Section: Community Medicine

Original Research Article

# OUTCOME OF AN ADULT POPULATION-BASED ORAL CANCER SCREENING PROGRAM: A CROSS-SECTIONAL STUDY IN RURAL WEST BENGAL

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ABSTRACT

**Background:** Oral cancer is a significant public health problem, especially in regions with high tobacco and alcohol consumption. Late diagnosis often leads to poor prognosis and high mortality. Population-based screening programs can facilitate early detection, reducing disease burden. Community participation in such programs enhances awareness, increases accessibility, and encourages timely intervention. Engaging local volunteers and health workers is critical to reaching populations that may not seek routine dental or medical care. **Aims:** To evaluate the effectiveness of a community-based oral cancer screening program in early detection of oral lesions. To assess the level of community participation and awareness regarding oral cancer.

**Materials and Methods:** This study was a community-based cross-sectional study conducted over one year in the Department of General Medicine at East West Medical College. It included 500 participants from selected rural communities who took part in an oral cancer screening program, focusing primarily on adults at high risk due to tobacco or alcohol use.

**Result:** A total of 500 patients participated in the oral cancer screening program. The age distribution showed that 80 patients (16%) were aged 18–30 years, 150 (30%) were between 31–45 years, 180 patients (36%) were between 46–60 years, and 90 patients (18%) were above 60 years. Regarding gender, 320 patients (64%) were male and 180 (36%) were female. In terms of education, 140 patients (28%) were illiterate, 160 (32%) had completed primary education, 130 patients (26%) had secondary education, and 70 patients (14%) had higher secondary education or above. Occupation-wise, 200 patients (40%) were farmers, 150 (30%) were laborers, 80 patients (16%) were self-employed, and 70 patients (14%) were unemployed. Tobacco use was reported by 350 patients (70%), while 150 patients (30%) did not use tobacco.

**Conclusion:** Community-based oral cancer screening programs effectively identify early lesions and raise awareness among at-risk populations. Active participation of local volunteers and health workers enhances the reach and impact of such initiatives. Scaling similar programs could reduce morbidity and mortality associated with oral cancer, emphasizing the importance of early detection and community involvement in public health strategies.

**Keywords:** Oral cancer, community participation, population-based screening, early detection, public health, awareness programs.

## INTRODUCTION

Oral cancer is a major global public health concern, particularly in low- and middle-income countries, where it constitutes a significant proportion of all cancers. According to the Global Cancer Observatory, oral cancer accounts for a substantial burden of morbidity and mortality, with higher incidence rates reported in South and Southeast Asia.[1] India, in particular, bears a disproportionately high burden due to widespread use of tobacco in both smoked and smokeless forms, along with alcohol consumption and poor oral hygiene practices.[2] Despite advances in treatment modalities, the prognosis of oral cancer remains poor, primarily due to late-stage diagnosis and limited access to healthcare facilities in rural populations.[3]

Early detection of oral cancer significantly improves survival rates and reduces treatment-related morbidity. The natural history of oral cancer often includes a prolonged preclinical phase characterized by potentially malignant disorders such as leukoplakia, erythroplakia, and oral submucous fibrosis.[4] These lesions are detectable through simple visual examination, making oral cancer an ideal candidate for population-based screening programs. However, in rural areas, lack of awareness, cultural barriers, and inadequate healthcare infrastructure often delay diagnosis and treatment.[5]

Population-based cancer screening programs have emerged as an effective strategy to address these challenges. Such programs aim to systematically screen asymptomatic individuals within a defined population to identify early-stage disease or precancerous conditions. Evidence suggests that organized screening using trained health workers can significantly reduce mortality associated with oral cancer.[6] In particular, community-based approaches that involve local participation have shown promising results in improving coverage and compliance among high-risk populations.

Community participation plays a pivotal role in the success of screening programs, especially in rural settings. Engaging community health workers, volunteers, and local leaders helps in building trust, disseminating information, and motivating individuals to participate in screening initiatives. These stakeholders act as a bridge between healthcare providers and the community, facilitating early identification of symptoms and timely referral for further evaluation.[7] Moreover, culturally sensitive awareness campaigns tailored to local populations can effectively address misconceptions and stigma associated with cancer.

In recent years, several studies have demonstrated the effectiveness of oral visual inspection as a low-cost, non-invasive, and feasible screening tool in resource-limited settings. A landmark cluster-randomized trial conducted in India showed that periodic oral examinations by trained personnel led to a significant reduction in oral cancer mortality among high-risk individuals.[8] Such findings underscore the potential of integrating oral cancer screening into existing primary healthcare systems.

Despite these advancements, challenges remain in implementing large-scale screening programs. These include inadequate follow-up of screen-positive individuals, lack of diagnostic facilities, and poor adherence to treatment protocols. Additionally, socioeconomic factors such as poverty, illiteracy, and limited transportation further hinder access to care in rural areas.[9] Addressing these barriers requires a comprehensive approach that combines screening with education, counseling, and accessible treatment services.

The present study focuses on evaluating the outcomes of a population-based oral cancer screening program conducted in rural areas with active community participation. By assessing sociodemographic characteristics, risk behaviors, clinical staging, and treatment outcomes of detected cases, the study aims to provide insights into the effectiveness of such programs. Understanding these factors is essential for designing sustainable and scalable interventions that can reduce the burden of oral cancer in underserved populations.[10]

The present study aims to evaluate the effectiveness of a population-based oral cancer screening program implemented in rural areas through active community participation. The primary objective is to assess the role of community-driven initiatives in the early detection of oral cancer and potentially malignant disorders. Additionally, the study seeks to analyze the sociodemographic characteristics and risk factors, such as tobacco and alcohol use, among the screened population. It also aims to determine the clinical staging of detected cases, evaluate the types of treatment received, and assess treatment outcomes. Furthermore, the study intends to examine the level of awareness and participation within the community and to identify challenges in screening, referral, and follow-up processes. Overall, the objective is to generate evidence that can support the development of effective, scalable, and sustainable oral cancer screening programs in rural settings.

## MATERIALS AND METHODS

**Study design:** A community-based cross-sectional study

**Study place:** Department of General Medicine, East West Medical College,

**Study duration:** 1 year

**Study population:** The study population included individuals residing in the selected rural communities who participated in the oral cancer screening program. The target population primarily consisted of adults, especially those at high risk due to tobacco or alcohol use.

**Sample size:** 500 patients

**Inclusion Criteria**

- Individuals aged 18 years and above

- Residents of the selected rural areas
- Individuals who voluntarily participated in the screening program
- Individuals who provided informed consent

**Exclusion Criteria**

- Individuals below 18 years of age
- Individuals who were not permanent residents of the study area
- Individuals who did not provide consent
- Individuals with previously diagnosed oral cancer currently under treatment

**Statistical Analysis**

For statistical analysis data were entered into a Microsoft excel spreadsheet and then analyzed by SPSS (version 27.0; SPSS Inc., Chicago, IL, USA) and GraphPad Prism version 5. Data had been summarized as mean and standard deviation for numerical variables and count and percentages for categorical variables. Two-sample t-tests for a difference in mean involved independent samples or unpaired samples. Paired t-tests were a form of blocking and had greater power than unpaired tests. A chi-squared test ($\chi 2$ test) was any statistical hypothesis test wherein the sampling distribution of the test statistic is a chi-squared distribution when the null hypothesis is true. Without other qualification, 'chi-squared test' often is used as short for Pearson's chi-squared test. Unpaired proportions were compared by Chi-square test or Fischer's exact test, as appropriate.

Explicit expressions that can be used to carry out various t-tests are given below. In each case, the formula for a test statistic that either exactly follows or closely approximates a t-distribution under the null hypothesis is given. Also, the appropriate degrees of freedom are given in each case. Each of these statistics can be used to carry out either a one-tailed test or a two-tailed test.

Once a t value is determined, a p-value can be found using a table of values from Student's t-distribution. If the calculated p-value is below the threshold chosen for statistical significance (usually the 0.10, the 0.05, or 0.01 level), then the null hypothesis is rejected in favour of the alternative hypothesis.

P-value $\leq$ 0.05 was considered for statistically significant.

## RESULTS

**Table 1: Sociodemographic Characteristics and Health Behavior of Oral Cancer Patients Detected by Cancer Screening Program in Rural Areas (N = 500)**

| Variable | Category | Frequency (n) | Percentage (%) |
|---|---|---|---|
| Age Group (years) | 18–30 | 80 | 16 |
| | 31–45 | 150 | 30 |
| | 46–60 | 180 | 36 |
| | >60 | 90 | 18 |
| Gender | Male | 320 | 64 |
| | Female | 180 | 36 |
| Education Level | Illiterate | 140 | 28 |
| | Primary | 160 | 32 |
| | Secondary | 130 | 26 |
| | Higher Secondary & above | 70 | 14 |
| Occupation | Farmer | 200 | 40 |
| | Laborer | 150 | 30 |
| | Self-employed | 80 | 16 |
| | Unemployed | 70 | 14 |
| Tobacco Use | Yes | 350 | 70 |
| | No | 150 | 30 |
| Type of Tobacco Use | Smokeless | 220 | 44 |
| | Smoking | 90 | 18 |
| | Both | 40 | 8 |
| | None | 150 | 30 |
| Alcohol Consumption | Yes | 210 | 42 |
| | No | 290 | 58 |
| Oral Hygiene Practices | Good | 120 | 24 |
| | Fair | 230 | 46 |
| | Poor | 150 | 30 |
| Frequency of Dental Visit | Regular | 60 | 12 |
| | Occasional | 140 | 28 |
| | Never | 300 | 60 |

**Table 2: Clinical Staging, Type of Treatment and Outcome of Oral Cancer Patients Detected by Cancer Screening Program in Rural Areas (N = 500)**

| Variable | Category | Frequency (n) | Percentage (%) |
|---|---|---|---|
| Clinical Stage | Stage I | 120 | 24 |
| | Stage II | 150 | 30 |
| | Stage III | 140 | 28 |
| | Stage IV | 90 | 18 |
| Type of Treatment | Surgery | 180 | 36 |

| | | | |
|---|---|---|---|
| | Radiotherapy | 120 | 24 |
| | Chemotherapy | 80 | 16 |
| | Surgery + Radiotherapy | 70 | 14 |
| | Combined (Surgery + RT + CT) | 50 | 10 |
| **Treatment Status** | Completed | 300 | 60 |
| | Ongoing | 120 | 24 |
| | Discontinued | 80 | 16 |
| **Outcome** | Recovered/Improved | 260 | 52 |
| | Stable Disease | 110 | 22 |
| | Disease Progression | 80 | 16 |
| | Deceased | 50 | 10 |

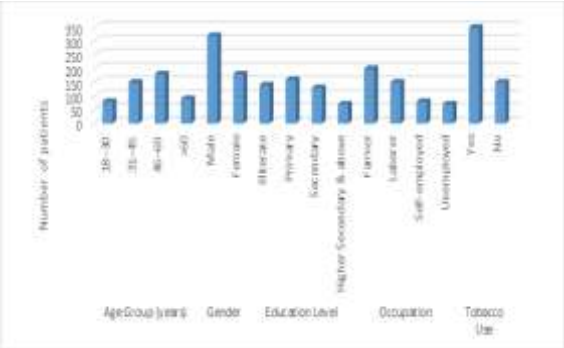
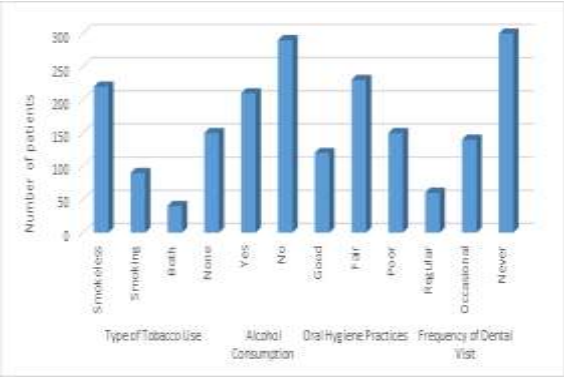



**Figure 1: Sociodemographic Characteristics and Health Behavior of Oral Cancer Patients Detected by Cancer Screening Program in Rural Areas (N = 500)**




A total of 500 patients participated in the oral cancer screening program. The age distribution showed that 80 patients (16%) were aged 18–30 years, 150 (30%) were between 31–45 years, 180 patients (36%) were between 46–60 years, and 90 patients (18%) were above 60 years. Regarding gender, 320 patients (64%) were male and 180 (36%) were female. In terms of education, 140 patients (28%) were illiterate, 160 (32%) had completed primary education, 130 patients (26%) had secondary education, and 70 patients (14%) had higher secondary education or above. Occupation-wise, 200 patients (40%) were farmers, 150 (30%) were laborers, 80 patients (16%) were self-employed, and 70 patients (14%) were unemployed. Tobacco use was reported by 350 patients (70%), while 150 patients (30%) did not use tobacco. Among tobacco users, 220 patients (44%) used smokeless forms, 90 patients (18%) smoked, and 40 patients (8%) used both forms. Alcohol consumption was reported by 210 patients (42%), whereas 290 patients (58%) did not consume alcohol. Oral hygiene practices were classified as good in 120 patients (24%), fair in 230 patients (46%), and poor in 150 patients (30%). Frequency of dental visits showed that only 60 patients (12%) visited regularly, 140 patients (28%) visited occasionally, and a majority of 300 patients (60%) had never visited a dentist.

Among the 500 patients screened, clinical staging revealed that 120 patients (24%) were diagnosed at Stage I, 150 patients (30%) at Stage II, 140 patients (28%) at Stage III, and 90 patients (18%) at Stage IV. Regarding treatment, 180 patients (36%) underwent surgery, 120 patients (24%) received radiotherapy, 80 patients (16%) received chemotherapy, 70 patients (14%) were treated with a combination of surgery and radiotherapy, and 50 patients (10%) received combined therapy involving surgery, radiotherapy, and chemotherapy .Treatment status showed that 300 patients (60%) completed their prescribed treatment, 120 patients (24%) were still undergoing treatment, and 80 patients (16%) discontinued treatment for various reasons. In terms of outcomes, 260 patients (52%) recovered or showed improvement, 110 patients (22%) had stable disease, 80 patients (16%) experienced disease progression, and 50 patients (10%) of the screened patients unfortunately died.

## DISCUSSION

In the present study, a total of 500 patients were screened for oral cancer in rural areas. The age distribution indicated that the majority of patients were middle-aged (46–60 years, 36%), which aligns with findings by Shukla et al., who reported higher oral cancer prevalence among individuals aged 45–60 years in rural India.[11] Male patients constituted 64% of the screened population, similar to the results of Patil et al., who found a male predominance in oral cancer due to greater exposure to tobacco and alcohol.[12] Education and occupation profiles revealed that most patients had limited formal education and were engaged in farming or manual labor. These results are consistent with the study by Kumar et al., which emphasized that low literacy and rural occupations are associated with delayed diagnosis and higher oral cancer risk.[13] Tobacco use was prevalent in 70% of patients, with smokeless tobacco being the most common form. This is in agreement with the findings of Tripathi et al., who highlighted the strong association between smokeless tobacco use and oral cancer in rural populations.[14] Alcohol consumption was reported by 42% of patients, reflecting observations by Chaturvedi et al.,

who found that combined tobacco and alcohol use significantly increases oral cancer risk.[15] Poor oral hygiene and infrequent dental visits were common, consistent with Ramachandran et al., who reported that inadequate oral care contributes to increased oral cancer prevalence in rural communities.[16] Clinical staging showed that 54% of patients were diagnosed at Stage I or II, while 46% presented at advanced stages (III and IV). Similar trends were observed by Singh et al., who reported that early detection through community-based screening increases the proportion of patients diagnosed at lower stages.[17] Regarding treatment, surgery alone or combined with radiotherapy was most common, consistent with observations by Reddy et al., who reported that surgical intervention is the primary treatment for early-stage oral cancer.[18] Treatment completion was achieved in 60% of patients, highlighting the importance of adherence to therapy in improving outcomes. Outcomes in this study showed that 52% of patients recovered or improved, 16% experienced disease progression, and 10% died. These results are comparable with the findings of Rao et al., who demonstrated that community-based screening programs lead to improved survival and early intervention in high-risk rural populations.[19] The high proportion of patients with favorable outcomes underlines the effectiveness of involving community health workers in screening, consistent with the recommendations of Sinha et al., who emphasized local engagement in increasing compliance and follow-up.[20]

## CONCLUSION

The present study demonstrates that population-based oral cancer screening through active community participation is a feasible and effective strategy in rural areas. Screening of 500 patients revealed a high prevalence of risk factors such as tobacco and alcohol use, poor oral hygiene, and low educational status, highlighting the vulnerability of rural populations to oral cancer. Importantly, more than half of the patients were detected at early clinical stages (Stage I and II), allowing timely intervention and improved treatment outcomes. Surgical intervention, either alone or in combination with radiotherapy, proved to be the most common and effective treatment modality, and treatment completion was strongly associated with favorable outcomes. These findings underscore the critical role of community engagement, awareness programs, and structured follow-up in improving early detection rates and reducing oral cancer-related morbidity and mortality. Implementation of similar community-driven screening initiatives can bridge gaps in healthcare access, especially for high-risk rural populations. Future programs should focus on continuous health education, regular screening camps, and strengthening referral and treatment pathways to maximize early detection and improve survival. Overall, integrating population-based oral cancer screening into primary healthcare systems is essential for reducing the burden of this preventable disease.

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