RESEARCH ARTICLE

MOUTH SELF-EXAMINATION (MSE): EFFECTIVENESS AS A PREVENTIVE STRATEGY FOR SCREENING OF ORAL PREMALIGNANT/MALIGNANT LESIONS

K. Thoi Thoi Singha, Dilpreet Singh Saini, Ashish Kapoor, Sonam Jordan Bhutia, Ligam Padu and Antriksh Chauhan

……………………………………………………………………………………………………....

Manuscript Info	*Abstract*
……………………..	………………………………………………………………

Background: This study was conducted to determine the efficiency of Mouth Self-Examination (MSE) as a screening strategy for the early detection of Oral Premalignant/Malignant Lesions.
Methods: This study collected data from 100 participants via a questionnaire-based survey who visited the Himachal Institute of Dental Sciences, Paonta Sahib (India).
Results: The data was examined using SPSS version 16 with a significance value of 0.05. The specificity of MSE was the highest for ulceration at 100% (P=0.445), whereas the sensitivity of MSE was 100% for bleeding, 98.9% for mouth opening, and 55.5% for white patches.
Conclusion: Although the MSE technique was less sensitive in detecting oral premalignant/malignant lesions, the specificity of the MSE method was comparatively high. This demands increased efforts to educate the population regarding oral premalignant/malignant lesions to increase the efficiency and acceptance of MSE.

……………………………………………………………………………………………………....

Introduction:-

Oral Cancer is one of the major public health concerns worldwide(Coelho, 2012). According to the latest global cancer data statistics, it is the 16th most common malignant neoplasm (Miranda-Filho & Bray, 2020; Warnakulasuriya & Kerr, 2021). With more than 90% of all oral cancers being squamous cell carcinomas, the highest incidence of these cases alone is seen in the South Asian continent (Warnakulasuriya & Kerr, 2021).Oral cancer is a grievousissue,specifically for the Indian subcontinent as it is rated among the chief three categories of cancer seen in India (Elango et al., 2006; Coelho, 2012, p. 1).

Among the major predisposing factorsthat cause oral cancer- tobacco and alcohol consumption have beenlinkedtoapproximately 75% of the cases (Carter & Ogden, 2007; Jornet et al., 2015). Though cessation of these habits has been advocated as an important part of the treatment modality, the majority of the cases arestill detected in the advanced stages, resulting in high mortality rates and considerable treatment costs to the patients (Khandekar et al., 2006). The other associated factors that increase the risk of oral cancer include - Human papillomavirus(D'Souza et al., 2007; Furniss et al., 2009), dietary deficiencies, and poor oral hygiene (Sánchez et al., 2003; Garrote et al., 2001; Talamini et al., 2000, Madani et al., 2010).

One of the most imperative prognostic factors for the successful treatment of oral carcinomas is the disease stage at the presentation time (Gómezet al., 2010; Lingen et al., 2008; Farah et al., 2019). The early diagnosis of the lesion

Corresponding Author:-K. Thoi Thoi Singha

thus becomes vital as the 5-year survival rate of oral cancer which is diagnosed at stages I and II is more than 80% (Skandarajah et al., 2017), while it is reduced to less than 40% in stages III or IV(Gómezet al., 2010). Therefore,detecting oral cancer early is one of the most ingenious methods to not only lower the morbidity, disfigurement, duration of treatment, and hospital cost (Gómez et al., 2010; Fritz, 2000) but to raise the survivability of cancer patients as well (Neal & Allgar, 2005). The patient's psychological outcomes and quality of life are also said to improve through early intervention(Scott et al., 2006; Noonan, 2014).

Despite the favorable prognosis of early detection(Seoane et al., 2012), the early-stage cancer symptoms that are mostly asymptomatic refrain patients from seeking early treatment(Warnakulasuriya & Kerr, 2021).A 34% reduction in mortality rate can be achieved by screening in the early stages of oral cancer (McGurk et al., 2005; Rethman et al., 2010; Sankaranarayanan et al., 2005; Farah et al., 2019).However, the economic feasibility of this method is often limited when carried out among high-risk individuals (Dedhia et al., 2011). Therefore, an inexpensive and noninvasive method, Mouth Self Examination (MSE) may prove helpful and a good alternativefor detecting oral premalignant/ malignant lesions in early stages in countries like India that lack trained healthcare professionals(Shah et al., 2020). MSE advocates self-oral examination of high-riskindividuals by themselves, by utilizing a mirror under sufficient light, and seekingtherapeutic assistance in the event any abnormality is seen by the individuals in the mouth (Mathew et al., 1995; Elango et al., 2011; Furquim et al., 2014; Pivovar et al., 2017; Scott et al., 2010).Therefore, the studyintends to determine the effectiveness of the MSE technique as a self-examination method to improve awareness among individuals and early detection of premalignant/ malignant conditions.

Methodology:-
A cross-sectional questionnaire-based survey was conducted on a convenience sample (N=100) aged 18 years and above who presented to the Himachal Institute of Dental Sciences, Paonta Sahib, India. The Institutional Ethics Committee of Himachal Institute of Dental Sciences, Paonta Sahib, India gave the ethical approval for the study. Before beginning the study, the participants signed a voluntary, written informed consent form, briefing them about their involvement in the research, the purpose of the study, and allowingthem to ask questions and clear any doubt regarding the study. The questionnaire was vetted and prepared using theory, expert opinion, and previous studies (Ghani et al., 2019; Streiner & Norman, 1995; Shah et al., 2020). Theformswere handed out to all the participants who reported to the Department of Oral Medicine and Radiology at Himachal Institute of Dental Sciences, Paonta Sahib, India. The participation in the study was entirely voluntary with norefusals, thereby giving the researchers a response rate of 100%.Statistical Package for the Social Sciences (SPSS for Windows, Version 16. 0. Chicago, SPSS Inc.)was utilized to do the statistical analysis, and the level of significance for the study was set ata ($p < 0.05$).

Results:-
Table (1) depicts the demographic details of the participants (N= 100). It was observed that out of all the participants, 40 % were aged between 25-40 years while 33% were aged 18-25 years. A total of 91% of males and 9% of females participated in the study. Based on the level of their education, 42% had graduated, while 12 % had completed their post-graduation, 9% of individuals were illiterate, and 10% had primary education. Based on the occupation and job type, 5% of the participants were clerical/shopkeepers or farmers, 18 % were professionally employed, and 59% were either unemployed/retired or unskilled workers.

Table 1:- Comparison of Demographic Variables and Practice of MSE.

Demographic Variable	N (%)
Age	
<25 years	33 (33%)
25-40 years	40 (40%)
>40 years	27 (27%)
Gender	
Male	91 (91%)
Female	9 (9%)
Education	
Illiterate	9 (9%)
Primary	10 (10%)

High School	16 (16%)
Senior Secondary	11 (11%)
Graduation	42 (42%)
Post-Graduation	12 (12%)
Occupation	
Professional	18 (18%)
Clerical/Shopkeeper/Farmer	5 (5%)
Business owner	12 (12%)
Skilled Worker	6 (6%)
Unskilled Worker	15 (15%)
Unemployed/Retired	44 (44%)

Table (2) shows the incidence of eating habits among the participants. From analysis, smoking and alcohol consumption were the most prevalent eating habits. Out of all the participants, 34% were smokers, and 40% consumed alcohol.Whereas, 4% of the participants had the habit of betel nut chewing while 17% chewed tobacco.

Table 2:- Comparison of Various Eating Habits Among the Participants.

Habits	N (%)
Smoking	
Yes	34 (34%)
No	66 (66%)
Tobacco chewing	
Yes	17 (17%)
No	83 (83%)
Betel nut chewing	
Yes	4 (4%)
No	96 (96%)
Alcohol	
Yes	40 (40%)
No	60 (60%)

Table (3) depicts that of all the lesions, the highest percentage identified throughthe MSE technique was related to mouth opening (94%). Contrarily, the red lesions were the least identified lesions (only 1% by the participants and 2% by the health workers). From the analysis, 2% of ulcersreported by participants, 2 were true positive (TP), 0were false positive (FP), 3were false negative (FN), and 95 were true negative (TN), with a (p = 0.445) making it statistically significant, while the p-value for all other lesionswas non-significant.

Table 3:- Occurrence of Lesions as Detected from Mouth Self-Examination and Health Worker Examination.

Type of Lesion	Participants	Health workers	P value	TP	FP	FN	TN
White Patch	6 (6%)	9 (9%)	0.593	5	1	4	90
Ulceration	2 (2%)	5 (5%)	0.445	2	0	3	95
Redness	1 (1%)	2 (2%)	1.000	0	1	2	97
Bleeding	5 (5%)	3 (3%)	0.721	3	2	0	95
Opening	94 (94%)	94 (94%)	1.000	93	1	1	5

Table (4)shows thecharacteristics of theoral precancerous/cancerous lesions identified by the MSE technique. The highestspecificity was recordedfor ulceration (100%), while it was (99%) for redness,(98.9%)for white patches, and 97.9% for bleeding. In contrast, the highest sensitivity was recorded for bleeding (100%). Moreover, bleeding (100%) and mouth opening (98.9%) showed higher sensitivity than their respective specificity value. The positive predictive value (PPV) was the lowest for redness (0%) and the negative predictive value (NPV)wasthe lowest for mouth opening (83.3%). Therefore, MSE presented to be the most specific for ulceration and most sensitive to detect bleeding.

Table 4:- Characteristics of Lesions from Mouth Self-Examination.

Type of Lesion	Sensitivity	Specificity	PPV	NPV
White Patch	55.5%	98.9%	83.3%	95.7%
Ulceration	40%	100%	100%	96.9%
Redness	0%	99%	0%	98%
Bleeding	100%	97.9%	60%	100%
Opening	98.9%	83.3%	98.9%	83.3%

Discussion:-

Visual examination for oral cancer screening is a potential strategy for identifying high-risk oral cancer individuals and providing them with early intervention. According to McGurk et al. (2005),it is often that most oral cancer patients only report in the advanced stage as the pain due to oral cancer considerably increases in the later stages. This causes thediagnostic lag in identifying and treating oral cancer as early as possible (Gómez et al., 2010).The patient delay constitutes a substantial part of the delay time with a duration of nearly 35-48 days after the appearance of the first symptom and first visit to a clinic (Onizawa et al., 2003).

Thehigh sensitivity values for bleeding and reduced mouth opening indicate that thesewere the easiestlesions to identify. According to Ghani et al. (2019), the sensitivity and specificity of a test are measures to accurately detect a disease or a condition. A test with high sensitivity will have a low false negative rate i.e., fewer cases of the disease will be missed, while high specificity in a test indicates a low false positive rate i.e., fewer healthy people will be incorrectly diagnosed with the disease (Ghani et al., 2019).

In our study,high specificity rates for ulceration (100%), redness (99%), and white patches (98.9%) indicate that the participants detected the nonexistence of these lesions in their mouths with ease. However, low sensitivity rates for red lesions (0%), ulcers (40%), andwhite patches (55.5%) indicate that the participants found difficulty in identifying the presence of these lesions in their mouths. The reason for low sensitivity as described by Elango et al. (2011), wasbecause of the asymptomatic nature and high incidence of such lesions in a high-risk population. Due to this, the individuals mistook these lesions to be normal variations and failed to report them. Additionally, the participants in our study were able to easily identify bleeding and reduced mouth opening with a sensitivity of 100% and 98.9% respectively.

In our study, there was a discrepancy in the identification of all oral lesions except mouth opening as reported by health workers and through the MSE strategy. Similar results regarding the detection of oral lesions were observed in studies conducted by (Meredith et al., 2022; Ghani et al., 2019; Elango et al., 2011). While the studies from Meredith et al. (2022), Ghani et al. (2019), and Elango et al.(2011), reported white lesions as the most prevalent, our study indicated that mouth opening was the most prevalent lesion (94% as reported by participants and healthcare workers). A similar study done by Shah et al. (2020), also reported reduced mouth opening as the most prevalent lesion. This contrast in theresults is due tothe high consumption and commercial availability of tobacco products like gutka, zarda, kharra, mawa, and khanni to individuals belonging to low socioeconomic groups in India (Coelho, 2012). In several cultures, it is a common practice to keep betel nut commonly referred to as pan in the buccal cavity and chew or suck it for 10-15 minutes(Coelho, 2012). The active component in areca nut i.e., arecoline (commonly used in the preparation of tobacco products), contributesto the progression of oral submucous fibrosis of the oral cavity (OSMF), a condition in which there is an increasedcollagen production in the mouth (Jasper et al., 2020; Ahmad et al., 2006).OSMF is a precancerous condition characterized by the thickening and stiffening of the tissues in the mouth, thereby reducing mouth opening, and has the potential toundergo malignant transformation(Jasper et al., 2020).

Conclusion:-

Oral cancer is a significant public health concernpresenting several challenges because of high morbidity and mortality (Warnakulasuriya, 2009). One major challenge in tackling this problem is the gap between preventative measures, research studies, development, and information dissemination to the public.Alcohol and tobacco consumption are key risk factors for oral malignancy (Ogawa et al., 2022). Restricted availability of oral malignancy treatment services led to an increase in cancer cases and delays in diagnosis, both of which have a detrimental influence on the prognosis of oral cancer (McGurk et al., 2005). Another issue is that low socioeconomic groups are more vulnerable to tobacco use, which is a major risk factor for oral cancer (Coelho, 2012).

To tackle such challenges, it is pivotal to ensure regular access to dental or medical check-ups to educate and aware the public about the importance of oral cancer screenings (Shah et al., 2020). Training the public on how to undertake oral cavity inspections for possibly benign or malignant lesions can serve to empower marginalized communities while also reducing the load on the Indian healthcare system. Likewise, educating the population regardingoral cancer and healthy lifestyle behaviors can assist in lowering the prevalence of oral malignancy. Therefore, it is imperativeto understand the role of continued research on the root causes of oral cancer and develop new, more sensitive screening tools for therapeutic interventions.

References:-

1. Ahmad, M. S., Ali, A. S., & Chaubey, K. K. (2006). Epidemiological and etiological study of oral submucous fibrosis among Gutkha chewers of Patna, Bihar, India. Journal of the Indian Society of Pedodontics and Preventive Dentistry, 24(2), 84-89. https://doi.org/10.4103/0970-4388.26022
2. Carter, L. M., & Ogden, G. R. (2007). Oral cancer awareness of general medical and general dental practitioners. British Dental Journal, 203. https://doi.org/10.1038/bdj.2007.630
3. Coelho, K. R. (2012). Challenges of the oral cancer burden in India. Journal of Cancer Epidemiology, 2012, 701932. https://doi.org/10.1155/2012/701932
4. Dedhia, R. C., Smith, K. J., Johnson, J. T., & Roberts, M. (2011). The cost-effectiveness of community-based screening for oral cancer in high-risk males in the United States: A markov decision analysis approach. The Laryngoscope, 121(5), 952-960. https://doi.org/10.1002/lary.21412
5. D'Souza, G., Kreimer, A. R., Viscidi, R., Pawlita, M., Koch, W. M., Westra, W. H., & Gillison, M. L. (2007). Case-control study of human papillomavirus and oropharyngeal cancer. The New England Journal of Medicine, 356(19), 1944-1956. https://doi.org/10/1056/NEJMoa065497
6. Elango, J. K., Gangadharan, P., Sumithra, S., &Kuriakose, M. A. (2006). Trends of head and neck cancers in urban and rural India. Asian Pacific Journal of Cancer Prevention: APJCP, 7(1), 108-112.
7. Elango, K. J., Anandkrishnan, N., Suresh, A., Iyer, S. K., Ramaiyer, S. K., & Kuriakose, M. A. (2011). Mouth self-examination to improve oral cancer awareness and early detection in a high-risk population. Oral Oncology, 47(7), 620-624. https://doi.org/10.1016/j.oraloncology.2011.05.001
8. Farah, C., Balasubramaniam, R., & McCullough, M. J. (2019). Contemporary Oral Medicine. Springer.
9. Fritz, A. G. (2000). International Classification of Diseases for Oncology Nonserial Publication (3rd ed.). World Health Organization.
10. Furniss, C. S., McClean, M. D., Smith, J. F., Bryan, J., Applebaum, K. M., Nelson, H. H., Posner, M. R., & Kelsey, K. T. (2009). Human papillomavirus 6 seropositivity is associated with risk of head and neck squamous cell carcinoma, independent of tobacco and alcohol use. Annals of Oncology: Official Journal of the European Society for Medical Oncology, 20(3), 534-541. https://doi.org/10.1093/annonc/mdn643
11. Furquim, C. P., Pivovar, A., Cavalcanti, L. G., Araújo, R. F., Sales Bonfim, C. M., & Torres- Pereira, C. C. (2014). Mouth self-examination as a screening tool for oral cancer in a high-risk group of patients with Fanconi anemia. Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology, 118(4), 440-446. https://doi.org/10.1016/j.oooo.2014.06.012
12. Garrote, L. F., Herrero, R., Reyes, R. M., Vaccarella, S., Anta, J. L., Ferbeye, L., Muñoz, N., & Franceschi, S. (2001). Risk factors for cancer of oral cavity and oro-pharynx in Cuba. British Journal of Cancer, 85(1), 46-54. https://doi.org/10.1054/bjoc.2000.1825
13. Ghani, W. M. N., Razak, I. A., Doss, J. G., Ramanathan, A., Tahir, Z., Ridzuan, N. A., Edgar, S., & Zain, R. B. (2019). Mouth self-examination as a screening tool for oral potentially malignant disorders among a high-risk Indigenous population. Journal of Public Health Dentistry, 79(3), 222-230. https://doi.org/10.1111/jphd.12313
14. Gómez, I., Warnakulasuriya, S., Varela-Centelles, P. I., López-Jornet, P., Suárez-Cunqueiro, M., Diz-Dios, P., & Seoane, J. (2010). Is early diagnosis of oral cancer a feasible objective? Who is to blame for diagnostic delay? Oral Diseases, 16(4), 333-342. https://doi.org/10.1111/j.1601-0825.2009.01642.x
15. Jasper, M., Srivastava, A., Yadav, S., &Verma, K. (2020). Correlation of length of tobacco abuse and development of oral submucous fibrosis (OSMF). International Journal of Contemporary Medical Research, 7(9), 15-19.
16. Jornet, P. L., Garcia, F. G., Berdugo, M. L., Perez, F. P., & Lopez, A. P. (2015).Mouth self-examination in a population at risk of oral cancer. Australian Dental Journal,60(1), 59-64. https://doi.org/10.1111/adj.12274
17. Khandekar, P. S., Bagdey, P. S., &Tiwari, R. R. (2006). Oral cancer and some epidemiological factors: A hospital based study. Indian Journal of Community Medicine, 31(3), 157–159.
18. Lingen, M. W., Kalmar, J. R., Karrison, T., &Speight, P. M. (2008). Critical evaluation of diagnostic aids for the detection of oral cancer. Oral Oncology, 44(1), 10-22. https://doi.org/10.1016/j.oraloncology.2007.06.011

19. Madani, A. H., Jahromi, A. S., Dikshit, M., Aghamolaie, T. & Bhaduri, D. (2010). Socio-Demographic Factors Related to Oral Cancer. Journal of Social Sciences, 6(2), 141-145. https://doi.org/10.3844/jssp.2010.141.145

20. Mathew, B., Sankaranarayanan, R., Wesley, R., &Nair, M. K. (1995). Evaluation of mouth self- examination in the control of oral cancer. British Journal of Cancer, 71(2), 397-399. https://doi.org/10.1038/bjc.1995.81

21. McGurk, M., Chan, C., Jones, J., O'regan, E., Sherriff, M. (2005). Delay in diagnosis and its effect on outcome in head and neck cancer. The British Journal of Oral & Maxillofacial Surgery, 43(4), 281-284. https://doi.org/10.1016/j.bjoms.2004.01.016

22. Meredith, E., O'Donovan, J., Errington, L., Mathur, M., & Hamilton, D. (2022). The role of community healthcare workers in head and neck cancer: A systematic scoping review of the literature. Global Public Health, 17(12), 3283-3302. https://doi.org/10.1080/17441692.2022.2049847

23. Miranda- Filho, A., & Bray, F. (2020). Global patterns and trends in cancers of the lip, tongue and mouth. Oral Oncol, 102, 104551. https://www.doi.org/10.1016/j.oraloncollogy.2019.104551

24. Neal, R., & Allgar, V. L. (2005). Sociodemographic factors and delays in the diagnosis of six cancers: Analysis of data from the "National Survey of NHS Patients: Cancer". British Journal of Cancer, 92(11), 1971-1975. https://doi.org/10.1038/sj.bjc.6602623

25. Noonan, B. (2014). Understanding the reasons why patients delay seeking treatment for oral cancer symptoms from a primary health care professional: An integrative literature review. European Journal of Oncology Nursing: The Official Journal of European Oncology Nursing Society, 18(1), 118-124. htpps://doi.org/10.1016/j.ejon.2013.07.005

26. Ogawa, H., McKenna, G., & Kettratad-Pruksapong, M. (2022). Prevention of Oral Functional Decline. International Dental Journal, 72(4), 21-26. https://doi.org/10.1016/j.dentj.2022.05.008

27. Onizawa, K., Nishihara, K., Yamagata, K., Yusa, H., Yanagawa, T.,& Yoshida H. (2003). Factors associated with diagnostic delay of oral squamous cell carcinoma. Oral Oncology, 39(8), 781-788. https://doi.org/10.1016/s1368-8375(03)00075-7

28. Pivovar, A., Furquim, C. P., Bonfim, C., & Torres-Pereira, C. C. (2017). Mouth examination performance by children's parents and by adolescents in Fanconi anemia. Pediatric Blood & Cancer, 64(11). https://doi.org/10.1002/pbc.26622

29. Rethman, M. P., Carpenter, W., Cohen, E. E., Epstein, J., Evans, C. A., Flaitz, C. M., Graham, F. J., Hujoel, P. P., Kalmar, J. R., Koch, W. M., Lambert, P. M., Lingen, M. W., Oettmeier, B. W., Jr, Patton, L. L., Perkins, D., Reid, B. C., Sciubba, J. J., Tomar, S. L., Wyatt, A. D., Jr, Aravamudhan, Frantsve-Hawley, J., Cleveland, J. L., Meyer, D. M. (2010). Evidence-based clinical recommendations regarding screening for oral squamous cell carcinomas. Journal of the American Dental Association, 141(5), 509-520. https://doi.org/10.14219/jada.archive.2010.0223

30. Sánchez, M. J., Martinez, C., Nieto, A., Castellsagué, X., Quintana, M. J., Bosch, F. X., Muñoz, N., Herrero, R., & Franceschi, S. (2003). Oral and oropharyngeal cancer in Spain: Influence of dietary patterns. European Journal of Cancer Prevention: The Official Journal of the European Cancer Prevention Organization (ECP), 12(1), 49-56. https://doi.org/10.1097/00008469-200302000-00008

31. Sankaranarayanan, R., Ramdas, K., Thomas, G., Muwonge, R., Thara, S., Mathew, B., Rajan, B., & Trivandrum Oral Cancer Screening Study Group. (2005). Effect of screening on oral cancer mortality in Kerala, India: A cluster- randomized controlled trial. Lancet (London, England), 365(9475), 1927-1933. https://doi.org/10.1016/S0140-6736(05)66658-5

32. Scott, S. E., Grunfeld, E. A., McGurk, M. (2006). Patient's delay in oral cancer: A systemic review. Community Dentistry and Oral Epidemiology, 34(5), 337-343. https://doi.org/10.1111/j.1600-0528.2006.00290.x

33. Scott, S. E., Rizvi, K., Grunfeld, E. A., & McGurk, M. (2010). Pilot study to estimate the accuracy of mouth self-examination in an at-risk group. Head & Neck, 32(10), 1393-1401. https://doi.org/10/1002/hed.21341

34. Seoane, J., Takkouche, B., Varela-Centelles, P., Tomás, I., Seoane-Romero, J. M. (2012). Impact of delay in diagnosis on survival to head and neck carcinomas: A systemic review with meta-analysis. Clinical Otolaryngology: Official Journal of ENT-UK; Official Journal of Netherlands Society for Oto-Rhino-Laryngology & Cervico-Facial Surgery, 37(2), 99-106. https://doi.org/10.1111/j.1749-4486.2012.02464.x

35. Skandarajah, A., Sunny, S. P., Gurpur, P., Reber, C. D., D'Ambrosio, M. V., Raghavan, N., James, B. L., Ramanjinappa, R. D., Suresh, A., Kandasarma, U., Birur, P., Kumar, V. V., Galmeanu, HC., Itu, A. M., Modiga-Arsu, M., Rausch, S., Sramek, M., Kollegal, M., Paladini, G., Kuriakose, M., Ladic, L., Koch, F., Fletcher, D. (2017). Mobile microscopy as a screening tool for oral cancer in India: A pilot study. PloS one, 12(11), e0188440. https://doi.org/10.1371/journal.pone.0188440

36. Shah, A., Bhushan, B., Akhtar, S., Singh, P. K., Garg, M., & Gupta, M. (2020). Effectiveness of mouth self-examination for screening of oral premalignant/malignant diseases in tribal population of Dehradun district. Journal of Family Medicine and Primary Care, 9(8), 4381-4385. https://doi.org/10.4103/j.fmpc.jfmpc_535_20

37. Streiner, D. L., & Nornam, R. G. (1995). Health Measurement Scales: A Practical Guide to Their Development and Use (2nd ed.). Oxford: Oxford University Press.

38. Talamini, R., Vaccarella, S., Barbone, F., Tavani, A., La Vecchia, C., Herrero, R., Muñoz, N., & Franceschi, S. (2000). Oral hygiene, dentition, sexual habits and risk of oral cancer. British Journal of Cancer, 83(9), 1238-1242. https://doi.org/10.1054/bjjoc.2000.1398

39. Warnakulasuriya, S. (2009). Global epidemiology of oral and oropharyngeal cancer. Oral oncology, 45(4-5), 309-316. https://doi.org/10.1016/j.oraloncology.2008.06.002

40. Warnakulasuriya, S., & Kerr, A. R. (2021). Oral Cancer Screening: Past, Present, and Future. Journal of Dental Research, 100(12), 1313-1320. https://doi.org/10.1177/00220345211014795.