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Site-Specific Distribution of Oral Cancer: A Retrospective Analysis among the South Indian Population

[1] Tanya Takkar, [2] Gidean Arularasan S [*], [3] Saai Arun Sunder, [4] Murugesan Krishnan, [5] M. P. Santhosh Kumar

[1] Post graduate, Department of Oral and Maxillofacial Surgery, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, 162, Poonamallee High Road, Velappanchavadi, Chennai, Tamil Nadu 600077, India.

[2] Assistant Professor, Department of Oral and Maxillofacial Surgery, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, 162, Poonamallee High Road, Velappanchavadi, Chennai, Tamil Nadu 600077, India.

[3] Assistant Professor, Department of Anesthesiology, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, 162, Poonamallee High Road, Velappanchavadi, Chennai, Tamil Nadu 600077, India.

[4] Professor, Head of the Department, Department of Oral and Maxillofacial Surgery, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, 162, Poonamallee High Road, Velappanchavadi, Chennai, Tamil Nadu 600077, India.

[5] Professor, Department of Oral and Maxillofacial Surgery, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, 162, Poonamallee High Road, Velappanchavadi, Chennai, Tamil Nadu 600077, India.

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KEYWORDS

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ABSTRACT:

The burden of oral cancer in India is particularly high, with an estimated seventy-seven thousand new cases reported annually, ranking among the top three cancers in the country. Within India, variations in oral cancer incidence are observed between different regions, including notable differences between the northern and southern states. Recognizing these regional differences is crucial for implementing targeted interventions and allocating resources effectively. Furthermore, the distribution of oral cancer across specific anatomical sites varies significantly between Western populations and those in India, particularly in South India. While common sites of oral cancer in the West include the tongue, floor of the mouth, and buccal mucosa.

In conclusion, the findings of this study highlight the complex interplay of demographic factors, including age-related trends, and site-specific distributions, in shaping the epidemiological profile of oral cancer within the South Indian population.

1. Introduction

The burden of oral cancer in India is particularly high, with an estimated seventy-seven thousand new cases reported annually, ranking among the top three cancers in the country [1,2]. Within India, variations in oral cancer incidence are observed between different regions, including notable differences between the northern and southern states. Recognizing these regional differences is crucial for implementing targeted interventions and allocating resources effectively [1]. Furthermore, the distribution of oral cancer across specific anatomical sites varies significantly between Western populations and those in India, particularly in South India [3]. While common sites of oral cancer in the West include the tongue, floor of the mouth, and buccal mucosa, South Indian populations exhibit a preference for cancers of the buccal mucosa, palate, and gingiva. These discrepancies highlight the importance of investigating the underlying factors driving such variations [3,4].

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The observed differences in site-specific incidence of oral cancer between Western populations and those in South Indian population can be attributed to multifactorial influences encompassing genetic predispositions, dietary habits, cultural practices, socioeconomic factors, and oral hygiene practices [5]. For instance, the prevalence of betel quid chewing, a common cultural practice in South India, has been strongly associated with an increased risk of oral cancer, particularly affecting the buccal mucosa. Additionally, dietary factors such as the consumption of spicy foods and nutritional deficiencies prevalent in certain regions of South India may contribute to the unique site distribution patterns observed [6].

While several studies have investigated the incidence and site distribution of oral cancer in India, limited attention has been paid to the specific nuances within the South Indian population. Previous literature predominantly focuses on broader trends across India or specific regions, thereby warranting a more granular analysis to elucidate the intricacies of oral cancer epidemiology within South India. By bridging this knowledge gap, this retrospective cross-sectional study aimed to examine the patterns of oral cancer among South Indian populations, with a specific focus on evaluating gender distribution, age group trends, and site distribution of oral cancer lesions.

2. Materials and Method

This retrospective cross-sectional study was conducted among patients reporting to the Department of Oral Oncology at Saveetha Dental College and Hospital, Chennai, between December 2021 and February 2024. Ethical approval was obtained from the Institutional Human Ethical Committee (IHEC/SDC/PhD/OMFS - 2340/21/12).

Inclusion criteria comprised patients of any age and gender diagnosed with oral squamous cell carcinoma (OSCC). Exclusion criteria were applied to ensure the study's focus on primary oral cancers. Cases of cancer originating from other sites and extending to the oral cavity, as well as secondary lesions in the oral cavity, malignancy other than squamous cell carcinoma were excluded from the analysis. This exclusion criterion aimed to maintain the study's specificity to primary oral squamous cell carcinoma. Data, including demographic details (age, gender) and site of oral cancer, were retrieved from the Digital Information Archive System (DIAS) maintained by the institution.

Diagnostic procedures followed standard criteria, including clinical examination, radiographic evaluation, and histopathological investigation. Histopathological investigation served as the gold standard for definitive diagnosis. Tissue biopsy specimens were obtained from suspicious lesions, and histopathological examination was performed by experienced pathologists. Criteria for malignancy included cellular dysplasia, nuclear pleomorphism, abnormal mitotic figures, and invasive growth patterns, consistent with established diagnostic guidelines [7].

Data analysis was done using IBM SPSS version 20. Descriptive statistical measures such as mean, standard deviation, percentage, and frequency were employed due to the non-parametric nature of the data. Results were presented in both tabular and graphical formats for comprehensive interpretation and visualization.

3. Results

The gender distribution among the patients revealed that the majority were male, constituting 80% of the study group, while females accounted for 20% (Figure 1). This gender disparity indicates potential differences in disease prevalence or healthcare-seeking behavior between males and females within the study population.

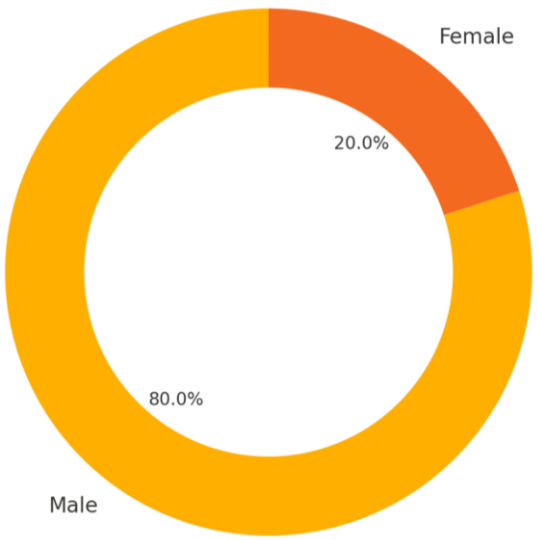

Figure 1: Gender distribution of patients with oral cancer

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A total of 240 patients were included in the study. The mean age of patients presenting with oral cancer was determined to be 51.58 years, with a standard deviation of 10.424. The age range varied from 24 to 78 years, spanning 54 years. Upon closer examination of age group distribution (Figure 2), it became evident that most patients fell within the middle-aged to older age brackets. Specifically, a significant proportion of cases 41.3% were observed in the 31-50 years age group, followed closely by the 51-70 years age group, which constituted 51.7% of the total group. Notably, while a smaller percentage of cases were observed in the <30 years (1.7%) and >70 years (5.3%) age groups, they nonetheless contributed to the overall diversity of ages represented in the study.

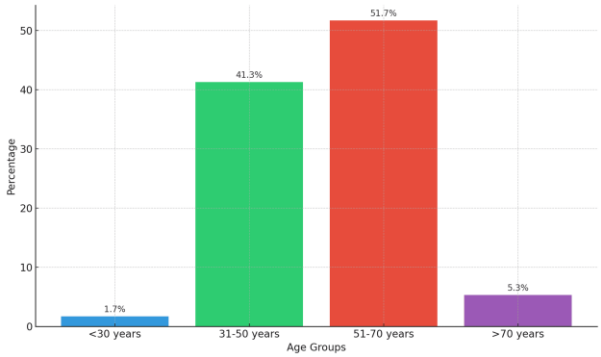

Figure 2: Age group distribution of patients with oral cancer

Regarding the site distribution of oral cancer lesions, diverse anatomical locations were identified, with prominent sites including the buccal mucosa (26.4%), mandibular gingivobuccal sulcus (24.2%), and lateral border of the tongue (15.5%) (Figure 3).

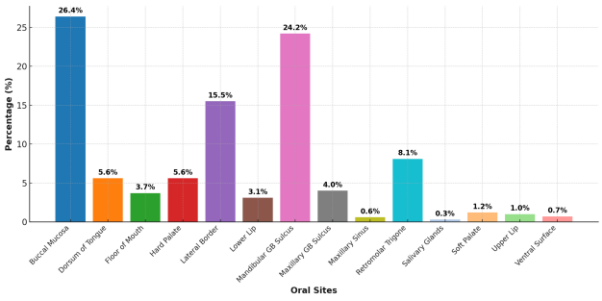

Figure 3: Site distribution of patients with oral cancer

4. Discussion

The observed distribution pattern of oral cancer may be influenced by factors such as local environmental exposures, oral hygiene practices, and genetic predispositions [8]. Our study delves into the multifaceted landscape of oral cancer epidemiology within the South Indian population, shedding light on demographic trends and site-specific distributions. Gender disparities in oral cancer incidence have been a consistent feature across various populations, with males historically exhibiting a higher prevalence [9]. Our study echoes this global trend, revealing that males comprised 80% of our patient group. This finding aligns with the study by Sahu PK et al (2019) [10] and data from the National Institute of Dental and Craniofacial Research (NIDCR) [11] which also reported a male predominance in oral cancer cases. Past studies have shown a predominance of oral cancer cases among males, with male-to-female ratios varying over time. For instance, a study reported male-to-female ratio of 1.68:1 in 1954 [12], while Ramachandra [13] observed a ratio of 3.8:1 in 1964. Similarly, Llewellyn CD et al [14] reported a ratio of 2:1 in 2003, and Balaram P et al [8] found a 1:1 ratio in 1998. However, our study reveals a striking male-to-female ratio of 4:1, indicating a substantial male predominance in oral cancer incidence. This contrasts with the equalization of gender ratios observed in some previous studies [8,12], suggesting a dynamic relationship of sociocultural, behavioral, and environmental factors influencing oral cancer trends.

A noteworthy shift in oral cancer epidemiology is the increasing incidence among females, attributed in part to changes in sociocultural practices. Balaram, et al. [8] proposed that ethnicity strongly influences the high rate of oral cancer in women due to social and cultural practices such as chewing habits. Traditionally, these practices were more prevalent among males, contributing to their higher oral cancer burden [15]. However, evolving societal norms have led to increased tobacco and smokeless tobacco use among females, bridging the gender gap in oral cancer incidence. This transformation highlights the dynamic nature of oral cancer epidemiology and the need for tailored interventions addressing changing risk factor profiles. While our study reaffirms the persistent male predominance in oral cancer incidence, it also highlights the emerging challenges posed by increasing female involvement. Understanding

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these shifting dynamics is crucial for informing targeted prevention and early detection strategies tailored to different demographic groups [16].

The age distribution of oral cancer patients in our study aligns with several previous investigations, reflecting a consistent trend across different populations in India and globally [17,18]. Our findings revealed a mean age of 51.58 years among patients presenting with oral cancer, with a notable concentration of cases observed in the 31-70 years age range. This aligns with findings from various investigations, including studies by Shenoi, et al. (2012) [19], Sharma, et al. (2018) [20], Borse, et al. (2020) [1], Malik, et al. (2018) [21], and Bhuyan, et al. (2022) [22], which reported mean ages ranging from 49.73 to 61 years for oral cancer patients. However, disparities in age distribution were also noted across different regions and populations. For instance, Sharma, et al. (2018) [20] highlighted an increased incidence of oral cancer at a very young age, attributing it to the indiscriminate usage of substances, particularly tobacco, leading to genetic damage. Additionally, regional variations were observed, such as the north-eastern region of India showing peculiar cancer incidence patterns, possibly influenced by genetic factors, lifestyle, and food habits. Furthermore, Bhuyan, et al. (2022) [22] reported gender-specific differences in age distribution, with a higher proportion of female patients in certain age groups, particularly between 45-64 years. The age group distribution further underscores the diverse age profile of oral cancer patients, with a significant concentration of cases observed in the middle-aged population. This distribution pattern aligns with previous studies indicating a higher incidence of oral cancer in middle-aged individuals, possibly attributable to cumulative exposure to risk factors over time [10]. Age-related risk factors, such as prolonged exposure to carcinogens, genetic mutations, and compromised immune function, contribute to the higher prevalence of oral cancer among older individuals. Early detection initiatives targeting this age group are critical for improving prognosis and outcomes through timely intervention and treatment [23]. However, variations in study methodologies, geographical locations, and time periods may influence the observed age distributions, highlighting the need for further research to comprehensively explore the underlying factors contributing to these age-related trends.

In the study by Sharma, et al. (2018) [20], which analyzed oral cancer statistics in India based on population-based cancer registries, the common sites of oral cancer include the tongue, buccal mucosa, and gingiva. Similarly, Borse, et al. (2020) [1], in their discussion on oral cancer diagnosis and perspectives in India, also highlighted the prevalence of oral cancer in the tongue, buccal mucosa, and gingiva. Comparing these findings with our study, we observed similar trends in the distribution of oral cancer sites. In our investigation, prominent sites of oral cancer lesions included the buccal mucosa (26.4%), mandibular gingivobuccal sulcus (24.2%), and lateral border of the tongue (15.5%). The observed distribution pattern may be influenced by factors such as local environmental exposures, oral hygiene practices, and genetic predispositions [8]. Understanding the site-specific distribution of oral cancer lesions is crucial for targeted diagnostic and treatment approaches, including surgical resection and radiotherapy, focused on the affected anatomical sites. The buccal mucosa's high incidence is particularly noteworthy, consistent with previous literature attributing it to the widespread practice of betel quid chewing in South India [4]. Betel quid, a common cultural practice prevalent in South Asian countries, has been strongly associated with an increased risk of oral cancer, particularly affecting the buccal mucosa. The gingivobuccal sulcus's involvement highlights the impact of local environmental exposures and oral hygiene practices on cancer site distribution. Furthermore, the lateral border of the tongue's prominence underscores the role of chronic irritants, such as tobacco and alcohol, in predisposing this anatomical site to malignant transformation. Understanding these site-specific distribution patterns is crucial for implementing targeted diagnostic and therapeutic interventions tailored to the specific needs of affected individuals.

While several studies have investigated the incidence and site distribution of oral cancer in India [1,2], limited attention has been paid to the unique characteristics within the South Indian population. Previous literature predominantly focuses on broader trends across India or specific regions, thereby warranting a more granular analysis to elucidate the intricacies of oral cancer epidemiology within South India. By bridging this knowledge gap, our retrospective c study provides

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valuable insights into the demographic and clinical characteristics of oral cancer within the South Indian population, with a specific focus on gender distribution, age group trends, and site distribution of oral cancer lesions.

The strengths of our study lie in its comprehensive approach, including a sizable sample size and diverse demographic representation. Rigorous diagnostic methods, such as clinical examination and histopathological analysis, ensure data accuracy. However, limitations include the retrospective design, potential biases, and reliance on data from a single institution, limiting generalizability. Despite this, our study offers valuable insights into oral cancer epidemiology.

Regarding implications, our findings guide future research, clinical practice, and public health initiatives. They pave the way for further exploration of risk factors and high-risk groups. Clinically, they emphasize the need for multidisciplinary approaches and targeted screening. From a public health standpoint, our study points out the importance of tobacco control and oral hygiene promotion to mitigate the oral cancer burden.

5. Conclusion

In conclusion, the findings of this study highlight the complex interplay of demographic factors, including age-related trends, and site-specific distributions, in shaping the epidemiological profile of oral cancer within the South Indian population. Moving forward, efforts to mitigate the burden of oral cancer should focus on implementing comprehensive prevention and early detection initiatives that take into account gender, age, and site-specific variations. Multidisciplinary approaches integrating public health interventions, behavioral counselling, and advancements in diagnostic and therapeutic modalities are essential for improving outcomes and reducing the morbidity and mortality associated with oral cancer. By addressing these factors comprehensively, we can enhance prevention, early detection, and treatment strategies tailored to the specific needs of the South Indian populace, ultimately reducing the burden of oral cancer and improving patient outcomes.

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