Review Article

# Prevalence of Oral Cancer in India: A Systematic Review

**Savitha S[1], Raj Mohan M[2], Prabu D[3], Dinesh Dhamodhar[2], Sindhu R[4], Nimmy P[1]**

**[1]Post Graduate (Master of Dental Surgery), Department of Public Health Dentistry, SRM Dental College, Ramapuram, Chennai, India, [2]Master of Dental Surgery, Reader, Department of Public Health Dentistry, SRM Dental College, Ramapuram, Chennai, India, [3]Master of Dental Surgery, Ph.D, Professor and Head, Department of Public Health Dentistry, SRM Dental College and Hospital, Ramapuram, Chennai, India, [4]Master of Dental Surgery, Senior lecturer, Department of Public Health Dentistry, SRM Dental College and Hospital, Ramapuram, Chennai, India.**

**How to cite this article:** Savitha S, Raj Mohan M, Prabu D et. al. Prevalence of Oral Cancer in India: A Systematic Review. Indian Journal of Public Health Research and Development / Vol. 15 No. 4, October-December 2024.

**Abstract**

In this study the systematic review of trials was carried out to evaluate the prevalence of oral cancer in India. The articles related to the prevalence of Oral Cancer in India were hand searched using electronic databases which includes Prospero, Grey literature, Science Direct, Lilacs, Wiley online library and PubMed. The most common site of Oral cancer in North, East, Central and West zone is Buccal mucosa while in North- east and south zone Tongue is the most affected part. Prevalence rate for Leukoplakia is 37.1%, Speckled leukoplakia is 21.7%, Oral Submucous Fibrosis is 21.1% and Lichen Planus is 19.8%. Highest prevalence can be seen in Males of East zone with 75.7%. The mean age group prevalence is 30- 50 years of age. The study observed a general increase in oral cancer incidence especially in the East Zone. This will pave the path for evidence- based interventions and policies that promote oral health and improve the overall well- being of the population. Indian Government should give importance for the prevention of Oral Cancer by implementing new schemes and providing awareness program to promote the healthy lifestyle and banning of tobacco products.

**KEYWORDS:** Oral Cancer, Prevalence, Tobacco, India

## Introduction

Cancer is the most frequent cause of mortality for people. Any malignant tumor that develops on the tongue, floor of the mouth, cheek lining, gingiva, palate, or lip is considered to be oral cancer. The most common forms of cancer found in India are breast cancer, cervical cancer and oral cancer. The most frequent risk factors for oral cancer are severe drunkenness, tobacco use, including smoking and smokeless tobacco, chewing betel nut, and the human papillomavirus (HPV). Bad dental hygiene and poor diet can both contribute to oral cancer.[1]

Oral cancer in India is associated with low income. Lower socio-economic class is associated with factors

**Corresponding Author: Prabu D,** Master of Dental Surgery, Ph.D, Professor and Head, Department of Public Health Dentistry, SRM Dental College, Ramapuram, Chennai, India.

**E-mail:** researchphdsrm@gmail.com

**Submission date:** Jan 30, 2024 **Revision date:** March 8, 2024 **Published date: September 20 , 2024**

such as diet, health care, living conditions, and risky behaviors that contribute to the development of oral cancer. In many low- and middle-income countries, including India, large segments of the population do not have access to well-organized and well-regulated cancer care systems. A cancer diagnosis often results in high personal medical costs. Such spending can push entire families below the poverty line and threaten social stability. Although there have been no major advances in the treatment of oral cancer in recent years, current treatments have improved the quality of life for oral cancer patients.[2]

South and Southeast Asian nations, including India, have the highest rates of oral cancer. About 90% to 95% of oral malignancies in India are squamous cell carcinomas. In India, the incidence of cancer is expected to rise from 1 million in 2012 to more than 1.7 million in 2035, according to the worldwide agency for research on cancer. In the same time span, the death rate from cancer will likewise rise from 680000 to 1- 2 million.[3]

The prevalence rate of oral cancer for males, it was 64.8% and for females it was 37.2% at 70 years of age. The next highest number was observed in west and northeast regions (58.4%) at 60 years of age. [4] With early detection and treatment, oral cancer is very common and often curable. The mouth is simple to inspect, therefore a doctor or dentist should be able to detect oral cancer in its early stages.

## Materials and Methods

In this study the systematic review of trials was carried out to evaluate the prevalence of oral cancer in India. SEARCH STRATEGY: The articles related to the prevalence of Oral Cancer in India were hand searched using electronic databases which includes Prospero, Grey literature, Science Direct, Lilacs, Cochrane library, Wiley online library and PubMed. The articles were retrieved from each database based on the MeSH representation "Oral cancer and prevalence", "oral cancer and India".

**INCLUSION CRITERIA:**

- Original articles
- Articles with full text are included

**EXCLUSION CRITERIA:**

- Articles other than English language
- Review articles

This systematic review was conducted in agreement with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). The protocol of this systematic review followed the Cochrane database of systematic reviews, and the bias assessment of the articles was done by using modified version of the Newcastle-Ottawa scale for cross-sectional studies.

## Results

Figure 1 depicts that a comprehensive search was conducted to gather articles concerned with the prevalence of oral cancer in India among children, adolescents, and adults. A total of 4257 were initially collected. After removing 3562 articles, a set of 450 unique articles remained. Further screening was based on the titles, resulting in the exclusion of 404 articles for various reasons. Eventually, a final selection of 17 complete text articles was made meeting the inclusion criteria for relevance and quality. These 17 articles were chosen to be incorporated into the present systematic review.

**TABLE 1: CHARACTERISTIC OF THE STUDY BASED ON PREVALENCE OF ORAL CANCER IN INDIA:**

| Author | Year | Place | Observation | METHODOLOGY |
|---|---|---|---|---|
| Vivek Borse et al., 2020 [2] | 2020 | Maharastra | 340 patients | WHO Performa |
| Swati Sharma et al, 2018 [3] | 2018 | North India | 29 population-based cancer registries | Questionnaire |

Continue.....

| | | | | |
|---|---|---|---|---|
| George B et al, 2019 [5] | 2019 | Kerala | 6966 study subjects | Suspected cases were subjected to Identify using Oral cancer screening device |
| KumarY S et al, 2015 [6] | 2015 | Udupi Taluk | 430 study sample | self reported questionnaire, Oral examination |
| Shivakumar KM et al, 2022 [7] | 2022 | Western Maharashtra | 300 adults in the age group of 35–55 years | structured questionnaire, which contains the general information and tobacco usage. |
| Shalini Gupta et al, 2014 [8] | 2014 | North India | 471 subjects | Information about chewing was acquired using the standardized interviewerbased questionnaire. The type of lesion by Oral Biopsy. |
| Shivakumar TT et al, 2022 [9] | 2018 | Punalur, Southern Kerala | 2368 subjects | Prescribed performa. For lesion Biopsy is done. |
| Krishna Priya et al, 2018 [10] | 2018 | Guntur city, Andhra Pradesh, South India | 300 participants in Guntur city | modified 1980 WHO Pro forma |
| Anand Choudhary et al, 2022 [11] | 2022 | Hazaribagh | 5,000 subjects | WHO performa |
| RahulSrivastava, 2020 [12] | 2020 | Kanpur City, India | 1,10,625 patients | WHO Performa (1997) |
| Sendhil Kumar, 2019 [13] | 2019 | Kodagu District | 1048 patients, 18 years of age and above | WHO Performa |
| J Kalavathy Elango et al, 2006[14] | 2006 | Maharashtra | 4,500 subjects | WHO Performa |
| Ashitha A et al, 2006 [15] | 2018 | Kerala | 2300 patients | Questionnaire |
| Rishi Das et al, 2012 [16] | 2017 | South India | 12473 patients of 18 yrs above | WHO performa |
| Shahul et al, 2021[17] | 2008 | Andhra pradesh | 1437 samples | WHO performa |
| Sasidaran et al, 2001[18] | 2013 | Kanyakumari | 231 samples | WHO performa, Questionnaire |
| Dhilip Charan et al, 2020 [19] | 2015 | Karnataka | 3415 samples | WHO performa |

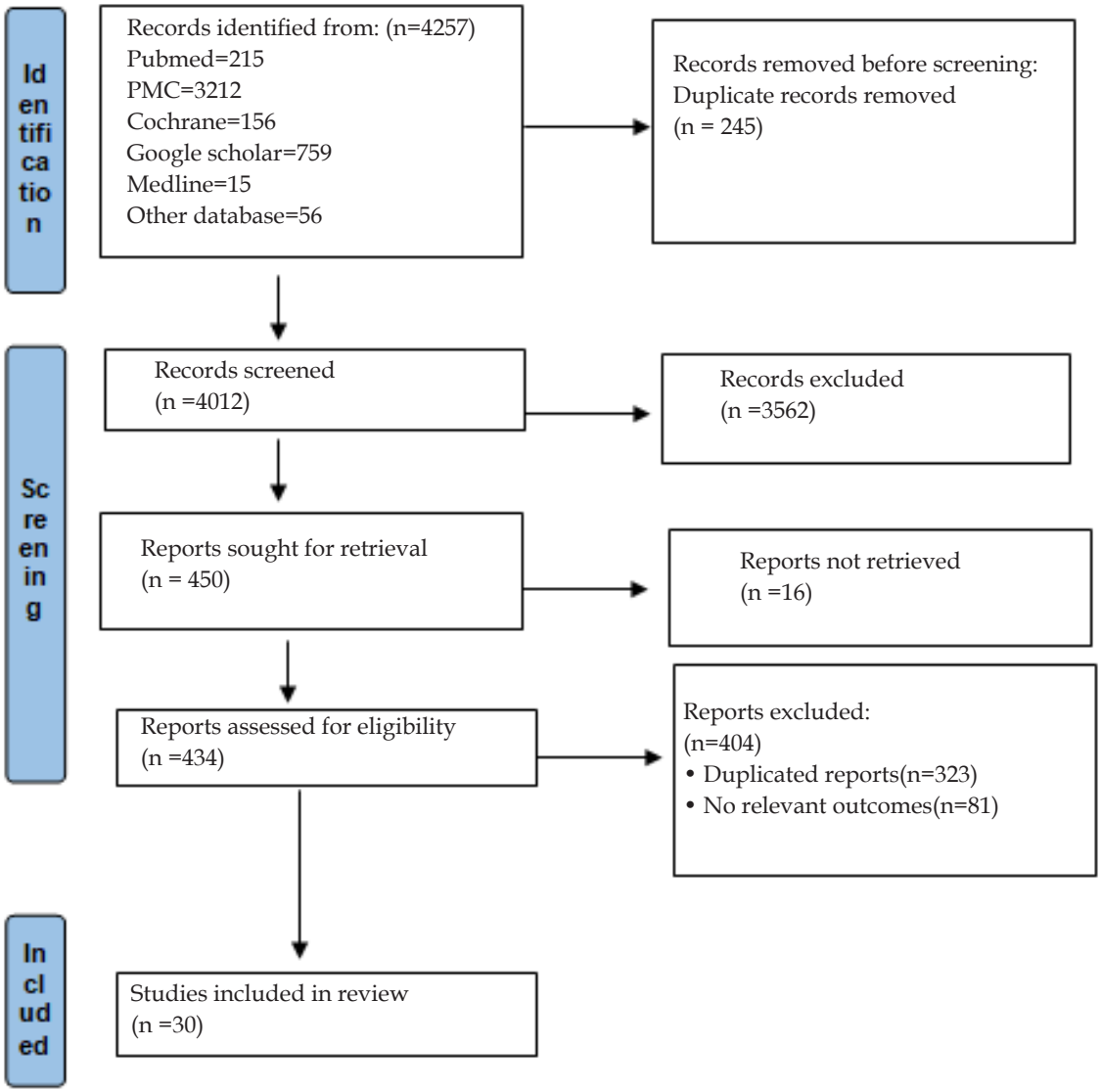


**FIGURE 1: PRISMA Flow Chart**

**TABLE 2: OUTCOME CHARACTERISTICS OF STUDIES INCLUDE IN THE REVIEW**

| Author | Year | Place | Results |
|---|---|---|---|
| Vivek Borse et al., 2020 [2] | 2020 | Maharastra | Overall prevalence of precancerous lesions in the study population was 4.4% |
| Swati Sharma et al, 2018 [3] | 2018 | North India | Prevalence rate of 8.6% |
| George B et al, 2019 [5] | 2019 | Kerala | Overall prevalence of precancerous lesions in the study population was 4.4% |
| KumarY S et al, 2015 [6] | 2015 | Udupi Taluk | Prevalence rate of 8.6% |
| Shivakumar KM et al, 2022 [7] | 2022 | Western Maharashtra | Overall prevalence of OPD is 4.13% |
| Gupta S et al, 2014 [8] | 2014 | North India | 22.85% had oral cancer, 64.52% had OSF, 8.6% had leukoplakia, and only 4.03% had lichen planus. |

Continue.....

| | | | |
|---|---|---|---|
| Shivakumar TT et al, 2022 [9] | 2018 | Punalur, Southern Kerala | Prevalence rate for Leukoplakia is 37.1%, Speckled leukoplakia is 21.7%, OSMF is 21.1% and LP is 19.8% |
| Krishna Priya et al, 2018 [10] | 2018 | Gundur city, Andhra Pradesh, South India | Overall prevalence of Oral Soft Tissue lesions was found in 42.4% |
| Anand Choudhary et al, 2022 [11] | 2022 | Hazaribagh | The most common lesion observed among tobacco abusers was tobacco pouch keratosis (46.1%), followed by 49 cases (16.1%) of OSMF, (14.1%) cases of lichenoid reaction, (12.2%) cases of smoker's palate/palatal hyperkeratosis. Leukoplakia was seen in (7.2%) cases, whereas erythroplakia was seen in (2.3%) cases, and only (2.0%) cases of ulceroproliferative lesions were seen. |
| Srivastava R, 2020 [12] | 2020 | Kanpur City, India | (57.56%) subjects were having oral submucous fibrosis (OSF), (23.70%) were having leukoplakia, (13.12%) were having Lichen planus, and (5.62%) were having oral cancer (P < 0.001) |
| Sendhil Kumar, 2019 [13] | 2019 | Kodagu District | The overall prevalence of OML was found to be 18.89%. |
| J Kalavathy Elango et al, 2006[14] | 2006 | Maharashtra | Overall prevalence of OPD is 4.13% |
| Ashitha A et al, 2006 [15] | 2018 | Kerala | 22.85% had oral cancer, 64.52% had OSF, 8.6% had leukoplakia, and only 4.03% had lichen planus. |
| Rishi Das et al, 2012 [16] | 2017 | South India | Prevalence rate for Leukoplakia is 37.1%, Speckled leukoplakia is 21.7%, OSMF is 21.1% and LP is 19.8% |
| Shahul P et al, 2021 [17] | 2008 | Andhra pradesh | Overall prevalence of Oral Soft Tissue lesions was found in 42.4% |
| Sasidaran et al, 2001 [18] | 2013 | Kanyakumari | Overall prevalence of precancerous lesions in the study population was 4.4% |
| Dhilip Charan et al, 2020 [19] | 2015 | Karnataka | Prevalence rate in the population was 21.2% |

**TABLE 3: ASSESSMENT OF BIAS IN STUDIES INCLUDED FOR REVIEW**

| AUTHOR (YEAR) | RANDOM SEQUENCE GENERATION | ALLOCATION CONCEALMENT | SELECTIVE REPORTING | INCOMPLETE OUTCOME DATA | BLINDING OF OUTCOME ASSESSMENT | BLINDING OF PARTICIPANTS AND PERSONALS |
|---|---|---|---|---|---|---|
| Vivek Borse et al., 2020[2] | + | + | - | - | + | + |
| Swati Sharma et al, 2018 [3] | + | + | - | + | + | + |

Continue.....

| | | | | | | |
|---|---|---|---|---|---|---|
| George B et al, 2019 [5] | + | + | + | + | + | + |
| KumarY S et al,2015[6] | + | + | + | + | + | + |
| Shivakumar KM et al, 2022 [7] | + | + | - | - | + | - |
| Gupta S et al, 2014 [8] | + | + | + | + | + | + |
| Shivakumar TT et al, 2022 [9] | - | + | - | - | + | + |
| Krishna Priya et al, 2018 [10] | + | + | - | - | + | + |
| Choudhary A et al, 2022 [11] | + | + | - | - | + | + |
| RahulSrivastava, 2020 [12] | + | + | - | - | - | - |
| Kumar S, 2019 [13] | + | + | - | - | + | + |
| J Kalavathy Elango et al, 2006[14] | + | + | - | - | + | + |
| Ashitha A et al, 2006 [15] | + | + | - | - | + | - |
| Rishi Das et al, 2012 [16] | + | + | + | + | + | + |
| Shahul et al, 2021 [17] | - | + | - | - | + | + |
| Sasidaran et al, 2001 [18] | + | + | - | - | + | + |
| Dhilip Charan et al, 2020 [19] | + | + | - | - | + | + |

+ Indicates Low Risk; - Indicates High Risk

**Table 4: DISTRIBUTION OF GENDER AND AGE GROUP AMONG ZONES OF INDIA IN THE INCLUDED STUDIES**

| ZONES | GENDER | | AGE GROUP |
|---|---|---|---|
| | Males | Females | |
| NORTH | 58.4% | 15.4% | 35-44 years |
| NORTH-EAST | 58.4 | 60.2 | 70-75 years |
| EAST | 75.7 | 24.3 | 40-55years |
| CENTRAL | 64.8 | 37.2 | 30-40years |
| SOUTH | 61.8 | 18.5 | 35 -55years |
| WEST | 67.6 | 32.3 | 60-69years |

**TABLE 5: COMMON AREA AND RISK FACTOR OF ORAL CANCER IN EACH ZONES OF INDIA:**

| ZONES | COMMON AREA | COMMON RISK FACTORS |
|---|---|---|
| NORTH | Buccal Mucosa | Smokeless Tobacco, Tobacco, Alcohol |
| NORTH-EAST | Tongue | Alcohol, Betel-quid, Tobacco, Smokeless Tobacco |
| EAST | Buccal Mucosa | Alcohol, Tobacco, Betel-quid |
| CENTRAL | Buccal Mucosa | Multiple Toxic Habits, Pan and Betel nut chewing |
| SOUTH | Tongue | Betel-Quid with tobacco, tobacco, alcohol |
| WEST | Buccal Mucosa | Alcohol, Tobacco, Multiple habits |

**Study description:**

Table 4 describes the prevalence of oral cancer in India based on gender and age group, the study shows the highest prevalence rate of 75.7% in east zone followed by 67.6%, 64.5% and 61.8% in west, central and south zone respectively. While in accordance with age group the prevalence of OC occurs in the mean age of 30-50 years old. The major site is Buccal mucosa, in south zone tongue is the most affected area. Common Risk factor for oral cancer prevalence is the usage of tobacco products.

## Discussion

Many studies have focused on examining the occurrence of Oral cancer in young and adolescents in India. However, there is a lack of comprehensive understanding regarding the prevalence rates of Oral cancer in various age groups, based on geographic distribution of the study site, common area of Oral cancer and diagnostic criteria. Consequently, this systematic review aims to address these gaps by proving a thorough examination of these factors.

Oral Cancer is recognized as a major public health problem in several countries. The existing prevalence of oral cancer in developed countries may be attributed to its population living in low socio- economic status. Oral cancer untreated at early stage has multiple consequences as it can lead to problems in mastication and speech and other problems. Treatment of Oral cancer at later stage becomes expensive, which in turn adds to burden in the quality of life. This systematic review attempted to quantify the burden of Oral cancer in India. The National Cancer Registry Program remains India's solitary National survey for estimation of oral cancer. The NCRP report does not include data according to different regions of the country but rather registry-wise. The reason for this was probably the limited number of registries in the vast country. Though NCRP report covers various parts of country, they do not sufficiently represent various regions. Thus, a comprehensive review of these studies was warranted to estimate the burden of Oral Cancer in India.[20]

A compiled summary of such updated recent, detailed statistics on all cancers of oral cavity and other associated sites would serve as a ready reference for researchers and clinicians who are interested in knowing about the oral cancer load in the country.

The overall risk of developing oral cancer among males was highest in the East zone followed by western, Central, southern and North zones, while among females, the highest incidence was observed in the northeast zone followed by central zone.

**Risk factors**

The present article revealed the maximum incidence for mouth cancer in central region. This highest incidence of mouth cancer in central region in India can be attributed due to many etiological factors. The most important among them is the use of tobacco. The highest prevalence of use of areca nut-based tobacco products among males in Madhya Pradesh.[21] Tobacco use was found to be more common among the uneducated masses in India. This can often be related to less knowledge and awareness among the uneducated people regarding the health hazards of tobacco use. Poverty was also significantly associated with higher risk of use of chewing tobacco. Thus, it indicates that there is a relationship between these socioeconomic indicators and tobacco consumption, thereby leading to increased oral cancer incidence.[22]

In India, the nonawareness of health hazards of tobacco is strongly associated with its use. The severity of health risks associated with tobacco use

is sometimes so much inadequately understood by tobacco users that there is a need to spread comprehensive information about the health hazards of tobacco uses among every subsection of the society. [23]

**Agespecific trends**

Oral cavity cancers were traditionally being thought of as a disease mainly affecting people of older age group. In the present article, the pattern observed is different. The cases are observed at a very early age of life. This increased incidence of oral cancer at a very young age group has been usually attributed to indiscriminate usage of substances, mainly tobacco and tobacco-related products, over a prolonged period of time, which leads to genetic damage. The present study reported that among all type of cancer Oral Cancer in males is enormously high in age group of 30- 45 years old.

Present article justifies that the magnitude of cancers of early age is apparently increasing in India. The differences in proportion and severity of childhood cancer incidence among different regions in India could be due to geographical and gender variations, exposure during prenatal development as well as compliance to cancer registration.

## Conclusion

The study observed a general increase in oral cancer incidence especially in the East Zone. Females showed a considerable high peak in oral cancer incidence in the northeastern states. More number of Studies and cancer registries should be established across country for more adequate representation of all regions of India. This will pave the path for evidence- based interventions and policies that promote oral health and improve the overall well-being of the population. Indian Government should give importance for the prevention of Oral Cancer by implementing new schemes and providing awareness program to promote the healthy lifestyle and banning of tobacco products.

**CONFLICT OF INTEREST STATEMENT:** Nil.

**FUNDING**: Nil

## References

1. Varshitha. Prevalence of Oral Cancer in India.J. Pharm. Sci. & Res. Vol. 7(10), 2015, 845-848.
2. Borse V, Konwar AN, Buragohain P. Oral cancer diagnosis and perspectives in India. Sens Int. 2020; 1:100046.
3. Sharma S, Satyanarayana L, Asthana S, Shivalingesh KK, Goutham BS et al. Oral cancer statistics in India on the basis of first report of 29 population-based cancer registries. J Oral Maxillofac Pathol. 2018;22(1):18-26.
4. Global Burden of Disease Collaborative Network. Global Burden of Disease Study 2019. Seattle: Institute of Health Metrics and Evaluation (IHME); 2020. [updated 2020 June 10; cited 2022 November 18]. Available from http://ghdx.healthdata.org/gbd-results-tool.
5. George B, Sebastian ST, Soman RR, Mulamoottil VM, Johny MK. Prevalence of precancerous lesions in an adult population. Indian J Dent Res 2019; 30:500-5
6. Kumar YS, Acharya S, Pentapati KC. Prevalence of oral potentially malignant disorders in workers of Udupi taluk. South Asian J Cancer 2015; 4:130-3.
7. Shivakumar K M, Raje V, Kadashetti V. Prevalence of oral potentially malignant disorders (OPMD) in adults of Western Maharashtra, India: A cross-sectional study. J Can Res Ther 2022;18(2): 239-43.
8. Gupta S, Singh R, Gupta OP, Tripathi A. Prevalence of oral cancer and pre-cancerous lesions and the association with numerous risk factors in North India: A hospital-based study. Natl J Maxillofac Surg 2014; 5:142-8.
9. Sivakumar TT, Sam N, Joseph AP. Prevalence of oral potentially malignant disorders and oral malignant lesions: a population-based study in a municipal town of southern Kerala. J Oral Maxillofac Pathol. 2018; 22:413-4.
10. Krishna Priya M, Srinivas P, Devaki T. Evaluation of the prevalence of oral mucosal lesions in a population of eastern coast of South India. J Int Soc Prevent Communit Dent. 2018; 8:396-401.
11. Choudhary A, Kesarwani P, Chakrabarty S, Yadav VK, Srivastava P. Prevalence of tobaccoassociated oral mucosal lesion in Hazaribagh population: A crosssectional study. J Family Med Prim Care 2022; 11:4705-10.
12. Srivastava R, Sharma L, Pradhan D, Jyoti B, Singh O. Prevalence of oral premalignant lesions and conditions among the population of Kanpur City, India: A cross-sectional study. J Family Med Prim Care. 2020; 9:1080-5.

13. Kumar S, Narayanan VS, Ananda SR, Kavitha AP, Krupashankar R. Prevalence and risk indicators of oral mucosal lesions in adult population visiting primary health centers and community health centers in Kodagu district. J Family Med Prim Care. 2019: l;8(7):2337-2342.
14. Elango JK, Gangadharan P, Sumithra S, Kuriakose MA. Trends of head and neck cancers in urban and rural India. Asian Pac J Cancer Prev. 2006;7(1):108-12.
15. Ashitha A, PS Bagdey. Oral Cancer and Some Epidemiological Factors: A Hospital Bases Study. Indian Journal of Community Medicine. 2006: 31(3); 157-159.
16. Rishi Das, Byakodi S, Hiremath S, Byakodi J, Adaki S et al. Oral cancer in India: an epidemiologic and clinical review. J Community Health. 2012;37(2):316-9.
17. Shahul P, Dewangan Y, Nayak T, Singh DK, Vibhakar V et al. Oral and Esophageal Cancer: Incidence, Prevalence and Correlation in General Indian Population: A retrospective Study. J Pharm Bioallied Sci. 2021;13(1): S221-S224.
18. Sasidaran et al. Precancerous lesions of the buccal mucosa. Rev Stomatol Chir Maxillofac. 2001;102(2):77-108.
19. Dhilip Charan S, Chandrashekar S, Chandan Shivamallu, Kollur Shiva Prasad, Chandan D, Sharanagouda S Patil et al. Oral cancer and its epidemiology, therapy and risk factors, case studies in Karnataka: A Review. International Journal of Pharmaceutical Sciences and Research. 2020; 10(3): 167-182.
20. The Global Cancer Observatory (Globocan). Lip, oral cavity. 2020.[updated on December 2020; cited on November 18 2022]. Available from https://gco.iarc.fr/today/data/factsheets/cancers/1-Lip-oral-cavity-fact-sheet.pdf.
21. Mehta FS, Bhonsle RB, Murti PR, Daftary DK, Gupta PC et al. Central papillary atrophy of the tongue among bidi smokers in India: A 10year study of 182 lesions. J Oral Pathol Med. 1989; 18:47580.
22. Sowmia V, Dinesh Dhamodhar, Sathiyapriya S, Prabu D, Rajmohan M et al. A Systematic Review on the Prevalence of Oral Cancer among Tobacco and Non-Tobacco Users In Tamil Nadu. Journal of Pharmaceutical Negative Results. 2022; 13(5): 1495-1498.
23. Aurlene N, Manipal S, Prabu D, Rajmohan. Prevalence of oral mucosal lesions, dental caries, and periodontal disease among patients with systemic lupus erythematosus in a teaching hospital in Chennai, Tamil Nadu. J Family Med Prim Care. 2020 ;9(7):3374-3380.