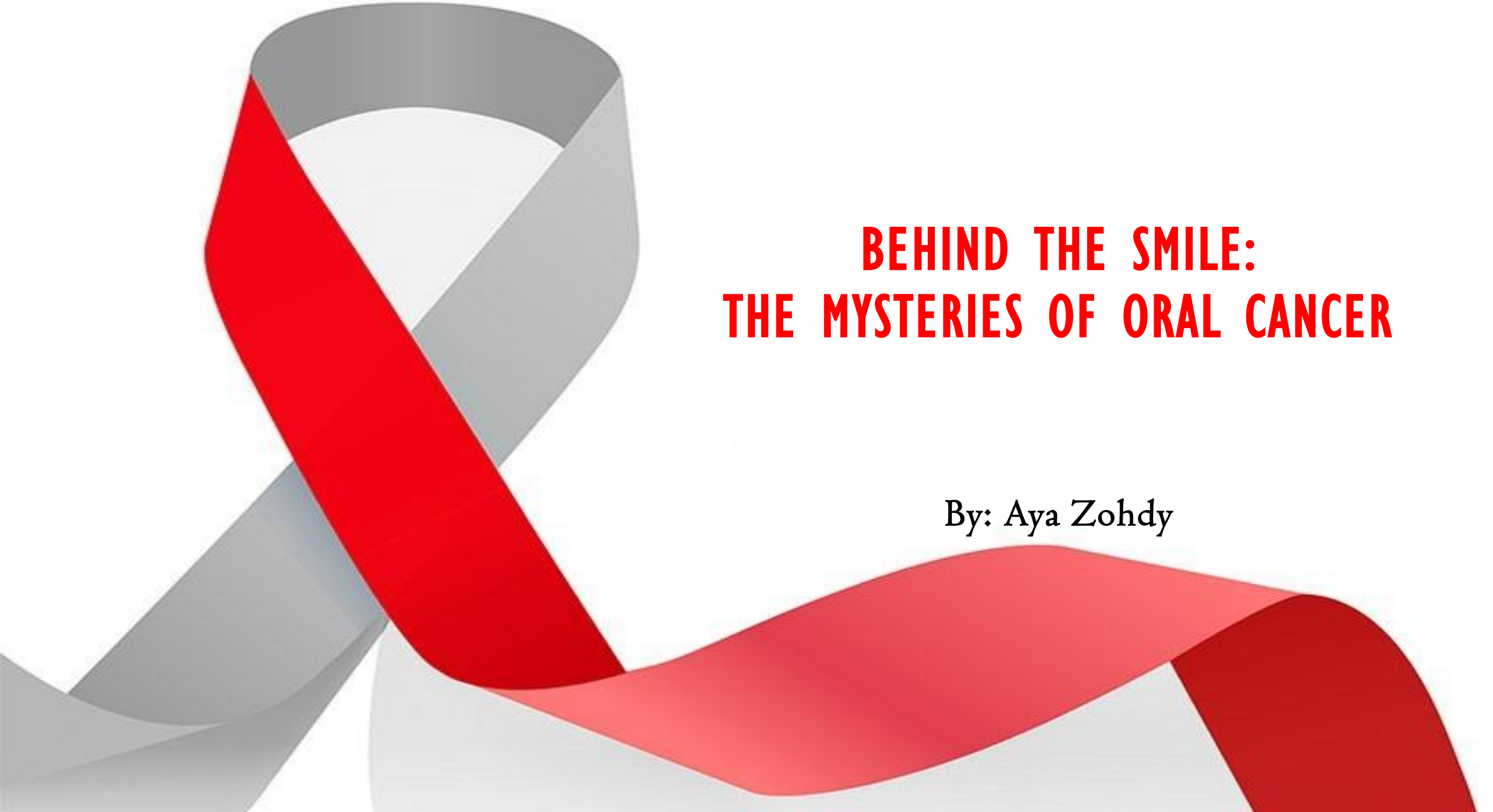
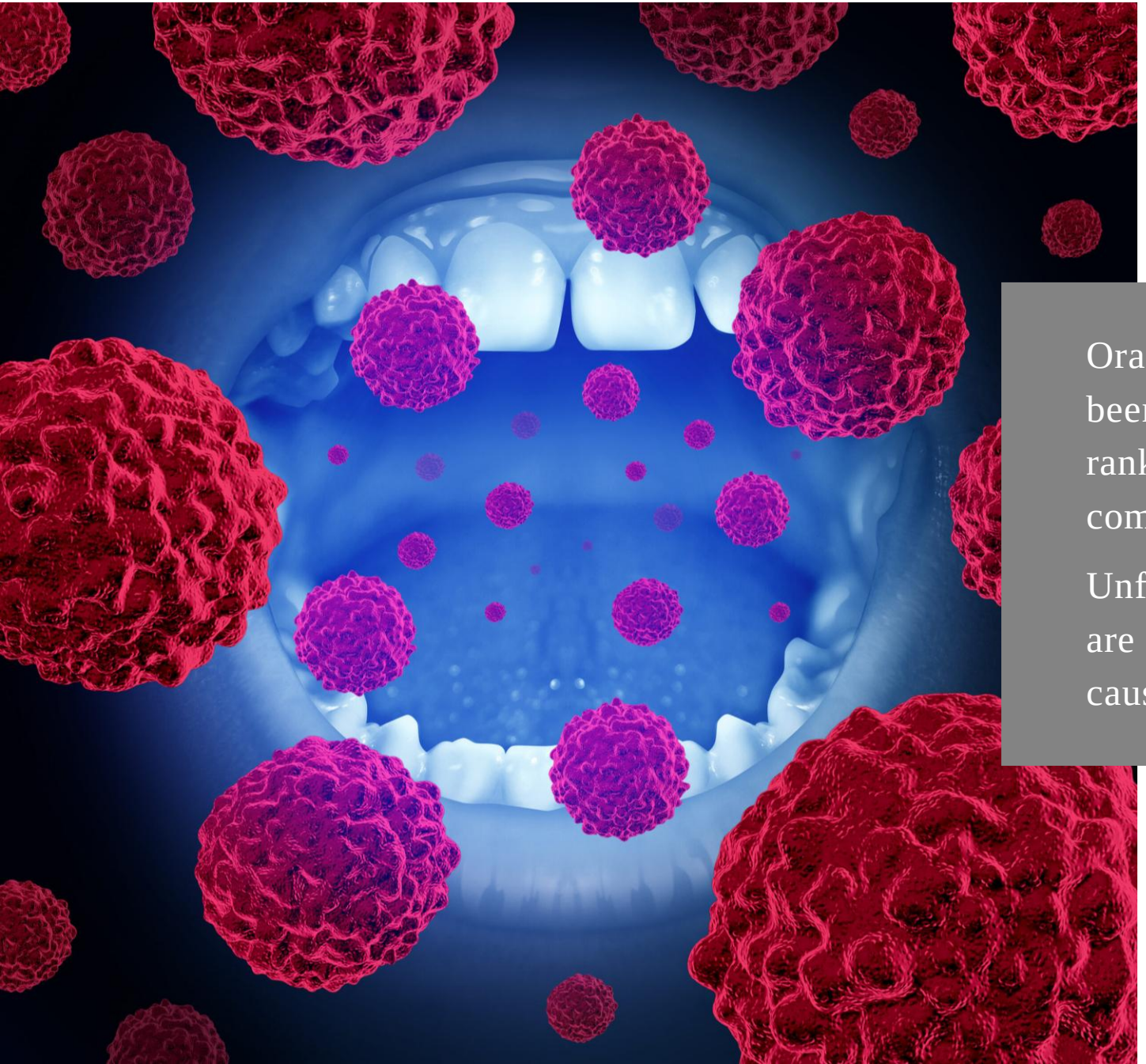


BEHIND THE SMILE: THE MYSTERIES OF ORAL CANCER

By: Aya Zohdy



STATEMENT OF PROBLEM

Oral cancer is one of the types of cancer that has been increasing among the population recently. Its ranking rose from 16th in 2022 to the 13th most common cancer worldwide in 2025.

Unfortunately, there are still groups of people who are unaware of its symptoms, incidence rate, and causes, etc.

- Oral health
- Mouth and oral cancer statistics | World Cancer Research Fund

THE AIM

The aim of this project is to analyze oral cancer from different aspects to provide **actionable insights for Dentists and public health awareness campaigns** and **improve screening strategies and the Public Health Strategies and Policies.**

AUDIENCES

DENTISTS

PUBLIC HEALTH OFFICIALS

RESEARCHERS

ORGANIZERS OF AWARENESS CAMPAIGNS

POLICYMAKERS

DATA OVERVIEW

The dataset (Oral Cancer Prediction Dataset) is based on real-world oral cancer statistics, aligning with global health reports.

Patients information

Symptoms

Risk factors

Diagnosis

Treatment, survival rate and economic burden

EXPLORATORY DATA ANALYSIS (EDA)

80,000 + Patients

17 Countries

15 - 101 Patients age

Both Gender

4 Cancer stages

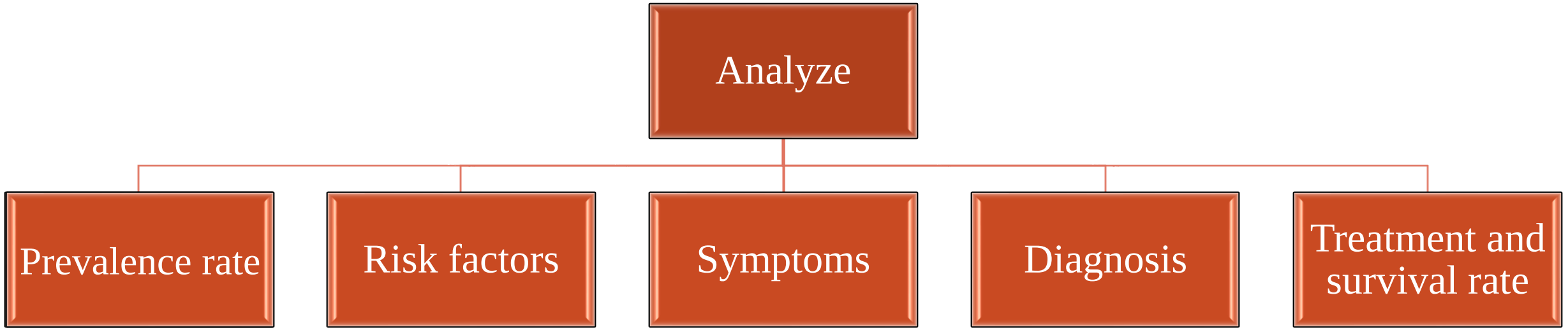
6 Tumor Size (cm)

Cancered + non-cancered patients

4 Types of treatment

Data sources: World Health Organization (WHO) – GLOBOCAN Reports National Cancer Institute (NCI) – Cancer Data Oral Cancer Foundation – Risk Factors & Statistics Academic Research Papers & Studies on Oral Cancer Epidemiology Country-Specific Cancer Registries & Public Health Reports

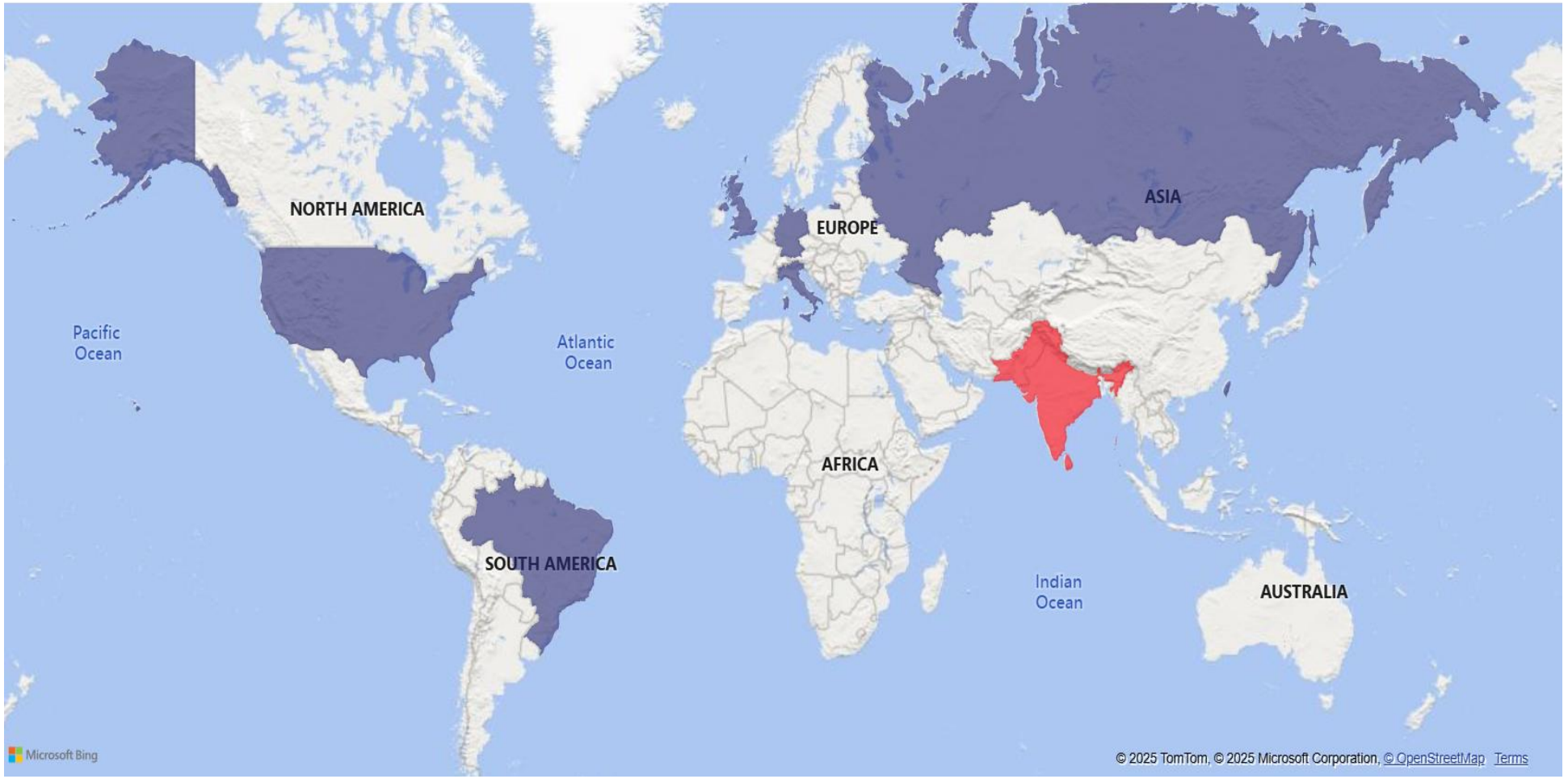
APPROACHES


Analyze
Prevalence rate
Risk factors
Symptoms
Diagnosis
Treatment and survival rate

Prevalence rate

Which countries are the most affected by cancer?

For High-risk Populations



Top 3 Countries

Pakistan

India

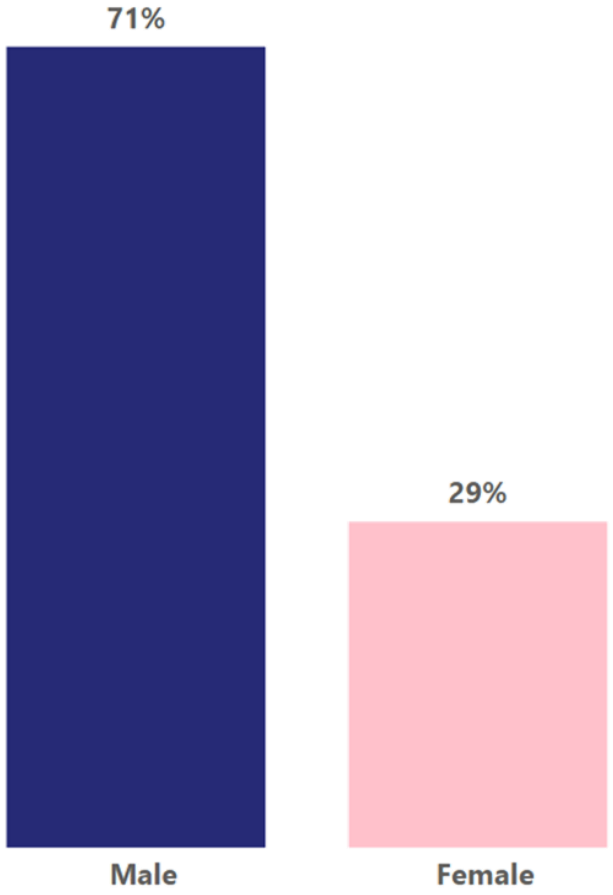
Sri Lanka

Prevalence rate

Which gender are the most affected by cancer?

- For Biological & Behavioral Risk Factors.
- For Public Health Strategy and Screening Programs.

Male > Female



applied sciences

MDPI

Review

Analysis of Risk Factors of Oral Cancer and Periodontitis from a Sex- and Gender-Related Perspective: Gender Dentistry

Federica Di Spirito [1,†], Alessandra Amato [2,†], Antonio Romano [3], Gianna Dipalma [4], Edit Xhajanka [5], Adone Baroni [6], Rosario Serpico [3], Francesco Inchingolo [4,‡] and Maria Contaldo [6,*,‡]

September 2022

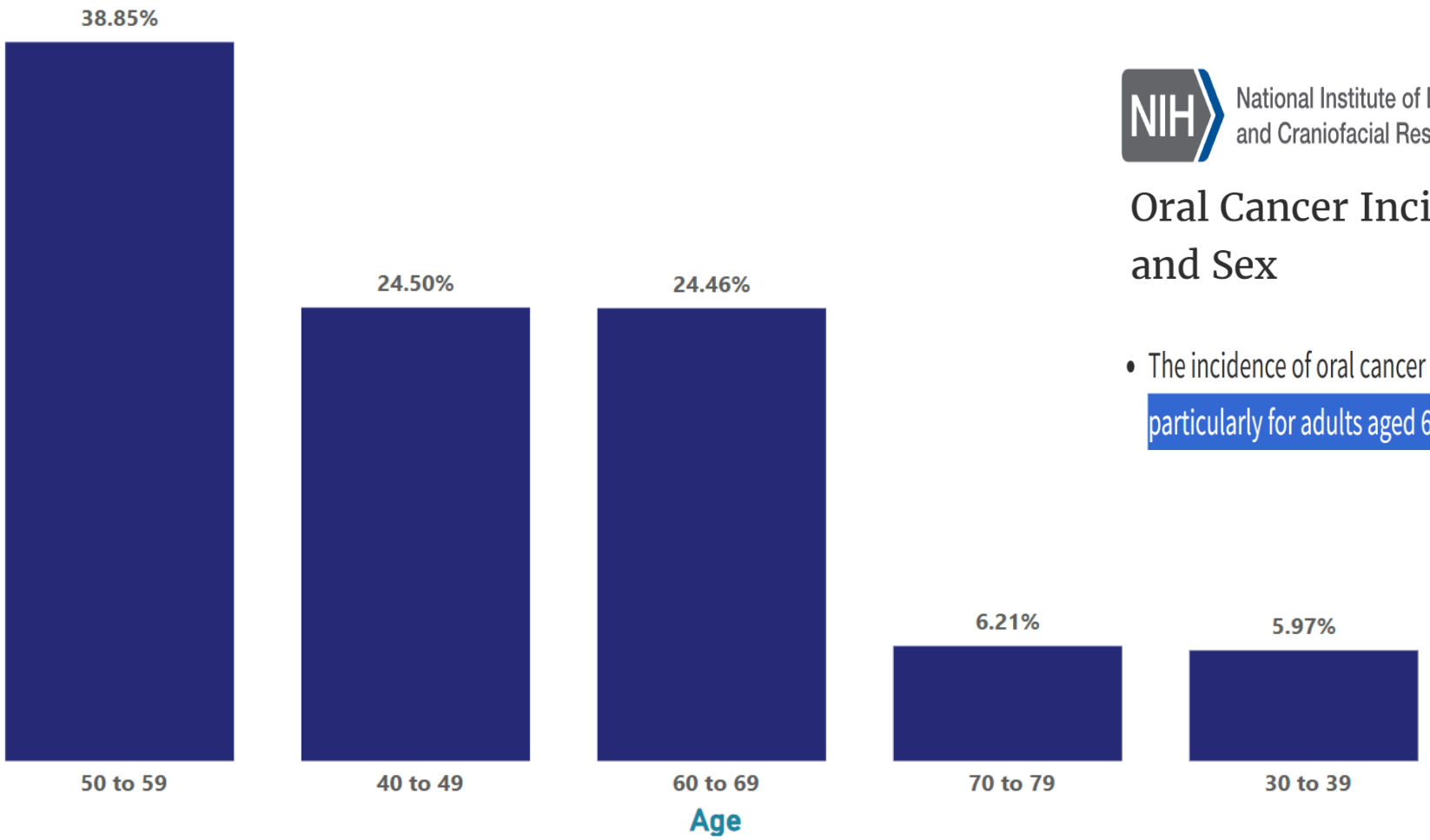
In 2020, the lip and oral cavity cancer incidence counted 264,000 new cases in males (70% of total cases) and 113,000 in females, with a male/female ratio equal to 2.3:1;

Prevalence rate

Top 5 most affected ages?

- For Biological & Behavioral Risk Factors.
- For Public Health Strategy and Screening Programs.
- For Personal Care (Reinforces the behavior of the person).

Fifties top the list



National Institute of Dental and Craniofacial Research

Oral Cancer Incidence (New Cases) by Age, Race, and Sex

January 2025

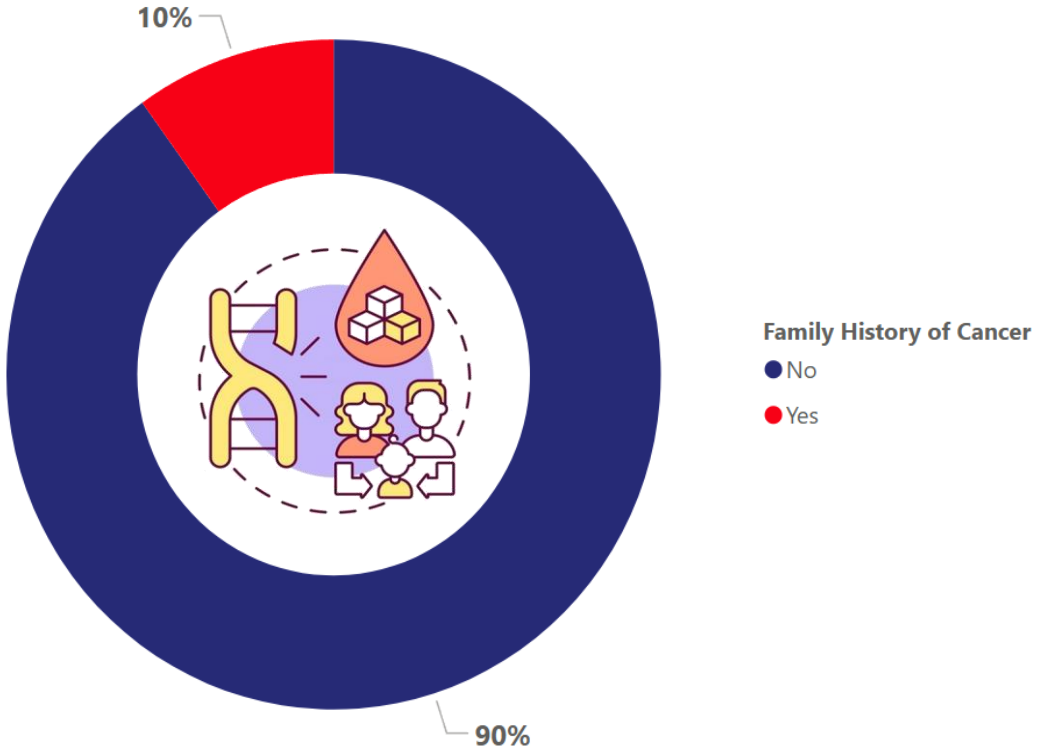
- The incidence of oral cancer increases with age. The increase becomes more rapid after age 50, particularly for adults aged 65 years and older.

Prevalence rate

Are the family cancer history increase incidence rate?

- For Public Health Strategy and Screening Programs.
- For Personal Care (Reinforces the behavior of the person).

10% of family cancer history



RESEARCH Open Access

The role of family history of Cancer in Oral Cavity Cancer

Paolo Junior Fantozzi[1*], Roxanne Bavarian[2,3], Ibon Tamayo[4], Marie-Abele Bind[4], Sook-Bin Woo[2,3] and Alessandro Villa[5]

2021

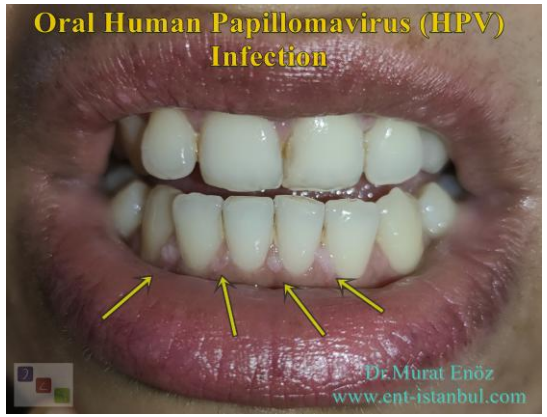
Personal history of solid cancer, hematologic malignancies and previous head and neck radiation therapy were not significantly associated with a higher risk of developing OSCC

Risk factors

Is there relation between HPV and oral cancer?

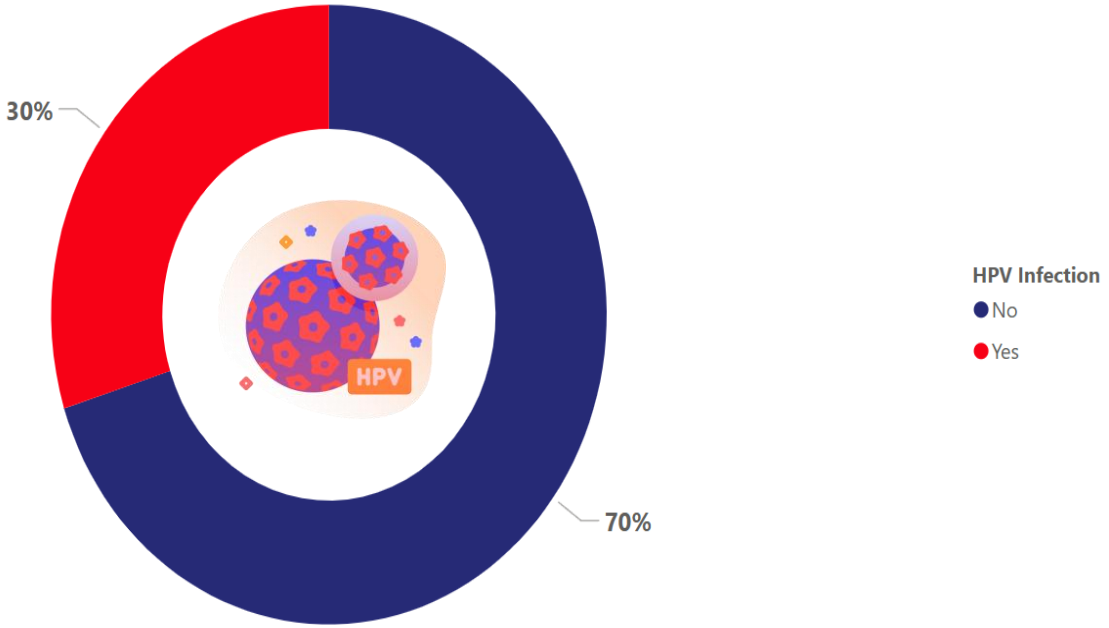
- Confirms that oral cancer is HPV-Driven.
- Prevention and vaccination.

Human papillomavirus (HPV) is a common **sexually transmitted infection.** HPV can affect the skin, genital area, mouth and throat. In some people, this can cause **oral cancer.**



Carcinoma tongue
on lateral border and ventral surface

30% HPV Patients



- Human papillomavirus and cancer
- Oral human papillomavirus infection

Risk factors

Is there relation between HPV and oral cancer?

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- Prevention and vaccination.

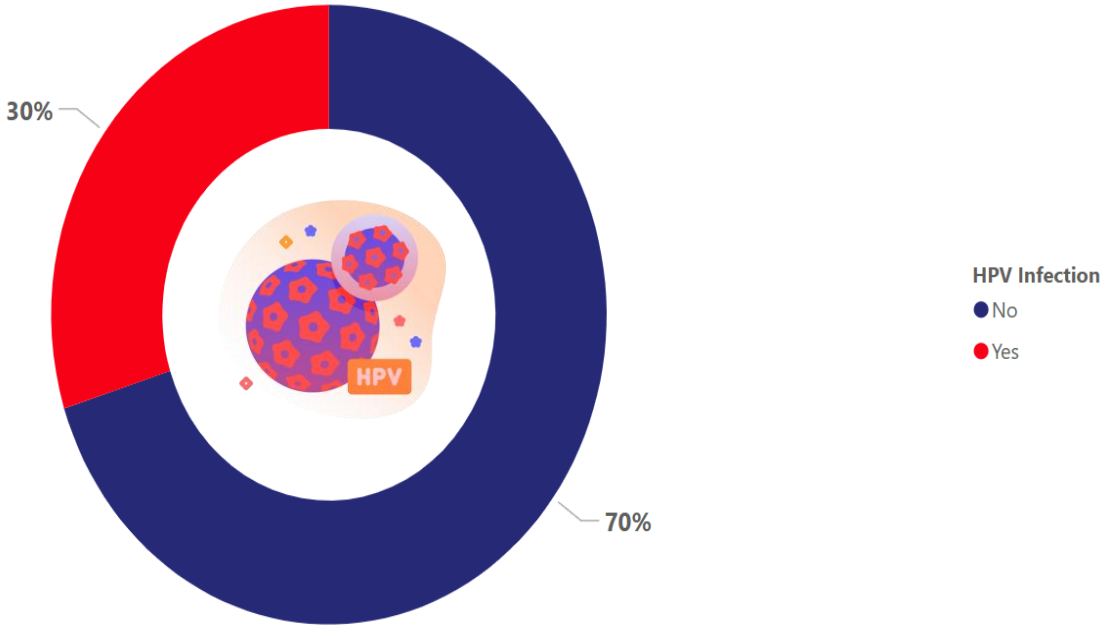
MAEDICA – a Journal of Clinical Medicine
2024; 19(4): 801-806
https://doi.org/10.26574/maedica.2024.19.4.801

MÆDICA - a Journal of Clinical Medicine
REVIEW

Association of HPV with Oral and Oropharyngeal Cancer: Current Evidence

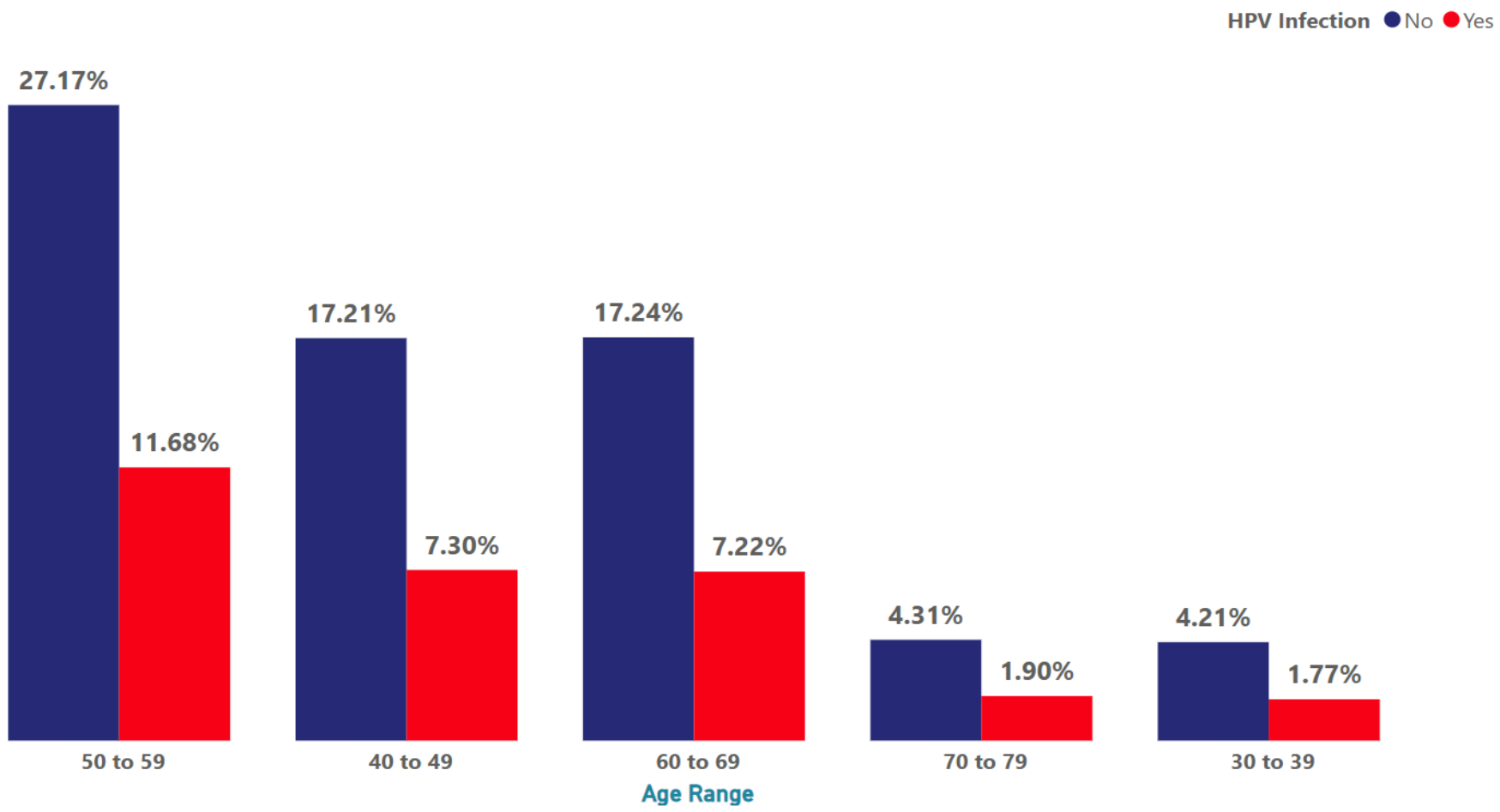
Over a period of 20 years, the rate of HPV-positive oral squamous cell carcinoma (OSCC) has increased from less than 20% to more than 70% in the United States and certain European nations (11). Until recently, it was believed that around 20% of oral cancers and 60% to 80% of oropharyngeal cancers were caused by HPV in-

30% HPV Patients



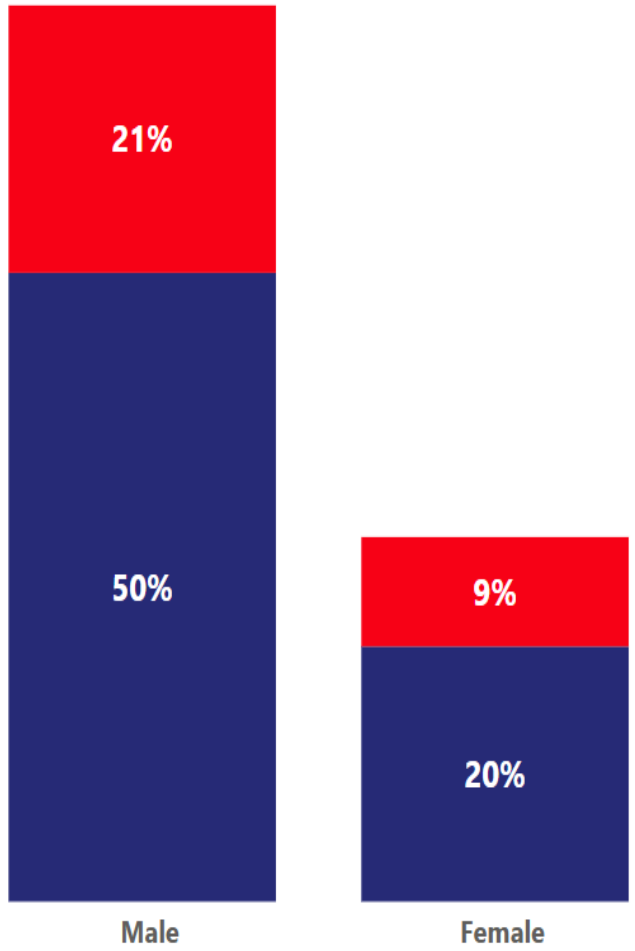
HPV X Age

12% of HPV-Driven oral cancer patients in fifties

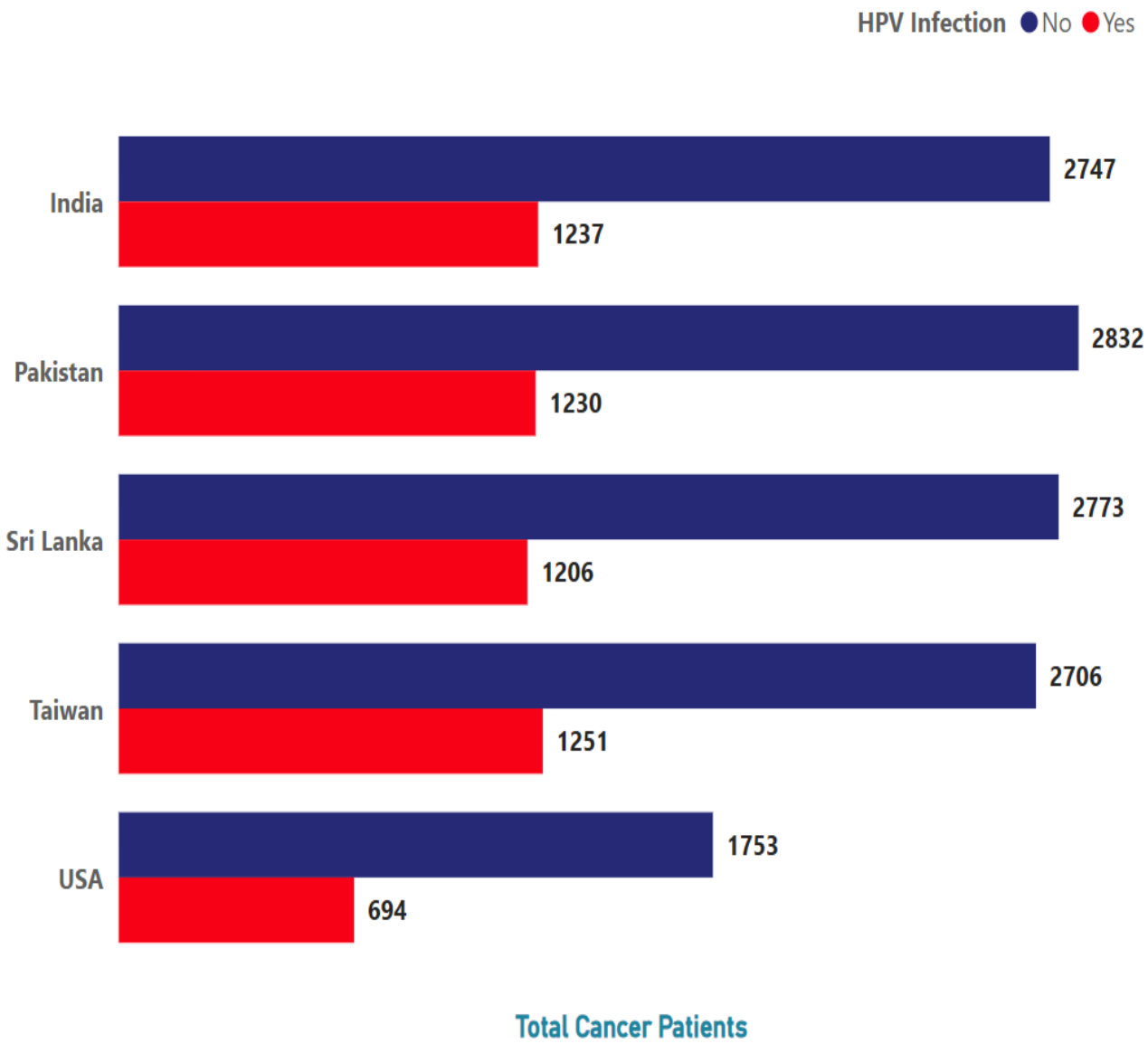


HPV X Gender

21% of HPV-Driven cancer patients Male



HPV X Countries

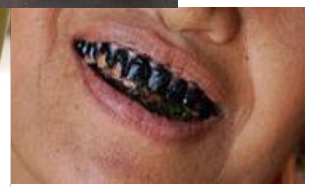


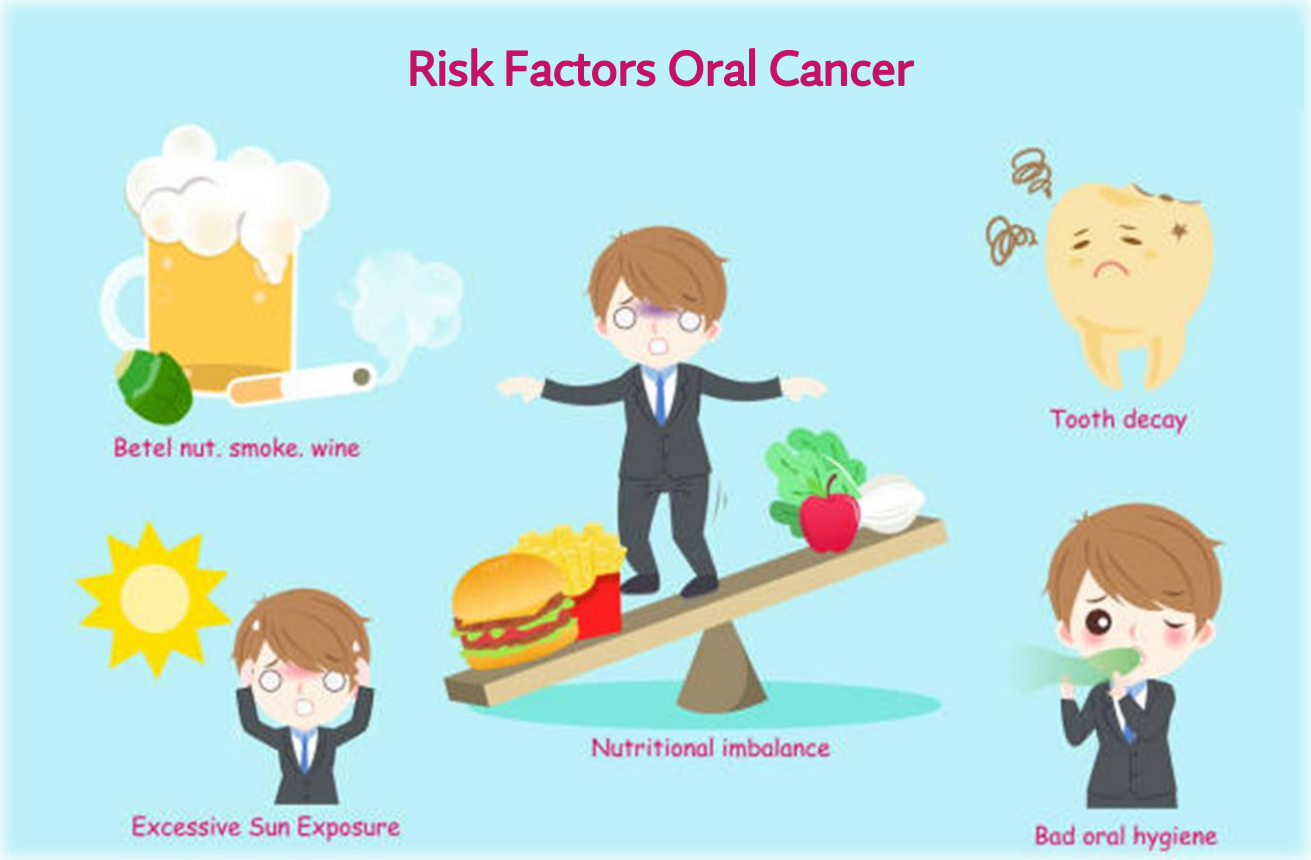
India on the top

Risk factors

Did the habits and daily routine assume the occurrence of the oral cancer?

- Rank the most dangerous habits.
- Regional and cultural risk patterns.
- For Public Health Strategy and Screening Programs.





Risk factors

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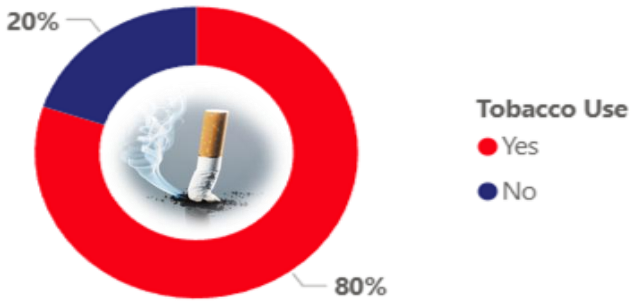
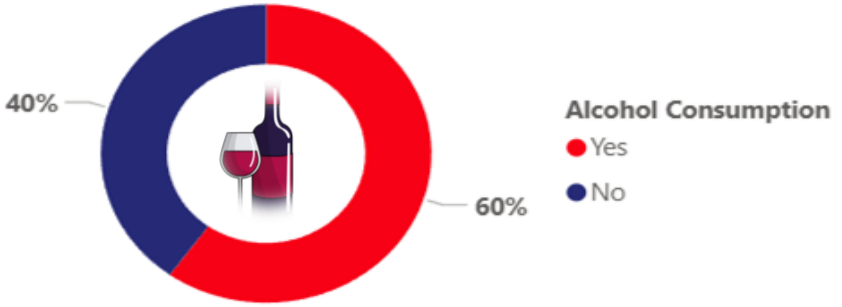
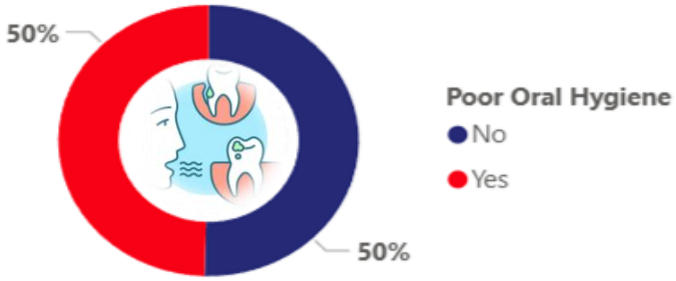
Smoking X OC



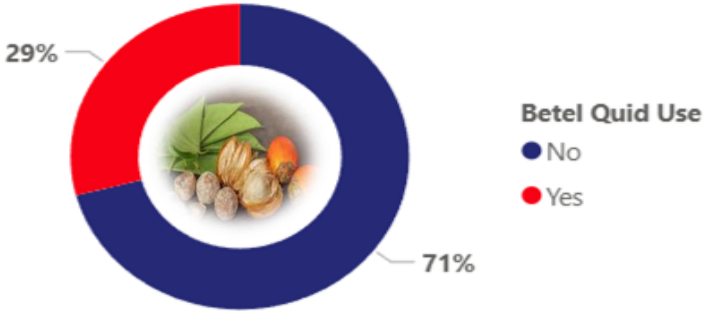
Alcohol Consumption X OC



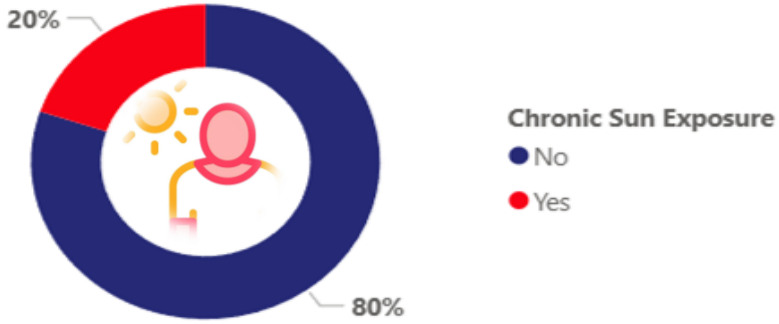
Poor Oral Hygiene X OC



Betel nut chewing X OC

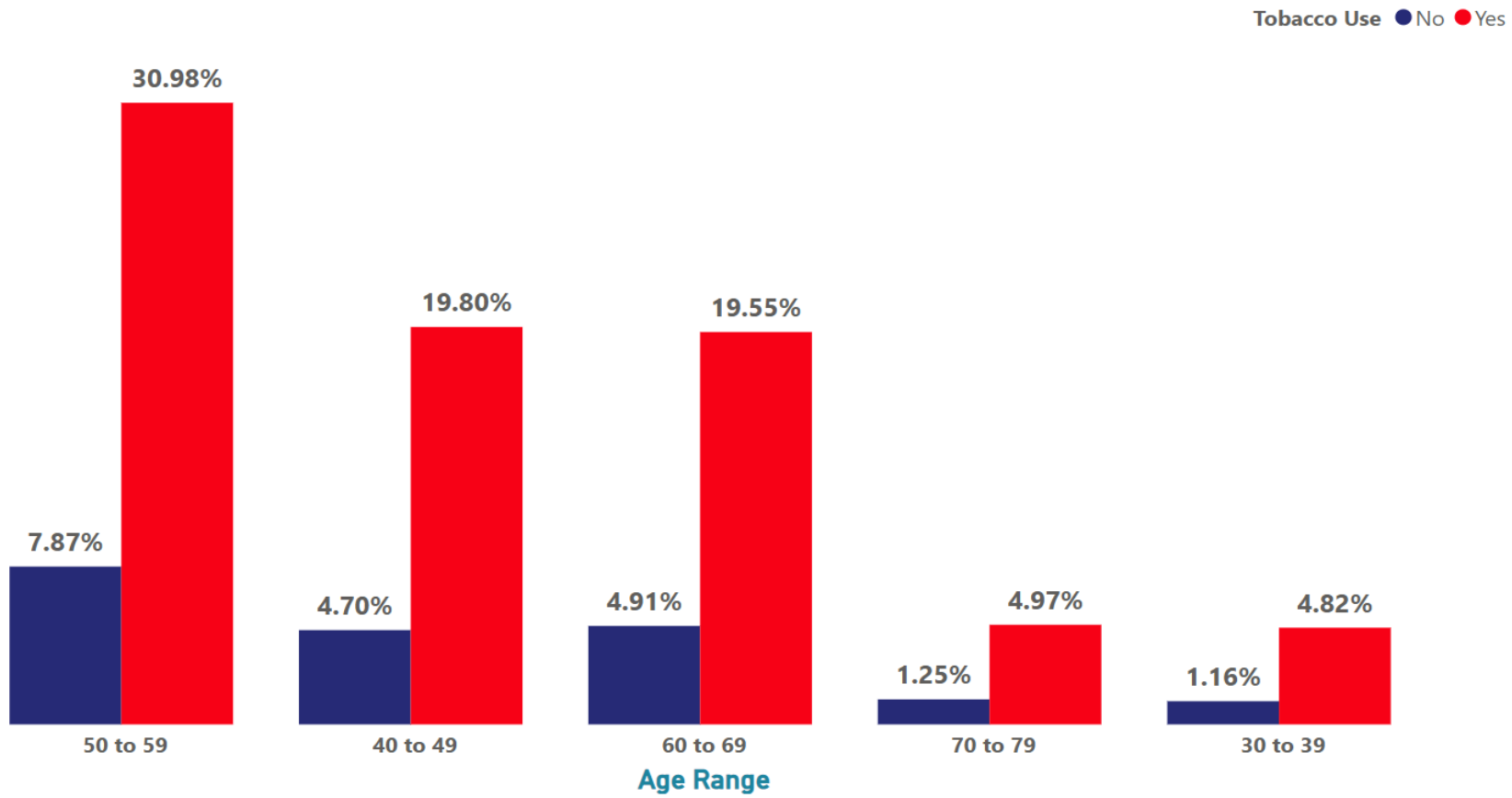


Chronic Sun Exposure X OC



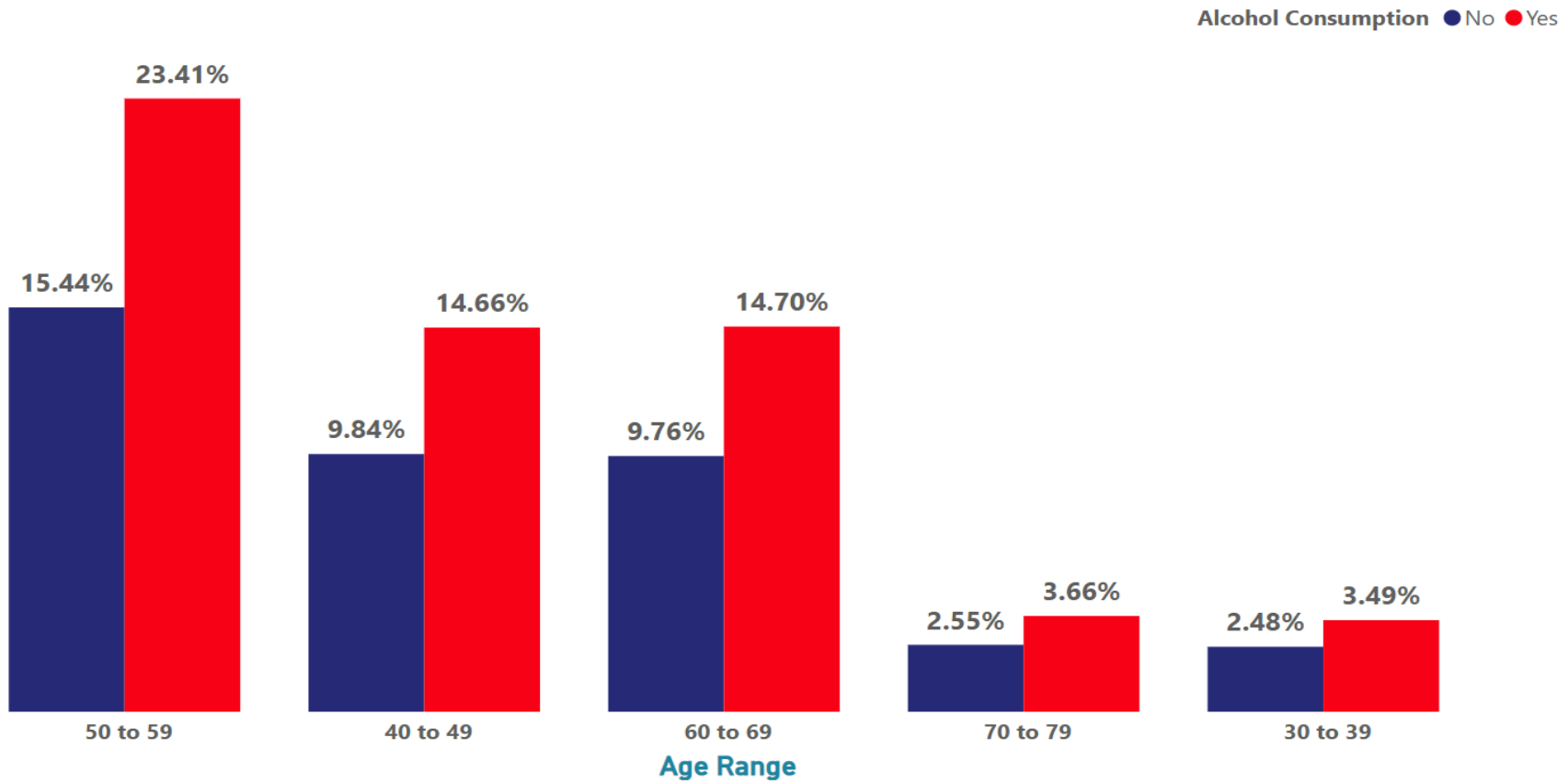
A. Smoking

31% of Oral Cancer patients are Smoker over the age of fifty



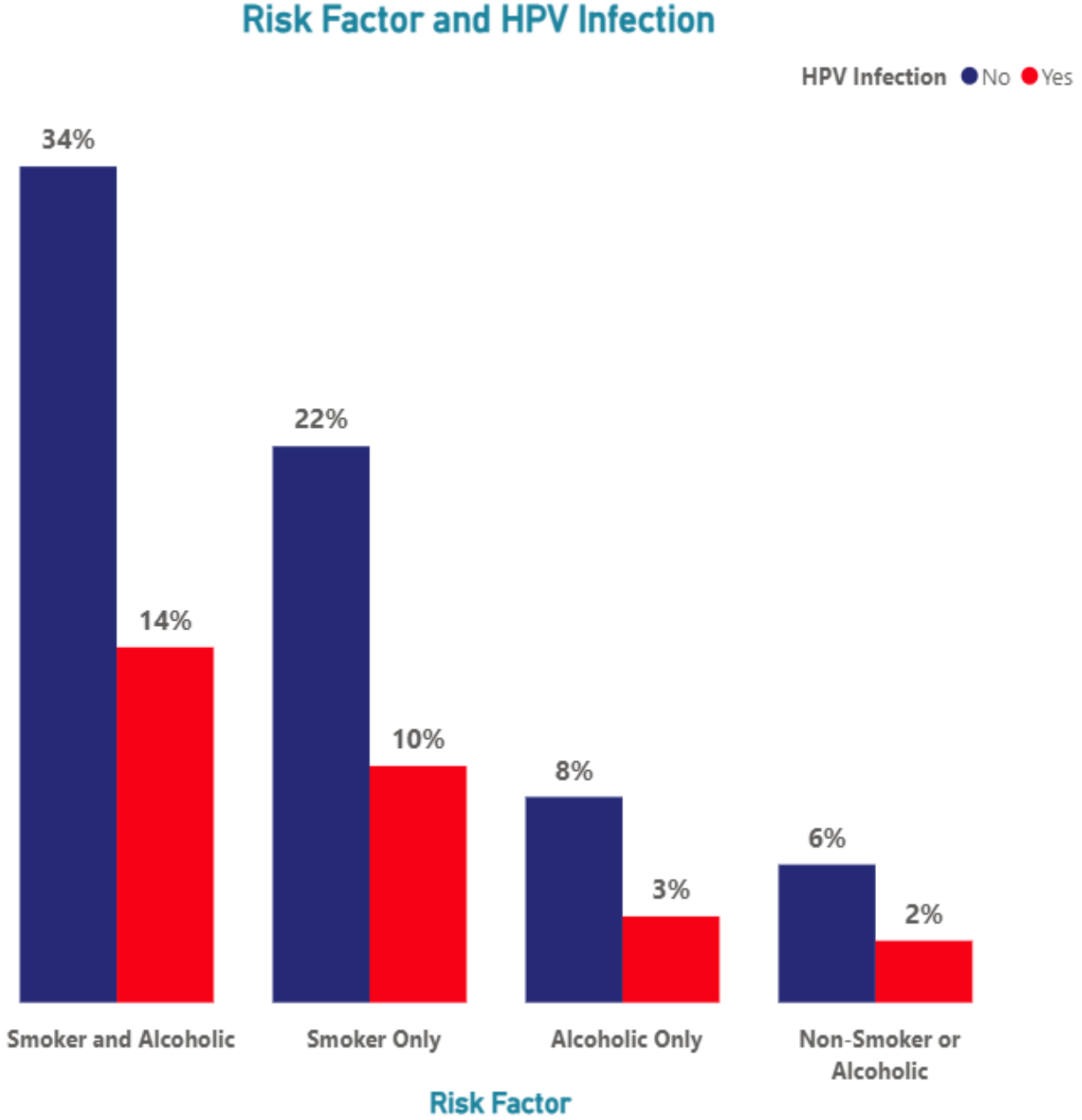
B. Alcoholism

23% of Oral Cancer patients are Alcoholic over the age of fifty



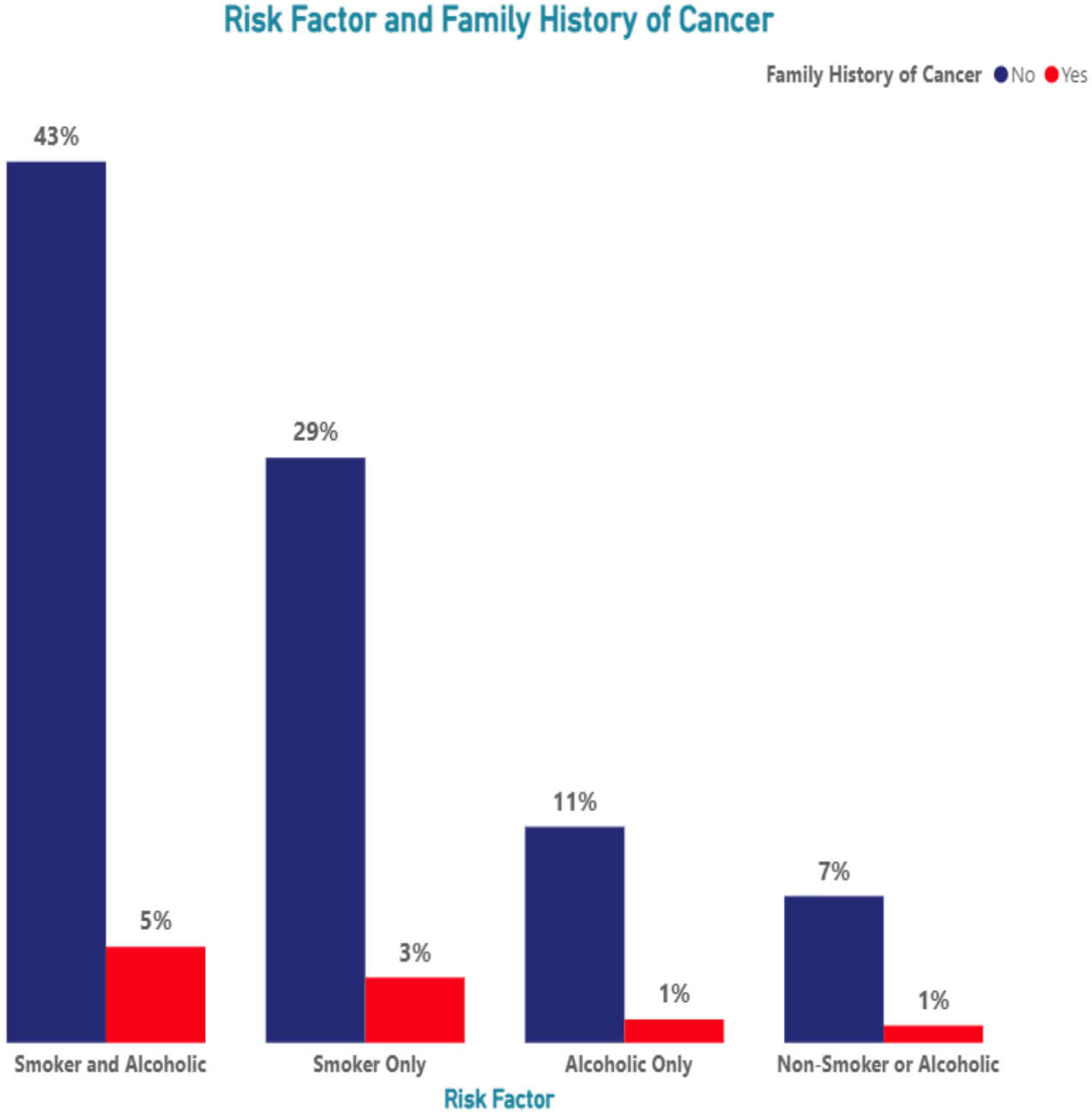
C. Combined Risk

14% Oral Cancer in HPV + Smoker + Alcoholic Patients



C. Combined Risk

5% Oral Cancer in Cancer History + Smoker + Alcoholic Patients



Smoking

Alcoholism

Oral Cancer

Smoking and its Role in Oral Cancer

Prabhu Manickam Natarajan[1], Bhuminathan Swamikannu[2], Leela Bhavani[3], Bindu Kamaraj[4], Loganathan Kamaraj[5], Ramachandran Veerakumar[6]

2024

Smoking is a major risk factor for oral cancer, contributing to the development of the disease through direct exposure to carcinogens, immune system suppression, chronic inflammation, and a synergistic effect with alcohol.

NIH NATIONAL CANCER INSTITUTE

2025

There is strong scientific evidence that alcohol drinking can cause cancer (1, 2). The International Agency for Research on Cancer (IARC) classified alcohol as a Group 1 carcinogen (cancer-causing substance) in 1987 due to sufficient evidence that it causes cancers of the oral cavity, pharynx, larynx, esophagus, and liver in people.

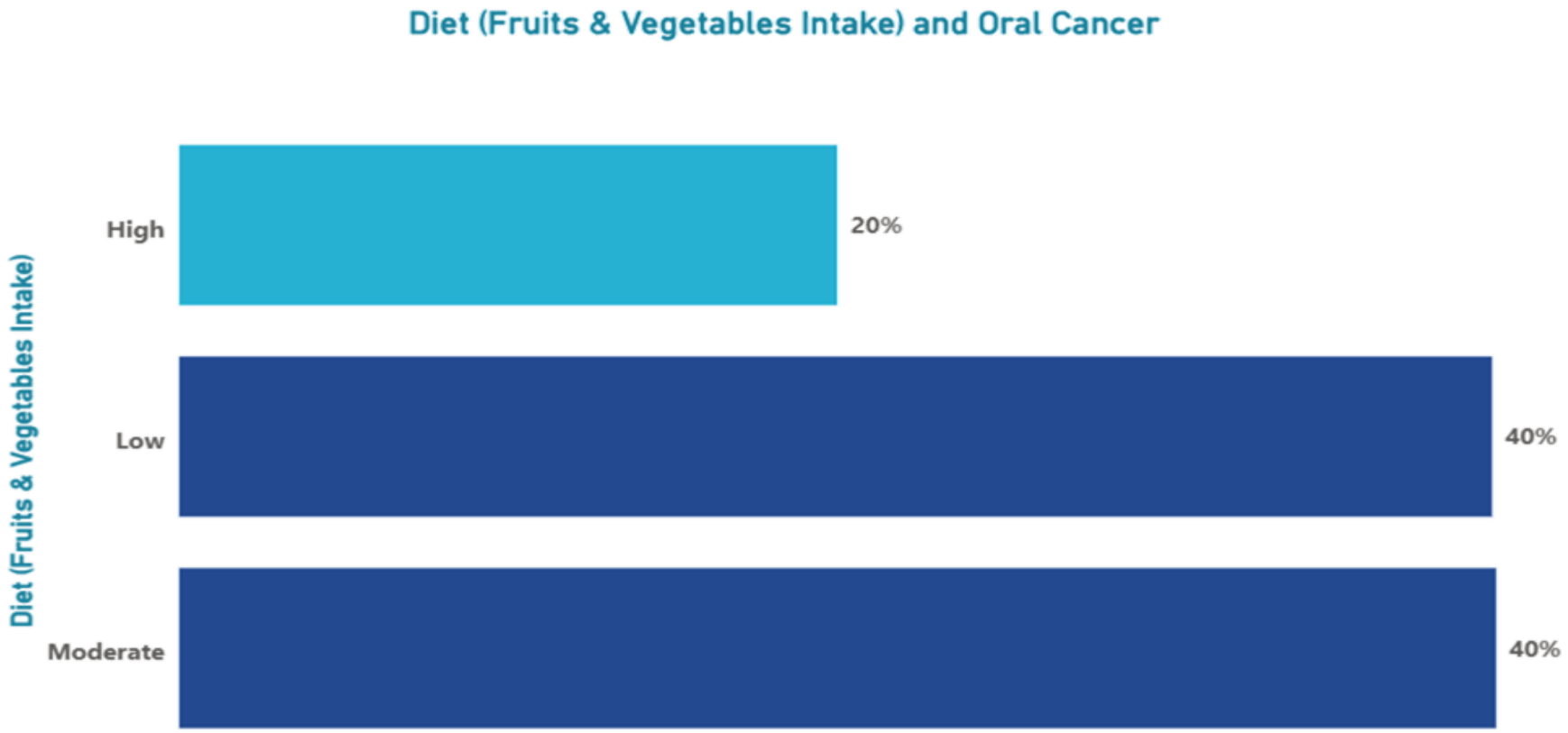
Epidemiologic research shows that people who use both alcohol and tobacco have much greater risks of developing cancers of the oral cavity (mouth), pharynx (throat), larynx, and esophagus than people who use either alcohol or tobacco alone. In fact, for oral and pharyngeal cancers, the harms associated with using both alcohol and tobacco are multiplicative; that is, they are greater than would be expected from adding the individual harms associated with alcohol and tobacco together (25, 26).

Risk factors

Did the diet decrease the occurrence of oral cancer?

- Diet as a source of protective compounds
- Public health recommendations
- Economic considerations

Oral Cancer < High Intake



Risk factors

Did the diet decrease the occurrence of oral cancer?

- Diet as a source of protective compounds
- Public health recommendations
- Economic considerations

Review

Epidemiology, Diagnostics, and Therapy of Oral Cancer—Update Review

2024

Julia Kijowska, Julia Grzegorczyk, Katarzyna Gliwa, Aleksandra Jędras and Monika Sitarz *

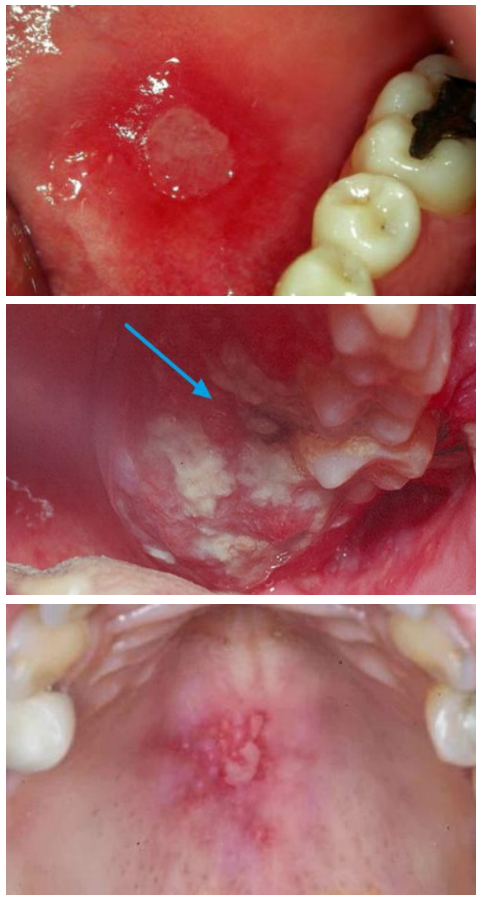
food also may increase risk of oral cancer [12]. On the other hand, there is a group of foods that may prevent oncogenesis. These include citrus fruits, yellow fruits and vegetables, blackberries, cranberries, products rich in omega 6 and 3 acids, garlic, curcumin, and many more [12,77–80].

Symptoms

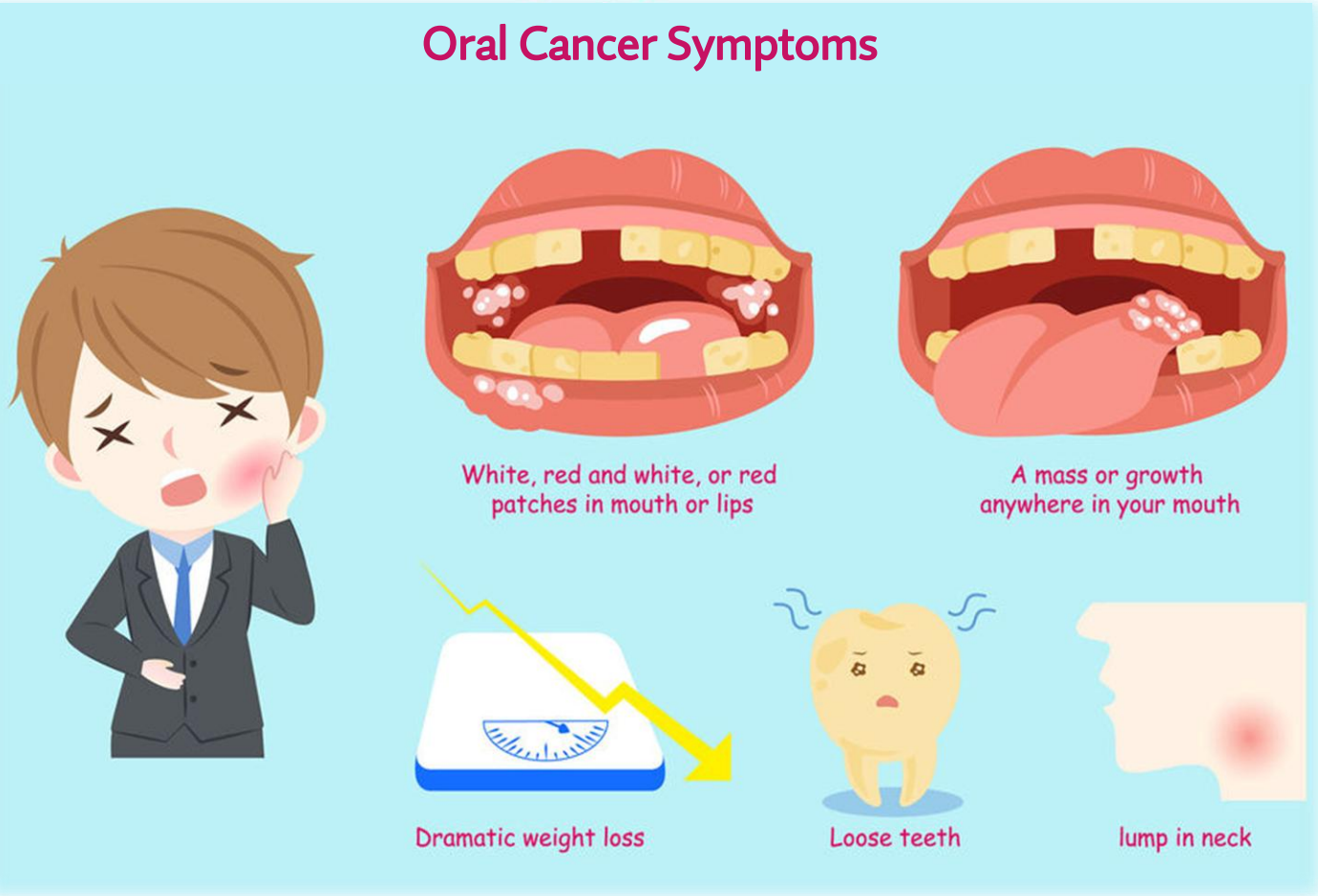
What are the most common symptoms?

- Early detection and screening.
- Recognize the red flag symptoms.
- Guiding clinical classification and resource allocation.

Patches



Oral Cancer Symptoms



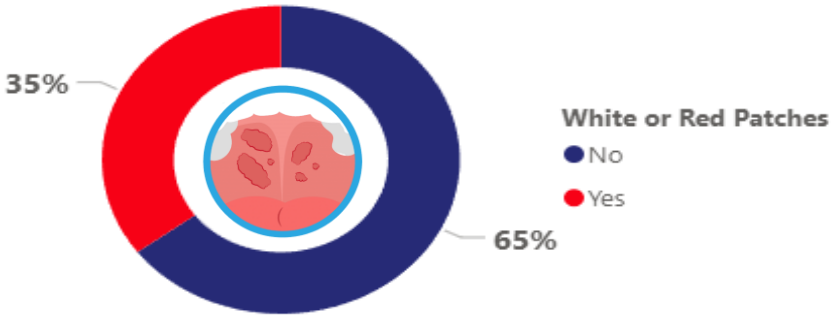
Lesion

Symptoms

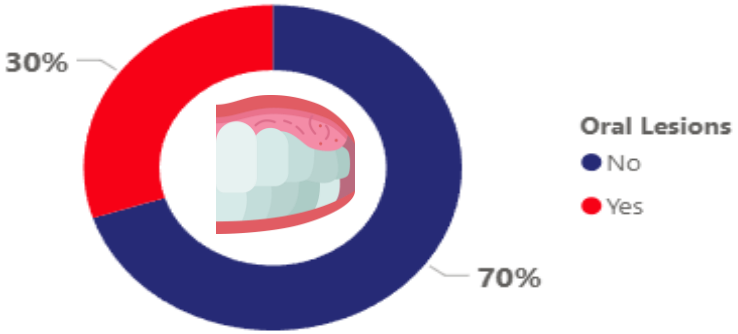
What are the most common symptoms?

- Early detection and screening.
- Recognize the red flag symptoms.
- Guiding clinical classification and resource allocation.

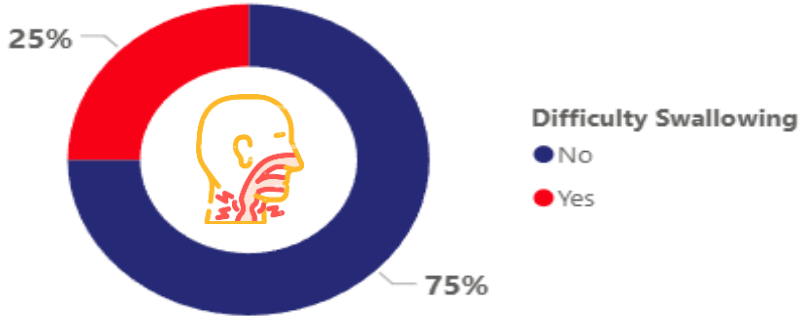
White or Red Patches



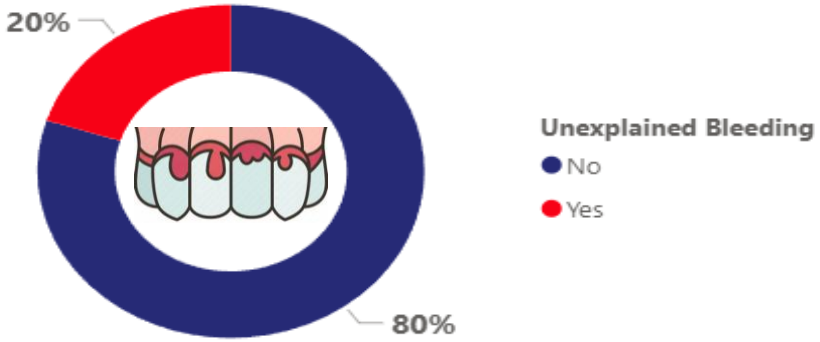
Oral Lesions



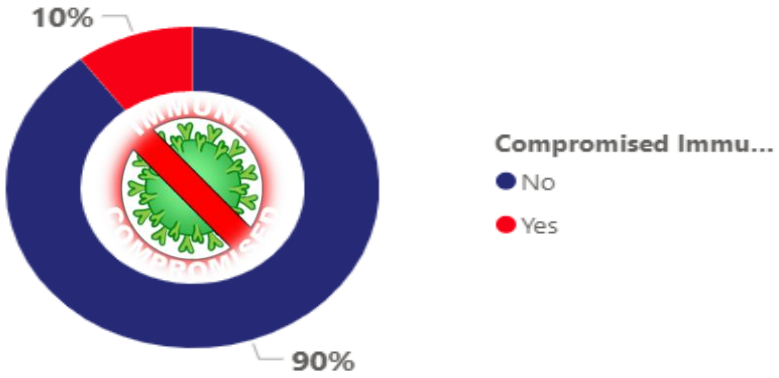
Difficulty Swallowing



Unexplained Bleeding



Compromised Immune System

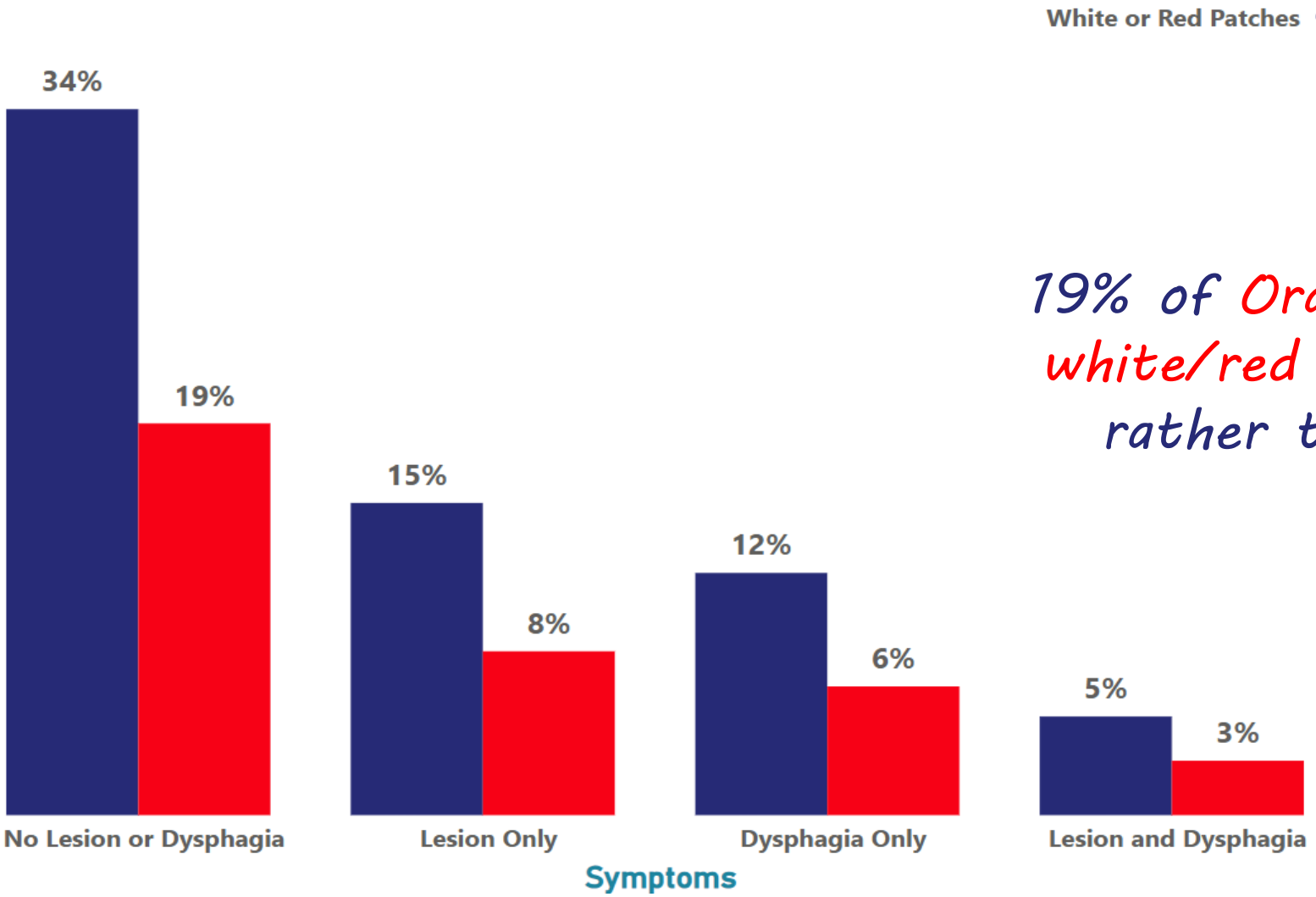


Symptoms

Combined White/Red patches, lesion and Difficulty of swallowing

Did all oral cancer show the same symptoms?

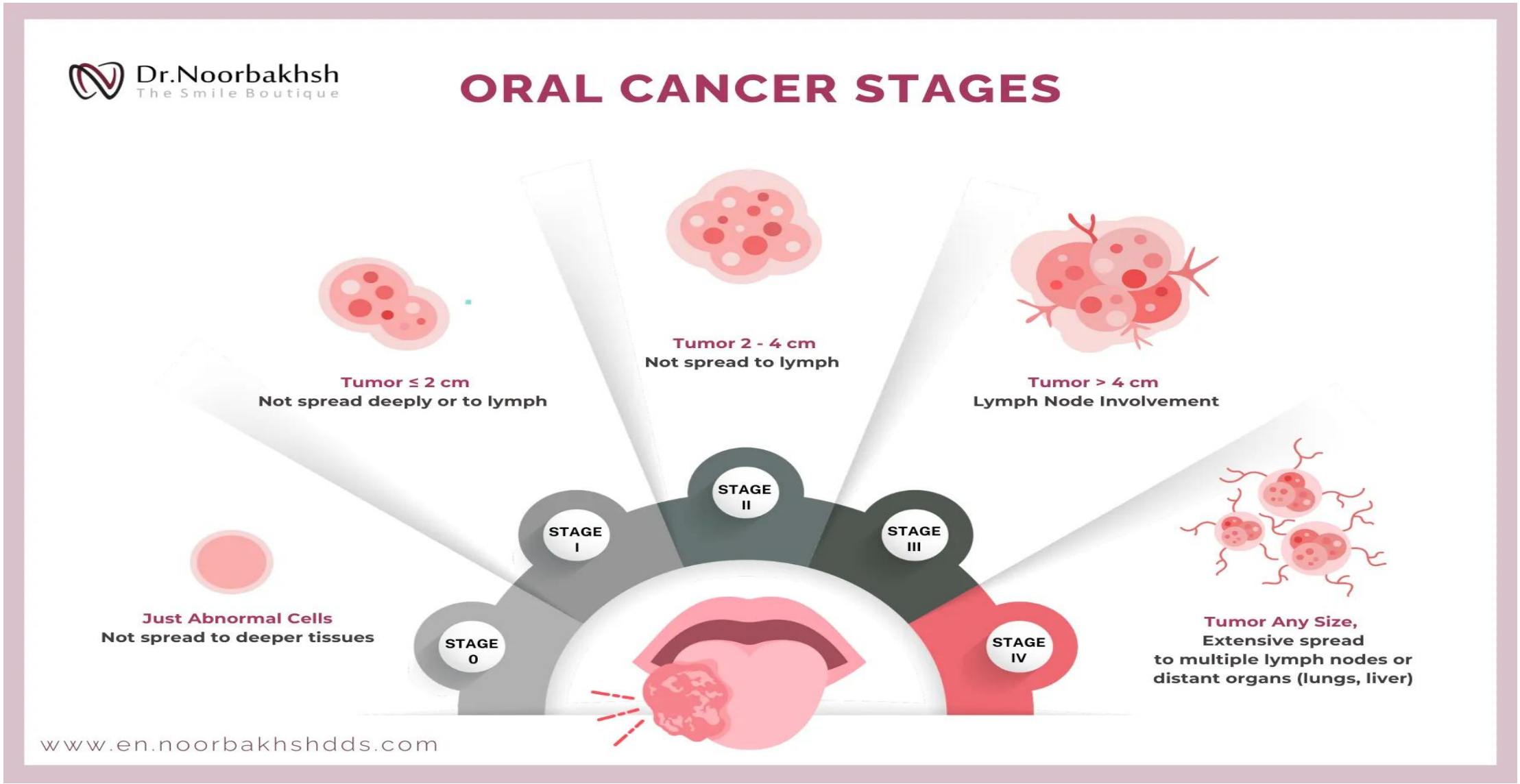
- Guiding the clinical examination
- Expect the prognosis and staging



19% of Oral Cancer patients show white/red patches as a symptom rather than having combined symptoms

Dysphagia = Difficulty Swallowing

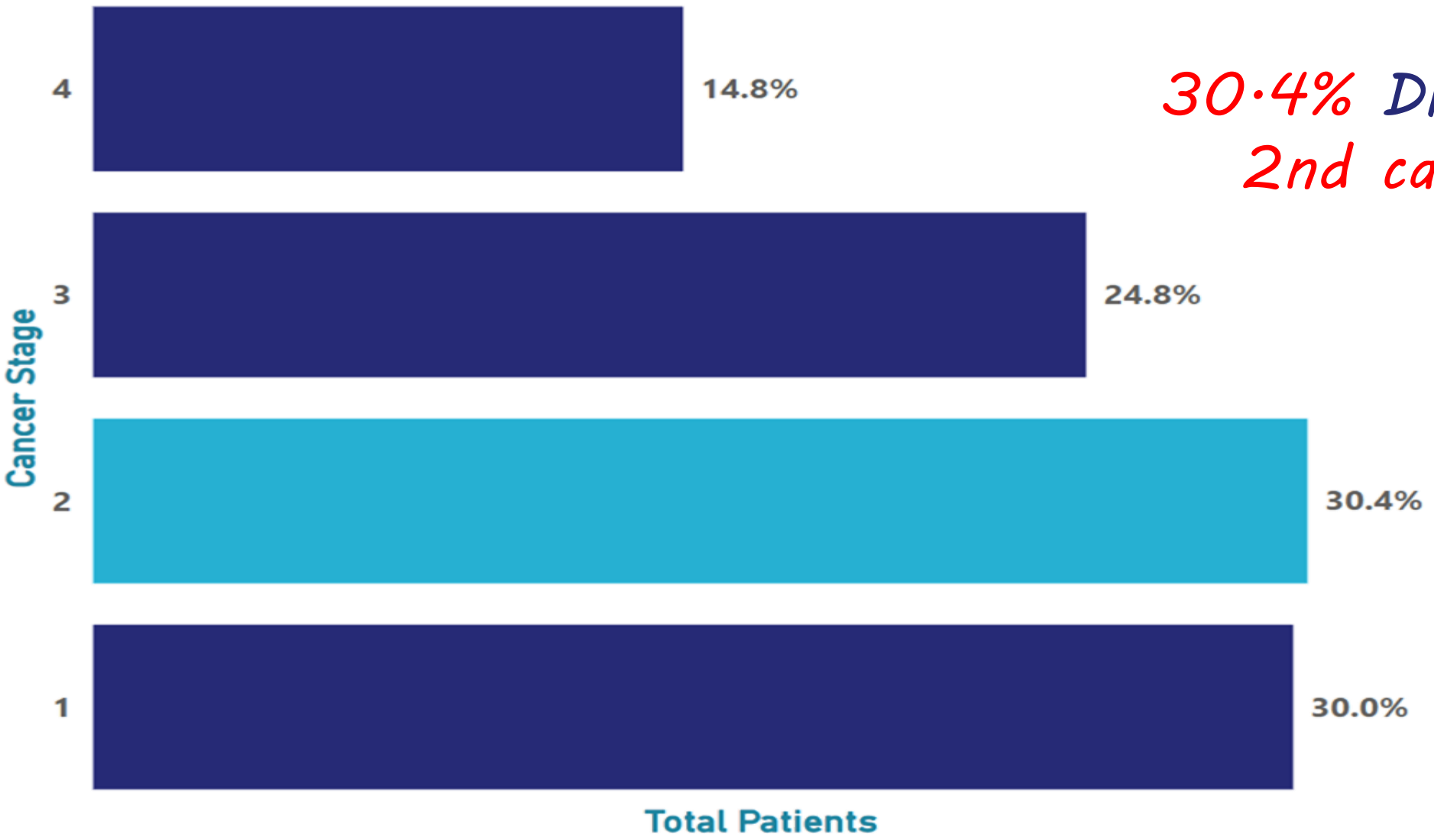
Diagnosis


Dr.Noorbakhsh
The Smile Boutique
ORAL CANCER STAGES
Tumor ≤ 2 cm
Not spread deeply or to lymph
Tumor 2 - 4 cm
Not spread to lymph
Tumor > 4 cm
Lymph Node Involvement
Just Abnormal Cells
Not spread to deeper tissues
STAGE 0
STAGE I
STAGE II
STAGE III
STAGE IV
Tumor Any Size,
Extensive spread
to multiple lymph nodes or
distant organs (lungs, liver)
www.en.noorbakhshdds.com

Diagnosis

In which stage the tumor mostly diagnose?

For Economic and human cost of late diagnosis



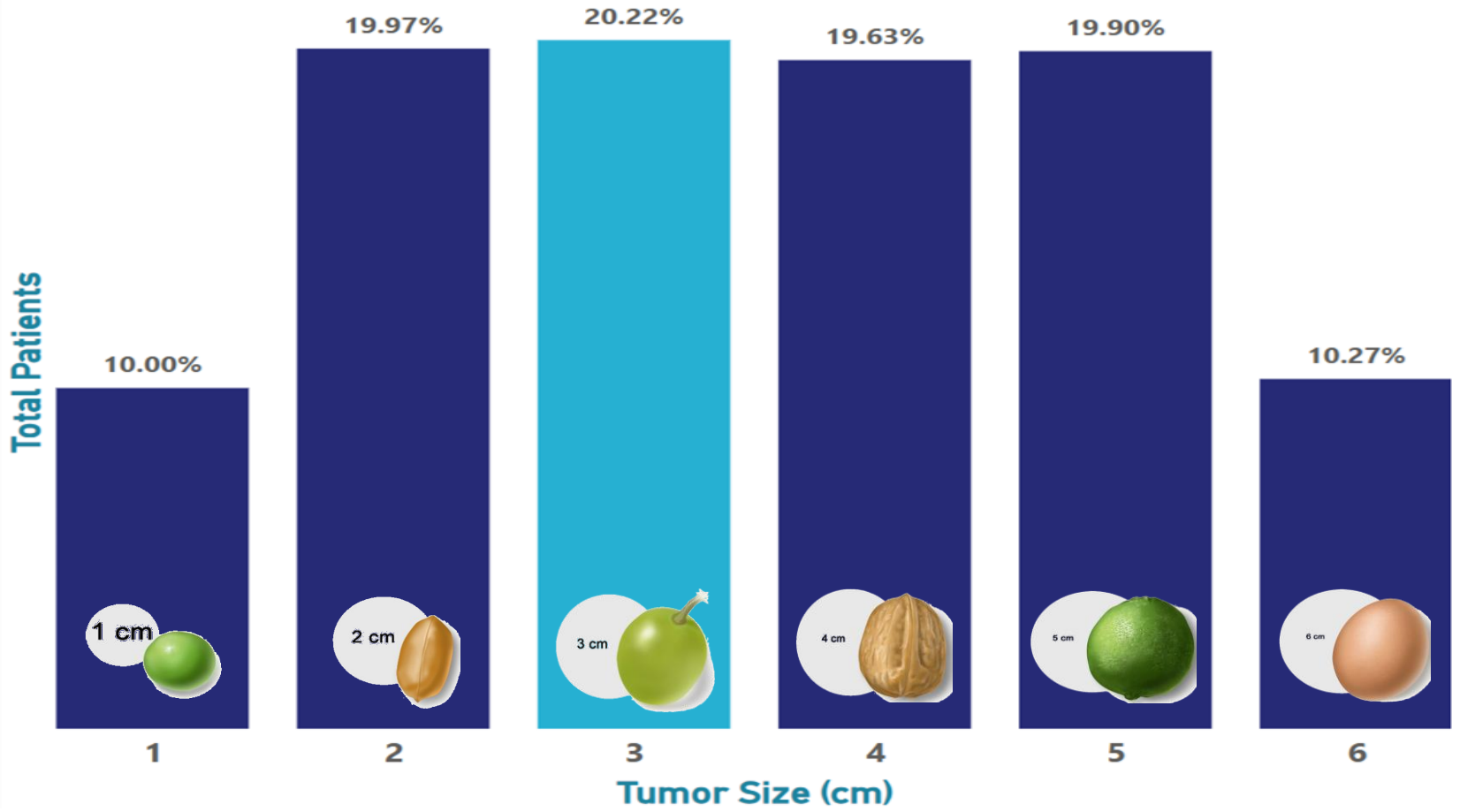
30·4% Diagnosed with 2nd cancer stage

Diagnosis

In which size the tumor mostly diagnose?

- Expect the harsh reality
- Economic and human cost of late diagnosis

20% Diagnosed with 3cm tumor size



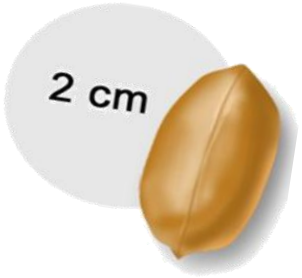
Diagnosis

Did the early diagnosis main small size of tumor?

Confirming this relationship is powerful because it impacts on treatment options, survival rate and economic and personal burden.

Early Diagnosis of Oral Cancer: A Complex Polyhedral Problem with a Difficult Solution 2023

what size should an oral carcinoma be to consider an early diagnosis has been made? T1 tumors in the AJCC classification are those that measure ≤ 2 cm in their greatest diameter both at the time of patient examination (T1c) and at the measurement of the operative specimen (T1p)



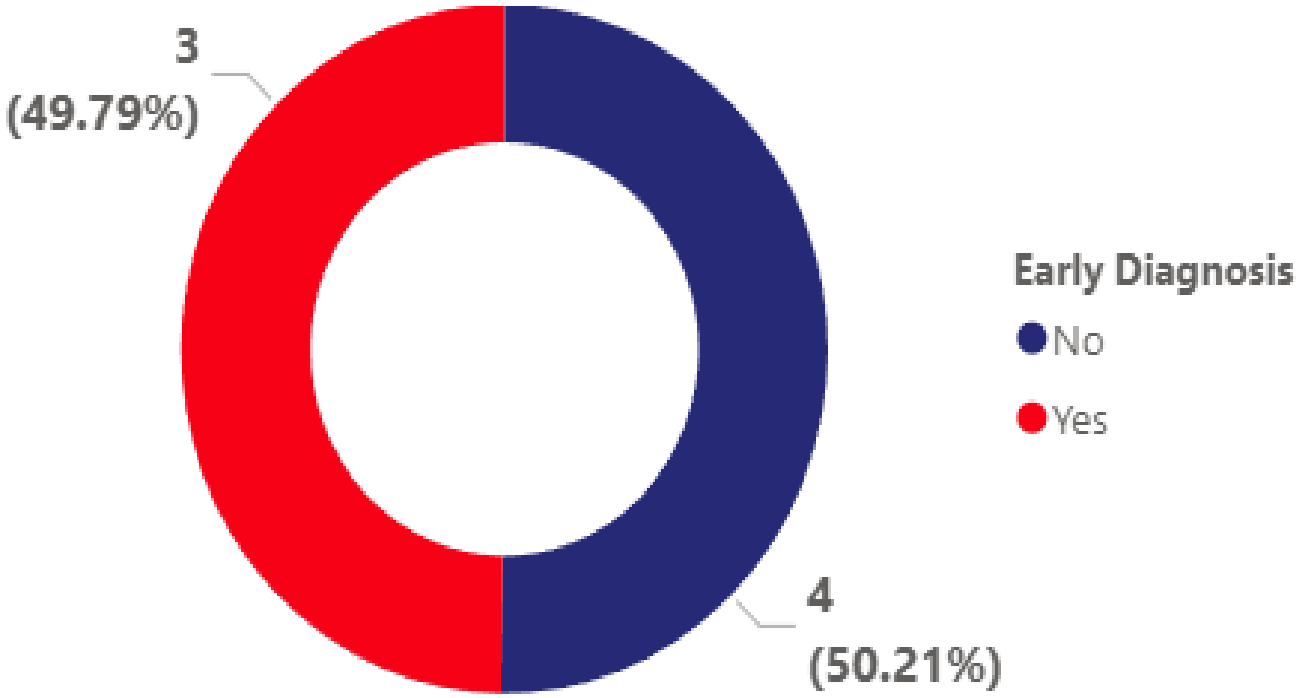
AJCC 8TH EDITION HEAD & NECK STAGING GUIDELINES 2018

- Previously, T1, T2, and T3 were defined only by tumour size (≤2 cm, >2 - 4 cm, and >4 cm respectively). Now **depth of invasion** (≤5 mm, >5 - 10 mm, and >10 mm) plays a role as well.
- To be considered T1 you must have a tumour size ≤ 2 cm AND a DOI ≤ 5 mm.

Diagnosis

Did the early diagnosis main small size of tumor?

Confirming this relationship is powerful because it impacts on treatment options, survival rate and economic and personal burden.

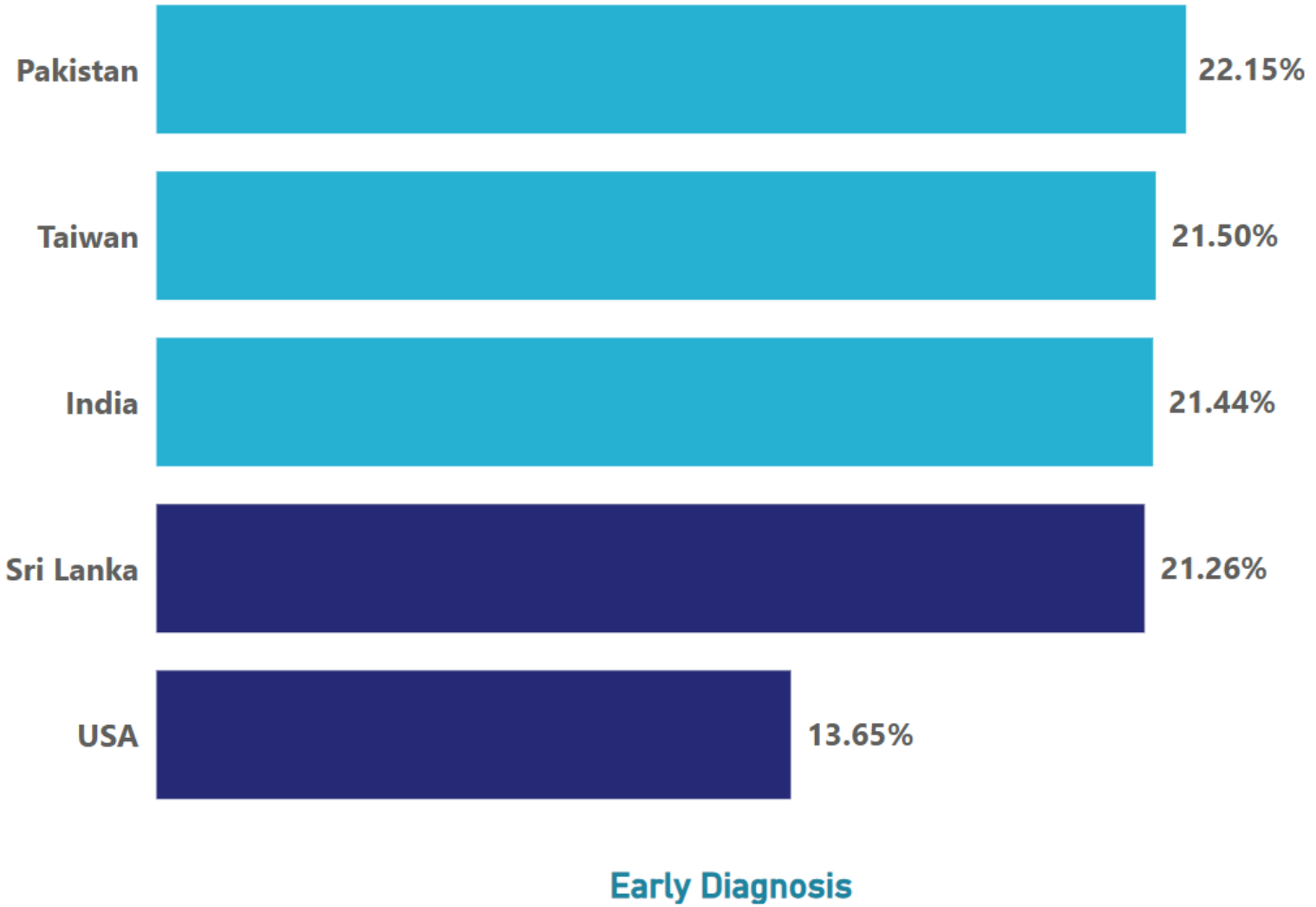


Diagnosed with
Size 3cm tumor

Diagnosis

Top 5 early diagnosed countries?

- Highlights effective public health strategies and policies
- Identifies global disparities and opportunities for intervention



Pakistan on the top

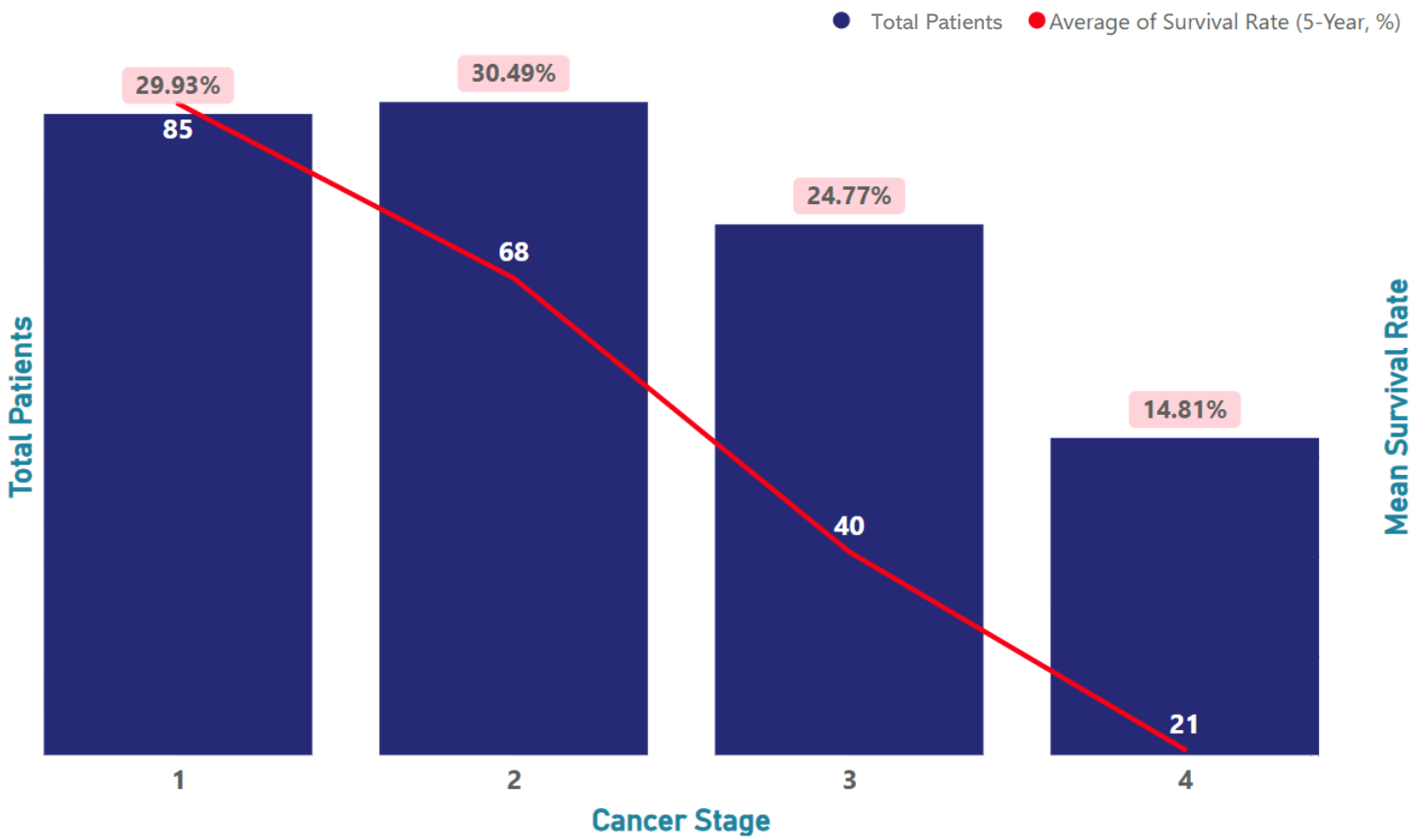
Treatment and survival rate

Is there relation between the survival rate &
A. Cancer Stage
B. Age
C. Type of treatment
D. Cost

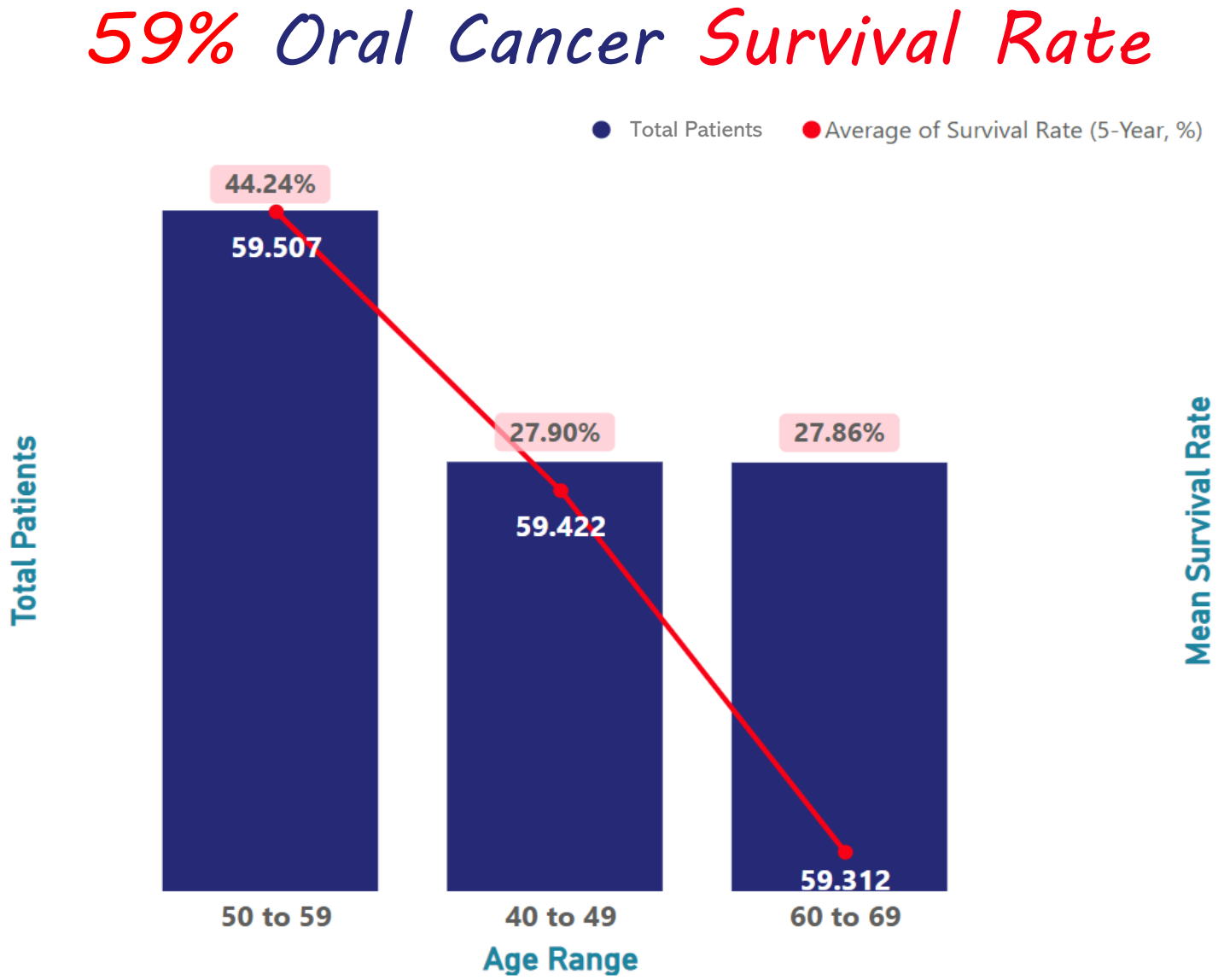
- Informed Consent
- Informing Standard of Care

A. Survival Rate X Cancer Stage

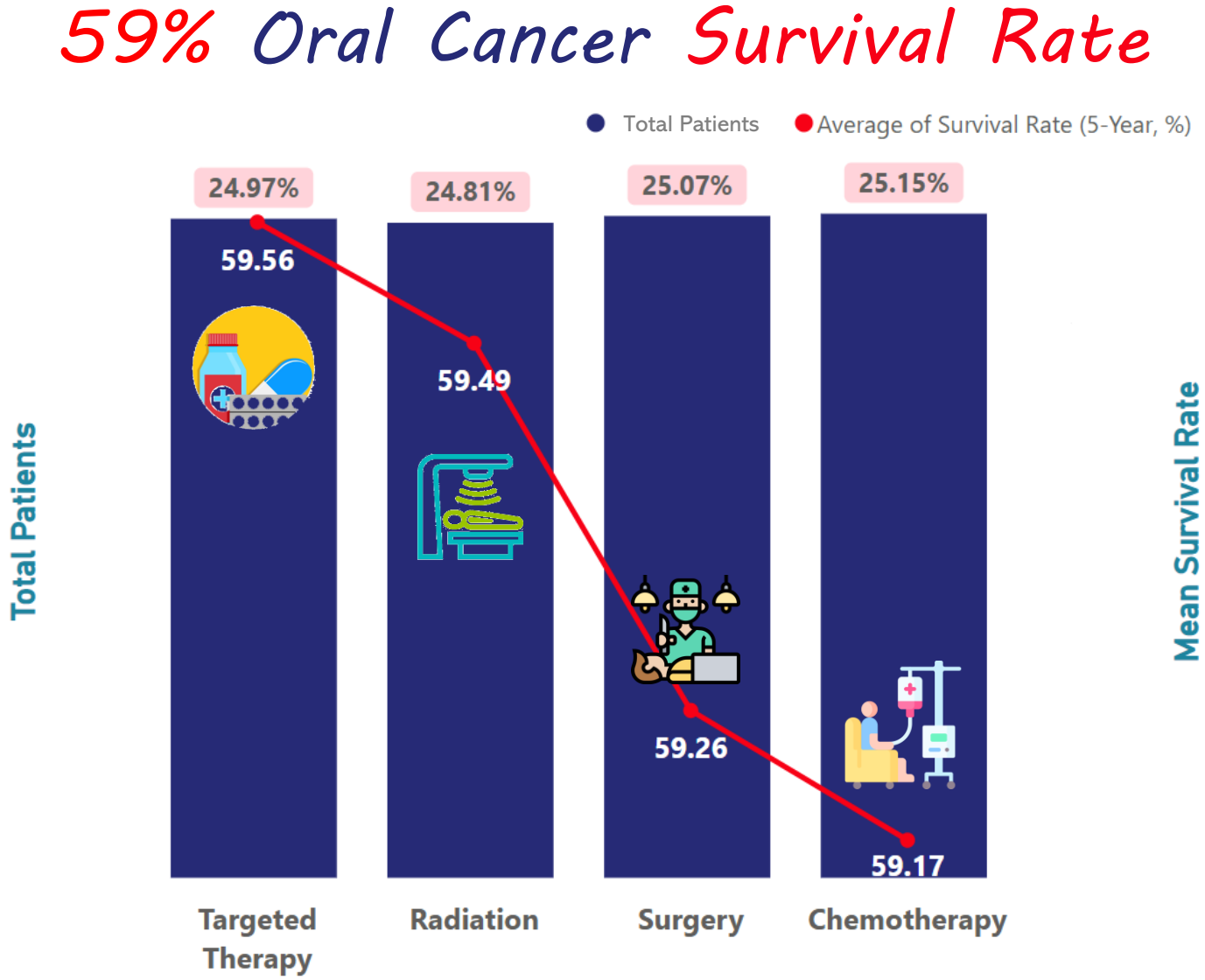
Cancer stage < Survival Rate



B. Survival Rate X Age

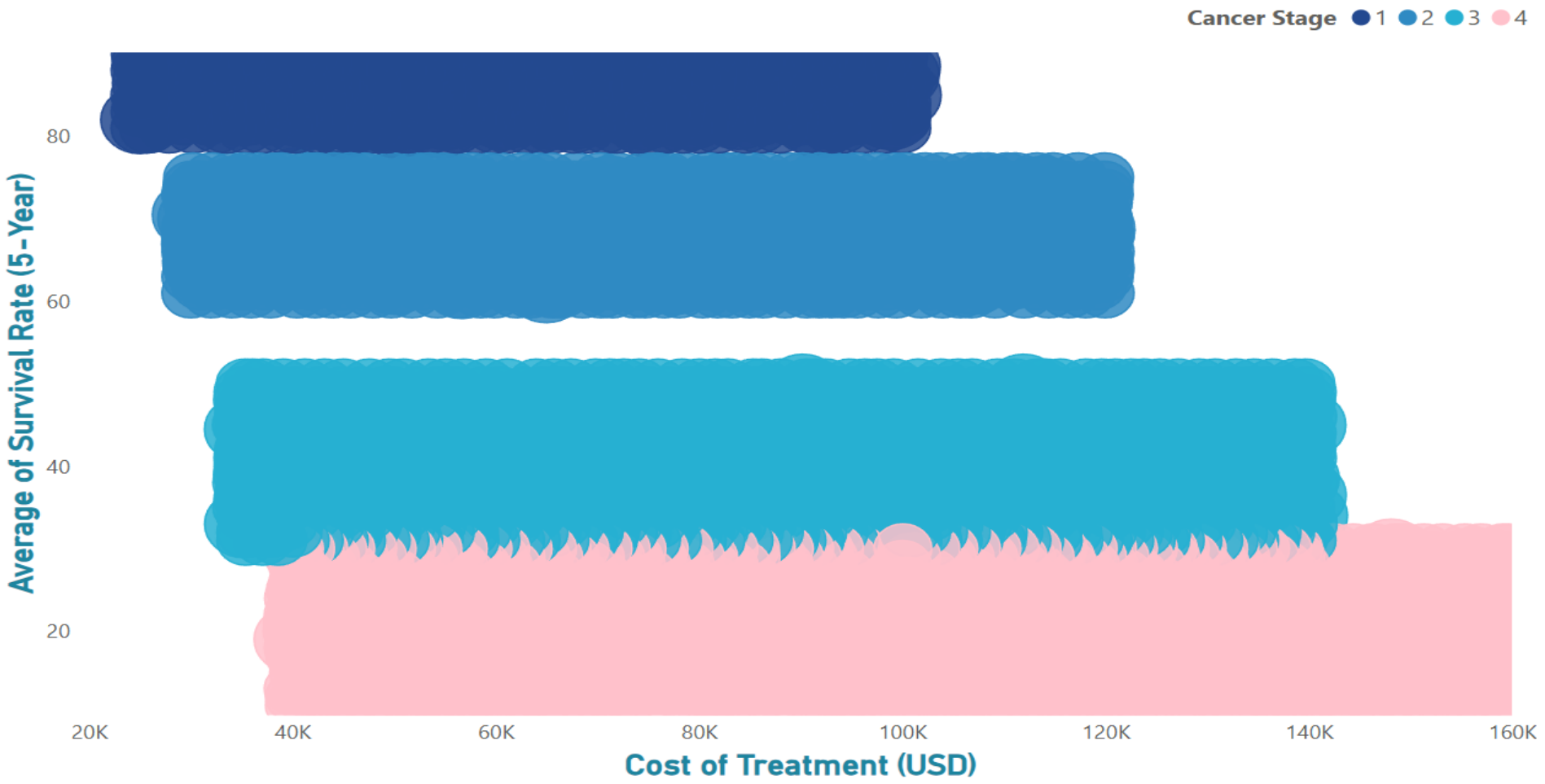


C. Survival Rate X Treatment Type



D. Cancer Stage X Cost

Survival Rate < Cancer Stage > Cost



City of Hope

Survival Rates Across Different Stages

2022

Survival rates for **oral cancer** vary significantly depending on the stage of diagnosis. Early stages (I and II) have a 5-year survival rate of over 80%, while advanced stages (III and IV) may have lower survival rates due to the spread of cancer. Timely diagnosis and personalized treatment plans are critical to improving these outcomes.

CANCER OF THE ORAL CAVITY

Pablo H Montero *, Snehal G Patel *

2015

Multiple factors are taken into account in selecting treatment for an individual patient. The risk of treatment-related complications should be assessed based on physiological age, comorbid conditions (e.g. cardiopulmonary status), lifestyle (smoking or alcohol), surgical resectability, and patient expectations.

Epidemiology, Diagnostics, and Therapy of Oral Cancer—Update Review

Julia Kijowska [1], Julia Grzegorczyk [1], Katarzyna Gliwa [1], Aleksandra Jędras [1], Monika Sitarz [1,*]

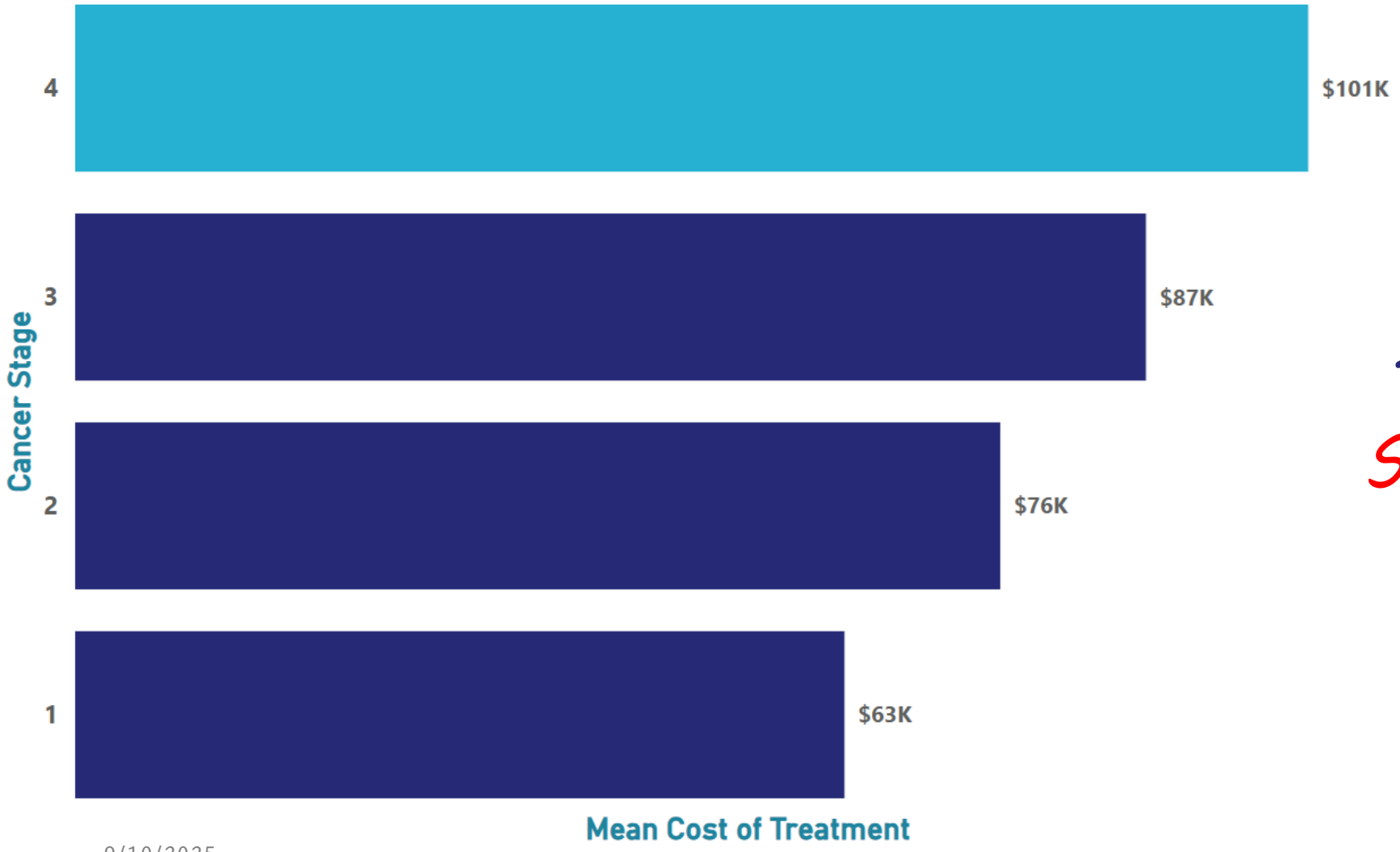
2024

Oral cancer treatment should be carried out in cooperation with a multidisciplinary team that will select the appropriate treatment method. The choice of method depends on several factors, but modern, advanced technology increases the probability of every treatment success.

Treatment and survival rate

What is the mean of the cost of treatment for each stage?

- Identify the patient needs.
- Measure indirect cost of illness and severity.
- Patient support system programs from health policy.



Top High cost
Stage 4 Cancer

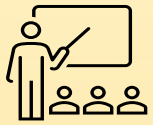
A Healthcare and Campaigns

Golden Advice

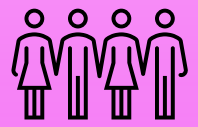
Recommendations

Improve screening strategies

Increase awareness campaigns for high risk groups



Increase supporting programs for low income patients



B. Public Recommendations

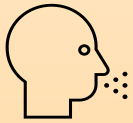
Stop smoking and alcohol

Maintain the oral hygiene

Reduce direct sun exposure

Increase vegetable and fruits intake

Monitor unusual symptoms



Golden Dentist Advice

"If you have a **white/red patch or a sore** in your mouth that **doesn't heal within 2 weeks** should be consult a dentist to rule out any serious conditions"

Golden Advice

Recommendations

- Detecting Oral Cancer: A Guide for Health Care Professionals
- Oral Cancer: Signs You Shouldn't Ignore | Bloomingdale Dentistry

THANK YOU