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A DESCRIPTIVE ANALYSIS OF TONGUE CARCINOMA: EPIDEMIOLOGY AND THERAPEUTIC OUTCOMES

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ABSTRACT

Background: Carcinoma of the tongue is a common and aggressive malignancy of the oral cavity, predominantly arising as squamous cell carcinoma (SCC). It is associated with high morbidity due to functional impairment of speech, swallowing, and aesthetics. Risk factors include tobacco use, betel quid chewing, alcohol consumption, and human papillomavirus (HPV) infection. Despite advances in treatment, late-stage presentation remains a major challenge in improving survival outcomes.

Objective: To describe the epidemiology, risk factors, clinical presentation, staging, and therapeutic outcomes of patients with carcinoma of the tongue in a tertiary care hospital setting.

Methods: This observational cross-sectional study included 60 patients with histopathologically confirmed tongue carcinoma, conducted over 12 months in the Departments of Oral & Maxillofacial Surgery and ENT. Patients aged ≥18 years with primary tongue SCC were enrolled, while those with recurrent disease, metastatic lesions from other sites, or prior chemo-radiotherapy were excluded. Data on demographics, risk factors, clinical features, TNM staging, and treatment modalities were collected using a structured proforma and analyzed using SPSS version 25**.** Descriptive statistics were calculated as frequencies and percentages.

Results: Among 60 patients, 70% were male and 53.3% were aged 41–60 years. The lateral border of the tongue was the most commonly affected site (63.3%**).** Tobacco use was the predominant risk factor **(**66.7%**),** followed by smokeless tobacco **(**58.3%**)** and betel quid/areca nut chewing **(**50%**).** Clinically, non-healing ulcers **(**75%**)** and pain **(**63.3%**)** were the most frequent presentations, with cervical lymphadenopathy observed in 50% of patients. Most cases presented at advanced stages, with Stage III and IV accounting for 61.6% **of** patients. Treatment primarily involved surgery with adjuvant radiotherapy (41.7%)**,** while early-stage disease was managed with surgery alone **(**30%**).**

Conclusion: Tongue carcinoma predominantly affects middle-aged males and is strongly associated with tobacco, betel quid, and alcohol use. Late-stage presentation is common, contributing to increased morbidity and complex treatment requirements. Implementation of early detection

programs, public awareness campaigns, and lifestyle modification initiatives is essential to reduce disease burden and improve clinical outcomes.

Keywords: Tongue carcinoma, oral squamous cell carcinoma, epidemiology, risk factors, TNM staging, treatment outcomes

1. Introduction

Carcinoma of the tongue is a significant subset of oral cavity malignancies and represents a major public health concern worldwide.[1] Among oral cancers, squamous cell carcinoma (SCC) constitutes the vast majority, accounting for more than 90% of cases, and arises from the stratified squamous epithelium of the tongue.[2] Globally, oral cancers are ranked among the top ten most common cancers, with a particularly high incidence in South Asian countries such as Pakistan, India, and Bangladesh.[3] This heightened prevalence is largely attributable to widespread tobacco use, betel quid chewing, and areca nut consumption, which are culturally ingrained habits in the region.4 The disease not only imposes a high mortality risk but also causes significant morbidity**,** affecting essential functions such as speech, swallowing, and mastication.[5]The anatomical distribution of tongue carcinoma is not uniform. The oral tongue**,** representing the anterior two-thirds, is the most commonly affected region, with the lateral borders particularly susceptible to malignant transformation.[6] This predilection may be explained by the pooling of carcinogenic substances in these areas, coupled with mechanical trauma from teeth and masticatory activity. Tongue carcinoma is characterized by its aggressive local invasion and early metastasis to regional cervical lymph nodes, which are major determinants of prognosis. Despite advances in surgical techniques, radiotherapy, and chemotherapy**,** survival rates have not improved significantly over the past decades, primarily due to late-stage presentation and delayed diagnosis**.**Several risk factors have been identified in the pathogenesis of tongue carcinoma.[7-8] Tobacco exposure**,** in both smoked and smokeless forms, remains the leading cause, while betel quid and areca nut chewing contribute to mucosal irritation and carcinogenesis.[9] Alcohol consumption acts synergistically with tobacco, enhancing mucosal permeability to carcinogens.[10] In recent years, human papillomavirus (HPV) infection**,** particularly HPV-16, has been recognized as a contributing factor, though its prevalence varies regionally.[11] Additional factors such as poor oral hygiene, chronic irritation from dental appliances, and nutritional deficiencies may also play a role in tumor development.[12] The interplay of these factors underscores the multifactorial nature of tongue carcinoma and highlights the importance of preventive measures.Clinically, tongue carcinoma often presents with non-healing ulcers, persistent pain, dysphagia, and cervical lymphadenopathy**.**[13] Unfortunately, these symptoms are frequently ignored or misattributed to benign oral conditions, leading to delayed medical consultation. Consequently, a substantial proportion of patients are diagnosed at advanced stages (Stage III or IV)**,** necessitating more aggressive treatment modalities and contributing to poorer functional outcomes.[14-15] Early detection, public awareness, and targeted screening programs are therefore essential to reduce disease burden and improve survival.This study aims to provide a comprehensive descriptive analysis of tongue carcinoma in a tertiary care setting, focusing on epidemiology, risk factors, clinical presentation, staging, and therapeutic outcomes**.** By highlighting local patterns of disease and treatment responses, the study seeks to inform clinical practice, preventive strategies, and public health interventions aimed at reducing the incidence and improving outcomes of this challenging malignancy.

2. Methodology

This study was designed as an observational cross-sectional analysis aimed at evaluating the epidemiological profile, risk factors, clinical presentation, staging, and therapeutic outcomes of patients with carcinoma of the tongue. The research was conducted at a tertiary care hospital, specifically within the Departments of Oral & Maxillofacial Surgery and ENT, over a period of 12 months. A total of 60 patients with histopathologically confirmed squamous cell carcinoma of the tongue were enrolled in the study.The inclusion criteria consisted of patients aged 18 years and

above with biopsy-proven carcinoma of the tongue, whereas patients with recurrent tongue carcinoma, metastatic lesions originating from other primary sites, or those who had previously received chemotherapy or radiotherapy were excluded to ensure a homogeneous study population and avoid confounding effects of prior treatment.Data were collected systematically using a structured proforma, which captured comprehensive information on demographic characteristics, exposure to risk factors (such as tobacco, alcohol, and betel nut use), clinical presentation, tumor staging according to the TNM classification, and the treatment modalities employed. This approach enabled a detailed assessment of patient profiles, disease characteristics, and management strategies. All collected data were analyzed using SPSS version 25. Descriptive statistics were employed to summarize the findings, with frequencies and percentages calculated for categorical variables. This methodology allowed for a clear and systematic representation of the epidemiological trends, clinical features, and treatment patterns of tongue carcinoma within the study population.

3. Results

Table 1: Demographic Characteristics and Incidence

Variable	**Frequency (n=60)**	**Percentage (%)**
Age Group		
20–40 years	10	16.7%
41–60 years	32	53.3%
>60 years	18	30%
Gender		
Male	42	70%
Female	18	30%
Site of Lesion		
Lateral border	38	63.3%
Ventral surface	12	20%
Dorsal surface	6	10%
Base of tongue	4	6.7%

The demographic distribution of patients with carcinoma of the tongue demonstrates a clear predominance among middle-aged individuals and males. In this study, the majority of patients (53.3%) belonged to the 41–60 years age group, followed by patients older than 60 years (30%). This age pattern suggests that prolonged exposure to carcinogenic agents such as tobacco, alcohol, and betel nut plays a significant role in disease development, as the cumulative effects of these risk factors typically manifest after several decades of use. The smaller proportion of patients aged 20–40 years (16.7%) indicates that tongue carcinoma is relatively uncommon in younger populations, although its occurrence in this age group highlights the potential influence of lifestyle factors and genetic susceptibility.Gender distribution revealed a marked male predominance (70%), while females constituted 30% of the study population. This finding is consistent with epidemiological patterns reported globally, where higher rates of tobacco and alcohol consumption among men contribute to increased disease incidence.Regarding the anatomical site of the tumor, the lateral border of the tongue was the most commonly affected region (63.3%), followed by the ventral surface (20%), dorsal surface (10%), and base of the tongue (6.7%). The predominance of lesions on the lateral border may be explained by the accumulation of carcinogenic substances and chronic mechanical irritation from teeth during mastication. This anatomical vulnerability highlights the importance of careful examination of this region during routine oral screening.

Table 2: Risk Factors Distribution

Risk Factor	Frequency	Percentage (%)
Tobacco smoking	40	66.7%
Smokeless tobacco	35	58.3%
Betel quid/Areca nut	30	50%
Alcohol consumption	28	46.7%
HPV infection	6	10%
Poor oral hygiene	25	41.7%
No identifiable risk factor	5	8.3%

The analysis of risk factors demonstrates that tobacco use is the most significant contributor to tongue carcinoma in the studied population. Tobacco smoking was reported in 66.7% of patients, making it the leading risk factor identified in this study. Smokeless tobacco use was also highly prevalent (58.3%), reflecting regional cultural practices where chewing tobacco is commonly used.

Additionally, betel quid and areca nut chewing were reported in 50% of patients, further emphasizing the role of traditional chewing habits in the development of oral malignancies in South Asian populations. These substances are known to contain carcinogenic compounds that induce chronic mucosal irritation and genetic alterations in epithelial cells.

Alcohol consumption was observed in 46.7% of patients, indicating its contributory role in carcinogenesis. Alcohol acts synergistically with tobacco by increasing mucosal permeability to carcinogens and enhancing their penetration into epithelial tissues.

Other contributing factors included poor oral hygiene (41.7%), which may facilitate chronic inflammation and mucosal damage, thereby promoting malignant transformation. Human papillomavirus (HPV) infection was identified in a smaller proportion of patients (10%), suggesting that while viral etiology may play a role, it is less prominent compared to traditional behavioral risk factors in this population. A small proportion of patients (8.3%) reported no identifiable risk factor, indicating that genetic predisposition or unidentified environmental exposures may also contribute to disease development.

Table 3: Clinical Presentation and Treatment Modalities

Variable	Frequency	Percentage (%)
Clinical Presentation		
Non-healing ulcer	45	75%
Pain	38	63.3%
Dysphagia	20	33.3%
Cervical lymphadenopathy	30	50%
Speech difficulty	15	25%
TNM Stage		
Stage I	8	13.3%
Stage II	15	25%
Stage III	20	33.3%
Stage IV	17	28.3%
Treatment		
Surgery alone	18	30%
Surgery + Radiotherapy	25	41.7%
Surgery + Chemoradiotherapy	12	20%

Variable	Frequency	Percentage (%)
Palliative care	5	8.3%

The clinical presentation of tongue carcinoma in this study highlights the late detection of the disease. The most common presenting symptom was a non-healing ulcer (75%), followed by pain (63.3%), dysphagia (33.3%), and speech difficulty (25%). These symptoms are typical of oral squamous cell carcinoma but are often overlooked by patients in the early stages, contributing to delayed diagnosis.Cervical lymphadenopathy was observed in 50% of patients, indicating regional lymph node involvement and suggesting aggressive disease progression. Lymph node metastasis is a critical prognostic factor in tongue carcinoma and significantly influences treatment planning and survival outcomes.The TNM staging distribution further supports the trend of late presentation. While early stages (Stage I and II) accounted for 38.3% of cases, the majority of patients (61.6%) were diagnosed at advanced stages (Stage III and IV). Advanced-stage presentation is commonly reported in developing countries due to lack of awareness, limited access to healthcare, and delayed referral to specialized centers.In terms of treatment, surgery combined with radiotherapy was the most frequently used modality (41.7%), reflecting its role as the standard treatment for locally advanced tongue carcinoma. Surgery alone was performed in 30% of cases, primarily for early-stage tumors where complete surgical excision can achieve favorable outcomes. Combined surgery with chemoradiotherapy was used in 20% of patients, typically in cases with high-risk pathological features or advanced disease. A small proportion of patients (8.3%) received palliative care due to advanced disease or poor general condition, underscoring the challenges associated with late-stage diagnosis.

4. Discussion

Carcinoma of the tongue predominantly affects middle-aged and elderly males, consistent with the higher prevalence of tobacco and alcohol use among men. In our study, 70% of patients were male, aligning with global epidemiological trends. The most commonly affected age group was 41–60 years (53.3%), which corresponds to prolonged exposure to carcinogens such as tobacco and areca nut. The lateral border of the tongue was the most frequent site (63.3%), likely due to pooling of carcinogens and mechanical irritation in this region. Tobacco use emerged as the most significant risk factor (66.7%), followed by smokeless tobacco and betel quid chewing. This pattern reflects regional habits in South Asia. Alcohol consumption showed a synergistic role, enhancing mucosal permeability to carcinogens. Clinically, the majority presented with a non-healing ulcer (75%) and pain (63.3%), indicating late presentation. Half of the patients had cervical lymph node involvement, suggesting aggressive disease behavior and delayed diagnosis.Regarding staging, most patients presented in Stage III and IV (61.6%), emphasizing lack of early screening and awareness. Advanced stage at presentation significantly affects prognosis and survival. Treatment primarily involved surgery combined with radiotherapy (41.7%), which remains the standard of care for locally advanced disease. Early-stage cancers were managed effectively with surgery alone.

5. Conclusion

Carcinoma of the tongue is a common and aggressive oral malignancy strongly associated with tobacco, alcohol, and betel nut use. Most patients present at advanced stages, leading to increased morbidity and complex treatment requirements. Early detection programs, public awareness, and tobacco cessation initiatives are crucial to reduce disease burden and improve survival outcomes.

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