



Original Research Article

ASSESSMENT OF RISK FACTORS AND SCREENING OF ORAL CANCER BY VISUAL EXAMINATION OF ORAL CAVITY IN KOLAR- A COMMUNITY BASED CROSS SECTIONAL STUDY

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ABSTRACT

Background: In India, oral cancer had become an increasing public health concern, mainly due to habits like chewing tobacco and areca nut. Detecting it early made a big difference in treatment and outcomes. One of the easiest and most affordable ways to identify the early signs was through a simple Visual Oral Examination (OVE). **Objectives:** This study aimed to identify risk factors linked to oral cancer and to screen adults over 30 years of age in the Kolar district. It also aimed to guide people with suspicious findings to the proper medical care.

Materials and Methods: A total of 423 individuals aged above 30 years from both urban and rural areas of Kolar were selected through a random sampling method between July 2023 and December 2024. Data was collected using a semi-structured questionnaire, followed by a basic oral Visual Examination. The data was analysed with SPSS, considering p-values below 0.05 as statistically significant.

Results: Nearly 26% of the participants showed early signs of oral changes that required further evaluation. The prevalence was higher among individuals with habits like smoking, using smokeless tobacco, or placing quid in the mouth. These signs were also more common among people from rural or economically weaker sections.

Conclusion: This study highlights the importance of early screening and awareness campaigns to combat oral cancer. Strengthening public health interventions, especially in rural and low-income communities, can help reduce the burden of this preventable disease.

Keywords: Oral cancer, Risk factors, Screening, Oral visual examination.

INTRODUCTION

According to earlier significant population-based research findings, oral cancer is defined as cancer of the lip, mouth, and tongue, including the anatomic description of the oral cavity.^[1]

Oral cancer, which was mainly of the squamous cell type, had been a major global health concern. It ranked as one of the 16 most common cancers and stood among the top 15 causes of cancer-related deaths. The frequency is far higher in some populations, such as indigenous cultures, where it accounts for 80% of cases, despite the incidence rate being only four cases per 100,000 people worldwide.

Its incidence is greatly influenced by demographic and regional variations.^[2]

Oral cancer was the eleventh most common cancer worldwide. It affected men more often than women and tended to become more serious with increasing age.^[3] Oral Squamous Cell Carcinoma (OSCC) affects about 275,000 people annually throughout the world and a large portion of these instances are linked to oropharyngeal malignancies that are linked to HPV.^[4]

Around 50% of patients with OSCC survive for five years, even with advances in diagnosis and therapy.^[5]

Two-third of the deaths worldwide from oral cancer occur in India. With OSCC making up 90-95% of all oral cancer in the country.^[6]

Risk factors: Tobacco use, which includes both smoking and smokeless forms, was one of the primary risk factors for oral cancer. Men were particularly prone to this, frequently combining alcohol and tobacco use.^[7]

The benefits of early detection include: Better survival rates and a higher standard of living for patients will result from less invasive and more effective therapies for oral cancer. In order to get favourable results, screening programs and shorter time between diagnosis and treatment are essential.^[8] Oral visual examination was a simple and effective method for screening oral cancer. It was especially helpful in identifying the most prevalent kind of oral cancer, oral squamous cell carcinoma (OSCC). It was particularly useful in detecting oral squamous cell carcinoma (OSCC), which was the most common type of mouth cancer.^[9]

Many individuals, particularly in countries like India, had limited awareness about the risk factors linked to oral cancer. This lack of knowledge posed a serious public health challenge. Even though the dangers of tobacco use were commonly recognized, actual changes in behaviour remained low. There was a strong need for more effective and targeted public health campaigns to bring about meaningful awareness and preventive action.^[10]

The number of cancer cases had been steadily rising across the world, leading to more people falling seriously ill or losing their lives. One of the key reasons for delayed diagnosis was the lack of awareness among the public about cancer risk factors, early symptoms, and warning signs. Additionally, there were not enough prevention programs available at the community level.

In view of these concerns, the purpose of this study was to determine the common risk factors for oral cancer, screen adults, and contribute to the reduction of disease-related illness and mortality.

2. Objectives of the study

"Among adults over 30 years living in the urban and rural field practice areas of the Department of Community Medicine in Kolar."

1. To assess the prevalence of risk factors for oral cancer in different sociodemographic groups using structured questionnaire.
2. To screen for oral cancer by visual examination of oral cavity and general physical examination.
3. To establish link of care for participants screened positive for oral cancer or those with risk factors for oral cancer.

MATERIALS AND METHODS

Study settings:

The study population was selected from rural health training centre Devarayasamudra (RHTC) and urban training health centre Gandhinagar (UHTC) Kolar.

Study population: All individuals above 30 years will be included in our study.

Study design: Community based Cross sectional study.

Study duration: July 2023 to December 2024

Inclusion Criteria

- Participants aged above 30 years.
- Permanent residents.

Exclusion Criteria

- Participants already diagnosed with cancers.
- Participants not willing to take part.

Study tool

A semi structured questionnaire was be used which includes sociodemographic details, general physical examination, risk factors for oral cancer and oral visual examination of oral cavity (OVE) data were captured by face-to-face interview.

Sampling method

Households were chosen using simple random sampling. From each selected household, one individual was interviewed to gather information about risk factors.

Sample size calculation: As there were no previous studies on this specific research topic, a prevalence of 50% was assumed. This is a commonly used approach in sample size estimation when prior prevalence data was unavailable and 50% represents the maximum variability, ensuring sufficient statistical power for the study.

$n = (z-\alpha)^2 (p)(q) / d^2$ n=Sample size z- α =power at 95%=1.96, p=50%

$q = 100 - p = 50$, d=absolute error=5%, $n = (1.96)^2(50)(50) / 5^2$

$n = 384 \pm 10$

$n = 423$ (sample size). The final sample size was set at 423 participants.

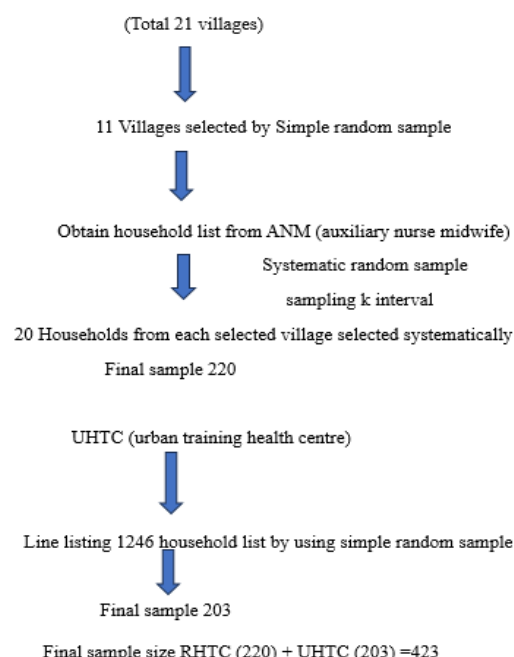


Figure 1: Methods of collection of data including sampling procedure

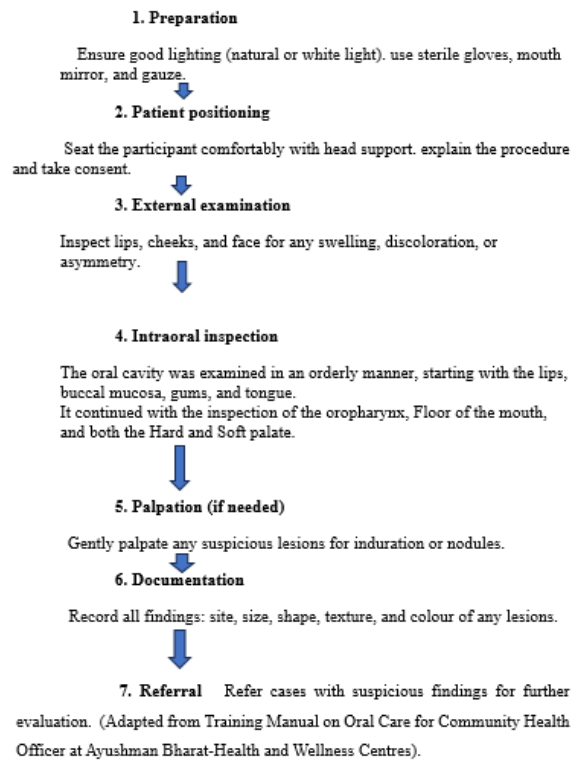


Figure 2: Oral visual examination procedure

Statistical Analysis: After being coded, all of the gathered data was organised and processed in Microsoft Excel. Frequency, proportions, means, and standard deviations were used to summarise quantitative variables. The Chi-square test was utilised to analyse categorical variables. Statistical significance was established at a p-value of less than 0.05. SPSS software, version 22, was used for the data analysis.

Approval for the study

The study was initiated after obtaining institutional ethical clearance from SDUMC No.DMC/KLR/IEC/16/2023-24.

RESULTS

Table 1: Distribution of sociodemographic details of study participants

Variable	Category	Frequency (n)	Percentage (%)
Area of Residence	Urban	203	48%
	Rural	220	52%
Age	30-40 yrs	161	38.1%
	41-50 yrs	85	20.1%
	51-60 yrs	83	19.6%
	>60 yrs	94	22.2%
Religion	Hindu	393	92.9%
	Christian	24	5.7%
	Muslim	6	1.4%
Caste	OBC	173	40.9%
	SC	196	46.3%
	ST	7	1.7%
	Others	47	11.1%
Socio-economic Status	Upper class	4	0.9%
	Upper middle	28	6.6%
	Middle class	84	19.9%
	Lower middle	169	40%
Chronic Illness	Lower class	138	32.6%
	Hypertension (HTN)	39	9.2%
	Diabetes Mellitus (DM)	56	13.2%
	HTN + DM	23	5.4%
	Asthma	8	1.9%
	Epilepsy	5	1.2%
	No chronic illness	292	69%

Out of the 423 individuals who participated in the study, slightly more than half (52%) were from rural areas, while 48% resided in urban locations. The largest age group was 30–40 years, comprising 38.1% of participants, followed by those aged over 60 years (22.2%), 41–50 years (20.1%), and 51–60 years (19.6%). A vast majority of the participants were Hindus (92.9%), with Christians and Muslims making up a small fraction. In terms of caste, nearly half (46.3%) were from the Scheduled Caste (SC)

group, followed by 40.9% from the Other Backward Classes (OBC). Most participants belonged to the lower socioeconomic strata, with 40% from the lower middle class and 32.6% from the lower class. Regarding chronic illness, 69% of participants had no known chronic conditions. Among those who did, diabetes (13.2%) and hypertension (9.2%) were the most common, followed by a smaller number with both conditions, asthma, or epilepsy.

Table 2: Association of Risk Factors with Oral Visual Examination Positivity

Risk Factor		OVE Positive(n=110) n (%)	OVE Negative (n=313) n (%)	Chi-square (p value)
Smoking tobacco	Yes	18 (30%)	42 (70%)	0.580 (0.432)
	No	92 (25.3%)	271 (74.7%)	
Smokeless tobacco	Yes	53 (38.4%)	85 (61.6%)	16.370 (<0.001)
	No	57 (20%)	228 (80%)	
Keeping quid in mouth>15min	Yes	16 (64%)	9 (36%)	19.934 (<0.001)
	No	94 (23.6%)	304 (76.4%)	
Alcohol intake	Yes	17 (40.5%)	25 (59.5%)	5.075 (0.040)
	No	93 (24.4%)	288 (75.6%)	
Spicy food intake	Yes	103 (26.8%)	282 (73.2%)	1.248 (0.334)
	No	7 (18.4%)	31 (81.6%)	
Radiation exposure	Yes	21 (35%)	39 (65%)	2.940 (0.111)
	No	89 (24.5%)	274 (75.5%)	
Bleeding gums	Yes	7 (19.4%)	29 (80.6%)	0.880 (0.430)
	No	103 (26.6%)	284 (73.4%)	
Mobility of tooth	Yes	16 (31.4%)	35 (68.6%)	0.868 (0.395)
	No	94 (25.3%)	278 (74.7%)	
Underwent oral procedure	Yes	42 (34.1%)	81 (65.9%)	5.974 (0.020)
	No	68 (22.7%)	232 (77.3%)	
H/o Visiting dentist	Yes	63 (25.9%)	180 (74.1%)	0.002 (1.000)
	No	47 (26.1%)	133 (73.9%)	
Tongue cleaning after brushing	Yes	101 (26.9%)	275 (73.1%)	1.292 (0.294)
	No	9 (19.1%)	38 (80.9%)	
Professional oral prophylaxis	Yes	3 (21.4%)	11 (78.6%)	0.158 (1.000)
	No	107 (26.2%)	313 (73.8%)	

The analysis showed that certain lifestyle and health-related factors had a significant association with positive findings on oral visual examination (OVE). Notably, individuals who used smokeless tobacco, had the habit of keeping quid in the mouth, consumed alcohol, or had a history of oral procedures were significantly more likely to test positive for early signs of oral disease. For instance, 64% of those who kept quid in the mouth and 38.4% of smokeless tobacco users were OVE positive, both with highly

significant p-values. On the other hand, factors like smoking tobacco, spicy food intake, radiation exposure, bleeding gums, tooth mobility, visiting a dentist, and oral hygiene awareness did not show statistically significant associations with OVE positivity. This suggests that some habits, especially those involving smokeless forms of tobacco and oral practices, pose a stronger risk for developing visible early signs of oral cancer.

Table 3: Univariate Logistic regression to Study the association of risk factors with OVE positivity

Sl. No	Risk factors for oral cancer	Crude OR	(95% CI)	p Value (<0.05)
1.	Smoking tobacco	1.26	(0.69-2.30)	0.447
2.	Smokeless tobacco	2.49	(1.59-3.91)	<0.001
3.	Habits of keeping quid	5.75	(1.60-20.63)	<0.001
4.	Alcohol intake	2.10	(1.06-4.19)	0.034
5.	Spicy food intake	1.61	(0.69-3.78)	0.268
6.	Radiation exposure	1.67	(0.93-2.96)	0.089
7.	Bleeding gums	0.66	(0.28-1.57)	0.351
8.	Mobility of tooth	1.35	(0.72-2.55)	0.353
9.	Underwent oral procedure	1.77	(1.12-2.80)	0.015
10.	H/o visiting dentist	0.99	(0.64-1.54)	0.966
11.	Tongue cleaning after brushing	1.55	(0.72-3.32)	0.259
12.	Professional oral prophylaxis	0.77	(0.21-2.18)	0.692

The study found that individuals who used smokeless tobacco, had a habit of keeping quid in their mouth, consumed alcohol, or had undergone oral procedures were significantly more likely to show positive findings on oral visual examination. Among these, the strongest association was seen with the habit of

keeping quid, followed by smokeless tobacco use. While other factors like smoking, spicy food intake, radiation exposure, bleeding gums, and dental hygiene habits were also assessed, they did not show a statistically significant link to OVE positivity.

Table 4: Multivariable Binary logistic regression to study the association of risk factors with OVE positivity

Sl. No	Risk factors for oral cancer	Adjusted OR	(95% Ci)	p Value
1.	Smoking tobacco	2.19	(1.04-4.61)	0.038
2.	Smokeless tobacco	2.18	(1.34-3.58)	0.002

3.	Habits of keeping quid	3.02	(1.42-6.43)	0.004
4.	Alcohol intake	1.65	(0.78-3.49)	0.190
5.	Spicy food intake	1.45	(0.69-3.03)	0.321
6.	Radiation exposure	1.41	(0.79-2.52)	0.240
7.	Bleeding gums	0.70	(0.29-1.72)	0.436
8.	Underwent oral procedure	1.97	(1.18-3.80)	0.008
9.	Tongue cleaning after brushing	1.41	(0.66-3.01)	0.378

In the multivariable analysis, even after adjusting for other factors, the study found that smoking tobacco, using smokeless tobacco, keeping quid in the mouth, and having undergone oral procedures were significantly associated with higher chances of a positive oral visual examination. Among these, keeping quid showed the strongest link, followed by smokeless tobacco and smoking. On the other hand, alcohol intake, spicy food, radiation exposure, bleeding gums, and tongue cleaning habits did not show a significant association with OVE positivity. This suggests that certain tobacco-related habits and past oral procedures remain strong independent predictors of early signs of oral disease.

DISCUSSION

This community-based study involved 423 adults aged 30 years and above, with nearly equal participation from both urban and rural areas. In our study rural participants had higher prevalence of positive findings on oral visual examination (OVE). Who reported that individuals in rural settings often face greater oral health challenges, mainly due to reduced access to dental care and limited health awareness. this pattern echoes the observations made by Hulke et al. (2024).^[11]

A significant proportion of participants fell within the 30–40-year age group—a stage of life increasingly affected by lifestyle-driven health issues, including oral precancers. Which highlights the growing impact of harmful habits during this phase. This age-related vulnerability aligns with prior research by Garcia-martin et al. (2019).^[12]

Gender distribution was almost equal, allowing a balanced comparison of behaviours and risk factors between men and women. however, when we analysed socioeconomic status, a large majority of participants came from lower or lower-middle-income backgrounds. Financial limitations in these groups often drive the use of inexpensive but harmful substances like bidis and gutkha, which significantly elevate the risk for oral cancers (Singh et al., 2024).^[13]

Additionally, over a 1/4th of the participants was illiterate. lower education levels have long been linked to poor oral hygiene and delayed help-seeking for oral lesions, a trend confirmed in our study as well (Viveka et al., 2024).^[14] Cultural and social influences based on caste also played a role. for instance, individuals from scheduled castes (SC) and other backward classes (OBC) exhibited higher use of oral risk products—a finding consistent with who documented that betel quid chewing remains a

culturally accepted norm in these communities (Chamoli et al. (2021)).^[15]

Risk factors associated with OVE positivity: The findings showed that over (26%) of the study participants had positive OVE results- indicating the presence of potential oral lesions. Among the major contributors were tobacco use (both smoked and smokeless), the habit of placing quid in the mouth and history of oral procedures.

Participants who smoked tobacco were more than twice as likely to have OVE-positive findings. Smokeless tobacco users showed a similarly strong association, with an adjusted odds ratio (AOR) of 2.18. these results are in line with past studies conducted in both northern (Gupta et al., 2022),^[16] and southern parts of India (Khan et al., 2020).^[17] which underscore the carcinogenic impact of tobacco in all its forms (Ray & Gupta 2024).^[18]

Among all risk behaviours, keeping quid in the mouth—a combination of tobacco and areca nut—emerged as the most significant factor. individuals practicing this habit had a threefold increase in OVE positivity (AOR = 3.02). despite being culturally accepted, especially in rural India, areca nut is a known carcinogen, and its widespread use persists due to addictive properties and social normalization (Maher, 2023).^[19] While alcohol consumption was associated with higher OVE positivity in crude analysis, it did not maintain significance after adjusting for other variables (AOR= 1.65). Still alcohol's synergistic role with tobacco and betel quid in promoting mucosal damage is well documented (Misra & das, 2024).^[20] A noteworthy predictor of OVE positivity was a history of prior oral procedures (AOR = 1.97). This could reflect underlying conditions prompting the procedure or suggest gaps in post-procedural oral care and follow-up. The study had several strengths including representation from both urban and rural areas of Kolar using simple random sampling, which ensured a diverse participant pool. Oral visual examination (OVE) served as an effective, non-invasive screening method, aided by a validated questionnaire that ensured consistent and accurate data collection. Robust statistical analysis using multivariable logistic regression further strengthened the findings. However, there were some limitations, such as the absence of histopathological confirmation, reliance on self-reported data which may introduce bias, and the exclusion of individuals under 30 years, possibly missing early-onset cases. To address these concerns, the study recommends local-language IEC campaigns for awareness, integrating OVE into routine primary care screenings, early intervention

programs in schools, and establishing tobacco and alcohol cessation support at PHCs.

CONCLUSION

Early detection through simple community screening like oral visual exams can help catch oral problems in time, especially in poorer areas. Chewing tobacco and areca nut are still the biggest causes of oral issues.

We need more awareness, education, and support to help people quit harmful habits. The findings from Kolar show the importance of making oral health a priority in similar places.

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