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INCIDENCE AND PREVALANCE OF DISORDERS OF TOUNGE IN SUBURBAN POPULATION A CLINICAL STUDY

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Abstract

Background: Tongue disorders encompass a wide range of conditions from benign anomalies to potentially malignant and malignant lesions. Their prevalence varies with sociodemographic and lifestyle factors. Data on suburban populations remain limited, despite unique exposures to both rural and urban risk factors. ***Objective:*** To assess the incidence and prevalence of tongue disorders in a suburban Indian population and evaluate their associations with demographic, lifestyle, and systemic factors. ***Methods:*** A cross-sectional study was conducted among 500 participants attending a suburban dental outpatient department. Data on demographics, habits, and systemic health were collected using structured questionnaires. Clinical examinations followed WHO criteria. Prevalence and incidence were calculated, while associations were analyzed using chi-square tests and logistic regression. ***Results:*** The prevalence of tongue disorders was 36.2%. Fissured tongue (12.8%) and geographic tongue (8.2%) were most common, followed by glossitis (7.6%) and candidiasis (4.8%). Potentially malignant disorders (leukoplakia 2.8%, erythroplakia 0.6%) and squamous cell carcinoma (1.2%) were detected. Tobacco use (OR=3.5, $p<0.001$), betel quid chewing (OR=2.4, $p=0.002$), and anemia (OR=1.9, $p=0.005$) were significant predictors. ***Conclusion:*** Tongue disorders are prevalent in suburban communities, with both benign and potentially malignant lesions observed. Preventive oral health programs and routine screenings are vital for early detection.

Keywords: Tongue disorders; Prevalence; Suburban population; Oral potentially malignant disorders; Tobacco use.

INTRODUCTION

The tongue is a vital organ that plays a fundamental role in speech, mastication, swallowing, and taste perception. In addition to its functional roles, the tongue is often described as a mirror of systemic health, as it can reflect local pathological conditions as well as systemic disorders. Disorders of the tongue can range from relatively benign developmental and inflammatory lesions to potentially malignant and malignant conditions, making their early identification and characterization of immense clinical significance.

Tongue disorders encompass a broad spectrum, including developmental anomalies such as fissured tongue and geographic tongue, inflammatory conditions such as glossitis, infective lesions like candidiasis, traumatic lesions including ulcers and frictional keratosis, and neoplastic lesions such as leukoplakia and squamous cell carcinoma. Many of these conditions are asymptomatic and discovered during routine oral examinations, while others present with pain, burning sensation, difficulty in speech or mastication, and significant compromise of quality of life.

The global prevalence of tongue disorders varies widely depending on geographic location, socioeconomic status, oral hygiene practices, tobacco and alcohol use, nutritional deficiencies, and access to healthcare. Epidemiological studies suggest that fissured tongue and geographic tongue are among the most common benign tongue lesions, whereas leukoplakia and erythroplakia are less frequent but of greater concern due to their malignant potential. The incidence of tongue cancer, particularly squamous cell carcinoma, has been increasing in many developing countries, primarily linked to the use of tobacco in smoked and smokeless forms, betel quid chewing, and alcohol consumption.

In suburban populations, where lifestyles are influenced both by rural traditions and urban practices, tongue disorders present an interesting epidemiological profile. Suburban communities often face unique risk factors such as poor oral hygiene, limited awareness of oral health, high prevalence of tobacco chewing, and nutritional deficiencies due to socioeconomic disparities. On the other hand, improved access to healthcare compared to rural areas may lead to better diagnosis and reporting of oral conditions. Thus, studying tongue disorders in suburban settings can yield insights into disease patterns and help design targeted preventive and therapeutic strategies.

The clinical importance of such a study lies in the fact that tongue lesions may be the earliest manifestation of systemic conditions such as anemia, diabetes mellitus, HIV infection, and nutritional deficiencies like vitamin B12 and folate deficiency. Early detection of tongue disorders not only helps in improving oral health outcomes but also facilitates timely referral and management of systemic diseases. Furthermore, knowledge about the incidence and prevalence of tongue disorders in suburban populations can help dental and medical professionals to prioritize health education campaigns, preventive strategies, and screening programs.

Given the paucity of epidemiological data on tongue disorders in suburban communities, the present study aims to determine the incidence and prevalence of various tongue disorders in a suburban population. The findings will contribute to a better understanding of the disease burden, help identify associated risk factors, and provide a foundation for improving community oral health services and preventive strategies.

METHODOLOGY

Study Design

The present research is a cross-sectional, observational clinical study conducted in a suburban population. The primary objective was to assess the incidence and prevalence of tongue disorders among individuals attending outpatient dental clinics.

Study Setting and Population
The study was carried out in the dental outpatient department of a suburban teaching hospital catering to a semi-urban community. The population included residents from suburban localities, representing a mix of rural and urban influences.

Sample Size and Sampling Technique
A sample size of 500 participants was calculated based on expected prevalence rates from previous studies with a 95% confidence interval and 5% margin of error. A systematic random sampling technique was employed to ensure representative selection of participants.

Inclusion and Exclusion Criteria
Inclusion Criteria:
- Individuals aged 15 years and above.
- Residents of the suburban area for at least 5 years.
- Willing to participate and provide informed consent.

Exclusion Criteria:
- Patients with acute systemic illness preventing oral examination.
- Individuals undergoing treatment for malignancies of the oral cavity.
- Non-consenting individuals.

Data Collection
A detailed demographic and medical history was obtained using a structured questionnaire, including information on age, gender, occupation, socioeconomic status, tobacco and alcohol use, dietary habits, and systemic diseases. Clinical examination of the tongue was conducted by calibrated dental professionals under adequate illumination using sterile mouth mirrors and explorers. Findings were recorded using the World Health Organization (WHO) Oral Health Assessment Form (modified).

Diagnostic Criteria
Tongue disorders were classified into:
1. **Developmental anomalies** (fissured tongue, geographic tongue, macroglossia).
2. **Inflammatory conditions** (glossitis, median rhomboid glossitis, burning tongue).
3. **Infective lesions** (candidiasis, viral lesions).
4. **Traumatic lesions** (ulcers, frictional keratosis).
5. **Potentially malignant lesions** (leukoplakia, erythroplakia, lichen planus).
6. **Malignant lesions** (squamous cell carcinoma).

Statistical Analysis
Data were compiled and analyzed using **SPSS software (version 25.0)**. Prevalence rates were calculated as proportions with 95% confidence intervals. Incidence was measured based on new cases identified during the study period. Associations between tongue disorders and risk factors (tobacco use, alcohol, systemic conditions) were assessed using chi-square tests, while logistic regression was applied to determine predictors. A *p-value* <0.05 was considered statistically significant.

RESULTS
A total of 500 participants were examined, comprising 282 males (56.4%) and 218 females (43.6%). The mean age of the study group was 39.7 ± 15.2 years, ranging from 15 to 78 years. Most participants belonged to the lower- and middle-socioeconomic groups. The overall prevalence of tongue disorders in the study population was 36.2% (n=181).

The highest proportion of participants belonged to the 25–44 years group (37.6%), followed by those aged 45–64 years (28.4%). Males outnumbered females. A majority (82.8%) belonged to lower and middle socioeconomic classes, consistent with the suburban demographic profile.

Table 1: Demographic Characteristics of Study Participants (N=500)

Variable	Categories	Frequency (n)	Percentage (%)
Age (years)	15–24	96	19.2
	25–44	188	37.6
	45–64	142	28.4
	≥65	74	14.8
Gender	Male	282	56.4
	Female	218	43.6
Socioeconomic Status	Lower	211	42.2
	Middle	203	40.6
	Upper	86	17.2

Among tongue disorders, fissured tongue (12.8%) and geographic tongue (8.2%) were the most common. Glossitis accounted for 7.6%, while candidiasis was found in 4.8%. Potentially malignant disorders such as leukoplakia (2.8%), erythroplakia (0.6%), and oral lichen planus (1.4%) were observed. Malignant lesions in the form of squamous cell carcinoma were diagnosed in 1.2% of participants.

Table 2: Distribution of Tongue Disorders (N=500)

Type of Disorder	Specific Lesion	Cases (n)	Prevalence (%)
Developmental	Fissured tongue	64	12.8
	Geographic tongue	41	8.2
	Macroglossia	6	1.2
Inflammatory	Glossitis	38	7.6
	Median rhomboid glossitis	8	1.6
Infective	Candidiasis	24	4.8
	Viral lesions (HPV, HSV)	7	1.4
Traumatic	Traumatic ulcer	15	3.0
	Frictional keratosis	9	1.8
Potentially Malignant	Leukoplakia	14	2.8
	Erythroplakia	3	0.6
	Lichen planus	7	1.4
Malignant	Squamous cell carcinoma	6	1.2
Total	—	181	36.2

A significant association was found between tongue disorders and tobacco use ($p<0.001$), which emerged as the strongest factor, followed by betel quid chewing and alcohol intake. Among systemic conditions, anemia (26% vs. 13.8%, $p<0.001$) and diabetes (16% vs. 8.8%, $p=0.009$) were significantly associated with tongue lesions.

Table 3: Association of Tongue Disorders with Habits and Systemic Diseases (N=500)

Risk Factor	With Disorder (n=181)	Without Disorder (n=319)	χ^2 value	p-value
Tobacco use	108 (59.7%)	102 (32.0%)	39.45	<0.001*
Alcohol intake	42 (23.2%)	43 (13.5%)	8.91	0.003*
Betel quid chewing	36 (19.9%)	29 (9.1%)	12.62	<0.001*
Anemia	47 (26.0%)	44 (13.8%)	11.54	<0.001*
Diabetes mellitus	29 (16.0%)	28 (8.8%)	6.92	0.009*

* Statistically significant

Logistic regression identified tobacco use (OR=3.5) as the most significant independent predictor of tongue disorders, followed by betel quid chewing (OR=2.4) and anemia (OR=1.9). Alcohol intake

was also a significant predictor, albeit with a lower effect size. Diabetes mellitus showed an elevated risk but did not reach statistical significance in multivariate analysis.

Table 4: Logistic Regression Analysis of Predictors of Tongue Disorders

Predictor	Odds Ratio (OR)	95% CI	p-value
Tobacco use	3.5	2.1 – 5.8	<0.001*
Betel quid chewing	2.4	1.3 – 4.3	0.002*
Alcohol intake	1.7	1.1 – 2.8	0.026*
Anemia	1.9	1.2 – 3.0	0.005*
Diabetes mellitus	1.5	0.9 – 2.6	0.081

* Significant predictors

DISCUSSION

The present study provides valuable insights into the epidemiology of tongue disorders in a suburban Indian population, revealing a prevalence of 36.2%. This aligns with previously reported prevalence rates ranging from 20% to 45% in community-based studies worldwide, confirming that tongue lesions constitute a significant component of oral mucosal pathology. The findings demonstrate the predominance of benign lesions such as fissured tongue and geographic tongue, while also underscoring the burden of potentially malignant disorders and carcinomas, which carry important public health implications.

Comparison with Indian Studies

Several Indian studies have documented the burden of tongue lesions. Reddy et al. reported a prevalence of 28.9% in a rural South Indian population, with fissured tongue (10.2%) and geographic tongue (6.5%) being the most common conditions [11]. Similarly, Patil et al. observed fissured tongue in 13.5% of individuals in a semi-urban community, a figure comparable to our finding of 12.8% [12]. Glossitis and candidiasis have been variably reported across Indian populations, ranging between 5% and 9%, which mirrors our findings of 7.6% and 4.8%.

Potentially malignant disorders (PMDs) are of particular concern in India due to the high prevalence of tobacco and betel quid habits. In our study, leukoplakia (2.8%) and erythroplakia (0.6%) were observed, consistent with a multicentric Indian survey that reported leukoplakia prevalence between 1.9% and 4.1%, depending on regional chewing habits [13]. Detection of squamous cell carcinoma in 1.2% of participants also aligns with hospital-based screening studies in India, which reported frequencies ranging from 0.9% to 1.5% [14]. These findings suggest that suburban populations, despite better healthcare access compared to rural areas, continue to face a substantial burden of PMDs and malignancies.

Comparison with Global Studies

Internationally, fissured tongue has been described as one of the most common benign lesions, with prevalence estimates ranging from 5% in Scandinavian cohorts to nearly 20% in Latin American populations [15]. Our finding of 12.8% fits within this spectrum. Geographic tongue prevalence has been reported between 1.5% and 9.8% globally, comparable to the 8.2% recorded in our study [16]. Glossitis and candidiasis show more variability, influenced by nutrition and immune status. For instance, a Brazilian study reported candidiasis in 6.2% of adults, similar to our prevalence of 4.8% [17].

The prevalence of leukoplakia and erythroplakia in our study also resonates with international literature, where leukoplakia ranges from 1% to 5% and erythroplakia consistently remains below 1% [18]. Tongue cancer, particularly squamous cell carcinoma, is recognized as one of the most aggressive oral cancers worldwide. The World Health Organization reports that oral cancers constitute up to 30% of all cancers in South Asia, with the tongue being the most commonly affected

site [19]. Our detection of carcinoma in 1.2% of the suburban sample, though modest, highlights the continuing need for vigilance.

Association with Risk Factors

Our study confirmed strong associations of tongue disorders with tobacco, betel quid chewing, and alcohol, in line with previous Indian and international reports. Warnakulasuriya demonstrated in a systematic review that smokeless tobacco users have a 3–4-fold higher risk of oral mucosal lesions compared with non-users [20]. This parallels our logistic regression findings, where tobacco use was the strongest predictor (OR=3.5). The role of alcohol as a cofactor was also evident, corroborating European data showing its synergistic carcinogenic effect when combined with tobacco [20].

Systemic conditions were also implicated. Anemia was significantly associated with tongue disorders in our cohort, consistent with earlier Indian reports that link iron and vitamin B12 deficiency to atrophic glossitis and burning tongue [11,12]. Diabetes mellitus, although not an independent predictor in regression analysis, demonstrated an elevated risk, supporting evidence that immunocompromised states predispose individuals to candidiasis and glossitis [17].

Clinical Significance

The clinical implications are two-fold. On one hand, benign lesions such as fissured tongue and geographic tongue may be asymptomatic but occasionally cause discomfort or esthetic concern. On the other hand, inflammatory and infective lesions may serve as indicators of systemic disease, offering clinicians an opportunity for early detection.

The identification of PMDs and carcinomas in a suburban population is especially significant. Many such lesions remain asymptomatic in early stages and may only be discovered during routine dental visits. Dentists therefore play a pivotal role in screening, referral, and early management. The failure to identify PMDs can lead to malignant transformation, drastically increasing morbidity and mortality [18,19].

Public Health Implications

The suburban setting is unique, with overlapping rural practices (tobacco chewing, betel quid) and urban behaviors (alcohol consumption, processed diets). This dual exposure may explain the observed disease burden. Preventive strategies should therefore be tailored specifically to suburban populations.

Key measures include awareness campaigns focusing on the risks of tobacco and betel quid, nutritional counseling to address anemia, and community oral screening camps integrated within primary healthcare. School-based oral health education and regular workplace dental check-ups could also be effective in early prevention. WHO has emphasized that universal oral health coverage should prioritize such community-level interventions in high-risk regions [19].

Limitations

The present study has some limitations. Its cross-sectional design precludes establishing causal relationships. It was also confined to a single suburban center, limiting generalizability. Finally, biopsy confirmation was not feasible for all potentially malignant lesions, though WHO criteria were strictly applied for diagnosis. Multicentric and longitudinal studies are warranted to better understand incidence, progression, and malignant transformation risks in suburban populations [20-25].

CONCLUSION

This clinical study highlights the significant prevalence of tongue disorders in a suburban Indian population, with more than one-third of individuals affected. Benign developmental anomalies such as fissured and geographic tongue were the most frequent findings, while inflammatory and infective lesions reflected underlying systemic or nutritional conditions. Importantly, potentially malignant

disorders and malignant lesions, although less frequent, pose a serious threat to public health. Tobacco use, betel quid chewing, and anemia emerged as major risk factors, underscoring the influence of lifestyle and systemic health on tongue pathology. These findings emphasize the role of dentists in early detection, particularly in suburban settings where dual exposure to rural and urban risk factors prevails. Integrating preventive oral health programs, regular screenings, and lifestyle modification campaigns into primary healthcare frameworks can help reduce the burden of tongue disorders and mitigate the progression of precancerous lesions to malignancies.

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