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Oral Cancer: A Public Health Challenges- A Narrative Review

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Abstract

Oral cancer remains a pressing global public health concern with significant morbidity and mortality, particularly in low- and middle-income countries (LMICs). Its multifactorial etiology, strong association with tobacco and alcohol use, and increasing linkage to human papillomavirus (HPV) infection highlight the urgent need for preventive strategies, early diagnosis, and appropriate management. This review explores the global burden, epidemiology, risk factors, clinical features, diagnostic methods, preventive strategies, and public health implications of oral cancer, drawing attention to the need for comprehensive interventions and equitable healthcare delivery systems.

Key words: Oral cancer, low- and middle-income countries, public health, tobacco

Introduction

Oral cancer, predominantly squamous cell carcinoma, affects the lips, tongue, floor of the mouth, buccal mucosa, and oropharynx. It ranks among the top 15 most common cancers globally and accounts for a significant proportion of cancer-related deaths, particularly in South and Southeast Asia [1]. Despite advances in treatment, oral cancer survival remains low due to late-stage diagnosis, inadequate screening, and persistent exposure to modifiable risk factors.

Global Epidemiology and Burden

According to GLOBOCAN 2020, oral cavity cancers account for approximately 377,713 new cases and 177,757 deaths globally per year [2]. The burden is highest in India, Pakistan, Bangladesh, Sri Lanka, and parts of South America due to high prevalence of smokeless tobacco, betel quid, and alcohol use. In high-income countries, although incidence rates are relatively lower, rising HPV-related oropharyngeal cancers have been observed [3].

Age-standardized incidence rates (ASIR) are significantly higher in men compared to women, with the male-to-female ratio ranging from 2:1 to 5:1 depending on the region [4]. Mortality rates remain disproportionately high in LMICs due to lack of awareness, screening programs, and accessible treatment services.

Etiology and Risk Factors

1. Tobacco Use

Tobacco, both smoked and smokeless, is the most significant risk factor. Smokeless tobacco products such as gutkha, khaini, and betel quid with tobacco are widely used in Asia and are directly carcinogenic to oral tissues [5]. Smokers are six times more likely to develop oral cancer than non-smokers [6].

2. Alcohol Consumption

Alcohol acts synergistically with tobacco, increasing the permeability of oral mucosa to carcinogens and contributing to DNA damage [7]. Chronic alcohol use also leads to nutritional deficiencies, further enhancing susceptibility.

3. Human Papillomavirus (HPV)

HPV, particularly type 16, has been implicated in oropharyngeal cancers. HPV-positive cancers often have better prognosis but are more common in younger individuals with no tobacco or alcohol history [8]. The role of HPV in oral (non-oropharyngeal) cancer is still under investigation.

4. Poor Oral Hygiene and Chronic Irritation

Ill-fitting dentures, sharp teeth, and poor dental hygiene contribute to chronic mucosal trauma and inflammation, potentially leading to malignancy [9].

5. Diet and Nutrition

Diets deficient in fruits, vegetables, and antioxidants are linked to increased cancer risk due to reduced mucosal protection and impaired immune surveillance [10].

Clinical Features

Oral cancer often presents as a persistent ulcer, leukoplakia, erythroplakia, or a non-healing lesion. It may also manifest as induration, swelling, or unexplained bleeding. Pain, difficulty in swallowing, speech problems, and lymphadenopathy may indicate advanced disease [11].

Diagnostic Approaches

Early detection remains key to improving prognosis. Diagnostic methods include:

- **Clinical Examination**: Visual and tactile examination of the oral cavity is the first step.
- **Biopsy**: Histopathological confirmation through incisional or excisional biopsy.
- **Imaging**: MRI, CT, and PET scans assess depth, lymph node involvement, and metastasis.
- **Adjunctive Tests**: Vital staining (toluidine blue), autofluorescence, and brush biopsies may assist in early detection, though not definitive [12].

Staging and Grading

The TNM (Tumor, Node, Metastasis) classification by the AJCC is widely used for staging. Histological grading indicates the degree of differentiation and helps in prognosis determination [13].

Management Strategies

Treatment is stage-dependent and includes:

1. Surgery

Early-stage lesions are managed with wide local excision. Advanced cases may require neck dissection and reconstructive surgery [14].

2. Radiotherapy

Used as primary treatment in non-resectable cases or as adjuvant therapy post-surgery. IMRT (intensity-modulated radiotherapy) improves targeting and reduces toxicity [15].

3. Chemotherapy

Primarily used in advanced stages, either alone or in combination with radiation. Cisplatin is commonly used; targeted therapies like cetuximab are being explored [16].

4. Immunotherapy

Emerging treatments with immune checkpoint inhibitors show promise in recurrent or metastatic disease [17].

Survival and Prognosis

Five-year survival rates range from 40% to 60%, depending on stage at diagnosis and healthcare access. Early-stage cancers have >80% survival, while late-stage cancers drop below 30% [18].

Prevention and Health Promotion

1. Tobacco and Alcohol Cessation

Comprehensive anti-tobacco laws, taxation, and behavioral interventions are critical. Alcohol reduction policies must also be integrated [19].

2. HPV Vaccination

Prophylactic HPV vaccination may reduce oropharyngeal cancers in the long term, though direct evidence for oral cancer prevention is limited.

3. Public Education

Awareness campaigns and community-based interventions play a crucial role in risk reduction and early help-seeking behavior.

4. Screening Programs

Opportunistic and population-based screening, especially in high-risk areas, can detect precancerous lesions and early cancers. Use of mobile technology and telemedicine in remote areas has shown success [20].

Oral Cancer in LMICs: Challenges and Opportunities

Resource limitations, lack of trained personnel, and cultural beliefs hinder early diagnosis and treatment in LMICs. Integration of oral cancer screening into existing primary healthcare systems and training of community health workers can bridge the gap. International collaborations and government support are essential to improve infrastructure and awareness.

Future Directions

- **Molecular and Genetic Research**: Identifying biomarkers for early diagnosis and targeted therapy.
- **AI and Telemedicine**: For remote screening and diagnostic support.
- **Policy Integration**: Inclusion of oral cancer control in national NCD strategies.

Conclusion

Oral cancer represents a preventable yet neglected public health issue. With strong associations to lifestyle and socio-economic factors, its burden is inequitably distributed. Comprehensive public health approaches that include education, risk factor modification, early detection, and accessible treatment are crucial to curbing its impact.

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