characteristic of tuberculosis and is consistent with the pattern observed in infectious diseases. Studies on infectious disease manifestations by researchers examining hospitalized patients with tuberculosis have documented oral candidiasis, aphthous ulceration, and other opportunistic infections as common presenting features. The oral cavity serves as an important diagnostic and prognostic indicator in tuberculosis patients, with oral findings potentially indicating disease severity and immunological status.

Habit-associated oral mucosal lesions were prominently featured, with tobacco chewing accounting for 29.6% of cases, followed by betel quid use (19.8%) and smoking (22.2%). These figures closely parallel findings from Goyal et al. (2016), who observed that smokeless tobacco products (including

chewing and betel quid) were more strongly associated with oral lesions than smoking alone, with such habits present in 68% of their study population. The carcinogenic and irritant effects of tobacco products operate through multiple mechanisms including direct chemical toxicity, production of reactive oxygen species, and impairment of salivary antimicrobial function. The combination of tobacco and alcohol use demonstrates synergistic carcinogenic effects, substantially elevating malignant transformation risk compared to either habit alone. Public health interventions targeting habit modification assume particular importance in institutional settings where captive patient populations represent opportunities for behavioral health promotion.

Anatomical distribution of lesions demonstrated buccal mucosa involvement in 39.5% of cases, followed by tongue involvement in 29.6%, consistent with findings from Babu et al. (2014) and other epidemiological surveys. The buccal mucosa's predilection for lesion development reflects its greater exposure to mechanical trauma, food irritants, and habit-related carcinogens. This distribution pattern has significant clinical implications, as lesions at these accessible sites facilitate early detection and intervention. Conversely, lesions involving the soft palate and posterior pharynx may escape detection, emphasizing the necessity for comprehensive oral examination including visualization of difficult-to-access mucosal surfaces in hospitalized patients.

The male predominance observed in this study (60.4% male vs. 39.6% female) parallels observations from multiple international and Indian studies. Goyal et al. (2016) documented male:female ratio of approximately 3.3:1 in their tertiary care center study, which exceeds the ratio observed in the present investigation. This sex difference may reflect differential exposure to risk habits, occupational exposures, or reporting patterns. Social and cultural factors influencing tobacco and alcohol use in various populations likely contribute significantly to these gender differences.

The mean age of 48.6 years in the present study reflects the predominantly middle-aged and older hospitalized population. Age-related increases in chronic disease prevalence, cumulative exposure to risk habits, and age-related immunological changes contribute to increased oral mucosal disease burden in older populations. Pentenero et al. (2008) documented increased prevalence of oral mucosal lesions with advancing age, with lesions being significantly more common in patients over 50 years compared to younger age groups, a pattern replicated in this study where patients above 50 years showed 68.4% prevalence compared to 61.2% in younger patients.

The multifactorial etiology of oral mucosal lesions highlighted in this study underscores the importance of comprehensive clinical assessment encompassing systemic health evaluation, habit documentation, and detailed oral examination. Healthcare providers, particularly in tertiary care settings, should recognize that oral mucosal findings frequently represent the initial manifestation of serious systemic diseases. Scully (2013) emphasized in his comprehensive textbook that oral examination represents an efficient diagnostic opportunity, with oral manifestations often preceding systemic presentation by months or years. Integration of oral health assessment into routine medical evaluation, particularly in hospitalized patients with complex medical conditions, represents a practical pathway for early diagnosis and improved clinical outcomes.

CONCLUSION

This cross-sectional study demonstrated that oral mucosal lesions affect nearly two-thirds of hospitalized patients in a tertiary care setting, with a complex array of causative factors including systemic diseases, demographic characteristics, and behavioral habits. Aphthous ulcers and oral lichen planus emerge as the most prevalent lesion types, while significant associations with diabetes mellitus, hypertension, tuberculosis, and infectious diseases underscore the oral cavity's role as a window into systemic health. The prominence of habit-associated lesions, particularly those related to tobacco use in its various forms, highlights the continued public health burden of preventable oral diseases in Indian populations. Male predominance and middle-aged presentation patterns reflect demographic factors and cumulative disease burden. The buccal mucosa and tongue represent the most common sites of involvement, facilitating clinical detection during routine examination. These findings emphasize the necessity for integrated oral-systemic health assessment protocols in

hospital-based care, recognition of oral manifestations as potential diagnostic indicators of underlying disease, and implementation of preventive interventions targeting modifiable risk factors, particularly tobacco and alcohol use cessation programs. Future research should explore longitudinal associations between specific oral lesion patterns and systemic disease outcomes, evaluate screening program effectiveness, and develop targeted interventions for high-risk hospitalized populations to improve both oral and systemic health outcomes.

RECOMMENDATIONS

Comprehensive oral health screening programs should be systematically integrated into admission protocols at tertiary care hospitals to detect oral mucosal pathology early. Multidisciplinary collaboration between physicians, dentists, and specialists is essential for managing hospitalized patients with oral manifestations of systemic disease. Implementation of targeted smoking and tobacco cessation counseling should be prioritized, particularly for patients with habit-related mucosal lesions. Healthcare providers require enhanced training in oral mucosal disease recognition and assessment methodologies. Research funding should support longitudinal studies investigating oral-systemic disease associations and evaluating intervention effectiveness to guide evidence-based prevention and management strategies.

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