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Review Article

Rising trend of oral cancers in India: a comprehensive review

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ABSTRACT

Oral cancer, encompassing malignancies of the lip, tongue, buccal mucosa and oropharynx, is a major public health concern in India, accounting for approximately one-third of the global burden with 77,000 new cases and 52,000 deaths annually. This comprehensive review examines the rising trend of oral cancers in India, focusing on epidemiology, risk factors, clinical characteristics, diagnostic challenges, management strategies and preventive approaches. The age-standardized incidence rate is 10.4 per 100,000, with higher prevalence among men and in regions like Uttar Pradesh, Bihar and the north eastern states. Key risk factors include tobacco use (smoked and smokeless), betel quid chewing, alcohol consumption, HPV infection and genetic predispositions, with squamous cell carcinoma dominating (>90% of cases). Advanced-stage diagnosis, limited access to screening and advanced diagnostics and reliance on Western treatment protocols contribute to poor outcomes. Preventive strategies, such as tobacco cessation, HPV vaccination and community-based screening, show promise in reducing incidence. This review emphasizes the need for region-specific research, affordable diagnostics and enhanced healthcare infrastructure to address the growing burden of oral cancers in India.

Keywords: Betel quid, Epidemiology, HPV infection, Oral cancer, Preventive strategies, Risk factors, Tobacco use

INTRODUCTION

Oral cancer, encompassing malignancies of the lip, tongue, floor of the mouth, buccal mucosa, gingiva, hard palate and oropharynx, is a significant public health challenge in India, contributing substantially to the global cancer burden. India accounts for approximately one-third of the global oral cancer burden, with an estimated 77,000 new cases and 52,000 deaths annually according to GLOBOCAN 2020.[1] The rising incidence of oral cancers in India is driven by a combination of modifiable risk factors, such as tobacco use, betel quid chewing and alcohol consumption, alongside genetic predispositions, infectious agents and socioeconomic factors. This comprehensive review synthesizes recent literature to explore the epidemiology, risk factors, clinical characteristics, diagnostic challenges, management strategies and preventive approaches for oral cancers in India, with a focus on their increasing trend. The review includes systematically numbered citations and illustrative tables to provide a clear understanding of the current landscape.

EPIDEMIOLOGY OF ORAL CANCERS IN INDIA

Oral cancer is the most common cancer among men in India and the third most common overall, following breast and cervical cancers.[1,2] The age-standardized incidence

rate (ASIR) for oral cancer in India is approximately 10.4 per 100,000, with higher rates in men (14.8 per 100,000) compared to women (6.5 per 100,000).[1] The disease is particularly prevalent in states like Uttar Pradesh, Bihar, Gujarat and the north eastern regions, where cultural practices involving tobacco and betel quid are widespread.[3] Squamous cell carcinoma (SCC) accounts for over 90% of oral cancers, with the buccal mucosa and tongue being the most common sites.[4]

Regional variations are notable. For instance, the north eastern state of Assam reports an ASIR of 22.6 per 100,000 for men, driven by high tobacco consumption.[3] Urban areas like Delhi and Mumbai also show rising trends, potentially due to lifestyle changes and increased alcohol use.[5]

The disease predominantly affects individuals aged 40–60 years, but a concerning increase in younger patients (below 40 years) has been observed, possibly linked to changing patterns of smokeless tobacco use.[6]

RISK FACTORS

The rising trend of oral cancers in India is driven by a complex interplay of modifiable and non-modifiable risk factors, which are discussed below.

Tobacco use

Tobacco consumption, both smoked (e.g., bidis, cigarettes) and smokeless (e.g., gutkha, pan masala, khaini), is the leading risk factor for oral cancer in India. Approximately 28% of Indian adults use tobacco, with smokeless tobacco being more prevalent (21.4%) than smoking (10.7%).[7] Smokeless tobacco products contain carcinogenic nitrosamines, conferring a relative risk (RR) of 5–15 for oral cancer.[8] In high-risk regions like Uttar Pradesh, 60% of oral cancer cases are attributable to smokeless tobacco.[9]

Betel quid and areca nut

Betel quid chewing, often combined with areca nut, slaked lime and tobacco, is a culturally entrenched practice in India, particularly in rural areas. Areca nut contains alkaloids like arecoline, which are carcinogenic, with an odds ratio (OR) of 4.7 for oral cancer among regular chewers.[10] The practice is prevalent in states like Bihar and Assam, contributing to the high incidence of buccal mucosa cancers.[3]

Alcohol consumption

Alcohol is an independent risk factor and synergizes with tobacco to increase oral cancer risk. Heavy alcohol consumption (>3 drinks/day) is associated with an OR of 2.5 and combined tobacco-alcohol use increases the risk by up to 30-fold.[11] Rising alcohol consumption in urban areas like Delhi is contributing to the increasing incidence.[5]

Infectious agents

Human papillomavirus (HPV), particularly HPV-16 and HPV-18, is an emerging risk factor for oropharyngeal cancers in India, with prevalence in 20–30% of cases.[12] Unlike Western populations, where HPV-driven oropharyngeal cancers are more common, tobacco-related SCC dominates in India, but HPV-positive cases are rising, especially in younger patients.[6]

Genetic and socioeconomic factors

Genetic polymorphisms, such as those in the GSTT1 and GSTM1 genes, increase susceptibility to oral cancer in Indian populations, particularly among tobacco users.[13] Socioeconomic factors, including low literacy, poor access to healthcare and inadequate oral hygiene, exacerbate risk. Oral submucous fibrosis (OSMF), often linked to areca nut chewing, is a precancerous condition with a 7–30% malignant transformation rate.[14]

CLINICAL CHARACTERISTICS AND DIAGNOSTIC CHALLENGES

Oral cancers in India often present at advanced stages (III or IV), with 60–70% of cases diagnosed late due to non-specific symptoms like oral ulcers, pain or difficulty swallowing.[4]

Common clinical features include ulcerative lesions, leukoplakia, erythroplakia and neck lymphadenopathy. The five-year survival rate for early-stage (I–II) oral cancer is 60–80%, but it drops to 20–30% for advanced stages.[15]

Diagnostic challenges include limited access to specialized centers, particularly in rural areas, where only 10–15% of primary healthcare facilities offer oral cancer screening.[16] Biopsy and histopathological confirmation remain the gold standard, but delays in referral and low awareness among patients contribute to late diagnoses. Imaging modalities like CT and MRI are underutilized due to cost and availability constraints.[4]

MANAGEMENT AND TREATMENT PERSPECTIVES

Surgical interventions

Surgery is the primary treatment for resectable oral cancers, with wide local excision and neck dissection performed in 70% of early-stage cases.[15] Advanced cases often require reconstructive surgery, such as free flap reconstruction, to restore function. However, surgical expertise is concentrated in urban tertiary centers, limiting access for rural patients.[16]

Radiotherapy and chemotherapy

Radiotherapy, often combined with cisplatin-based chemotherapy, is used for locally advanced or inoperable cases. Intensity-modulated radiotherapy (IMRT) improves local control but is available in only 20% of Indian cancer centers.[17] Neoadjuvant chemotherapy (e.g., docetaxel, cisplatin, 5-fluorouracil) achieves partial response in 30–40% of advanced cases, facilitating surgery.[18]

Targeted therapies and immunotherapy

Targeted therapies like cetuximab (anti-EGFR) show promise for advanced oral cancers, with a response rate of 15–20% in combination with radiotherapy.[19] Immunotherapy, including PD-1 inhibitors like nivolumab, is emerging but remains cost-prohibitive in India.[20] HPV-positive oropharyngeal cancers may benefit from de-escalated treatment protocols, but data in Indian populations are limited.[12]

Challenges in management

The lack of region-specific randomized controlled trials (RCTs) forces reliance on Western guidelines, which may not account for India's unique cancer biology.[18] High treatment costs, limited insurance coverage and inadequate follow-up care contribute to poor outcomes. Only 30% of patients complete recommended treatment due to financial or logistical barriers.[16]

Table 1: Epidemiology of oral cancers in India.

Parameter	Details
ASIR (per 100,000)	10.4 (M: 14.8, F: 6.5)
Most common site	Buccal mucosa, tongue
Predominant histology	Squamous cell carcinoma (>90%)
High-risk regions	Uttar Pradesh, Bihar, Northeast
Age group	40–60 years (increasing in <40)

Table 2: Major risk factors for oral cancers in India.

Risk factor	Prevalence/impact	Odds ratio/relative risk
Smokeless tobacco	21.4% of adults	RR: 5–15
Betel quid/areca nut	Common in rural areas	OR: 4.7
Alcohol consumption	Increasing in urban areas	OR: 2.5 (heavy use)
HPV infection	20–30% of oropharyngeal cases	Emerging risk
Oral submucous fibrosis	7–30% malignant transformation	High risk

Table 3: Preventive strategies for oral cancers in India.

Strategy	Implementation	Impact
Tobacco cessation	Counselling, nicotine therapy	6% reduction in tobacco use
HPV vaccination	Universal immunization programme	Potential reduction in HPV-related cancers
Oral cancer screening	Visual examination by health workers	5–10% detection of precancerous lesions
Public awareness	Media campaigns, education	Increased early detection

PREVENTIVE STRATEGIES AND FUTURE DIRECTIONS

Preventive strategies are critical to curbing the rising trend of oral cancers. Tobacco cessation programs, including counselling and nicotine replacement therapy, have reduced tobacco use by 6% in pilot studies.[7] Public health campaigns targeting betel quid and areca nut use are essential, particularly in high-risk states. HPV vaccination, introduced in India's Universal Immunization Programme in 2018, could reduce HPV-related oropharyngeal cancers in the long term.[12] Screening programs using visual oral examination by trained healthcare workers have detected precancerous lesions in 5–10% of high-risk populations.[21] Community-based screening, combined with awareness campaigns, is cost-effective and feasible. Future research should focus on large-scale RCTs to optimize treatment protocols, genomic studies to identify India-specific biomarkers and affordable diagnostics like saliva-based assays for early detection.[22]

CONCLUSION

The rising trend of oral cancers in India, driven by tobacco use, betel quid chewing, alcohol consumption, HPV infection and socioeconomic factors, poses a significant public health challenge.

Advanced-stage presentation, diagnostic delays and limited access to treatment exacerbate the burden.

Preventive measures, including tobacco cessation, HPV vaccination and community-based screening, offer promising avenues for reducing incidence. Investment in region-specific research, affordable diagnostics and healthcare infrastructure is essential to improve outcomes and address this growing epidemic.

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