

Assessment of Periodontal Status in Patients with Oral Lesions - A Retrospective Study in South Indian Population

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Abstract

Oral potentially malignant disorders (OPMD) are defined as the risk of malignancy being present in a lesion or condition either at the time of initial diagnosis or at a future date. They have the potential to undergo malignant transformation. Some of the potentially malignant disorders that are related to oral squamous cell carcinoma are Oral submucous fibrosis (OSMF), Leukoplakia, Erythroplakia, & Lichen Planus. There is a dual relationship between Oral carcinoma and periodontitis. Oral lesions may have an indirect effect on initiating periodontitis. Periodontitis can be considered as one of the risk factors for the development of oral cancer. The aim of the study is to assess the periodontal status of patients who are diagnosed with oral lesions in Saveetha Institute of Medical & Technical Sciences (SIMATS). This is a retrospective study, carried out by analysis of the patient records from June 2019 to March 2020 were assessed. Parameters assessed were - Age, Sex, Systemic status, Periodontal parameters (Periodontal probing depth - PPD, Loss of Attachment - LOA, Bleeding on Probing - BOP), periodontal status (Healthy gingiva, Gingivitis, Periodontitis) & Severity of periodontitis (Mild, moderate & severe). Data was analysed using SPSS version 23.0. Chi square test was done to compare the differences in proportion. A total of 192 subjects were included in the study. 93 patients (48.4%) were diagnosed with OSMF, whereas 99 patients (51.6%) were diagnosed with Leukoplakia. Males constituted 93.75% of the study population and females constituted 6.25% of the study population. Age group of the study population ranged from 20 years to 80 years. Mean age of the study population is 42.25 years. 51.04% of the patients were diagnosed with gingivitis, 43.23% of the patients were diagnosed with periodontitis & 5.73% of the patients had healthy gingiva. Chi square test results showed statistically significant association between oral lesions and habits, with a p value of 0.000. Leukoplakia was found to be more prevalent among smokers & OSMF was found to be more prevalent among patients who had the habit of chewing Areca nut, Hans, Mawa and Pan. However, there was no statistically significant difference between oral lesions based on periodontal status & severity of periodontitis. Oral lesions can be considered as an attributing factor for development of periodontitis.

Keywords - Leukoplakia; Oral lesions; Oral submucous fibrosis; Periodontitis; Premalignant lesion.

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Introduction

Oral carcinoma is a public health problem in many countries¹. About 3,00,000 new cases of oral cancer are reported every year worldwide and the majority of the cases are detected in developing countries. Around one third of the cases are seen in India. The number of cases has been increasing over the few years in developed countries². About 90% of the oral cancers are reported as squamous cell carcinoma. Oral potentially malignant disorders (OPMD) can develop into oral squamous cell

carcinomas (OSCC). The term OMPD includes around 20 oral lesions and conditions that have the potential to undergo malignant transformation³. Some of the potentially malignant disorders that are related to oral squamous cell carcinoma are Oral submucous fibrosis (OSMF), Leukoplakia, Erythroplakia, & Lichen Planus⁴. OSMF is most prevalent in the Southeast Asian countries, ranging from 3.2 – 17.6%⁵. Leukoplakia, Erythroplakia & OSMF have potential risk factors including arecanut, slaked lime, tobacco and alcohol⁶. These habits are also risk factors for development of oral squamous cell carcinoma. Several other factors that are associated with oral cancer include Human Papillomavirus infection, stress and low socioeconomic status⁷⁻⁹. Poor oral hygiene, Periodontitis and chronic irritation caused by dentures or other appliances are considered to be risk factors for OSCC¹¹⁰.

Periodontitis is a chronic inflammatory oral disease caused by gram negative bacteria residing in the tooth supporting structures¹¹⁻¹⁴. It is a multifactorial disease, and is influenced by several risk factors¹⁵. The disease progresses as a result of host immune response to bacteria, producing breakdown of connective tissue and alveolar bone¹⁶⁻¹⁸. The endotoxins released by the subgingival flora acts as a prerequisite for periodontal destruction. They stimulate the host immune cells like the polymorphonuclear neutrophils (PMNs), macrophages, B & T lymphocytes to produce cytokines, proteolytic enzymes, and acute phase proteins that mediate tissue destruction¹⁹⁻²¹. Consequences of periodontitis include loss of tooth, loss of function and unpleasant esthetics^{22,23}. Over the past few decades, several advancements in clinical and radiographic diagnosis are in practice²⁴. Early diagnosis and treatment planning of periodontitis is of primary importance, as it eventually leads to tooth loss²⁵.

Research has proved the association between periodontitis and oral carcinoma, signifying an immune – inflammatory pathway^{26,27}. Specific transcription factors act as a link between inflammation and cancer. These factors, on stimulation, have the ability to increase the expression of genes that are involved in production of inflammatory mediators and proliferation of cancer cells. Chronic inflammation activates certain cellular pathways that cause initial cell transformation and cancer progression. On persistent accumulation of

cytokines, chemokines, and reactive oxygen species, the inflammatory mediators activate oncogenes and inactivate tumor suppressor genes that lead to uncontrolled cellular proliferation. This may produce genetic alterations that increase the risk of cancer development^{28,29}. Tezal et al found that potentially malignant oral disorders are involved in immuno inflammatory pathogenesis that could possibly be associated with periodontitis³⁰. Another study done in Pomerania showed that leukoplakia is associated with gingival inflammation³¹. Considering the above reasons the present study was conducted to examine the periodontal status of the patients with OSMF & Leukoplakia in the South Indian population.

Materials & Method

This is a retrospective study, carried out by analysis of the patient records from June 2019 to March 2020 were assessed. The study design was reviewed and approved by the Ethical Committee of Saveetha Institute of Medical and Technical Sciences (SIMATS). Data from 200 patients who were diagnosed with OSMF and Leukoplakia at SIMATS were reviewed in the study. Case sheets with incomplete data were excluded from the study. A total of 192 patients were included in the study.

Parameters assessed -

Demographic details including Patient name, Patient identity number (PID No.), Age, Sex, Habits, systemic status were recorded. Periodontal parameters including Bleeding on probing (BOP), Periodontal probing depth (PPD), Loss of Attachment (LOA), and Periodontal status (Healthy gingiva, Gingivitis, Periodontitis), Severity of periodontitis (Mild, moderate, severe periodontitis) were taken into account in this study.

Group I (n = 93) included patients who were diagnosed with OSMF, Group II (n = 99) included patients who were diagnosed with Leukoplakia. Habits were categorized into use of Areca nut, Ghutka, Hans, Mawa, Pan & Tobacco smoking. Systemic status were categorized into systemically healthy patients, and systemically compromised patients (Diabetes & Hypertension). Periodontal status were categorized into healthy gingiva, gingivitis and periodontitis.

According to Centers for Disease Control & Prevention - American Academy of Periodontology (CDC-AAP) case definition,

a) Mild periodontitis - ≥ 2 interproximal sites with CAL ≥ 3 mm, and ≥ 2 interproximal sites with pocket depth ≥ 4 mm (not on same tooth) or one site with pocket depth ≥ 5 mm

b) Moderate ≥ 2 interproximal sites with CAL ≥ 4 mm (not on the same tooth) or ≥ 2 interproximal sites with pocket depth ≥ 5 mm (not on the same tooth).

c) Severe ≥ 2 interproximal sites with CAL ≥ 6 mm (not on same tooth) and ≥ 1 interproximal site with pocket depth ≥ 5 mm^{32 33}.

Statistical Analysis

The data obtained analysed using statistical software SPSS version 23.0 (Statistical Package For The Social Sciences). Chi squared test was performed to assess the relationship of oral lesions with gender, habits, periodontal status and severity of periodontitis. A difference was considered to be of statistical significance if $p < 0.05$.

Result & Discussion

A total of 192 subjects were included in the study. 93 patients (48.4%) were diagnosed with OSMF, whereas 99 patients (51.6%) were diagnosed with Leukoplakia (Figure 1). Males constituted 93.75% of the study population and females constituted 6.25% of the study population (Figure 2). Age group of the study population ranged from 20 years to 80 years (Figure 3). Mean age of the study population is 42.25 years. 51.04% of the patients were diagnosed with gingivitis, 43.23% of the patients were diagnosed with periodontitis & 5.73% of the patients had healthy gingiva (Figure 4).

Chi squared test was performed to assess the relationship of oral lesions with gender, habits, periodontal status and severity of periodontitis. Association between oral lesions and habits was found to be statistically significant with a p value of 0.000. Hence, from figure 5 it is evident that Leukoplakia was found to be more prevalent among smokers & OSMF was found to be more prevalent among patients who had the habit of chewing Areca nut, Hans, Mawa and Pan. Figure 6 shows that

association between oral lesions and periodontal status was found to be statistically insignificant. Chi square test results showed no statistically significant difference between oral lesions based on severity of periodontitis (Figure 7).

Periodontitis is a common oral disease caused by bacterial infection, leading to irreversible attachment loss, alveolar bone loss and eventually to tooth loss. It is a multi-factorial disease influenced by several risk factors like smoking, diabetes, socioeconomic status, oral hygiene, and genetic susceptibility³⁴. The extent, severity and course of the periodontal disease is dependent on these risk factors. Periodontitis is related to various oral pathological conditions including pre-malignant and malignant lesions. Smoking is the most important risk factor for oral leukoplakia and for periodontitis³⁵. Periodontal sites are commonly involved in proliferative types of leukoplakia³⁶

Recent research has focussed on the molecular and cellular pathways that act as a link between inflammation and cancer³⁷. Two pathways link inflammation and cancer. In the intrinsic pathway, oncogenes that enhance the expression of inflammatory mediators and produce an inflammatory environment are activated. Whereas the extrinsic pathway drives the inflammatory conditions which predispose to cancer. Transcription factors like nuclear factor kappa Beta (NF-kB), and cytokines like Tumor necrosis factor and other chemokines act as important orchestrators for both intrinsic and extrinsic pathways³⁸. Thus, inflammation is a key component of the tumour microenvironment.

Mean age of the study population is 42.25 years. This finding is similar to that of the study by N Prakash Rai et al, where the mean age was 47.7 years³⁹. This is not in accordance with the study by Rathod S et al, where the mean age was 35 years⁴⁰. This result was opposing to the findings of the studies by Shenoy & Hedge, Bansal et al, Sinor et al & Gaszynska et al, where the mean age was 71.2 years, 70.49 years, 71.2 years, 75.5 years respectively. All these studies focussed on geriatric population⁴¹⁻⁴⁴.

In the present study, Males constituted 93.75% of the study population and females constituted 6.25% of the study population. This finding is opposing to the study by Sajankumar RP et al, where 57.03% of the study

population were males and 42.97% of the population were females.³² It was opposing to the study by Shenoy RP et al, where 54.9% & 45.1% of the participants were males and females respectively⁴¹

In the current study, the percentage of OSMF was 48.4% & leukoplakia was 51.6%. However, studies conducted by Tang et al & Yang et al, showed that OSMF was present in 5.49% & 23.2 % of the study population respectively ^{45,46}. This lower prevalence is because smaller communities were studied (Aborigines of Taiwan & Elderly Venezuelan population).

In this study, 4.17% of the study population, belonging to the OSMF group had healthy gingiva & 1.56% of the study population, belonging to Leukoplakia group had healthy gingiva (Figure 6). These findings are opposing to the study by Sajankumar RP, where no patient had a healthy gingiva ³². Whereas in Shaheen et al, Agrawal et al & Mary et al studies, 0.91 % of the patients had healthy gingiva.⁴⁷⁻⁴⁹

Results from the present study shows that 40% of the patients with OSMF and 51% of the patients with Leukoplakia were diagnosed with periodontitis. There are several reasons for the association between

malignant lesions of oral cavity and periodontal disease. Periodontal pathogens have the ability to convert nitrate into nitrite or acetaldehyde ⁵⁰. Evidence suggests that in patients with periodontal infection, there is production of carcinogenic metabolites. Increased level of mediators and inflammatory markers are considered to be associated with development of tumors. Compromised epithelial barrier in periodontitis allows the carcinogens produced by alcohol and tobacco consumption to penetrate the underlying tissues ²⁷. According to Nourelahi M et al, the rate of occurrence of oral malignancy is significantly related to tooth loss and other periodontal parameters such as clinical attachment loss and alveolar bone loss. Hence, periodontal disease can be considered as an independent risk factor for oral cancer ⁵¹.

Limitations and future scope -

Further longitudinal studies are needed to investigate the periodontal status in patients with oral lesions with larger sample size. Dose dependent relationships between the habits, oral lesions & periodontitis should be studied. Effect of treatment of oral lesions on periodontal status should be assessed in future studies.

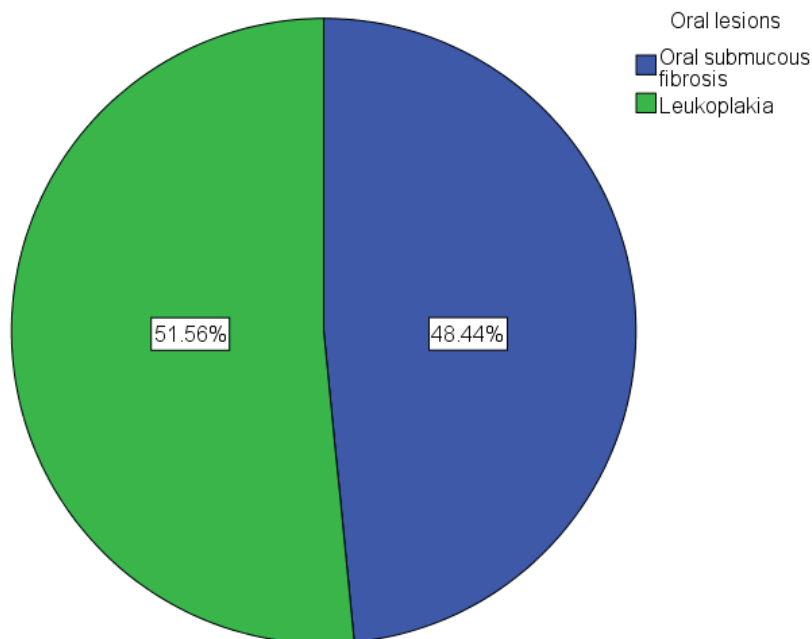


Figure 1 : Pie chart representing distribution of the oral lesions in the study population. Blue denotes Oral submucous fibrosis (OSMF) and green denotes Leukoplakia. 51.56% of the study population were diagnosed with leukoplakia and 48.44% of the patients were diagnosed with OSMF.

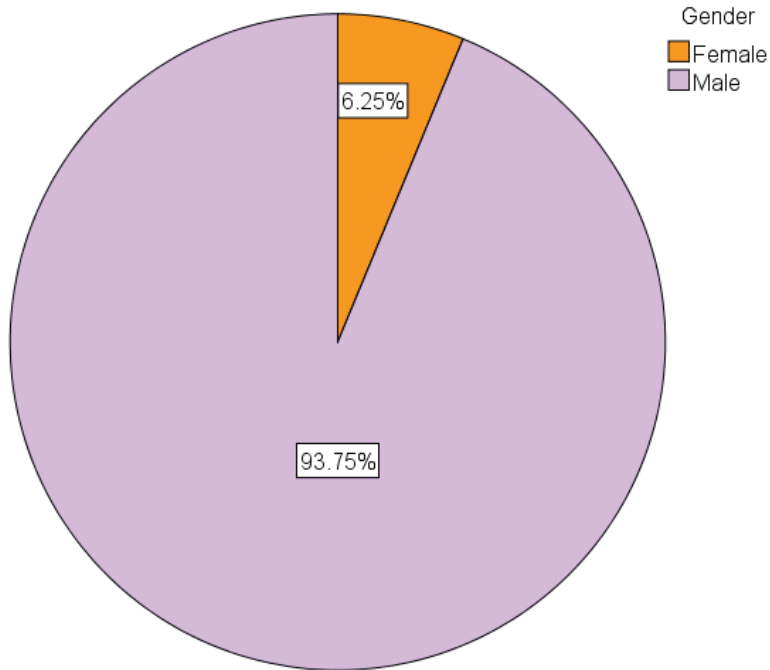


Figure 2 : Pie chart representing distribution of the gender in the study population. Purple denotes males and orange denotes females. 93.75% of the study population were males and 6.25% of the participants were females.

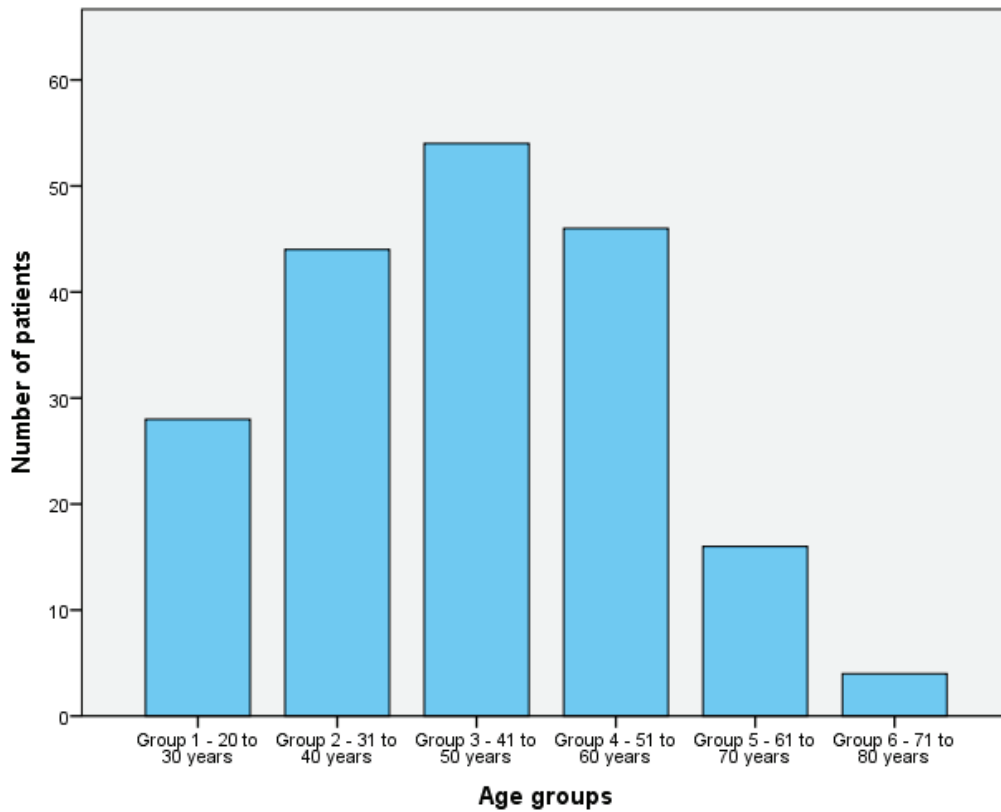


Figure 3 : Bar graph showing age groups of the study population. X axis represents the different age groups (20 - 30 years, 31 - 40 years, 41 - 50 years, 51 - 60 years, 61 - 70 years & 71 - 80 years) & Y axis represents the number of patients. Maximum patients of the study population belonged to the age group of 41 to 50 years.

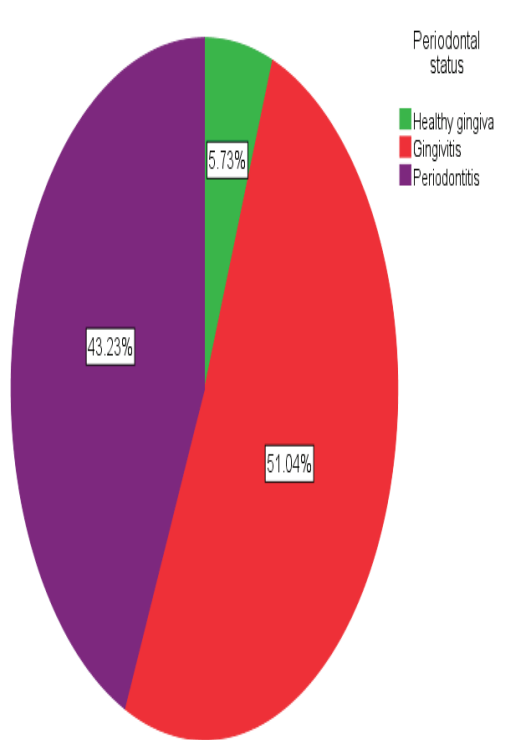


Figure 4: Pie chart representing distribution of periodontal status of the study population. Green denotes healthy gingiva, red denotes gingivitis and purple denotes periodontitis. 51.04% of the patients were diagnosed with gingivitis, followed by periodontitis (43.23%) and healthy gingiva (5.73%).

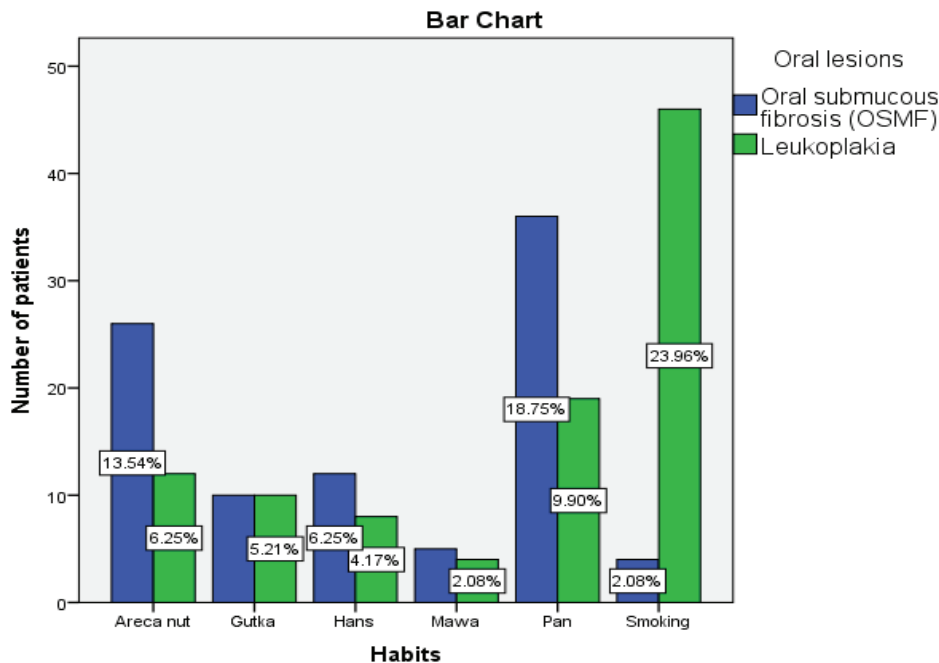


Figure 5: Bar graph depicting the relationship between the Oral lesions and habits of the patients. X axis represents the habits of the patients and Y axis represents the number of patients. Blue denotes Oral submucous fibrosis (OSMF) and green denotes Leukoplakia. Chi square test was done and association between oral lesions and habits was found to be statistically significant. (Pearson’s Chi square value : 46.46, df - 5, p value - 0.000 - significant). Therefore, Leukoplakia was found to be more prevalent among smokers & OSMF was found to be more prevalent among patients who had the habit of chewing Areca nut, Hans, Mawa and Pan. _

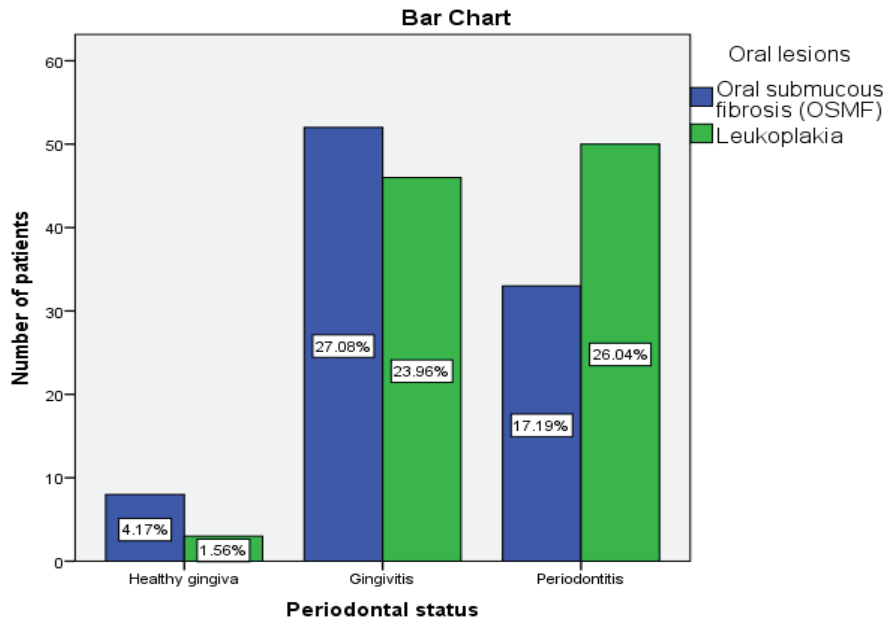


Figure 6: Bar graph depicting the relationship between the Oral lesions and periodontal status of the patients. X axis represents the periodontal status of the patients and Y axis represents the number of patients. Blue denotes Oral submucous fibrosis (OSMF) and green denotes Leukoplakia. Chi square test was done and association between oral lesions and periodontal status was found to be statistically insignificant. (Pearson’s Chi square value : 5.7, df - 2, p value - 0.051 - insignificant). However there was no statistically significant difference between oral lesions based on periodontal status, the oral lesions were more prevalent in the gingivitis and periodontitis group when compared with patients who had healthy gingiva.

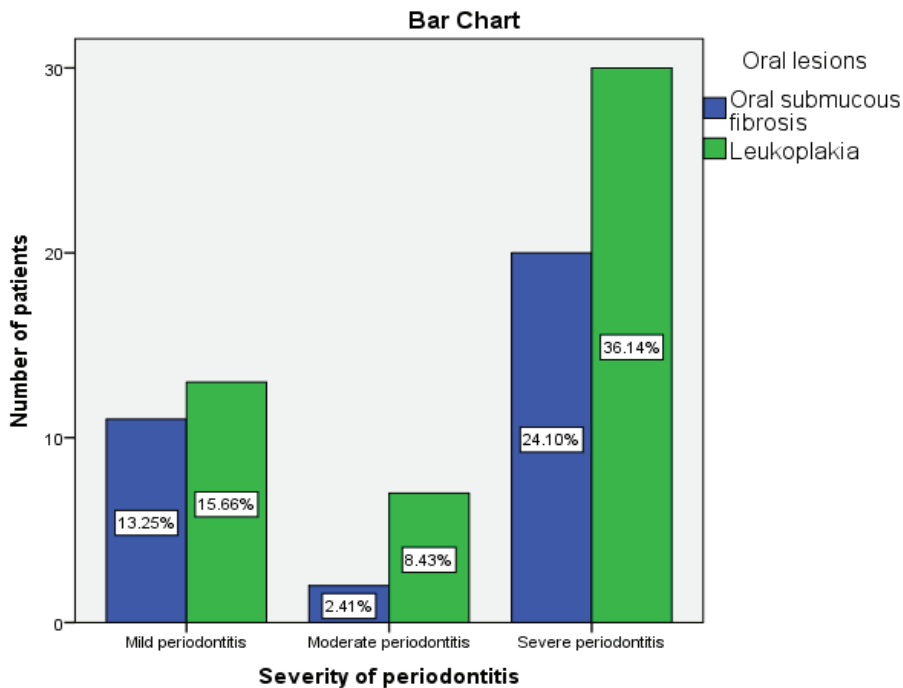


Figure 7: Bar graph depicting the relationship between the Oral lesions and severity of periodontitis. X axis represents the mild, moderate and severe periodontitis and Y axis represents the number of patients. Blue denotes Oral submucous fibrosis (OSMF) and green denotes Leukoplakia. Chi square test was done and association between oral lesions and severity of periodontitis was found to be statistically insignificant. (Pearson’s Chi square value : 1.52, df - 2, p value - 0.466- not significant). However there was no statistically significant difference between oral lesions based on severity of periodontitis, the severe periodontitis group had more number of oral lesions than patients who had mild periodontitis.

Conclusion

Based on this evidence, dentists should consider periodontal disease as an attributing factor for development of oral carcinoma. It is also advisable to provide periodontal therapy for patients with oral premalignant disorders to achieve ideal therapeutic results.

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Conflict of Interest - Nil

Source of Funding - Self

Ethical Clearance: It is taken from “Saveetha Institute Human Ethical Committee” (Ethical Approval Number- SDC/SIHEC/2020/DIASDATA/0619-0320)

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