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

BY

Dr. SUDHAKAR.S

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In
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DEPARTMENT OF COMMUNITY MEDICINE
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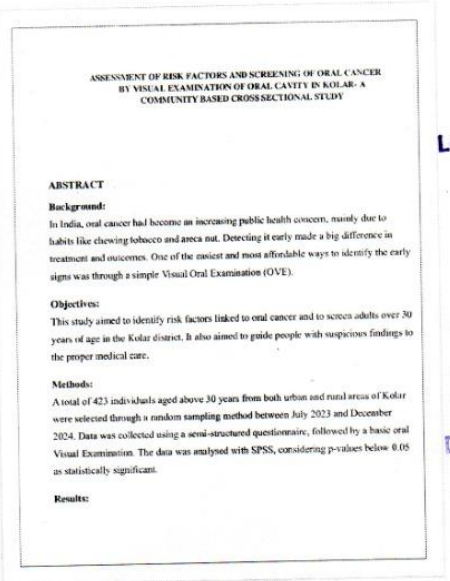

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ABSTRACT

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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.

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.

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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.

Key Words: Oral cancer, Risk factors, Screening, Oral visual examination.

LIST OF ABBREVIATIONS

AI: Artificial Intelligence

ANM: Auxiliary Nurse Midwife

AOR: Adjusted Odds Ratio

BMI: Body Mass Index

CI: Confidence Interval

COR: Crude Odds Ratio

DM: Diabetes Mellitus

HPV: Human Papilloma Virus

HTN: Hypertension

JNC: Joint National Committee

OBC: Other Backward Class

OPMD: Oral Potentially Malignant Disorders

OSCC: Oral Squamous Cell Carcinoma

OVE: Oral Visual Examination

RHTC: Rural Health Training Centre

SC: Scheduled Caste

SPSS: Statistical Package for the Social Sciences

ST: Scheduled Tribe

UHTC: Urban Health Training Centr

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INTRODUCTION

1.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] HPV infection was recognised as a significant risk factor for oral cancer, contributing significantly to its development along with other infections such as syphilis.[1] A dietary risk factor for oral cancer has been identified as low consumption of oily fish, and these factors may combine with other lifestyle choices

to increase the risk.[8] Nutritional deficiencies and inadequate oral hygiene, including periodontal disease were also linked to a higher risk of developing oral cancer.[1]

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.[9]

Chemotherapy, radiation, and surgery are only a few of the many interventions needed to treat advanced oral cancer. Early detection can help individuals and healthcare systems save money by reducing the need for these costly therapies.[10]

Challenges: - Although technologies like the electronic tongue (e-tongue) and artificial intelligence (AI) models had shown high accuracy in studies, their practical use in real-world settings remained limited. This was mainly because different studies use different methods and there was still a need long-term trials to confirm their true reliability. Similarly, tools like the VELscope, which used special light to detect early changes in the mouth, seem helpful in spotting potentially cancerous mouth conditions. However, more research was needed to clearly understand how accurate and dependable these tools truly were. [11]

Liquid biopsies offered a less invasive option for detecting cancer, but they still faced challenges in accurately identifying tumour variations. More evidence was required to prove their effectiveness in early cancer detection. [12]

In many underdeveloped countries, people lacked access to advanced diagnostic technologies, which often resulted in late diagnoses, more complications, and higher death rates. This highlighted the urgent need to develop simple, affordable screening methods that could be used widely across all communities.[13]

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. This method involved a thorough clinical assessment that included both visual inspection and palpation, making it valuable for early detection and improving patient outcomes. It was especially effective among high-risk individuals, such as those with a history of tobacco or alcohol use.[14]

1.1 Problem statement-

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.[15]

NEED FOR STUDY: -

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.

OBJECTIVES OF STUDY

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.

REVIEW OF LITERATURE

History of oral Cancer: - Hippocrates is credited with naming the disease "cancer." He believed it was caused by an imbalance in the body's humours.[16]

The history of oral cancer is long and complex, stretching from ancient times to today. Early civilizations like the Egyptians and Greeks first recognized oral cancer. They described it in medical texts, and treatments mostly involved surgery and cauterization to control symptoms and stop bleeding.[17]

Over the centuries, our understanding of oral cancer has progressed considerably, shaped by advancements in culture, science, and technology.

Ancient Egyptian and Greek doctors recorded cases of oral cancer.

Modern developments: -

The Renaissance was a turning point in medical history. During this time, there was a greater understanding of how diseases work and how tissues are affected. This new knowledge led to more advanced surgical and drug treatments.[17]

In the 20th century, evidence-based medicine emerged incorporating surgery, radiation and chemotherapy as standard treatment approaches. Doctors have been able to detect and treat oral cancer more effectively by having a better understanding of risk factors such as alcohol consumption, tobacco use, and HPV infection.[18]

Age and oral cancer: -

The relationship between age and oral cancer in India is complex, with several studies identifying different age groups as more risk. Oral cancer is widespread across various regions of the country, with certain age groups exhibiting higher incidence rates. The majority of cases tend to occur in the 30–50-year age range, with a significant rise in incidence observed in the East Zone of India.[19]

Gender and oral cancer: -

Oral cancer was the third most prevalent cancer in India, and it disproportionately affected men. It was the most commonly diagnosed cancer in Indian men and a leading cause of cancer-related mortality.

With about two and a half men affected for every woman, oral squamous cell carcinoma was more common in men than in women. Men typically received their diagnoses around age 57, whereas women typically received their diagnoses around age 46.[20]

Religion and oral cancer: -

In India, religion and cultural traditions played an important role in how often oral cancer occurred and how it was treated. These factors affected people's daily habits, their decisions to seek medical care, and the treatment they choose. The high number of oral cancer cases was closely linked to common cultural habits like chewing betel quid, tobacco, and areca nut. These practices were deeply connected to religious rituals and social customs in many communities. These practices are widespread among various religious groups, contributing to the country's high oral cancer rates. Despite improvements in medical technology and

treatment, many people with oral cancer were still diagnosed at a late stage. This along with limited access to healthcare lead to low survival rates.[21]

Caste and oral cancer: -

A large portion of people in India lived in rural areas, where many from lower caste communities faced financial struggles and limited access to healthcare and education. Limited awareness and lack of preventive measures driven by illiteracy and poverty within lower caste communities contribute to higher rates of oral cancer.[22]

Chronic illness and oral cancer: -

Chronic illnesses like diabetes and oral cancer are common in India and put a strain on the healthcare system. People are now realizing that diabetes and oral cancer can have similar causes. Being overweight and certain changes in the body may raise the risk for both diseases. Diabetes is a common chronic condition in India and is linked to a higher risk of oral cancer. This is because both conditions share common risk factors, including oxidative stress and immune system dysfunction. This connection shows the importance of creating public health strategies that address both of these health issues together.[23]

Family history and oral cancer: -

A family history of cancer significantly impacts the risk and prognosis of oral cancer in India. Research suggests that having a family history of cancer can affect both the probability of developing oral cancer and the prognosis for those diagnosed. This connection is intricate, involving A combination of family history, the environment around us, and the way we live our lives all work together to affect our health. The following sections provide a detailed exploration of these elements.

People who had a family history of cancer often faced worse outcomes after being diagnosed with oral squamous cell carcinoma. They were more likely to experience a recurrence or had shorter survival compared to those without such a history. This implied that a family history of cancer might be a risk factor for a worse prognosis on its own.[24]

Risk factors of oral cancer: -

Tobacco use, whether smoked or smokeless, is closely linked to oral cancer in India. Individuals who use tobacco face a notably higher risk of developing oral cancer, with a pooled effect size of 2.71 for smoked tobacco and 2.68 for smokeless tobacco.[25]

Cigarettes and oral cancer: -

Cigarette smoking has long been known to be a significant habit that raises the risk of oral cancer. Numerous studies have demonstrated a strong correlation between smoking and the illness. Cigarette smoke contained harmful substances like nitrosamines and polycyclic aromatic hydrocarbons, which could damage the tissues inside the mouth. Additionally, it contained cadmium, a hazardous element that raised the generation of reactive oxygen species, which could cause cancer and damage to cells.

Smoking was one of the biggest risk factors for oral cancer because of these detrimental effects taken together. Indeed, smoking was thought to be the cause of almost half of the deaths from this illness.[25]

Bidi and oral cancer: -

In India, bidi smoking has been a significant risk factor for oral cancer. Especially among people from lower-income backgrounds. Since bidis were cheaper than cigarettes, they were more commonly used. This widespread use contributed to a higher number of oral and oropharyngeal cancer cases. Studies found that bidi smoke contained several harmful chemicals that increased the chances of developing cancer in the mouth and throat. Among bidi smokers, the base of the tongue was often the most affected area.[26]

In South India, studies showed that around 18.2% of people who smoked bidis developed oral cancer, while about 14.3% developed leukoplakia-a white patch in the mouth that's often seen as an early warning sign or precancerous condition.[27]

Chutta and oral cancer: -

In India, chutta, a type of smokeless tobacco, has been a major cause of oral cancer risk. Its use along with other tobacco products was widespread, especially when combined with areca nut and betel quid. These habits were deeply rooted in cultural practices, which made it difficult to raise awareness or change behaviour. Even though treatment options and awareness efforts had improved over time, the number of oral cancer cases continued to rise.[28]

Reverse smoking and oral cancer: -

Reverse smoking was a dangerous habit where people placed the lit end of a cigarette or bidi inside their mouth instead of holding it the usual way. This was associated with a significantly increased risk of oral cancer and frequently resulted in burns and injuries to the roof of the mouth. In some regions of India, the practice was more widespread. Studies showed that reverse smoking had a strong association with oral squamous cell carcinoma, particularly affecting the palate. In fact, the risk of developing oral cancer was found to be over 40 times higher in reverse smokers compared to those who didn't smoke.[29,30]

Betel leaf, areca nut and oral cancer: -

In India, betel leaf commonly used in preparing betel quid was a strong link to oral cancer, especially when mixed with areca nut and sometimes tobacco. The International Agency for Research on Cancer categorized areca nut, a major component of betel quid, as a Group 1 carcinogen, which means it considerably raised the risk of developing cancer. This risk became even higher when tobacco was added to the mix. Studies have shown that chewing areca nut and betel leaf together increases the risk of developing oral cancer by almost eight times compared to those who do not. Betel quid chewing alone accounted for nearly half about 49.5% of oral cancer cases in the country, highlighting its major impact on public health.[31]

Gutkha and oral cancer: -

The growing incidence of oral cancer in India was largely caused by gutkha, a type of smokeless tobacco. Although its health hazards were well established, its use remained widespread, especially in rural communities where socioeconomic challenges and limited education played a major role. Estimates suggest that over 65 million individuals consumed gutkha, making it one of the most harmful oral carcinogens in the country. Regular use of gutkha was strongly linked to the development of conditions like oral submucous fibrosis (OSMF) and leukoplakia-both considered early warning signs of oral cancer. The combination of gutkha chewing and bidi smoking further elevated the risk. According to research, nearly one-third of gutkha users (33.3%) developed tobacco pouch keratosis, a precancerous lesion associated with oral malignancies.[32]

Pan masala and oral cancer: -

Pan masala, a commonly chewed product in India, was closely linked to a higher risk of oral cancer. Typically made from areca nut, slaked lime, and various flavouring agents, it was popular among people of all age groups and backgrounds. Interestingly, even when tobacco was not included, the use of pan masala was associated with a greater chance of developing precancerous changes in the mouth. According to a North Indian study, people who ate non-tobacco pan masala had a significantly higher chance of developing oral precancer than people who didn't use it (odds ratio of 20.71).[33] Pan masala consumption is linked to oral submucous fibrosis was a condition that made the mouth stiff and difficult to open over time. In many cases, it gradually worsened and often lead to oral cancer if not treated early.[34]

Alcohol and oral cancer: -

In India, it has been demonstrated that alcohol use significantly contributes to the development of oral cancer. Especially when paired with habits like tobacco use and chewing betel quid. The widespread incidence of oral cancer in the country is largely driven by these combined risk factors. While alcohol alone poses health risks, its impact on oral cancer becomes significantly greater when used alongside tobacco and areca nut products. Research indicates that nearly 75% of oral cavity cancers in India are associated with the combined effects of smoking, alcohol consumption, and other high-risk chewing habits.[35]

Sharp tooth and oral cancer: -

Sharp teeth or dental irregularities can contribute to oral cancer by causing constant irritation or injury to the mouth's lining. this ongoing irritation can lead to changes in cells that might increase the risk of cancer. while sharp teeth aren't the main cause of oral cancer, they can be a contributing factor, especially with other risks like tobacco and alcohol use. sharp teeth can repeatedly damage the oral tissues, causing ongoing irritation. this can lead to changes in the cells making the tissue more susceptible to cancerous transformations.[36] The irritation caused by sharp teeth can result in inflammation and the development of lesions which may be early signs of oral cancer.[37]

Dental caries and oral cancer: -

Although both dental caries and oral cancer are serious issues for oral health, their causes and effects differ. Dental caries mainly caused by bacteria that lead to tooth decay can be managed successfully with early detection and treatment. on the other hand, oral cancer was a more serious condition involving malignant growths in the mouth and it was linked to higher rates of illness and death. Early detection of dental caries can prevent them from developing into more serious oral health problems, highlighting the importance of regular dental visits and the use of advanced diagnostic tools.[38]

Dental fluorosis and oral cancer: -

Dental fluorosis and oral cancer are separate oral health problems, but they can overlap in areas with high fluoride exposure. Dental fluorosis occurs when too much fluoride is consumed during tooth development, causing weak enamel. oral cancer involves cancerous growths in the mouth and had several risk factors tobacco use and poor oral hygiene. The link between these conditions was complicated and affected by both environmental and lifestyle factors. Dental fluorosis was common in areas with high fluoride levels in water, like certain regions of Africa and India. In Vijayawada, India almost 45% of residents were impacted by dental fluorosis, but many cases go undiagnosed due to a lack of awareness.[39]

Ulcer growth and oral cancer: -

Persistent ulcers in the mouth are often early warning signs of oral cancer, particularly in individuals with high-risk habits. Long-term alcohol use, tobacco use, and persistent mouth irritation have all been linked to oral squamous cell carcinoma (OSCC), the most prevalent type of oral cancer. These factors can cause ulcers that fail to heal, which may eventually

become cancerous if left unchecked. People with a history of tobacco use are particularly at risk for developing chronic ulcers because they are far more likely to develop OSCC. In a study conducted in western Maharashtra, 80.4% of patients who had non-healing ulcers and a background of tobacco use were diagnosed with OSCC. Tobacco, being a potent carcinogen, compromises the protective lining of the mouth, making it more vulnerable to cancer development.[40]

Leucoplakia and oral cancer: -

Oral leucoplakia was a condition where white patches appear in the mouth and can lead to oral cancer. The risk of it turning cancerous depends on factors like the type and location of the leucoplakia, as well as habits like smoking or having a weakened immune system. understanding these factors was important for early detection and treatment to prevent cancer. Oral leucoplakia had an overall malignant transformation rate of about 6.64%.[41] dysplastic leucoplakia, particularly those with higher levels of dysplasia, greatly raises the risk of turning into cancer.42

Erythroplakia and oral cancer: -

Oral Erythroplakia is an uncommon but serious condition that appears as a red patch inside the mouth It only affects 0.02% to 1.14% of people, but it has a high risk of developing into oral cancer, particularly squamous cell carcinoma. Because of this strong potential for malignancy, recognizing and treating erythroplakia early is extremely important for preventing cancer.[43]

Figure 1: Oral visual examination procedure

1. Preparation

Ensure good lighting (natural or white light). use sterile gloves, mouth mirror, and gauze.

2. Patient positioning

Seat the participant comfortably with head support. explain the procedure and take consent.

3. External examination

Inspect lips, cheeks, and face for any swelling, discoloration, or asymmetry.

4. Intraoral inspection

The oral cavity was examined in an orderly manner, starting with the lips, buccal mucosa, gums, and tongue.
It continued with the inspection of the oropharynx, Floor of the mouth, and both the Hard and Soft palate.

5. Palpation (if needed)

Gently palpate any suspicious lesions for induration or nodules.

6. Documentation

Record all findings: site, size, shape, texture, and colour of any lesions.

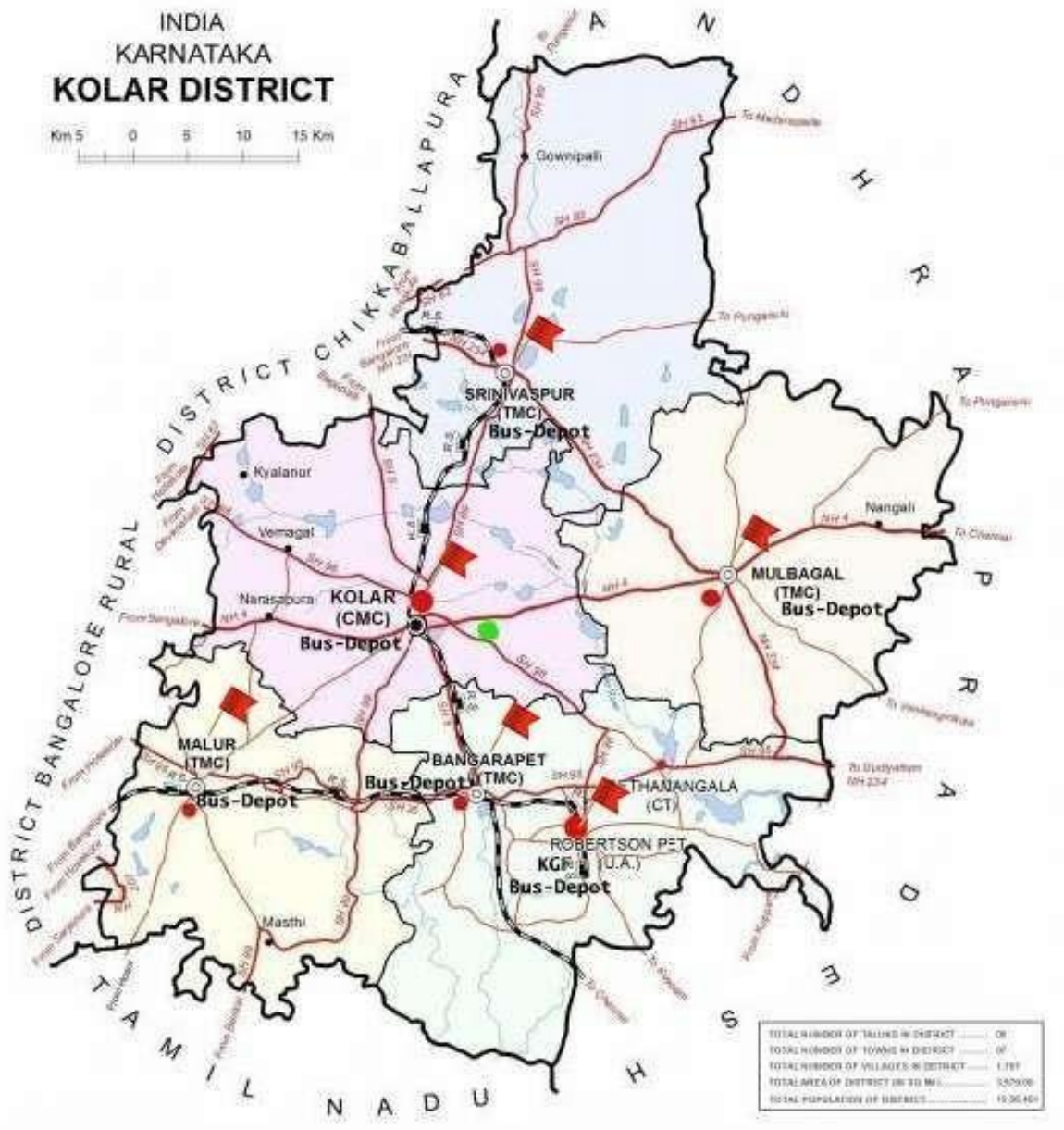
7. Referral Refer cases with suspicious findings for further evaluation (e.g., biopsy).[44]

MATERIALS AND METHODS

4.MATERIALS AND METHODS

4.0 Topography of Kolar district

Figure no: 2 Map of Kolar district.



The easternmost district in Karnataka is Kolar district, which is located in the southeast of the state. The district office is in the town of Kolar. Geographically speaking, it is bounded to the west by Bangalore Rural, to the north by Chikkaballapur, to the east by Andhra Pradesh's Chittoor district, and to the south by Tamil Nadu's Krishnagiri and Vellore districts. The six taluks that comprise the district are Kolar, Mulbagal, Malur, Bangarpet, Srinivaspura, and Kolar Gold Fields (KGF).

4.1 Study settings:

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

4.2 Study population:

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

4.3 Study design:

Community based Cross sectional study.

4.4 Study duration:

July 2023 to December 2024

4.5 Inclusion criteria

- Participants aged above 30 years.
- Permanent residents.

Exclusion criteria

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

4.6 Study tool:

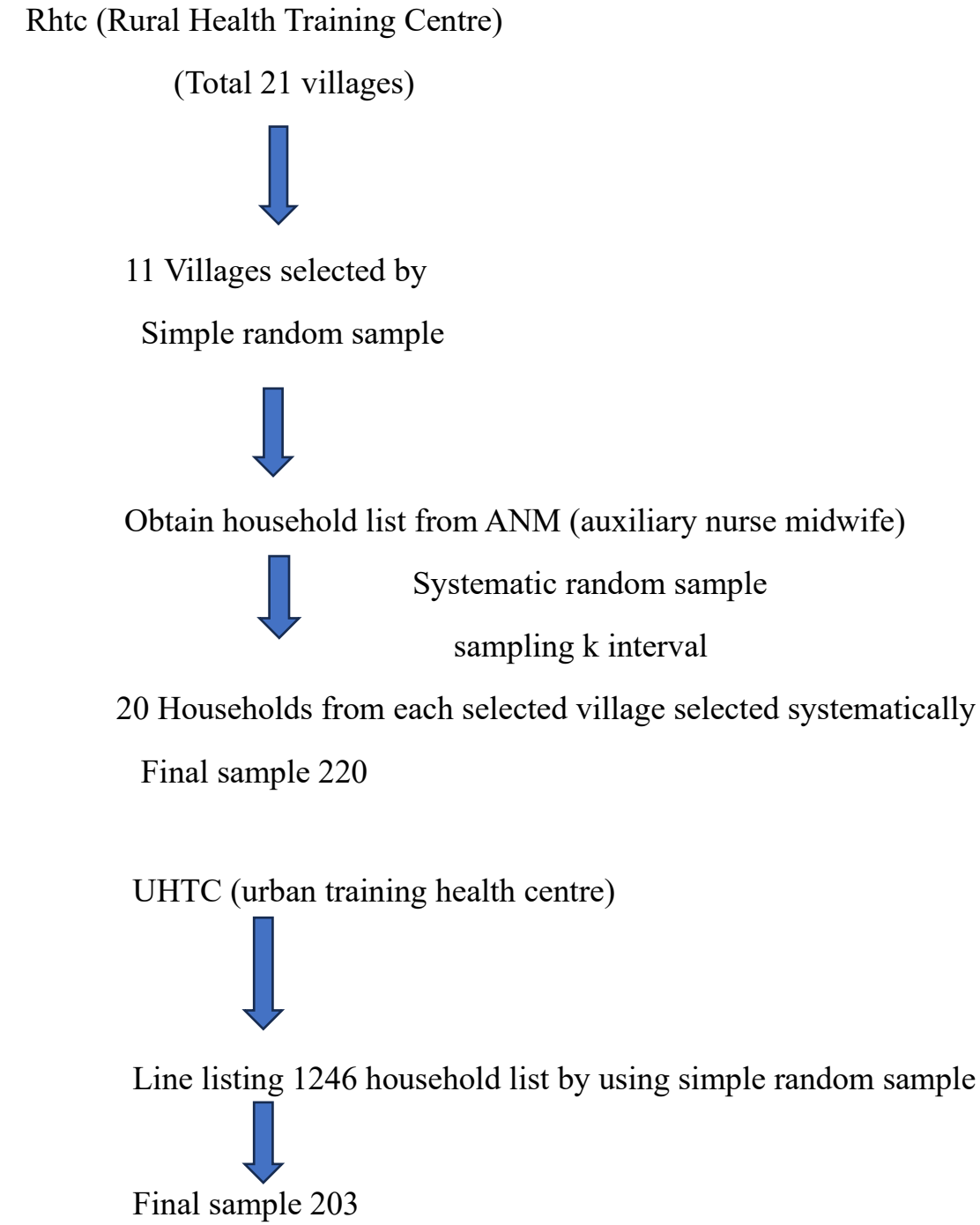
A semi structured questionnaire was be used which includes sociodemographic details, general physical examination, risk factors for oral cancer and oral visual examination of oral cavity (OVE) data were captured by face-to-face interview.

4.7 Sampling method:

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

4.8 Methods of collection of data including sampling procedure:

Figure No:3 Flowchart of sampling procedure



In Kolar district, sampling was done from both rural and urban areas in a planned way. in the rural area, covered by the rural health training centre (RHTC), there were 21 villages in total. out of these 11 villages were randomly selected. With the help of the auxiliary nurse midwife (ANM), a list of households was made for each village. Using systematic random sampling, 20 households were chosen from each village based on a calculated interval, giving a total of 220 rural households.

In the urban area, under the urban health training centre (UHTC), there was a list of 1246 households. From this list 203 households were selected randomly for the study.

In total, the study included 423 households - 220 from the rural area and 203 from the urban area. This sampling method helped ensure that the study covered a good mix of people from both rural and urban settings.

One individual from that selected household was be interviewed and all information pertaining to the risk of oral cancer was captured. all individuals interviewed were subjected oral visual examination of oral cavity (OVE).

4.9. 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+/-10

n=423(sample size)

n=sample size p=prevalence d=absolute error zα=confidence interval q=100-p

The final sample size was set at 423 participants.

4.10 Tool construction for data collection:

A semi-open, semi-structured questionnaire was designed to collect details on sociodemographic factors, lifestyle-related risk factors, oral health, findings from the general physical examination, and to aid in the screening for oral cancer (**Annexure I**).

4.11 Pilot study:

Total 15 individuals fulfilling the inclusion and exclusion criteria were interviewed and examined during 1month of pilot study April 2024 to test predesigned questionnaire and to make any changes if necessary.

4.12 Approval for the study

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

4.13 Autonomy

An information sheet outlining the study's goal and inviting their voluntary participation was given to each participant. No one was under any obligation to participate; it was completely voluntary. After being fully informed about the purpose of the study, the procedures, and any potential risks or benefits, each participant provided their informed consent.

4.14 Confidentiality

A Self-administered and, confidential questionnaire was completed by the participants to obtain this data. throughout the study strict confidentiality of the personal information, their health status and only responses to stress assessment were also conducted. anonymized data were kept in a department locker to ensure limited accessibility.

4.15 Benevolence

The participants who were found to have Ove positive were informed regarding the same and advised to seek medical support. the study aimed to benefit the participants and contribute to the understanding of risk factors and premalignant lesion of oral cancer its impact on health among population. researcher ensured that the study design, procedures, and prioritized the well-being of the participants.

4.16 Justice

Research ensured that the selection of participants was fair and equitable, devoid of any discrimination. The benefits of the research were distributed fairly among all participants, while minimizing any burdens or risks

4.13 Final data collection

a) Written consent:

All participants gave their written informed consent after being informed of the study's goal and given the assurance that their data would be kept private. The consent was given in a language that they were familiar with and understood (**Annexure II**).

b) Data collection process:

Once a good rapport was established, participants were kindly asked to spare about 30 minutes for the interview and examination. Sociodemographic details were gathered using a pretested, semi-structured questionnaire. Information on risk factors was collected, and a general physical examination was carried out, which included measuring Height, Weight, Vital signs, Blood Pressure, and Pulse rate.

4.14 Tools and techniques used in the study.

A) Tools:

I) Pretested semi structured questionnaire.

II) Portable weighing machine

III) Stethoscope

IV) Sphygmomanometer

V) Measuring tape

B) Technique: -

1.History:

All the information regarding existing morbidities was collected verbally as said by participants. an attempt was made to check their health cards or personal records for the information on the past morbidities to gather information about treatment or hospital admission

2.Anthropometric measurements:

a) Weight: To ensure accurate weight measurements, the weighing machine was regularly calibrated using a known standard weight. Before starting, the participants were clearly guided on the weighing procedure. They were asked to wear light clothing and stand barefoot on a Berkeley dial-type bathroom scale. The scale was reset to zero after each use. Each participant was carefully observed for correct posture-standing upright, feet together, without support, and looking straight ahead at a fixed point on the opposite wall to maintain proper alignment. Weight was recorded only when the scale showed accurate readings, and each measurement was noted to the nearest 100 grams.[45,46]

b) Height: Participants was measured using Non-elastic Measuring tape fixed to a flat wall. Participants stood barefoot on a level surface with their heels, buttocks, and back of the head touching the wall, and their arms resting naturally at their sides. They were asked to look straight ahead, fixing their gaze on a point on the opposite wall to align their head in the Frankfurt plane. A non-flexible ruler was used to mark the top of head, and the elevation was measured to the closest 1 centimetre. [45,46]

3.Indices

1) **Calculation of BMI**

Body Mass Index (BMI) was calculated using the same standard formula used globally: Weight in kilograms divided by the square of height in meters.

(BMI = Weight [kg] / Height [m^2]).

Participants with a BMI greater than 25 were categorized as obese.

In Asian populations, particularly among Asian Indians, health risks related to obesity-such as insulin resistance-can occur even at lower BMI levels due to higher amounts of visceral fat, despite having a relatively lean body frame. Therefore, the BMI classification recommended specifically for Asian adults was used in this study.[47]

Classification	BMI for Europids	Classification	BMI for Asians
Underweight	>18.5	Underweight	>18.5
Normal weight	18.5-24.99	Normal weight	18.5-22.99
Over weight	>25	Over weight	>23
Pre Obese	25-29.99	At risk	23-24.99
Obese I	30-34.99	Obese I	25-29.99
Obese II	35-39.99	Obese II	>30
Obese III	>40		

3.Clinical examination: Pulse and blood pressure was measured for all the participants. clinical examination of cardiovascular system was done.

a) Pulse:

The radial pulse in the right hand was measured for complete one minute and the reading was entered.

b) Blood pressure measurement: -

To ensure accurate blood pressure readings, participants were first made to feel relaxed and comfortable. Blood pressure was measured while the participant was seated, after allowing a few minutes of rest. Around the fourth intercostal space, the forearm was supported so that the elbow crease (cubital fossa) was at heart level. Participants were advised to avoid wearing tight sleeves during the procedure.

After being wrapped around the exposed arm, a typical adult cuff was inflated to a pressure of around 30 mmHg above the point at which the pulse vanished. It was then gradually deflated at a rate of about 2 mmHg per second. A stethoscope was positioned over the brachial artery on the right arm to listen for Korotkoff sounds during deflation. Systolic blood pressure was measured at the first sound heard, and diastolic blood pressure was measured at Phase V, when the sound completely stopped. At least three-minute intervals were used to take three readings; the lowest of the three was used for analysis.[48]

Classification	**Systolic BP (mm Hg)**	**Diastolic BP (mm Hg)**
Normal	<120	<80
Pre-hypertension	120-139	80-89
Stage 1 hypertension	140-159	90-99
Stage 2 hypertension	>160	>100

Source: Joint National Commission on detection, evaluation and treatment of high blood pressure (JNC 8).[48]

4.14 Definitions of variables (annexure no: iii)

1. 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.

2.Documentation phase:

The analysed data were presented clearly using text, tables, and graphs for better understanding. The findings were then interpreted and compared with results from other relevant studies to draw meaningful conclusions.

RESULTS

Table 1 - Distribution of Study participants according to area of residency (n=423).

Area of residence	Frequency	Percentage (%)
Urban	203	48%
Rural	220	52 %
Total	**423**	**100%**

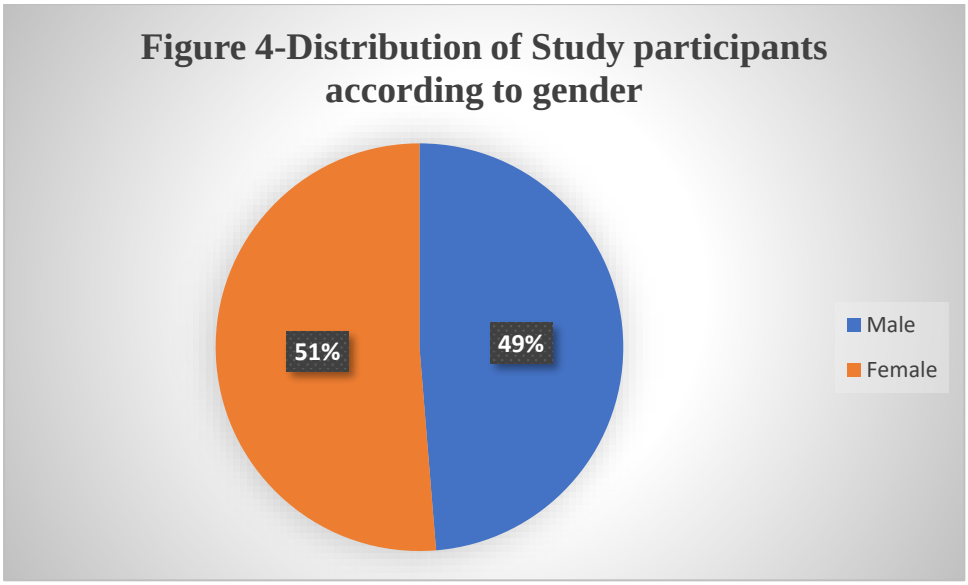
Out of the 423 individuals who participated in the study, just over half—52% (220 participants)—were from rural areas, while 48% (203 participants) were from urban areas.

Table 2- Distribution of Study participant according to age (n=423).

Age (in years)	Frequency (n)	Percentage (%)
30-40yrs	161	38.1%
41-50yrs	85	20.1%
51-60yrs	83	19.6%
>60yrs	94	22.2%
total	423	100.0

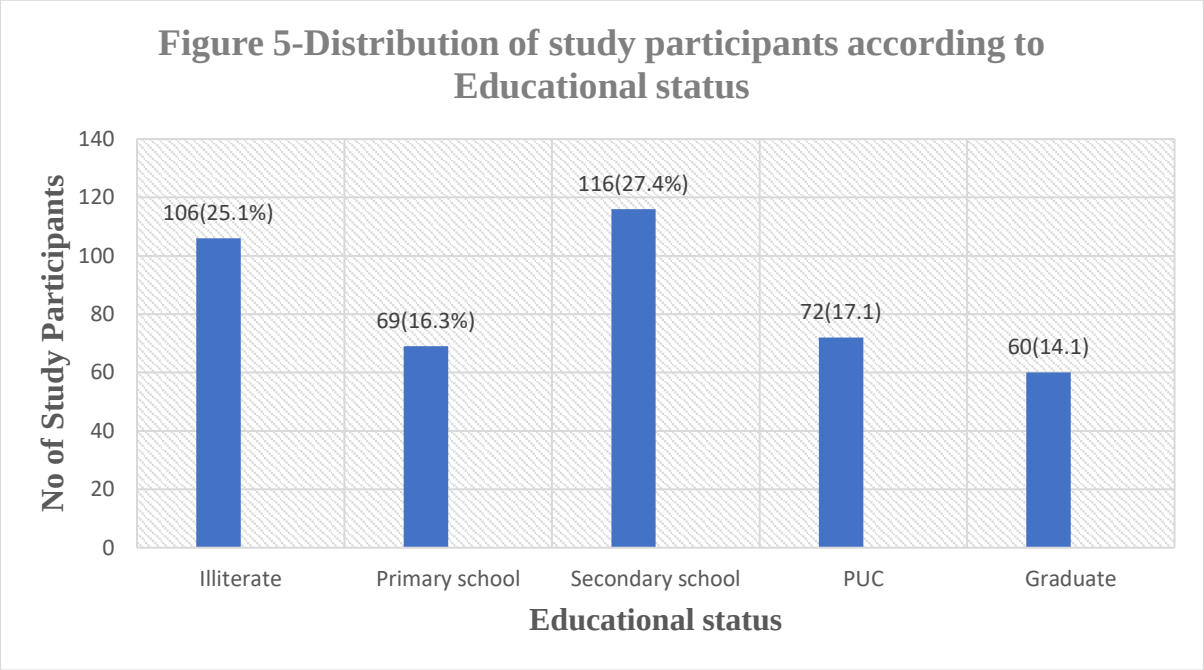
The study included participants from different age groups. the largest group 38.1% (161 participants) was between 30-40 years, followed by 20.1% (85 participants) in the 41-50 years group. 19.6% (83 participants) were in the 51-60 years range and 22.2% (94 participants) were over 60 years. most participants are in their 30 to 40 years.

Figure 4-Distribution of Study participants according to gender (n=423).



The study included nearly equal number of male and female participants. 48.7% (206 were male), while 51.3% (217 were female).

Figure 5: Distribution of Study participants according to educational status (n=423).



The distribution of study participants based on their educational status is presented in a simple bar chart. 27.4% (116 participants) had completed secondary schooling followed by 25.1% (106 participants) who were illiterate**.** 17.1% (72 participants) had finished pre-university course (PUC)**,** 16.3% (69 participants) had primary school education and 14.1% (60 participants) were graduates**.**

Table 3-Distribution of Study participants according to religion (n=423).

Religion	Frequency (n)	Percentage (%)
Hindu	393	92.9%
Christian	24	5.7%
Muslim	6	1.4%
Total	423	100.0

The study shows that most participants were Hindu making up about 93% of the group. Christians made up to 6%, and Muslims were around 1%.

Table 4-Distribution of Study participants according to caste(n=423).

Caste	Frequency(n)	Percentage (%)
OBC	173	40.9%
SC	196	46.3%
ST	7	1.7%
Others	47	11.1%
Total	423	100.0

The study showed majority of participants were from the SC (46%) and OBC (41%) groups. a smaller portion were from the "others" category (11%), and only (2%) belong to ST.

Table 5-Distribution of Study participants by Modified BG Prasad classification 2024 (n=423).

Socio-economic status	Frequency (n)	Percentage (%)
Upper class	4	0.9%
Upper middle	28	6.6%
Middle class	84	19.9%
Lower middle class	169	40.0%
Lower class	138	32.6%
Total	423	100.0

The study shows most of the people belonged to lower socio-economic backgrounds. 40% were from the lower middle class, 33% were from the lower class, and 20% were from the middle class. only a small percentage were from the upper middle class (7%) and the upper class (1%).

Table 6- Distribution of Study participants according to Chronic illness (n=423).

Chronic illness	Frequency(n)	Percentage (%)
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%
Total	423	100.0

Most participants in the study, 69% (292 people), did not have any chronic illnesses. among those who had chronic conditions, Diabetes Mellitus (DM) was the most common, affecting 13.2% (56 people), followed by Hypertension (HTN) at 9.2% (39 people). a smaller group, 5.4% (23 people), have both hypertension and diabetes. asthma affects 1.8% (8 people), and epilepsy is the least common, affecting 1.1% (5 people). diabetes and hypertension are the most frequently reported conditions.

Table 7- General Physical Examination findings among the participants (n=423).

Parameters	Frequency(n)	Percentage (%)
Pallor	57	13.5%
Clubbing	21	5.0%
Edema	3	0.7%
Total	423	100.0

Out of the 423 participants examined:

- Pallor was found in 57 participants (13.5%).
- Clubbing was observed in 21 participants (5%).
- Edema was seen in 3 participants (0.7%).

Table 8-Distribution Blood Pressure among the participants (n=423).

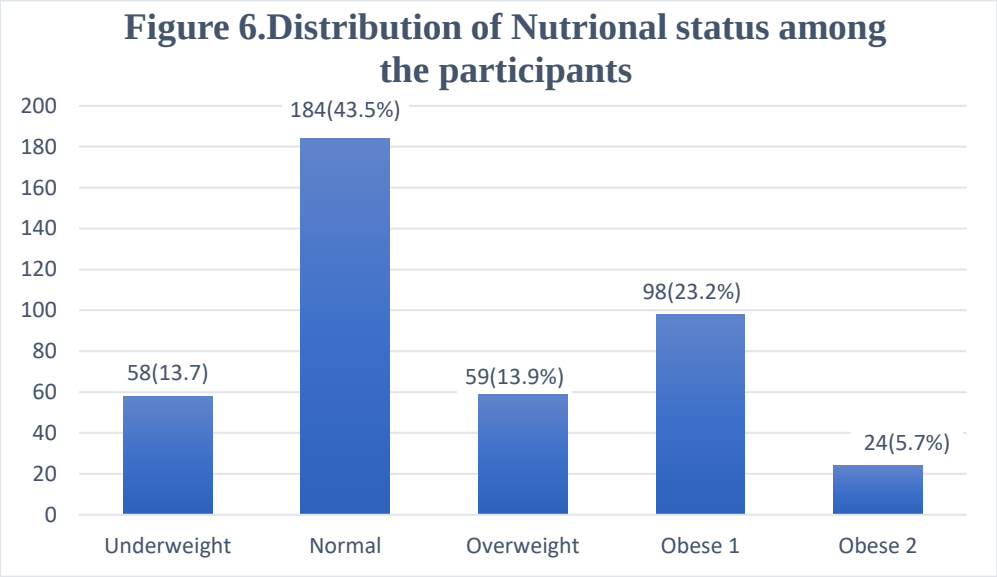
HTN-grading	Frequency (n)	Percentage (%)
Normal	138	32.6%
Prehypertension	233	55.1%
Stage 1 HTN	45	10.6%
Stage 2 HTN	7	1.7%
Total	423	100.0

***JNC-8 classification**

Out of the 423 participants examined:

About 32.6% of participants had normal blood pressure, 55.1% were in the Prehypertension stage, 10.6% had Stage 1 Hypertension, and 1.7% had Stage 2 Hypertension.

Figure 6. Distribution of Nutritional status among the participants (n=423).



***Asian BMI classification**

Out of the 423 participants examined

About 43.5% of participants had normal weight, while 13.7% were underweight. about 13.9% were overweight, 23.2% belonged to Obese class 1, and 5.7% are Obese class 2.

Table 9- Association between Smoking tobacco and OVE positivity(n=423).

Smoke tobacco	OVE positive	OVE negative	Chi-square value (p value, df)
	Yes	No	
Yes	18(30%)	42(70%)	χ^2 =0.580
No	92(25.3%)	271(74.7%)	p =0.432
Total	**110(26%)**	**313(74%)**	df=1

The Chi-square test was used to examine the association between smoking tobacco and OVE positivity. The results showed that among those who smoke tobacco 30% tested positive for OVE while 25.3% of non-smokers tested positive. Although the percentage of OVE positivity was higher in smokers, the difference was not statistically significant.

Table 10- Association between Smoking tobacco and OVE positivity (Urban N=203).

Smoke tobacco	OVE Positive Yes	OVE Negative No	Chi-square value (p value, df)
Yes	5(14.3%)	30(85.7%)	χ^2 =0.259 p =0.806 df=1
No	30(17.9%)	138(82.1%)	
Total	**35(17.2%)**	**168(82.8%)**	

***Chi-square test**

Among those who smoked tobacco, 14.3% tested positive on oral visual examination (OVE), while 17.9% of non-smokers were OVE positive. Smokers had a slightly lower percentage of OVE positivity than non-smokers, but this difference was not statistically significant.

Table 11- Association between Smoking tobacco and OVE positivity (Rural n=220).

Smoke tobacco	OVE Positive	OVE Negative	Chi-square value (p value, df)
	Yes	No	
Yes	13(52%)	12(48.1%)	χ^2 =4.183
No	62(31.8%)	133(68.6%)	p =**0.046**
Total	**75(34%)**	**145(66%)**	df=1

***Chi-square test**

Among rural smokers, 52% were found to be OVE positive compared to 31.8% of non-smokers. this difference was statistically significant indicating association between smoking tobacco and OVE positivity in the rural population. smokers in rural areas had a significantly higher chance of showing positive findings on oral visual examination compared to non-smokers.

Table 12-Association between Smokeless tobacco use and OVE positivity (n=423).

Smokeless tobacco	**OVE positive**	**OVE negative**	**Chi-square value (p value, df)**
	Yes	**No**	
Yes	53(38.4%)	85(61.6%)	χ^2 =16.370
No	92(20%)	228(80%)	p =**<0.001**
Total	**110(26%)**	**313(74%)**	df=1

***Chi-square test**

The results indicate that 38.4% of individuals who used smokeless tobacco tested positive for OVE compared to only 20% of those who do not use smokeless tobacco. The difference was statistically significant. Suggesting that individuals who use smokeless tobacco were more likely to test positive for OVE compared to non-users.

Table 13-Association between Smokeless tobacco use and OVE positivity (Urban n=203).

Smokeless tobacco	OVE Positive Yes	OVE Negative No	Chi-square value (p value, df)
Yes	25(33.3%)	50(66.7%)	χ^2 =21.586 p =**<0.001** df=1
No	10(7.8%)	118(92.2%)	
Total	**35(17.2%)**	**168(82.8%)**	

***Chi-square test**

The findings revealed that, in contrast to 7.8% of non-users, 33.3% of urban participants who used smokeless tobacco tested positive on oral visual examination. This difference was statistically significant, suggesting that smokeless tobacco use and over-positivity are strongly correlated in urban populations.

Table 14-Association between Smokeless tobacco use and OVE positivity (Rural n=220).

Smokeless Tobacco	**OVE Positive** **Yes**	**OVE Negative** **No**	**Chi-square value (p value, df)**
Yes	27(43.5%)	35(56.5%)	χ^2 =3.681
No	48(30.3%)	110(69.7%)	p =**0.040**
Total	**75(34%)**	**145(66%)**	df=1

***Chi-square test**

Among rural users of smokeless tobacco, 43.5% tested positive on oral visual examination, whereas 30.3% of non-users were OVE positive. This difference turned out to be statistically significant. implying a correlation between rural population OVE positivity and smokeless tobacco use.

Table 15-Association between The Habit of keeping quid in the mouth and OVE positivity (n=423).

Keeping quid in the mouth	**OVE Positive**	**OVE Negative**	**Chi-square value (p value, df)**
	Yes	**No**	
Yes	16(64%)	9(36%)	χ^2 =19.934
No	94(23.6%)	304(76.4%)	p =**<0.001**
Total	**110(26%)**	**313(74%)**	df=1

***Chi-square test**

The above table shows that 64% of individuals who keep quid in their mouth tested positive for OVE, compared to only 23.6% of those who did not have this habit. The statistically significant difference showed that people who kept their quid in the mouth were more likely to experience OVE positivity than people who didn't.

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Table 16-Association between The Habit of keeping quid in the mouth and OVE positivity (Urban n=203).

Keeping quid in the mouth	**OVE Positive** **Yes**	**OVE Negative** **No**	**Chi-square value (p value, df)**
Yes	11(64.7%)	6(35.3%)	χ^2 =29.299
No	24(12.9%)	162(87.1%)	**p =<0.001**
Total	**35(17.2%)**	**168(82.8%)**	df=1

***Chi-square test**

The association between the Habit of keeping quid in the mouth and OVE positivity was assessed among urban participants. A sharp rise of 64.7% individuals reported keeping quid in the mouth tested positive on oral visual examination compared to only 12.9% among those who did not have this habit. This difference was statistically significant indicating a strong association.

Table 17-Association between The Habit of keeping quid in the mouth and OVE positivity (Rural n=203).

Keeping quid in the mouth	OVE Positive	OVE Negative	Chi-square value (p value, df)
	Yes	No	
Yes	4(57.1%)	3(42.9%)	χ^2 =1.763
No	71(33.3%)	142(66.7%)	p =0.230
Total	**75(34%%)**	**145(66%)**	df=1

***Chi-square test**

In the rural population, the relationship between The Habit of keeping quid in the mouth and OVE positivity was examined. among those who practiced this habit, 57.1% tested positive on oral visual examination compared to 33.3% who did not have. While the percentage of OVE positivity was noticeably higher in individuals with the habit, The difference was not having statistically significance.

Table 18-Association between Alcohol intake and OVE positivity (n=423).

Alcohol intake	OVE Positive	OVE Negative	Chi-square value (p value, df)
	Yes	No	
Yes	17(40.5%)	25(59.5%)	χ^2 =5.075
No	93(24.4%)	288(75.6%)	p =**0.040**
Total	**110(26.0%)**	**313(74.0%)**	df=1

***Chi-square test**

The results show that 40.5% of individuals who consumed alcohol tested positive for OVE compared to 24.4% of non-alcohol consumer. The difference was statistically significant. Suggesting that alcohol intake was associated with a higher likelihood of OVE positivity. This suggests that drinking alcohol increases the risk of OVE positivity.

Table 19-Association between Alcohol intake and OVE positivity (Urban n=203).

Alcohol intake	OVE Positive	OVE Negative	Chi-square value (p value, df)
	Yes	No	
Yes	7(25%)	21(75%)	χ^2 =1.370
No	28(16%)	147(84%)	p =0.280
Total	**35(17.2%)**	**168(74%)**	df=1

***Chi-square test**

Among the 203 urban participants, the association between alcohol intake and OVE positivity was not statistically significant. OVE positivity was observed in 25% of individuals who reported alcohol consumption compared to 16% among those who did not consume alcohol. There was higher percentage of alcohol, but the difference was not statistically significant.

Table 20-Association between Alcohol intake and OVE positivity (Rural n=220).

Alcohol intake	**OVE Positive**	**OVE Negative**	**Chi-square value (p value, df)**
	Yes	**No**	
Yes	10(71.4%)	4(28.6%)	χ^2 =9.471
No	64(31.5%)	141(68.5%)	p =**0.006**
Total	**74(26%)**	**313(74%)**	df=1

***Chi-square test**

Among 220 rural participants, a significant association was observed between alcohol intake and OVE positivity. 71.4% of individuals who reported alcohol consumption tested positive on oral visual examination compared to only 31.5% among those who did not consume alcohol. It was discovered that this difference was statistically significant. Indicating that alcohol consumption and OVE positivity are strongly correlated.

Table 21-Association between Intake of spicy foods and OVE positivity (n=423).

Intake of spicy foods	OVE Positive Yes	OVE Negative No	Chi-square value (p value, df)
Yes	103(26.8%)	282(73.2%)	χ^2 =1.248 p =0.334 df=1
No	7(18.4%)	31(81.6%)	
Total	**110(26%)**	**313(74%)**	

***Chi-square test**

The results indicate that 26.8% of individuals who consumed spicy foods tested positive for OVE compared to 18.4% of those who did not consume. However, there was no statistically significant difference.

Table 22-Association between Exposure to radiation and OVE positivity(n=423).

Exposure to radiation	OVE positive Yes	OVE Negative No	Chi-square value (p value, df)
Yes	21(35.0%)	39(65.0%)	χ^2 =2.940 p =0.111 df=1
No	89(24.5%)	274(75.5%)	
Total	**110(26%)**	**313(74%)**	

***Chi-square test**

The results indicate that 35.0% of individuals exposed to radiation tested positive for OVE compared to 24.5% of those who were not exposed. However, there was no statistically significant difference.

Table 23-Association between History of Bleeding gums and OVE positivity (n=423).

History of Bleeding gums	OVE Positive Yes	OVE Negative No	Chi-square value (p value, df)
Yes	7(19.4%)	29(80.6%)	χ^2 =0.880 p =0.430 df=1
No	103(26.6%)	284(73.4%)	
Total	**110(26%)**	**313(74%)**	

***Chi-square test**

The results show that 19.4% of individuals with a history of bleeding gums tested positive for OVE compared to 26.6% of those without this history. However, there was no statistically significant difference.

Table 24-Association between History of Tooth mobility and OVE positivity (n=423).

History of Tooth Mobility	OVE Positive Yes	OVE Negative No	Chi-square value (p value, df)
Yes	16(31.4%)	35(68.6%)	χ^2 =0.868 p =0.395 df=1
No	94(25.3%)	278(74.7%)	
Total	**110(26%)**	**313(74%)**	

***Chi-square test**

The results show that 31.4% of individuals with a history of tooth mobility tested positive for OVE compared to 25.3% of those without that history. However, there was no statistically significant difference.

Table 25-Association between History of Oral procedure and OVE positivity (n=423).

History of Oral procedure	OVE Positive Yes	OVE Negative No	Chi-square value (p value, df)
Yes	42(34.1%)	81(65.9%)	χ^2 =5.974 p =**0.020** df=1
No	68(22.7%)	232(77.3%)	
Total	**110(26%)**	**313(74%)**	

***Chi-square test**

The results shows that 34.1% of individuals who had underwent an oral procedure tested positive for OVE compared to 22.7% of those who had not. This difference was statistically significant. Suggesting that OVE positivity was substantially more likely to occur in people who had previously had an oral procedure than in people who had not.

Table 26-Association between History of Oral procedure and OVE positivity (Urban n=203).

History of Oral procedure	OVE Positive Yes	OVE Negative No	Chi-square value (p value, df)
Yes	9(20.9%)	34(79.1%)	χ^2 =0.520 p =0.497 df=1
No	26(16.3%)	134(83.8%)	
Total	**35(17.2%)**	**168(82.8%)**	

***Chi-square test**

Among the 203 urban participants OVE positivity was observed in 20.9% of individuals who had a history of oral procedures compared to 16.3% among those without such a history. Although there was a slight increase in OVE positivity among those with a history of oral procedures, the difference was not significant.

Table 27-Association between History of Oral procedure and OVE positivity (Rural n=220).

History of Oral Procedure	OVE Positive Yes	OVE Negative No	Chi-square value (p value, df)
Yes	32(40.5%)	47(59.5%)	χ^2 =2.492 p =0.137 df=1
No	43(30%)	98(70%)	
Total	**75(34%)**	**145(66%)**	

***Chi-square test**

Among those who had underwent an oral procedure, 40.5% tested positive on oral visual examination compared to 30% among those with no such history. while a higher proportion of OVE positivity was seen in individuals with the oral procedures. There was no statistically significant difference.

Table 28-Association between History of Visiting a Dentist and OVE positivity (n=423).

Ever Visited a Dentist	OVE Positive Yes	OVE Negative No	Chi-square value (p value, df)
Yes	63(25.9%)	180(74.1%)	χ^2 =0.002 p =1.000 df=1
No	47(26.1%)	133(73.9%)	
Total	**110(26.0%)**	**313(74.0%)**	

***Chi-square test**

The results show that 25.9% of individuals who had visited a dentist tested positive for OVE compared to 26.1% of those who had never visited one. However, Since the difference was so small, it was not statistically significant.

Table 29-Association between Tongue cleaning after brushing and OVE positivity (n=423).

Tongue cleaning after brushing	OVE Positive Yes	OVE Negative NO	Chi-square value (p value, df)
Yes	101(26.9%)	275(73.1%)	χ^2 =1.292 p =0.294 df=1
No	9(19.1%)	38(80.9%)	
Total	**110(26.0%)**	**313(74.0%)**	

***Chi-square test**

The results show that 26.9% of individuals who cleaned their tongue tested positive for OVE compared to 19.1% of those who did not. However, there was no statistically significant difference.

Table 30-Association between Awareness of professional oral prophylaxis and OVE positivity (n=423).

Awareness of professional oral prophylaxis	OVE Positive Yes	OVE Negative No	Chi-square value (p value, df)
Yes	3(21.4%)	11(78.6%)	χ^2 =0.158 p =1.000 df=1
No	107(26.2%)	302(73.8%)	
Total	**110(26.0%)**	**313(74.0%)**	

***Chi-square test**

The results show that 21.4% of those who are aware of professional oral prophylaxis tested positive for OVE, compared to 26.2% of those who were not aware. However, this difference was very small and not statistically significant.

Table 31-Association between Awareness of proper oral hygiene and OVE positivity (n=423).

Awareness of proper oral hygiene	OVE Positive Yes	OVE Negative No	Chi-square value (p value, df)
Yes	11(21.2%)	41(78.8%)	χ^2 =0.725
No	99(26.7%)	272(73.3%)	p =0.500
Total	**110(26.0%)**	**313(74.0%)**	df=1

***Chi-square test**

The results show that 21.2% of those who were aware of proper oral hygiene tested positive for OVE compared to 26.7% of those who are not aware. However, this difference was small and not statistically significant.

Table 32: 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
13.	Awareness of oral hygiene	0.74	(0.37-1.49)	0.396

This table presents the p-values, Confidence Intervals (CI), and Crude odds ratios (COR) obtained from univariate logistic regression analysis. The objective was to determine the specific risk factors that each study participant had in relation to a positive oral visual examination result (OVE).

1. Tobacco use: -

Smoking tobacco: Individuals who smoked tobacco had 1.26 times higher odds of OVE positivity compared to non-smokers. This correlation, however was not statistically significant ($p = 0.447$).

Smokeless tobacco: The use of Smokeless tobacco showed a significant association with OVE positivity. Users had 2.49 times higher odds of positive findings compared to non-users ($p < 0.001$), indicating a strong and meaningful link.

Habit of Keeping quid in the mouth: Participants who had this habit exhibited 5.75 times greater odds of OVE positivity. This association was highly significant ($p < 0.001$), suggesting a major risk factor for oral precancerous lesions.

2. Alcohol intake: -

Participants who reported alcohol consumption had 2.10 times increased odds of OVE positivity, and this result was statistically significant ($p = 0.034$), indicating that alcohol may contribute to oral lesion development.

3. Dietary habits: -

Spicy food intake: The odds of OVE positivity were 1.61 times higher among those who frequently consumed spicy foods. However, indicating that this relationship was not statistically significant ($p = 0.268$).

4. Radiation exposure: -

History of radiation exposure was associated with 1.67 times increased odds of OVE positivity. although this suggests a possible risk, the finding did not reach statistical significance (p = 0.089).

5.Oral health conditions: -

Bleeding gums: Participants with bleeding gums had lower odds (OR = 0.66) of OVE positivity, but this association was not statistically significant (p = 0.351).

Mobility of tooth: Those reporting tooth mobility had 1.35 times higher odds but the finding was not significant (p = 0.353).

6.Dental history and practices: -

Underwent oral procedure: Participants who had previously undergone an oral procedure had a statistically significant increased risk of OVE positivity, with 1.77 times higher odds (p = 0.015).

History of visiting a dentist: this factor showed no significant association with OVE positivity (OR=0.99, p = 0.966), implying that routine dental visits alone may not reduce risk.

Tongue cleaning after brushing: The practice was associated with 1.55 times higher odds, but this was not statistically significant (p = 0.259).

Professional oral prophylaxis: Participants who had undergone this preventive measure showed reduced odds (OR= 0.77) of OVE positivity, despite this, the outcome was not statistically significant (p = 0.692).

Awareness of proper oral hygiene: Those who reported being aware of proper hygiene practices had lower odds (OR= 0.74) of OVE positivity. However, the correlation (p = 0.396) was not statistically significant.

Table 33- 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

This table shows the results of a multivariable binary logistic regression analysis that determined which risk factors among study participants were independently linked to a positive oral visual examination result (OVE). The analysis accounts for confounding variables, giving a clearer picture of the direct impact of each factor.

1. Smoking tobacco: -

After adjusting for other variables, individuals who smoked tobacco had 2.19 times higher odds of testing positive on OVE compared to non-smokers. Smoking was identified as an independent risk factor for oral lesions, and this association was statistically significant ($p = 0.038$).

2. Smokeless tobacco use: -

Participants who utilised smokeless tobacco products had 2.18 times increased risk of OVE positivity. this relationship remained strong and statistically significant even after adjustment ($p = 0.002$), reinforcing its role as a key risk factor.

3. Habit of keeping quid in the mouth: -

Habit of keeping quid in the mouth was significantly associated with OVE positivity. these individuals had 3.02 times higher odds of a positive OVE finding ($p = 0.004$), making it one of the most potent independent predictors of early oral lesions.

4. Alcohol intake: -

Although participants who consumed alcohol had 1.65 times higher odds of OVE positivity, this association was not statistically significant after adjustment ($p = 0.190$), suggesting that its independent effect may be limited when controlling for other habits.

5. Spicy food intake: -

The analysis showed 1.45 times higher odds of OVE positivity among those who frequently consumed spicy foods. however, this relationship was not significant (p = 0.321), indicating that dietary spice intake did not independently predict OVE outcomes.

6. Radiation exposure: -

Participants with a history of radiation exposure had 1.41 times the odds of OVE positivity, but the result was not statistically significant (p = 0.240), suggesting the relationship was weak or possibly confounded by other factors.

7. Bleeding gums: -

Those who reported bleeding gums had lower odds (AOR = 0.70) of being OVE positive. There was no strong independent link, though, as this association was not statistically significant (p = 0.436).

8. Underwent oral procedure: -

Participants who had previously undergone an oral procedure were found to have 1.97 times higher odds of OVE positivity, and this association was statistically significant (p = 0.008). This suggests a potential link between past oral procedures and underlying or recurring oral health conditions.

9. Tongue cleaning after brushing: -

This oral hygiene practice showed a slight increase in odds (AOR = 1.41). However, the correlation was not statistically significant (p = 0.378). Implying no meaningful independent effect on OVE outcomes.

Conclusion: -

In the multivariate model, the following risk factors remained statistically significant and independently associated with OVE positivity: smoking tobacco, use of smokeless tobacco, habit of keeping quid in the mouth, and history of undergoing an oral procedure. These results imply that the early onset of potentially malignant disorders of the mouth may be significantly influenced by tobacco-related behaviours as well as previous oral health interventions. When confounders were taken into account, additional variables such as alcohol consumption, dental hygiene habits, and consumption of spicy foods did not exhibit independent relationships.

DISCUSSION

Discussion: -

This Cross-sectional study was conducted among adults above 30 years in the Kolar district to understand the prevalence and key risk factors for oral cancer using oral visual examination (OVE). The findings shed light on how everyday habits, socio-demographic characteristics and oral health behaviours are linked to early signs of oral cancer. With a sample size of 423 participants from both rural and urban backgrounds, this study helped us to better understand the real-world challenges in early oral cancer detection.

Sociodemographic findings

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).[49]

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).[50]

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).[51]

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).[52] 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).[53]

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)[54] and southern parts of India (Khan et al., 2020).[55] which underscore the carcinogenic impact of tobacco in all its forms (Ray & Gupta 2024).[56]

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).[57]

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).[58]

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.

Awareness, hygiene, and access to care

The study also highlighted a worrying lack of awareness and access to oral healthcare. Very few participants had undergone professional dental cleanings or visited a dentist in recent times. This gap is critical-early recognition and treatment of oral lesions dramatically improve outcomes, as supported by Akshitha et al. (2023).[59]

Clinical indicators such as tooth mobility and bleeding gums were common among participants with OVE-positive findings, indicating that poor oral hygiene remains a significant, yet modifiable risk factor. Community-focused oral hygiene education could play a key role in mitigating these risks.

How demographics shape oral health risks

The concentration of OVE positivity among individuals aged 30–40 years underscores the early onset of risky habits. This age group could benefit the most from preventive initiatives and targeted education programs. While gender distribution in the study was nearly balanced, men were more likely to report tobacco and alcohol use-a trend that reflects broader national patterns (Singh & Kumar, 2023).[60]

Although some participants had chronic conditions like diabetes and hypertension, these did not show a significant link with OVE positivity. Still, such conditions may impact general oral health and should be considered in comprehensive care models.

What the bigger picture tells us

when we compared our results with another recent research (from 2020-2025), a clear pattern emerged. tobacco use, low socio-economic status and limited education continue to be the leading contributors to oral health risks. Our results show:

- 38.4% of smokeless tobacco users had positive OVE findings.
- 64% of people who kept quid in their mouth tested positive.
- alcohol users had higher positivity rates (40.5%) than non-users (24.4%).

These numbers align with national and regional trends, confirming that these issues are not isolated to Kolar but are part of a broader public health challenge (Savitha et al., 2024).[61]

SUMMARY & CONCLUSION

SUMMARY: -

Oral cancer continues to be a pressing public health concern in India, with increasing incidence especially among individuals in low-resource and rural settings. In order to investigate the prevalence of oral potentially malignant disorders (OPMD), a community-based cross-sectional study was conducted among adults aged 30 and older in the Kolar district of Karnataka, assess behavioural, demographic risk factors and evaluate the effectiveness of oral visual examination (OVE) as a screening tool.

A total of 423 participants were enrolled, nearly evenly divided between rural (52%) and urban (48%) areas. gender distribution was almost equal. The majority of the participants were in the 30–40 years age group, an age range increasingly affected by early exposure to tobacco, alcohol, and areca nut.

The sociodemographic profile revealed that a significant proportion belonged to lower socioeconomic strata, with many having low education levels-factors commonly associated with poor health awareness and unhealthy lifestyle choices.

This study found that 26% of the population screened positive through OVE, indicating a significant burden of early-stage oral lesions in the community. This finding reinforces the role of OVE as an effective, affordable, and non-invasive tool for community-level screening.

Among the major risk factors associated with OVE positivity:

- Smokeless tobacco use (AOR = 2.18) and smoking tobacco (AOR= 2.19) significantly increased the risk of positive oral findings.

- The habit of placing quid in the mouth, which usually includes areca nut and tobacco, showed the strongest association (AOR = 3.02).
- History of oral procedures also emerged as a contributing factor (AOR = 1.97), possibly reflecting underlying oral health issues or insufficient post-procedure care.

Although alcohol use showed a positive association in univariate analysis, it was not statistically significant in multivariable analysis. Nonetheless, its synergistic risk factor role should not be disregarded, particularly when paired with quid and tobacco.

The study also found that poor oral hygiene, including issues like bleeding gums and tooth mobility was common among those with OVE-positive findings further emphasizing the role of basic oral care in prevention. Furthermore, participants' low use of dental services and noticeable ignorance of oral cancer point to serious gaps in public health outreach.

CONCLUSION: -

The study emphasises how important it is to use community-level screening programs like OVE to detect oral health problems early particularly in underprivileged populations. The primary causes of OPMDs remain the socioeconomic costs of tobacco use and areca nut consumption. Targeted public health initiatives that prioritise easily accessible screening, health education, and habit cessation are essential to stopping the rising trend of oral cancer. The Kolar findings highlight the need for integrated and preventive oral health strategies in comparable settings and speak to a larger national concern.

STRENGTH OF THE STUDY

STRENGTH OF THE STUDY: -

1.Study design: -

The inclusion of participants from both urban and rural regions of Kolar ensures a diverse and representative sample.

2.Random sampling technique: -

By employing simple random sampling and covering various villages, the study minimized selection bias.

3.Oral visual examination: -

The use of oral visual examination (OVE) adds strength to the study by clinical screening and improved early detection.

4.Validated questionnaire: -

This study used a well-tested and validated questionnaire, which helped us gather clear and consistent information. It ensured that participants easily understood the questions and provided accurate responses, thereby adding significant value to the quality of our findings.

5.Robust-statistical methods: -

The multivariable logistic regression helped us to look at associations and understand which risk factors truly had an independent impact.

LIMITATIONS OF THE STUDY

LIMITATIONS OF THE STUDY: -

1.No histopathological confirmation: -

While OVE was a practical and non-invasive screening tool, it does not offer the same level of accuracy as a biopsy.

2.Self-reported data: -

Behavioural habits such as tobacco and alcohol consumption may be under reported due to social desirability bias.

3.Age-restricted sample: -

The exclusion of individuals under 30 years may overlook early-onset oral cancer cases.

RECOMMENDATIONS

RECOMMENDATIONS: -

1.Awareness campaigns: -

IEC programs, particularly in local languages, to raise public awareness of the risks associated with alcohol consumption, tobacco use and betel nut use.

2.Screening integration into primary care: -

Oral visual examination should be routinely incorporated into public health programs like NP-NCDS.

3.School-level early intervention: -

Develop programs to the target teenagers and young adults before bad habits are started.

4.Tobacco and alcohol cessation support: -

Establish behaviour change communication and counselling units at PHCs and CHCs

5.**Training healthcare workers: -**

primary healthcare providers with tools and skills to detect early oral lesions.

6.Regular follow ups for OVE positive cases: -

Early referral and diagnostic confirmation of biopsy. participants screened positive for OVE.

7.Further research.

8.Oral hygiene promotion.

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ANNEXURES

ANNEXURE-I

Proforma No: - **Date-**

Name of The Village: -

Assessment of risk factors and screening for oral cancer by visual examination of oral cavity in Kolar- a community based cross sectional study.

A. GENERAL PROFORMA (SOCIODEMOGRAPHIC DETAILS)

Sl.NO	PARAMETERS	RESPONSE
1.	Name	
2.	Age	
3.	Gender	Male
		Female
		Transgender
4.	Address, (Duration of stay at address)	
5.	Education	Illiterate
		Primary school
		Secondary school
		PUC
		Graduate
		Post Graduate
6.	Religion	Hindu
		Christian
		Muslim
		Others
7.	Caste	
8.	Monthly income in rupees	
9.	Total no of family members	
10.	Socio-Economic Status	
11.	Chronic Illness	Hypertension
		Diabetes
		Cancer
		Asthma
		Tuberculosis
		Epilepsy
12.	Family h/o cancer	Yes/No
13.	If yes, what is the relationship with participants	

B. RISK FACTORS FOR ORAL CANCER: -

SL.NO	PARAMETERS	RESONSE
14.	Do you smoke tobacco	Yes/No
If yes	1)Age of starting use	
	2)Product-Cigarette/Beedi/Chutta/reverse smoker	
	3)Years of use	
	4)Current use	
	5)Quantity per day	
15.	Do you use smokeless tobacco	Yes/No
If yes	1)Age of starting the use	
	2) Product-Areca nut/Betel Leaf/Gutka/Pan Masala	
	3)Years of use	
	4)Current use	
	5)Quantity per day	
16.	Habits of keeping quid in the mouth	Yes/No
If yes	1)Duration of keeping	
	2)Duration of this habit	
17.	Do you consume alcohol	Yes/No
If yes	1) Age of starting the use	
	2) Product	
	3) Years of use	
	4) Current use	
	5) Quantity per day	
18.	Do you consume more spicy foods?	Yes/No
19.	Did you have Exposure to Radiation anytime	Yes/No
If yes	1) X rays/CT/MRI	
	2) Parts exposed	
20.	I)Did you have any bleeding gums?	Yes/No
	ii)Did you have any pus/discharge from the gums?	Yes/No
	iii)Did you have any mobility of teeth?	Yes/No
C.	**ORAL HEALTH QUESTIONNAIRE**	
21.	Have you undergone any Oral procedure?	Yes/No
If yes for what	I)Sharp tooth	
	ii)Dentures	
	iii)Fillings	
	iv)Braces	
	v)Others(specify)	
22.	Did you have any history of trauma to oral	Yes/No

If yes	cavity?	
	1) Site	
	2) What did you do for it.	
23.	Have you ever visited a dentist?	a) Yes b) No
24.	If so, when was the first time you visited? (years old)	
25.	What do you use for tooth brushing?	a) Tooth paste b) Charcoal c) Brick powder d) Ash powder e) Others: - (specify)
26.	How many times a day do you brush your teeth?	a) Never b) Once (in the morning) c) Once (in the evening) d) Twice (both in the morning and in the evening) e) Three times f) More than three times
27.	What type of toothbrush do you use?	a) No tooth brush used b) Neem stick

		c) Manual
28. If yes	Have you ever used dental floss?	a) Yes b) No
		I) Once a week II) More than once a year III) Once a day
29 If yes,	Do you use any other tools for your oral hygiene at home?	a) Yes b) No
	Name them?	
30.	Do you also clean your tongue after tooth brushing?	a) Yes b) No
31.	Do you know what professional oral prophylaxis/scaling?	a) Yes b) No
32.	During the orthodontic treatment, has your dentist ever recommended that you to undergo professional oral hygiene?	a) Yes b) No
33.	Do you know about proper oral hygiene?	a) Yes b) No
34.	Have you ever attended meetings on oral hygiene held by a dentist or dental hygiene at school or anywhere else?	a) Yes b) No
35.	Would you like to receive more information about oral health?	a) Yes b) No

D. GENERAL PHYSICAL EXAMINATION: -

SL.NO	PARAMETERS	RESPONSE
36.	Pallor-lower Palpebral conjunctiva	
37.	Clubbing	
38.	Edema	

39.	BP Systolic(mmhg)	
	Diastolic(mmhg)	
40.	Pulse	
41.	Weight in (kgs)	
42.	Height in (cm)	
43.	BMI	

E. ORAL EXAMINATION: -

SL.NO	PARAMETERS	RESPONSE
44.	a) Restriction in opening of mouth	Yes/No
If yes	b) Grade of Trismus	
	c)Inter incisor distance	
	d)Oral Mucosa-Blanching	
	e) Presence of fibrous bands	
	f) Restriction in protrusion of tongue	
45.	Sharp Tooth	Yes/No
	Dental Caries	Yes/No
	Dental Fluorosis	Yes/No
46.	Growth	Yes/No
If yes	Shape	
	Size	
	Duration	
47.	Ulcer-growth	Yes/No
If yes	Shape	
	Size	
	Duration	
48.	White patch-site	Yes/No
If yes	Size	
	Shape	
	Duration	
49.	Red patch-site	Yes/No
If yes	Size	
	Shape	
	Duration	
50. If yes	Swelling in the neck level of lymph node a) Site b) Mobile/Fixed c)How many d)Ipsilateral/contralateral	Yes/No

51.	Any other findings? a) Nicotine stains b) Gingivitis c) Periodontitis	

A. GENERAL PROFORMA (SOCIODEMOGRAPHIC DETAILS)

ಕ್ರಮ ಸಂಖ್ಯೆ	ಪರಿಮಾಣಗಳು (Parameters)	ಪ್ರತಿಕ್ರಿಯೆ (Response)
1	ಹೆಸರು (Name)	
2	ವಯಸ್ಸು (Age)	
3	ಲಿಂಗ (Gender)	ಪುರುಷ / ಮಹಿಳೆ / ತೃತೀಯ ಲಿಂಗಿ
4	ವಿಳಾಸ (ಈ ವಿಳಾಸದಲ್ಲಿ ವಾಸ ಮಾಡುವ ಅವಧಿ) (Address, Duration of Stay)	
5	ಶಿಕ್ಷಣ (Education)	ಅನಕ್ಷರಸ್ಥ / ಪ್ರಾಥಮಿಕ / ಪ್ರೌಢ / ಪಿಯುಸಿ / ಪದವಿ / ಸ್ನಾತಕೋತ್ತರ
6	ಧರ್ಮ (Religion)	ಹಿಂದೂ / ಕ್ರಿಶ್ಚಿಯನ್ / ಮುಸ್ಲಿಂ / ಇತರೆ
7	ಜಾತಿ (Caste)	
8	ಮಾಸಿಕ ಆದಾಯ (Monthly Income)	
9	ಕುಟುಂಬದ ಒಟ್ಟು ಸದಸ್ಯರು (Family Members)	
10	ಸಾಂಖ್ಯಿಕ-ಆರ್ಥಿಕ ಸ್ಥಿತಿ (Socio-Economic Status)	
11	ಕ್ರೋನಿಕ್ ರೋಗಗಳು (Chronic Illness)	ಹೈಪರ್ ಟೆನ್ಷನ್ / ಡಯಬೆಟಿಸ್ / ಕ್ಯಾನ್ಸರ್ / ಆಸ್ತ್ಮಾ / ಟಿಬಿ / ಎಪಿಲೆಪ್ಸಿ
12	ಕುಟುಂಬದಲ್ಲಿ ಕ್ಯಾನ್ಸರ್ ಇತಿಹಾಸವಿದೆಯೇ? (Family History of Cancer)	ಹೌದು / ಇಲ್ಲ
13	ಹೌದಾದರೆ ಸಂಬಂಧ (If yes, relationship)	

B. RISK FACTORS FOR ORAL CANCER

ಕ್ರಮ ಸಂಖ್ಯೆ	ಪರಿಮಾಣಗಳು (Parameters)	ಪ್ರತಿಕ್ರಿಯೆ (Response)
14	ನೀವು ಧೂಮಪಾನ ಮಾಡುತ್ತೀರಾ? (Do you smoke tobacco?)	ಹೌದು / ಇಲ್ಲ
	ಪ್ರಾರಂಭದ ವಯಸ್ಸು (Age of starting use)	
	ಉತ್ಪನ್ನ (Product - Cigarette/Beedi/Chutta/Reverse Smoker)	
	ಬಳಸಿದ ವರ್ಷಗಳು (Years of use)	
	ಪ್ರಸ್ತುತ ಬಳಸುತ್ತಿದ್ದೀರಾ? (Current use)	
	ಪ್ರತಿದಿನ ಪ್ರಮಾಣ (Quantity per day)	
15	ನೀವು ಧೂಮರಹಿತ ತಂಬಾಕು ಬಳಸುತೀರಾ? (Do you use smokeless tobacco?)	ಹೌದು / ಇಲ್ಲ
	ಪ್ರಾರಂಭದ ವಯಸ್ಸು (Age of starting use)	
	ಉತ್ಪನ್ನ (Product - Areca nut/Betel Leaf/Gutka/Pan Masala)	
	ಬಳಸಿದ ವರ್ಷಗಳು (Years of use)	
	ಪ್ರಸ್ತುತ ಬಳಸುತ್ತಿದ್ದೀರಾ? (Current use)	
	ಪ್ರತಿದಿನ ಪ್ರಮಾಣ (Quantity per day)	
16	ನೀವು ಕ್ವಿಡ್ ಬಾಯಿಯಲ್ಲಿ ಇಡುತ್ತೀರಾ? (Quid habit)	ಹೌದು / ಇಲ್ಲ
	ಬಾಯಿಯಲ್ಲಿ ಇಡುವ ಅವಧಿ (Duration of keeping)	
	ಅಭ್ಯಾಸದ ಅವಧಿ (Duration of this habit)	
17	ನೀವು ಮದ್ಯಪಾನ ಮಾಡುತ್ತೀರಾ? (Do you consume alcohol?)	ಹೌದು / ಇಲ್ಲ
	ಪ್ರಾರಂಭದ ವಯಸ್ಸು (Age of starting use)	
	ಉತ್ಪನ್ನ (Product)	

	ಬಳಸಿದ ವರ್ಷಗಳು (Years of use)	
	ಪ್ರಸ್ತುತ ಬಳಸುತ್ತಿದ್ದೀರಾ? (Current use)	
	ಪ್ರತಿದಿನ ಪ್ರಮಾಣ (Quantity per day)	
18	ನೀವು ಹೆಚ್ಚು ಮಸಾಲೆದ ಆಹಾರ ಸೇವಿಸುತ್ತೀರಾ? (Spicy food)	ಹೌದು / ಇಲ್ಲ
19	ನೀವು ರೇಡಿಯೇಷನ್‌ಗೆ ಒಳಗಾಗಿದ್ದೀರಾ? (Radiation exposure)	ಹೌದು / ಇಲ್ಲ
	ಎಕ್ಸ್-ರೇ / ಸಿಟಿ / ಎಂಆರ್‌ಐ (X-ray/CT/MRI)	
	ಹೆಚ್ಚು ಕಿರಣ ಬಿದ್ದ ಭಾಗಗಳು (Parts exposed)	
20	i) ರಕ್ತಸ್ರಾವ? ii) ಪಸ್ ಬಿಡುಗಡೆ? iii) ಹಲ್ಲು ಚಲನೆ?	ಹೌದು / ಇಲ್ಲ

C. ORAL HEALTH QUESTIONNAIRE

ಕ್ರಮ ಸಂಖ್ಯೆ	ಪರಿಮಾಣಗಳು (Parameters)	ಪ್ರತಿಕ್ರಿಯೆ (Response)
21	ಬಾಯಿಗೆ ಚಿಕಿತ್ಸೆ ಪಡೆದಿದ್ದೀರಾ? (Undergone any oral procedure?)	ಹೌದು / ಇಲ್ಲ
	Sharp tooth / Dentures / Fillings / Braces / ಇತರೆ	
22	ಬಾಯಿಗೆ ಗಾಯವಿದೆಯೆ? (Oral trauma history)	ಹೌದು / ಇಲ್ಲ
	ಗಾಯದ ಸ್ಥಳ (Site)	
	ಉಪಚಾರ ಮಾಡಿದೀರಾ? (Action taken)	
23	ದಂತವೈದ್ಯನನ್ನು ಭೇಟಿಯಾದೀರಾ? (Visited a dentist?)	ಹೌದು / ಇಲ್ಲ
24	ಪ್ರಥಮ ಭೇಟಿಯ ವಯಸ್ಸು (First visit age)	
25	ಹಲ್ಲು ತೊಳೆಯಲು ಬಳಸುವದು? (Tooth cleaning agent)	ಪೇಸ್ಟ್ / ಕೋಳ / ಇಟ್ಟಿಗೆ / ಭಸ್ಮ / ಇತರೆ
26	ದಿನಕ್ಕೆ ಎಷ್ಟು ಬಾರಿ ತೊಳೆಯುತ್ತೀರಿ? (Frequency)	ಒಮ್ಮೆ / ಎರಡು / ಮೂರು / ಹೆಚ್ಚು

27	ಟೂತ್‌ಬ್ರಷ್ ಪ್ರಕಾರ (Toothbrush type)	Manual / Neem stick / None
28	ಫ್ಲಾಸ್ ಬಳಕೆ (Used dental floss?)	ಹೌದು / ಇಲ್ಲ
	Frequency: Once a week / daily / yearly	
29	ಇತರೆ ಉಪಕರಣ (Other hygiene tools)	ಹೌದು / ಇಲ್ಲ
30	ನಾಲಿಗೆ ಶುದ್ಧೀಕರಣ (Clean tongue?)	ಹೌದು / ಇಲ್ಲ
31	ಸ್ಕೇಲಿಂಗ್ ಬಗ್ಗೆ ತಿಳಿದಿದೆಯೆ? (Know about scaling?)	ಹೌದು / ಇಲ್ಲ
32	Orthodontic treatment – hygiene suggestion?	ಹೌದು / ಇಲ್ಲ
33	ಸರಿಯಾದ ಬಾಯಿಯ ಶುದ್ಧತೆ ಬಗ್ಗೆ ತಿಳಿದಿದೆಯೆ? (Know oral hygiene?)	ಹೌದು / ಇಲ್ಲ
34	Oral hygiene awareness programs attended?	ಹೌದು / ಇಲ್ಲ
35	ಹೆಚ್ಚು ಮಾಹಿತಿ ಬೇಕಾ? (Want more info?)	ಹೌದು / ಇಲ್ಲ

D.GENERAL PHYSICAL EXAMINATION

ಕ್ರಮ ಸಂಖ್ಯೆ	ಪರಿಮಾಣಗಳು (Parameters)	ಪ್ರತಿಕ್ರಿಯೆ (Response)
36	ಪಾಲರ್ (Pallor – lower palpebral conjunctiva)	
37	ಕ್ಲಬಿಂಗ್ (Clubbing)	
38	ಊತ (Edema)	
39	BP – ಸಿಸ್ಟಾಲಿಕ್ / ಡಯಾಸ್ಟಾಲಿಕ್ (Systolic/Diastolic)	
40	Pulse	
41	ತೂಕ (Weight in kg)	
42	ಎತ್ತರ (Height in cm)	
43	ಬಿಎಂಟಿಐ (BMI)	

E. ORAL EXAMINATION

ಕ್ರಮ ಸಂಖ್ಯೆ (Sl. No.)	ಪರಿಮಾಣಗಳು (Parameters)	ಪ್ರತಿಕ್ರಿಯೆ (Response)

44	ಬಾಯಿಗೆ ತೆರೆಯಲು ಅಡಚಣೆ (Difficulty opening mouth)	ಹೌದು / ಇಲ್ಲ
	ಟ್ರಿಸ್ಮಸ್‌ನ ಶ್ರೇಣಿ (Grade of trismus)	
	ಇಂಟರ್ ಇನ್ಸೈಸರ್ ಅಂತರ (Inter-incisor distance)	
	ಬಾಯಿಮುಚ್ಚಳ – ಬಿಳುಪಾಗುವುದು (Mucosal pallor)	
	ತಂತುಪಟ್ಟಿಗಳ ಹಾಜರಾತಿ (Presence of fibrous bands)	
	ನಾಲಿಗೆಯ ಮುಂದೂಡುವಿಕೆಗೆ ಅಡಚಣೆ (Restricted tongue protrusion)	
45	ಗರಗಿನ ಹಲ್ಲು (Loose teeth)	ಹೌದು / ಇಲ್ಲ
	ದಂತ ಕ್ಷಯ (Dental caries)	ಹೌದು / ಇಲ್ಲ
	ಡೆಂಟಲ್ ಫ್ಲುಒರೋಸಿಸ್ (Dental fluorosis)	ಹೌದು / ಇಲ್ಲ
46	ಗರಿಕೆ (Growth)	ಹೌದು / ಇಲ್ಲ
	ಆಕಾರ (Shape)	
	ಗಾತ್ರ (Size)	
	ಅವಧಿ (Duration)	
47	ಅಲ್ಸರ್ ಅಥವಾ ಗರಿಕೆ (Ulcer or growth)	ಹೌದು / ಇಲ್ಲ
	ಆಕಾರ (Shape)	
	ಗಾತ್ರ (Size)	
	ಅವಧಿ (Duration)	
48	ಬಿಳಿ ತೊರೆಯು - ಸ್ಥಳ (White patch - location)	ಹೌದು / ಇಲ್ಲ
	ಗಾತ್ರ (Size)	
	ಆಕಾರ (Shape)	
	ಅವಧಿ (Duration)	
49	ಕೆಂಪು ತೊರೆಯು - ಸ್ಥಳ (Red patch - location)	ಹೌದು / ಇಲ್ಲ
	ಗಾತ್ರ (Size)	
	ಆಕಾರ (Shape)	
	ಅವಧಿ (Duration)	
50	ಗಂಟಲಿನ ಭಾಗದಲ್ಲಿ ಊತ (Swelling in neck region)	ಹೌದು / ಇಲ್ಲ

	ಸ್ಥಳ (Location)	
	ಚಲಿಸುವ/ಸ್ಥಿರವಾದ (Movable/Fixed)	
	ಎಷ್ಟು (Size)	
	ಏಕಪಕ್ಷೀಯ / ವಿಭಿನ್ನ ಪಾರ್ಶ್ವ (Unilateral / Bilateral)	
51	ಇತರೆ ಕಂಡುಬರುವ ಲಕ್ಷಣಗಳು (Other visible signs)	

ANNEXURE-II

INFORMATION SHEET

Title: **ASSESSMENT OF RISK FACTORS AND SCREENING FOR ORAL CANCER BY VISUAL EXAMINATION OF ORAL CAVITY IN KOLAR- COMMUNITY BASED CROSS SECTIONAL STUDY.**

My name is Dr. Sudhakar.S, Post graduate in the department of community medicine, Sri Devaraj Urs Medical College, Kolar. I am carrying out a study on assessment of risk factors and screening for oral cancer among population in Kolar. The study has been reviewed by the local ethical review board and has been started only after their formal approval.

Participation in this study doesn't involve any cost for you. This study is not only beneficial to you but also to the community at large. The results gathered from this study will be beneficial in estimating the prevalence.

All the information collected from you will be strictly confidential and will not be disclosed to any outsider unless compelled by law. This information collected will be used only for research.

There is no compulsion to participate in this study. You will be no way affected if you don't wish to participate in this study. You are required to sign only if you voluntarily agree to participate in this study. Further, you are liberty to withdraw from the study at any time. If you wish to do so. It is up to decide whether to participate. This document will be stored in the safe locker in the department of Community Medicine in the college and a copy is given to you for information.

For any further classification you are free to contact the principal investigator.

Dr. Sudhakar.S Mob no:9494392612

ಮಾಹಿತಿ ಹಾಳೆ:

SL.No.

ಶೀರ್ಷಿಕೆ: ಅಪಾಯದ ಅಂಶಗಳ ಮೌಲ್ಯಮಾಪನ ಮತ್ತು ಕೋಲಾರದಲ್ಲಿ ಬಾಯಿಯ ಕುಹರದ ದೃಷ್ಟಿ ಪರೀಕ್ಷೆಯ ಮೂಲಕ ಬಾಯಿಯ ಕ್ಯಾನ್ಸರ್‌ಗಾಗಿ ಸ್ಕ್ರೀನಿಂಗ್- ಸಮುದಾಯ ಆಧಾರಿತ ಕ್ರಾಸ್ ಸೆಕ್ಷನಲ್ ಸ್ಟಡಿ

ನನ್ನ ಹೆಸರು ಡಾ.ಸುಧಾಕರ್.ಎಸ್, ಸಮುದಾಯ ವೈದ್ಯಕೀಯ ವಿಭಾಗದಲ್ಲಿ ಸ್ನಾತಕೋತ್ತರ ಪದವಿ, ಶ್ರೀ ದೇವರಾಜ್ ಅರಸ್ ವೈದ್ಯಕೀಯ ಕಾಲೇಜು, ಕೋಲಾರ. ನಾನು ಕೋಲಾರದ ಜನಸಂಖ್ಯೆಯಲ್ಲಿ ಅಪಾಯದ ಅಂಶಗಳ ಮೌಲ್ಯಮಾಪನ ಮತ್ತು ಬಾಯಿಯ ಕ್ಯಾನ್ಸರ್ ಸ್ಕ್ರೀನಿಂಗ್ ಕುರಿತು ಅಧ್ಯಯನವನ್ನು ನಡೆಸುತ್ತಿದ್ದೇನೆ. ಸ್ಥಳೀಯ ನೈತಿಕ ಪರಿಶೀಲನಾ ಮಂಡಳಿಯಿಂದ ಅಧ್ಯಯನವನ್ನು ಪರಿಶೀಲಿಸಲಾಗಿದೆ ಮತ್ತು ಅವರ ಔಪಚಾರಿಕ ಅನುಮೋದನೆಯ ನಂತರವೇ ಪ್ರಾರಂಭಿಸಲಾಗಿದೆ.
ನಿಮ್ಮಿಂದ ಸಂಗ್ರಹಿಸಿದ ಎಲ್ಲಾ ಮಾಹಿತಿಯು ಕಟ್ಟುನಿಟ್ಟಾಗಿ ಗೌಪ್ಯವಾಗಿರುತ್ತದೆ ಮತ್ತು ಕಾನೂನಿನಿಂದ ಬಲವಂತದ ಹೊರತು ಯಾವುದೇ ಹೊರಗಿನವರಿಗೆ ಬಹಿರಂಗಪಡಿಸಲಾಗುವುದಿಲ್ಲ. ಸಂಗ್ರಹಿಸಿದ ಈ ಮಾಹಿತಿಯನ್ನು ಸಂಶೋಧನೆಗೆ ಮಾತ್ರ ಬಳಸಲಾಗುತ್ತದೆ.
ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸಲು ಯಾವುದೇ ಒತ್ತಾಯವಿಲ್ಲ. ನೀವು ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸಲು ಬಯಸದಿದ್ದರೆ ನೀವು ಯಾವುದೇ ರೀತಿಯಲ್ಲಿ ಪರಿಣಾಮ ಬೀರುವುದಿಲ್ಲ. ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸಲು ನೀವು ಸ್ವಯಂಪ್ರೇರಣೆಯಿಂದ ಒಪ್ಪಿಕೊಂಡರೆ ಮಾತ್ರ ನೀವು ಸಹಿ ಮಾಡಬೇಕಾಗುತ್ತದೆ. ಇದಲ್ಲದೆ, ಯಾವುದೇ ಸಮಯದಲ್ಲಿ ಅಧ್ಯಯನದಿಂದ ಹಿಂದೆ ಸರಿಯಲು ನಿಮಗೆ ಸ್ವಾತಂತ್ರ್ಯವಿದೆ. ನೀವು ಹಾಗೆ ಮಾಡಲು ಬಯಸಿದರೆ. ಭಾಗವಹಿಸಬೇಕೆ ಎಂಬುದು ನಿರ್ಧಾರಕ್ಕೆ ಬಿಟ್ಟದ್ದು. ಈ ಡಾಕ್ಯುಮೆಂಟ್ ಅನ್ನು ಕಾಲೇಜಿನ ಕಮ್ಯುನಿಟಿ ಮೆಡಿಸಿನ್ ವಿಭಾಗದಲ್ಲಿ ಸುರಕ್ಷಿತ ಲಾಕರ್‌ನಲ್ಲಿ ಸಂಗ್ರಹಿಸಲಾಗುತ್ತದೆ ಮತ್ತು ಮಾಹಿತಿಗಾಗಿ ಪ್ರತಿಯನ್ನು ನಿಮಗೆ ನೀಡಲಾಗುತ್ತದೆ.

ಯಾವುದೇ ಹೆಚ್ಚಿನ ವರ್ಗೀಕರಣಕ್ಕಾಗಿ ನೀವು ಪ್ರಧಾನ ತನಿಖಾಧಿಕಾರಿಯನ್ನು ಸಂಪರ್ಕಿಸಲು ಮುಕ್ತರಾಗಿದ್ದೀರಿ.

ಡಾ.ಸುಧಾಕರ್.ಎಸ್ ಮೊ.ಸಂ:9494392612

INFORMED CONSENT

SL. No:

Title: **ASSESSMENT OF RISK FACTORS AND SCREENING FOR ORAL CANCER BY VISUAL EXAMINATION OF ORAL CAVITY IN KOLAR- COMMUNITY BASED CROSS SECTIONAL STUDY.**

I, the undersigned, agree tom participate in this study and to undergo counselling and disclosure of my personal information and as outlined in this consent form.

I have been read out/ explained in my local language i.e. in Kannada and understand the purpose of this study and the confidential nature of the information that will be collected and disclosed during the study.

I have had the opportunity to ask questions regarding the various aspects of this study and my questions have been answered to my full satisfaction. The information collected will be used only for research.

I understand that I remain free to withdraw from this study at any time. Participation in this study is under my sole discretion and does not involve any cost to me.

Subject's name and signature/thumb impression

Name and signature of witness

1. Date:
2.

Name and signature of interviewer:

Name and signature of Principal Investigator: Dr. Sudhakar

ತಿಳಿವಳಿಕೆ ಒಪ್ಪಿಗೆ

SL.No.

ಶೀರ್ಷಿಕೆ: ಅಪಾಯದ ಅಂಶಗಳ ಮೌಲ್ಯಮಾಪನ ಮತ್ತು ಕೋಲಾರದಲ್ಲಿ ಬಾಯಿಯ ಕುಹರದ ದೃಷ್ಟಿ ಪರೀಕ್ಷೆಯ ಮೂಲಕ ಬಾಯಿಯ ಕ್ಯಾನ್ಸರ್‌ಗಾಗಿ ಸ್ಕ್ರೀನಿಂಗ್- ಸಮುದಾಯ ಆಧಾರಿತ ಕ್ರಾಸ್ ಸೆಕ್ಷನಲ್ ಸ್ಟಡಿ

ನಾನು, ಕೆಳಗೆ ಸಹಿ ಮಾಡಿದ್ದೇನೆ, ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸಲು ಮತ್ತು ನನ್ನ ವೈಯಕ್ತಿಕ ಮಾಹಿತಿಯ ಸಮಾಲೋಚನೆ ಮತ್ತು ಬಹಿರಂಗಪಡಿಸುವಿಕೆಗೆ ಒಳಗಾಗಲು ಮತ್ತು ಈ ಒಪ್ಪಿಗೆ ನಮೂನೆಯಲ್ಲಿ ವಿವರಿಸಿರುವಂತೆ ಒಪ್ಪಿಕೊಳ್ಳುತ್ತೇನೆ.

ನಾನು ನನ್ನ ಸ್ಥಳೀಯ ಭಾಷೆಯಲ್ಲಿ ಅಂದರೆ ಕನ್ನಡದಲ್ಲಿ ಓದಿದ್ದೇನೆ/ ವಿವರಿಸಿದ್ದೇನೆ ಮತ್ತು ಈ ಅಧ್ಯಯನದ ಉದ್ದೇಶ ಮತ್ತು ಅಧ್ಯಯನದ ಸಮಯದಲ್ಲಿ ಸಂಗ್ರಹಿಸಿದ ಮತ್ತು ಬಹಿರಂಗಪಡಿಸುವ ಮಾಹಿತಿಯ ಗೌಪ್ಯ ಸ್ವರೂಪವನ್ನು ಅರ್ಥಮಾಡಿಕೊಂಡಿದ್ದೇನೆ.

ಈ ಅಧ್ಯಯನದ ವಿವಿಧ ಅಂಶಗಳ ಬಗ್ಗೆ ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಲು ನನಗೆ ಅವಕಾಶವಿದೆ ಮತ್ತು ನನ್ನ ಪ್ರಶ್ನೆಗಳಿಗೆ ನನ್ನ ಪೂರ್ಣ ತೃಪ್ತಿಗೆ ಉತ್ತರಿಸಲಾಗಿದೆ. ಸಂಗ್ರಹಿಸಿದ ಮಾಹಿತಿಯನ್ನು ಸಂಶೋಧನೆಗೆ ಮಾತ್ರ ಬಳಸಲಾಗುತ್ತದೆ.

ನಾನು ಯಾವುದೇ ಸಮಯದಲ್ಲಿ ಈ ಅಧ್ಯಯನದಿಂದ ಹಿಂದೆ ಸರಿಯಲು ಮುಕ್ತನಾಗಿರುತ್ತೇನೆ ಎಂದು ನಾನು ಅರ್ಥಮಾಡಿಕೊಂಡಿದ್ದೇನೆ. ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸುವಿಕೆಯು ನನ್ನ ಸ್ವಂತ ವಿವೇಚನೆಗೆ ಒಳಪಟ್ಟಿರುತ್ತದೆ ಮತ್ತು ನನಗೆ ಯಾವುದೇ ವೆಚ್ಚವನ್ನು ಒಳಗೊಂಡಿರುವುದಿಲ್ಲ.

ವಿಷಯದ ಹೆಸರು ಮತ್ತು ಸಹಿ/ಹೆಬ್ಬೆರಳಿನ ಗುರುತು

ಸಾಕ್ಷಿಯ ಹೆಸರು ಮತ್ತು ಸಹಿ

1. ದಿನಾಂಕ:

2.

ಸಂದರ್ಶಕರ ಹೆಸರು ಮತ್ತು ಸಹಿ:

ಪ್ರಧಾನ ತನಿಖಾಧಿಕಾರಿಯ ಹೆಸರು ಮತ್ತು ಸಹಿ: ಡಾ.ಸುಧಾಕರ.ಎಸ್

ANNEXURE III

DEFINITIONS OF VARIABLES

1.AGE:

The age was recorded as stated by the subject to the nearest completed year.

2.Address:

The permanent Residential Address in which subject was staying in the past one year.

3.Education:

Formal education was recorded as recorded as stated by the subject.

Primary: Subject with education up to Vth standard.

Secondary: Subject with education between VIth to Xth standard.

Higher secondary: People with education up to Pre-university (up to XII standard).

Graduate: People above university level of education (minimum 3 years)

Post Graduate: People with additional degree after Graduation.

4.Per capita income:

Per capita income is total family income divided by family size.

PCI= Total family income/ Family members.[62]

5.Family Size:

It is defined as total family members, adults and children under one roof and sharing the same kitchen. For calculating family size, children under 12 years of age are considered as half and above 12 years as one. Infants are not considered.

6.Socio-Economic status:[63]

Modified B.G Prasad's classification was used for socioeconomic status for rural and urban families according to per capita income for month of May 2024

(Consumer Price Index for Month of May-2024) latest updated

SOCIO ECONOMIC CLASS	PER CAPITA INCOME
Class I (upper)	9,098 and above
Class II (Upper Middle)	4,549-9,097

Class III (Lower Middle)	2,729-4,548
Class IV (Upper Lower)	1,364-2,728
Class V (Lower)	<1,364

7.Chronic illness:

Presence of the any of following one or more conditions with non-communicable disease (HTN, DM, Epilepsy, TB, Asthma) were included in it

a) **Hypertension:** Blood pressure of > 140 Systolic and >90 Diastolic, as well as isolated systolic blood pressure of >140 was considered as hypertensive.[64]

b) **Diabetes Mellitus:** If his Fasting blood sugar level was >126 mg% or he is a diagnosed case of DM on medications were considered as having DM.[65]

c) Asthma: Chronic inflammatory disease of air ways characterized by variable symptoms, reversible air flow obstruction and bronchospasms. Common symptoms include breathlessness, wheezing, coughing, chest tightness, shortness of breath was considered as asthma.

d) Tuberculosis:

If the individual had a history of being diagnosed with tuberculosis by a medical professional or was undergoing/received anti-tubercular treatment (ATT), they were considered as having tuberculosis. Common symptoms include chronic cough, weight loss, night sweats, and fever.

e) Epilepsy:

If the participant had a clinical history of two or more unprovoked seizures at least 24 hours apart, or was on regular anti-epileptic medication prescribed by a physician, they were considered as having epilepsy. Symptoms may include episodes of convulsions, altered awareness, or sudden behavioural changes.

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION & RESEARCH

SRI DEVARAJ URS MEDICAL COLLEGE

Tamaka, Kolar

INSTITUTIONAL ETHICS COMMITTEE

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10. Dr.D.Srinivasan, Assoc. Prof. Dept. of Surgery, SDUMC
11. Dr.Shilpa M D Assoc. Prof. Dept. of Pathology, SDUMC

No. DMC/KLR/IEC/16/ 2023-24 **Date: 10/04/2023**

PRIOR PERMISSION TO START OF STUDY

The Institutional Ethics Committee of Sri Devaraj Urs Medical College, Tamaka, Kolar has examined and unanimously approved the synopsis entitled **"Assessment Of Risk Factors And Screening For Oral Cancer By Visual Examination Of Oral Cavity In Kolar- A Community Based Cross Sectional Study."** being investigated by **Dr.Sudhakar S & Dr.Sunil.B.N** in the Department of Community Medicine at Sri Devaraj Urs Medical College, Tamaka, Kolar. **Permission is granted by the Ethics Committee to start the study.**

Sujatha.M.P

Member Secretary

Member Secretary
Institutional Ethics Committee
Sri Devaraj Urs Medical College
Tamaka, Kolar.

Chairman

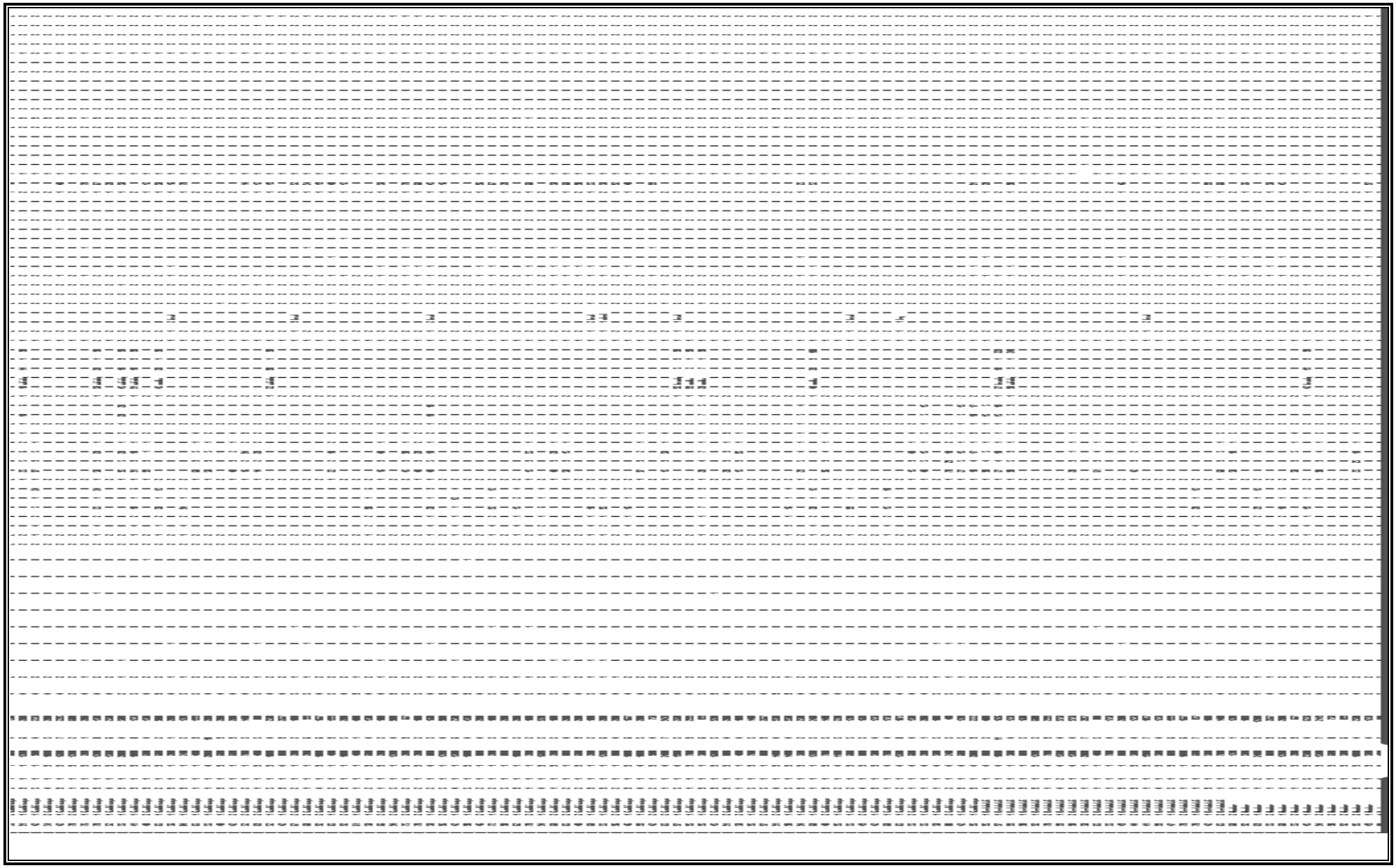
CHAIRMAN
Institutional Ethics Committee
Sri Devaraj Urs Medical College
Tamaka, Kolar

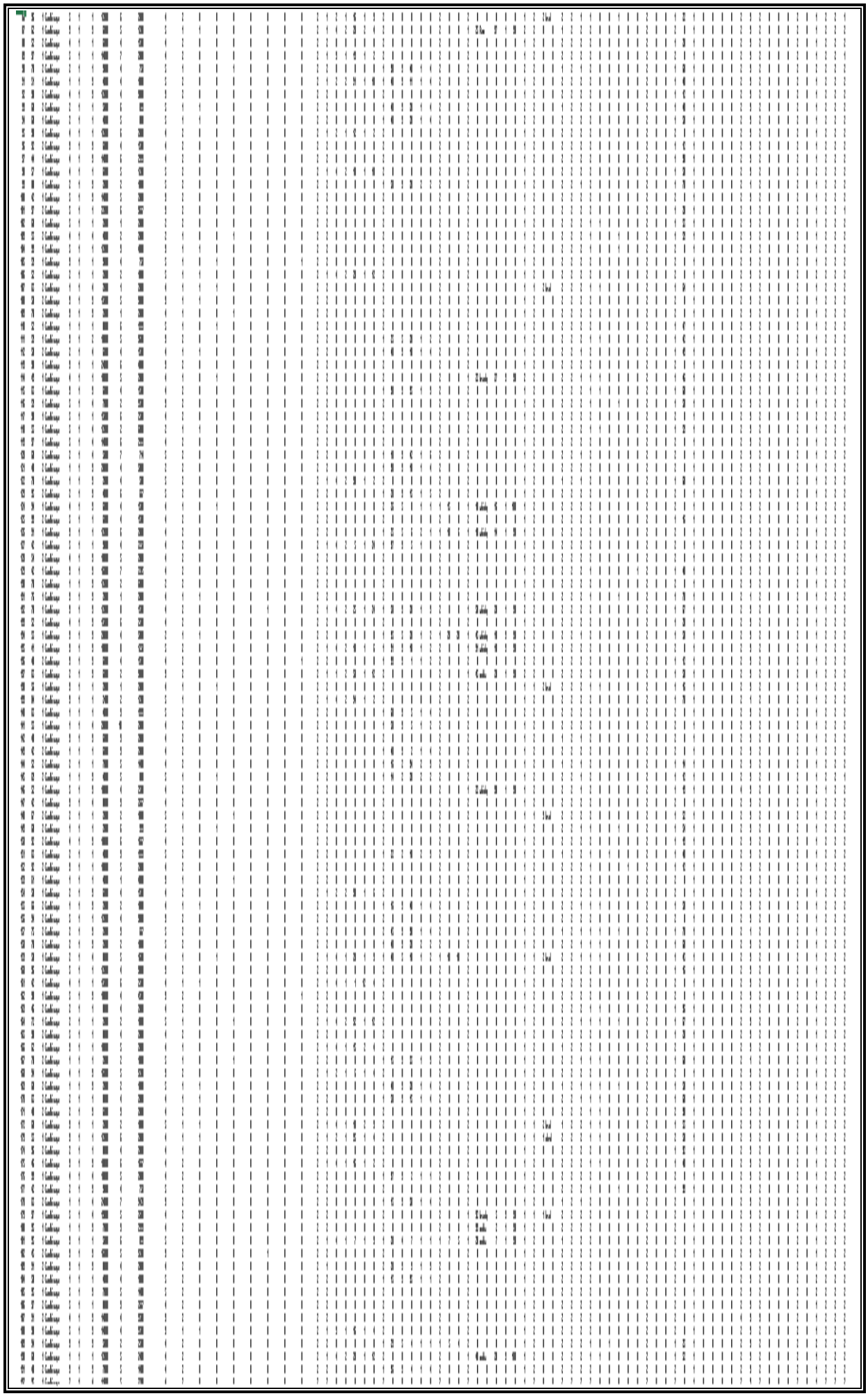
GANTT CHART

STEP	ACTIVITY	TIME PERIOD											
		2023				2024			2025				
		Feb-march	April	May-June	July	Aug-Sentember	October-November	December	January	February	March	April	
1	Topic search, selection & synopsis writing												
2	Synopsis submission												
3	Approval by IEC*												
4	Proforma Preparation and validation												
5	Pilot project												
6	Review of literature												
7	Data collection												
8	Data analysis												
9	Dissertation writing												
10	Submission of dissertation												

Conducting Interviews with participants to Assess risk factors and screening of oral cancer in Devarayasamudra, Kolar, Karnataka.

MASTER CHART





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