

Association of oral cancer site with addiction and sociodemographic characteristics: A cross-sectional study conducted at a tertiary health centre

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Abstract

Introduction: In contemporary epidemic scenarios, oral cancer ranks the top 3 cancer types afflicting the Indian population. The primary risk factors include alcohol consumption, tobacco usage in various forms, such as cigarettes and smokeless tobacco, betelnut chewing, and infection with the human papillomavirus. This article submitted in preprint in medRxiv on 20 February 2024.

Materials and Methods: This study, conducted at a tertiary healthcare center, adopted a hospital-based cross-sectional approach involving 233 oral cancer patients who sought medical care from January 1 to December 31, 2017.

Results: The findings indicate that males above the age of 60 (40.11%) and females aged between 41 and 50 years (45.45%) were the most affected groups. A statistically significant association ($P < 0.05$) was found. The primary sites for oral cancer were the cheek (40.36%) and tongue (31.78%). Remarkably, the majority of male patients exhibited a combination of addictions, including tobacco chewing, smoking, and alcohol use, whereas most female patients were exclusively involved in tobacco chewing.

Conclusion: To curb the increasing prevalence of oral cancer in India, it is imperative to implement comprehensive public education initiatives and health promotion strategies aimed at reducing both smoking and alcohol consumption.

Keywords: Alcohol use, health promotion, prevention, smoking, tobacco use

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INTRODUCTION

In today's world, noncommunicable diseases, often called modern epidemics, are on the rise. Among the top 10 causes of mortality, cancer, the second leading cause of

death in developed nations, plays a significant role in this trend.^[1] Oral cancer, an ancient ailment documented in texts such as the Sushruta Samhita, is a malignant neoplasm affecting various oral structures, including

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the lips, mouth floor, cheek lining, gingiva, palate, and tongue. Its local aggressiveness leads to disfigurement, functional impairment, and physical and psychosocial distress, ultimately affecting an individual's quality of life.^[2] Oral cancer ranks as the 6th most prevalent cancer worldwide, with notable geographical variations.^[3] In India, it constitutes nearly 40% of all cancer cases and remains among the top three cancer types.^[4] Alarmingly, more than five individuals in India succumb to oral cancer every hour.^[5] Common risk factors for oral cancer include tobacco product usage, such as cigarettes, smokeless tobacco, betel nut chewing, excessive alcohol consumption, and human papillomavirus (HPV) infection. Low socioeconomic status, often linked to factors such as nutrition and personal habits, is also associated with increased risk.^[2]

India, a developing nation, faces a unique challenge: 22% of its population lives below the poverty line. A cancer diagnosis often exacerbates the economic struggles of affected families.^[6,7] To monitor cancer incidence, survival, and mortality, the Indian Council of Medical Research initiated the National Cancer Registry Programme (NCRP) in 1982. This program includes population-based cancer registration (PBCR), with “Barshi” as the primary registry for rural areas in western Maharashtra and the Marathwada region. The incidence of cancer varies significantly across Indian cities, with rates ranging from 37.3 per 100,000 in Barshi to 86.7 per 100,000 in Chennai among males and 44.1 per 100,000 in Barshi to 101.2 per 100,000 in Chennai among females, according to population-based cancer registries (PBCRs). The estimated overall cancer incidence in India ranges from 70-90 cases per 100,000 people, resulting in approximately 79 lakh new cancer cases annually. In the year 2000, cancer was responsible for 5.5 lakh deaths in India, with Maharashtra accounting for 9% of these cases.^[8] It is crucial to dispel two misconceptions about cancer: First, that it is inevitable, and second, that it affects only industrialized nations. In reality, approximately 80% of cancer cases are preventable and linked to environmental factors.^[9] Early detection of oral cancer and mitigating risk factors offer the best chance of long-term survival, improved treatment outcomes, and more cost-effective healthcare.

With this perspective in mind, we studied oral cancer patients at a tertiary healthcare center to investigate the relationships between risk factors and oral cancer patients seeking care. This article was submitted in preprint in medRxiv on 20 February 2024.

MATERIALS AND METHODS

Study design

This hospital-based descriptive study, employing a cross-sectional design, was conducted with oral cancer patients.

Place and duration of study

Patients were attending a tertiary healthcare center over a one-year period from January 1, 2017, to December 31, 2017.

Inclusion and exclusion criteria

All patients who were diagnosed with oral cancer at the Tertiary Health Care Centre during the study period and who consented to participate were included. Among the 241 patients diagnosed with oral cancer, 233 met the inclusion criteria.

Sampling size and sampling

Patients who attended a tertiary healthcare center over a one-year period and met the inclusion criteria were included in the study. Therefore, the tenure sampling method was used because the study was conducted for 1 year of tenure.

Data collection

Permission was obtained from the surgery and ENT departments, and individuals were informed about the study. Informed written consent in the local language was obtained before participation. A separate proforma was completed for each patient and their relatives, ensuring that patient identity remained confidential. A predesigned, pretested proforma was used to gather information on sociodemographic characteristics; personal habits such as tobacco consumption (including chewing, betel quid, smoking, gutkha, khaini, or other forms); alcohol consumption (including duration, frequency, and amount); and the impact of these habits on living standards. Proforma was validated for the language by the language experts and face validation was done by researchers and subject experts of institute, and it was pretested on 25 patients outside the study setting area.

Data analysis

Data was collected, compiled, and analyzed using MS Excel. Percentages for qualitative variables and mean and Standard Deviation (SD) for quantitative variables was obtained. Chi-square test was applied wherever necessary to know the association between variables. The value of $P < 0.05$ was considered statistically significant. Data analysis was carried out via SPSS software version 16.

Ethical approval

This study was ethically approved by institutional ethics committee as per standards. P. G. Coordination committee, Dr V. M. Govt. Medical College, Solapur, number 535, dated 06/09/2016 had approved this protocol.

RESULTS

This cross-sectional study, which was conducted over one year from January 1, 2017, to December 31, 2017, included 233 diagnosed oral cancer patients attending a tertiary care center. The key findings are summarized below.

Table 1 displays the age and site wise distribution of oral cancer patients by sex. The age range of affected individuals was 26–81 years, with the highest number of oral cancer patients in the above 60 years age group, accounting for 32.61%, followed by 32.19% in the 51–60 years age group. The least affected age group was those under 30 years, at 1.29%. The sex distribution revealed that 71.67% of the patients were males, whereas 28.32% were females, resulting in a male-to-female ratio of 2.5:1. The most affected age group among males was above 60 years (40.11%), whereas among females, it was 41–50 years (45.45%). The differences in age and sex distributions were statistically significant ($P < 0.05$).

Figure 1 shows the distribution of patients according to their place of residence. Among 233 oral cancer patients, Majority, (54.94%) lived in urban areas, and 45.06% lived in rural areas. This difference was not statistically significant ($P > 0.05$).

Chart 1 shows that the majority of patients (33.79% had a class III socioeconomic status (according to the modified B.G. Prasad's classification), followed by 28.32% with a class IV socioeconomic status. The least affected patients had a class I socioeconomic status. This difference was highly significant ($P < 0.01$).

Table 1: Distribution of patients age and site of cancer with relation to gender

	Gender		Total <i>n</i> (%)	Characteristics
	Male	Female		
Age				
<30*	3 (100%)	0 (0%)	3 (1.29%)	Chi square - 30.3 <i>P</i> <0.05
31–40*	15 (100%)	0 (0%)	15 (6.44%)	
41–50	34 (53.12%)	30 (46.88%)	64 (27.47%)	
51–60	48 (64%)	27 (36%)	75 (32.19%)	
>60	67 (88.16%)	9 (11.84%)	76 (32.61%)	
Total	167 (71.67%)	66 (28.32%)	233 (100%)	
Cancer site				
Lip	6 (75%)	3 (25%)	9 (3.88%)	Chi square - 3.87 <i>P</i> >0.05
Tongue	59 (79.73%)	15 (20.27%)	74 (31.78%)	
Gum	13 (68.42%)	6 (31.58%)	19 (8.17%)	
Floor of mouth	6 (60%)	4 (40%)	10 (4.29%)	
Cheek	64 (68.09%)	30 (31.91%)	94 (40.36%)	
Palate	12 (79.73%)	5 (79.73%)	17 (7.23%)	
Other mouth parts*	7 (79.73%)	3 (79.73%)	10 (4.29%)	
Total	167 (71.67%)	66 (28.32%)	233 (100%)	

[Rows with *were clubbed together for statistical calculation] *Other mouth parts include the oropharyngeal isthmus and palatoglossal fold

Table 2 illustrates the age and site-wise distribution of oral cancer patients. Cheek (40.36%) was the most common site of oral cancer, followed by the tongue (31.78%) and gum (8.17%), whereas the lip (3.88%) was the least affected site. The floor of the mouth and other mouth parts (oropharyngeal isthmus and palatoglossal fold) were equally affected (4.29%). No statistically significant association was found between cancer site and age at diagnosis ($P > 0.05$).

Table 3 presents the distribution of patients by their habit patterns in terms of sex and cancer site. The majority of oral cancer patients reported tobacco chewing alone (32.18%), followed by tobacco chewing combined with smoking (18.88%). Among males, the most common habit was tobacco chewing combined with alcohol and smoking (22.16%), followed by tobacco chewing combined with smoking (21.56%). Among females, tobacco chewing alone was more common (63.64%) than among males (19.76%). This association between sex and habit patterns was highly significant ($P < 0.01$). In terms of the distribution of patients according to their habit patterns and cancer site, the tongue was the common site of cancer when a single habit, such as chewing, smoking, or alcohol consumption, was present (56%). The cheek was the common site. in cases with a combination of more than one habit. Patients with no habits were more likely to develop cancer in other mouth parts, such as the oropharyngeal isthmus and palatoglossal fold (40%). This association between cancer site and habit pattern was highly significant ($P = 0.00$). Moreover, 54.94% of the oral cancer patients had lived for more than 10 years, whereas 36.05% had lived for 5–10 years, and this difference was highly significant ($P < 0.01$).

Figure 2 shows the distribution of patients according to their duration of addiction. In the present study, 54.94% of oral cancer patients had habits for more than 10 years, followed

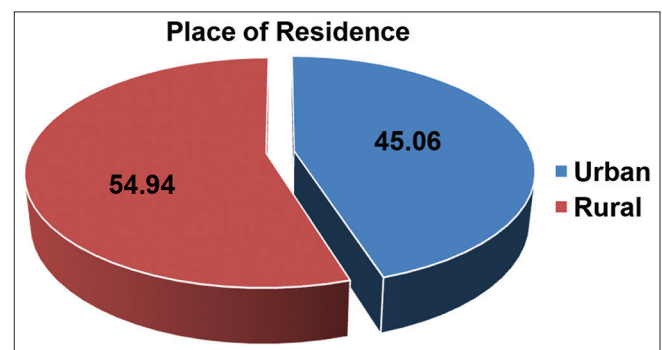


Figure 1: Distribution of patients according to residence: [Chi-square value for goodness of fit is 2.27, $P > 0.05$, not significant]

by 36.05% of patients who had habits for 5–10 years, and this difference was highly significant ($P < 0.01$).

The study revealed that most patients were diagnosed with stage III disease (69.96%), followed by stage II disease (21.03%). No cases of stage I disease were reported in the study population. Stage III and stage IV cancers were more common in males, accounting for 78.53% and 80.95%, respectively, whereas stage II cancers were more prevalent in females (55.1%). Table 4 shows that the association between sex and stage at diagnosis was highly significant ($P < 0.01$). Furthermore, there was a strong association between stage and age at diagnosis, with 69.96% of patients having stage III cancer, most of whom were in the 40–60 years age group.

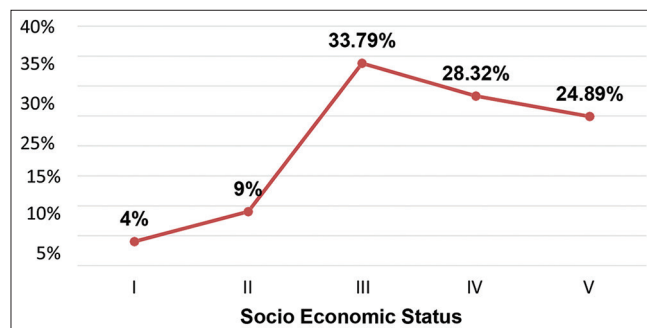


Chart 1: Distribution of patients according to socioeconomic status: Chi-square = 77.794. $P < 0.01$

DISCUSSION

In this study, of 233 oral cancer patients, the highest proportion of cases were individuals above 60 years of age, with the least affected group being those under 30 years of age. Most patients were male, resulting in a male-to-female ratio of 2.5:1. Among males, the most affected age group was above 60 years, whereas among females, it was 41–50 years, with no female patients younger than 40 years. These findings align with those of previous studies.^[4,10,11] In a study done by Akhilesh Krishna *et al.*^[12] in northern part of India shows that age group 41-50 affected most.

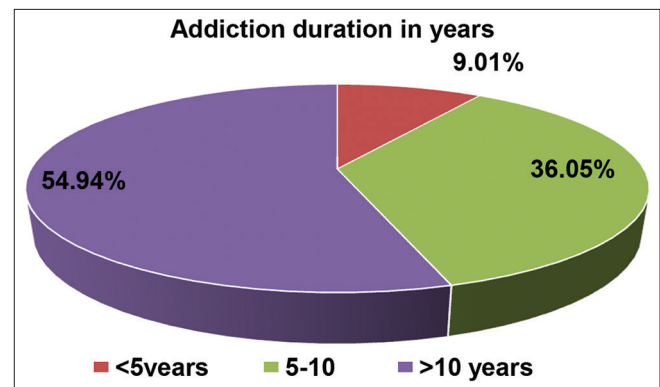


Figure 2: Distribution of patients according to the duration of habit (Addiction): [Chi-square value for goodness of fit is 74.495, df = 2, $P < 0.01$, highly significant]

Table 2: Age and cancer site distribution of patients

Cancer site	Age at diagnosis (years)			Total No (%)	Chi square test
	<40	40–60	>60		
Lip	00	07 (77.78%)	02 (22.22%)	9 (3.88%)	Chi-square - 6.54 $P > 0.05$
Tongue	5 (6.76%)	43 (58.11%)	26 (35.13%)	74 (31.78%)	
Gum	02 (10.53%)	13 (68.42%)	04 (21.05%)	19 (8.17%)	
Floor of mouth	00	06 (60%)	04 (40%)	10 (4.29%)	
Cheek	7 (11.45%)	55 (58.51%)	32 (30.04%)	94 (40.36%)	
Palate	02 (11.76%)	10 (58.82%)	05 (29.41%)	17 (7.23%)	
Other mouth parts*	2 (20%)	5 (50%)	3 (30%)	10 (4.29%)	
Total	18 (7.73%)	139 (59.75%)	76 (32.61%)	233 (100%)	

*Other mouth parts include the oropharyngeal isthmus and palatoglossal fold

Table 3: Distribution of patients addiction habit with gender and cancer site

Addiction	Tobacco chewing	Smoking alone	Alcohol alone	Tobacco chewing	Tobacco chewing	Smoking + Alcohol	Tobacco chewing	No Addiction	Total
Male	33 (19.76%)	16 (9.58%)	11 (6.59%)	36 (21.56%)	10 (5.99%)	21 (12.57%)	37 (22.16%)	3 (1.8%)	167 (71.67%)
Female	42 (63.64%)	3 (4.55%)	1 (1.52%)	8 (12.12%)	4 (6.06%)	2 (3.03%)	0	6 (9.09%)	66 (28.32%)
$P < 0.01$									
Cancer site									
Lip	9 (100%)	0	0	0	0	0	0	0	9 (3.88%)
Tongue	42 (56%)	16 (21.6%)	10 (13.51%)	5 (6.75%)	0	0	0	1 (1.35%)	74 (31.78%)
Gum	6 (31.57%)	0	0	12 (63.15%)	0	0	0	1 (5.26%)	19 (8.17%)
Mouth	4 (40%)	0	0	6 (60%)	0	0	0	0	10 (4.29%)
Cheek	14 (14.89%)	3 (3.19%)	2 (2.12%)	21 (22.34%)	14 (14.89%)	21 (22.34%)	19 (20.21%)	0	94 (40.36%)
Palate	0	0	0	0	0	2 (11.76%)	12 (70.58%)	3 (17.64%)	17 (7.23%)
Other*	0	0	0	0	0	0	6 (60%)	4 (40%)	10 (4.29%)
Total	75 (32.18%)	19 (8.15%)	12 (5.15%)	44 (18.88%)	14 (6.04%)	23 (9.87%)	37 (15.87%)	9 (3.86%)	233 (100%)

$P = 0.00$. *Other mouth parts include the oropharyngeal isthmus and palatoglossal fold

Table 4: Association of stage of oral cancer with sex and age at diagnosis

	Stage at Diagnosis				Total	P
	Stage I [#]	Stage II [#]	Stage III	Stage IV		
Gender						
Male	0	22 (44.9%)	128 (78.53%)	17 (80.95%)	167 (71.67%)	<0.01
Female	0	27 (55.1%)	35 (21.47%)	4 (19.05%)	66 (28.32%)	
Total	0	49 (21.03%)	163 (69.96%)	21 (9.01%)	233 (100%)	
Age at diagnosis (years)						
<40	0	14 (28.57%)	4 (2.45%)	0	18 (7.73%)	<0.01
40–60	0	32 (65.30%)	102 (62.57%)	5 (23.80%)	139 (59.75%)	
> 60	0	3 (6.12%)	57 (34.97%)	16 (76.19%)	76 (32.61%)	
Total	0	49 (21.03%)	163 (69.96%)	21 (9.01%)	233 (100%)	

However, Durgadevi Pancharethinam *et al.*,^[13] a Study in southern part of India, reported a different pattern, with most patients being younger than 30 years and the minimum affected being older than 50 years. This difference may be because of different sociodemographic and behavioral characteristics of the population in different geographical region of India. As present study was done in western part of India. With respect to education, most oral cancer patients in our study were graduates, with 15.02% being illiterate, a finding that is consistent with Durgadevi Pancharethinam *et al.*'s^[13] study, however Madani *et al.*^[14] reported majority of patients from illiterate background. Our results contrast with those of another study in which half of the patients had no schooling and one-fourth had only primary education.^[4,5] The distribution of oral cancer patients by occupation revealed that the majority were clerical and skilled workers, with only 8.15% unemployed, in contrast to Ganesh R *et al.*'s^[4] findings, where a greater proportion of patients were unemployed and less skilled. The modified B.G. Prasad classification revealed that most patients belonged to the lower-middle class, followed by the upper-lower class, with the least affected belonging to the upper class. These results are consistent with the findings of Akhilesh Krishna *et al.* and S P Khandekar *et al.*,^[11,15] but Ganesh R *et al.* reported a greater proportion of upper to lower-class patients.^[4,12]

The cheek was the most common site of oral cancer, followed by the tongue, whereas the lip was the least affected site. Both the floor of the mouth and other mouth parts were equally affected. These findings are consistent with those of previous studies^[15–18] but in a study from north part of India done by Sahu PK *et al.*,^[19] most common site of involvement was the buccal mucosa followed by the tongue. The sex distribution of cancer sites revealed that cheek and tongue were the most common sites in both males and females, with no significant associations found between them, which is in agreement with the findings of a study conducted at a cancer hospital in Kolhapur.^[20] However, another study reported different results, with the tongue and buccal mucosa being the most common sites in both

sexes.^[10] The distribution of patients by habit patterns revealed that the tongue was the common site where a single habit, whether chewing, smoking, or alcohol consumption, was present. The cheek was the common site in patients with a combination of more than one habit, and patients with no habits/addictions were more likely to develop cancer in other mouthparts. These results align with those of Addala L *et al.*^[10] However, Taban R J *et al.*^[21] reported that nontobacco users had more tumors of the buccal mucosa, tongue, and hard palate.

In this study, the majority of oral cancer patients chewed tobacco alone, followed by tobacco chewing combined with smoking, in a study from northern India done by Akhilesh Krishna *et al.*^[12] reported the same findings. Among males, multiple addictive habits were more common, whereas females predominantly chew tobacco alone. These findings are similar to those of other studies.^[5,22,23] The duration of habits revealed that most patients had lived for more than 10 years, with a significant difference observed ($P < 0.01$). The study also revealed that most patients were diagnosed with stage III disease, followed by stage II disease, and no patients with stage I disease were reported. This distribution differed by sex, with stage III and IV being more common in males and stage II being more prevalent in females. These findings were highly significant ($P < 0.01$). There was also a strong association between stage and age at diagnosis, with most stage III patients falling into the 40–60 years age group and stage IV patients primarily above 60 years.

CONCLUSION

In this study, male sex, rural location, and additive habits, mainly tobacco and alcohol, were major risk factors for oral cancer. Males above 60 years of age and females in the 41–50 years age group were most affected by oral cancer. The cheek is the most common site for cancer and is often associated with a single addictive habit, followed by the tongue, which is more commonly affected by a combination

of two or more habits. The main focus on deaddiction and raising awareness of risk factors are essential steps to reduce the likelihood of developing oral cancer. Public health initiatives should emphasize education, prevention, and early treatment to combat addiction and oral cancer. There should be strict and legal provisions for selling tobacco products and alcohol.

Ethical approval and patient consent

It is an observational study; no intervention was made. Before the commencement of this study – the Institutional Ethical Committee “P.G. Coordination committee, Dr V.M. Govt. Medical College, Solapur, number 535, dated 06/09/2016” had approved this protocol.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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