Journal of Contemporary Issues in Business and Government Vol. 27, No. 2, 2021
https://cibg.org.au/

P-ISSN: 2204-1990; E-ISSN: 1323-6903
DOI: 10.47750/cibg.2021.27.02.248

Pattern of tooth mobility in smokers and non-smokers with chronic periodontitis

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Abstract: Periodontitis is an infectious inflammatory disease that is caused by the bacteria of dental plaque resulting in the progressive destruction of the tissue supporting the teeth, that is gingival, periodontal ligament, cementum and the alveolar bone. The progression of the disease is accelerated by tobacco consumption. The aim of this study is to find the pattern of tooth mobility in smokers and non smokers. This retrospective study was conducted in a Private dental college, chennai. The sample size was 100, with 50 smokers and 50 non smokers. The data was collected from the hospital digital database. It was observed that tooth mobility in smokers was prevalent in the posterior region (16%) ($p<0.05$) and in the maxilla and both the jaws (11% & 23% respectively). Tooth mobility in smokers was commonly seen in the posterior region of maxilla (10%) and anterior region of mandible (20%) for which the P value was found to be statistically significant (<0.05). For non-smokers, there was an increased tooth mobility observed in the anterior region of the mandible (34%) for which the P value was found to be statistically significant (<0.05). Within the limits of the study, it can be concluded that smoking causes increased periodontal destruction to the surrounding tissues, with tooth mobility and loss commonly observed in the posterior regions of maxilla and posterior region in both the jaws. Thus, Progression of disease can be prevented by early diagnosis and by tobacco cessation programmes.

Keywords: smoking, periodontitis, tooth mobility, recession, furcation

INTRODUCTION

Periodontitis is an infectious inflammatory disease that is caused by the bacteria of dental plaque resulting in the progressive destruction of the tissue supporting the teeth, that is gingival, periodontal ligament, cementum and the alveolar bone (Newman, 2007),(Pihlstrom, 2001).It is an infective condition and is caused by pathogens namely, aggregatibacter actinomycetemcomitans, porphyromonas gingivalis, prevotella intermedia, fusobacterium nucleatum and few other microorganisms (Rai, Kaur and Kharb, 2009).

The first sign of periodontal destruction is from the displacement of junctional epithelium which results in pocket formation between the tooth and the gingiva (Löe *et al.*, 1978). The other signs of disease include root exposure due to recession, mobility furcation environment which can, in later stages, lead to tooth loss.The risk factors involved in periodontal destruction are ageing, tobacco consumption, alcohol consumption, stress and few systemic conditions like diabetes mellitus (Arigbede, Babatope and Bamidele, 2012).

Tooth loss remains a major concern, especially in young adults. Physiological tooth mobility is defined as the slight displacement of the clinical crown of a tooth, that is allowed by the resilience of an intact and healthy periodontium, under the application of a moderate force (Mühlemann, 1954), (Glargia and Lindhe, 1997). The degree of tooth mobility may be influenced by a wide variety of factors, such as: the root surface area with connective tissue attachment and therefore tooth type and morphology (e.g. crown-to-root ratio, number, shape and length of roots etc.) and the structural, biophysical (e.g. viscoelasticity and resilience) and metabolic properties of the periodontal ligament and the supporting alveolar bone.

These properties may be affected by functional (e.g. intensity and direction of occlusal forces), local (e.g. severity of periodontal inflammation) or systemic conditions (e.g. diabetes); such conditions could be either

physiological (e.g. pregnancy) or pathological (e.g. periodontal or periapical abscess) (Mühlemann, Savdir and Rateitschak, 1965).

There are both local and systemic factors that could result in tooth loss. Poor oral hygiene could cause caries and periodontal disease leading to the loss of teeth (Axelsson and Lindhe, 1978). Additionally, there are a number of systemic diseases such as diabetes, hypophosphatasia, leukemia, hyperthyroidism, etc whose effects on the oral cavity could make the teeth susceptible to exfoliation (Fure and Zickert, 1997).

According to studies, tobacco consumption is one of the main risk factors associated with chronic periodontitis (BERGSTROM and J, 2006). Cigarette smoking or other forms of tobacco usage has shown five times increased risk of developing periodontal diseases (Papapanou, 1996).Smokers have a greater risk of tooth loss than a non-smoker (Ahlqwist *et al.*, 1989) and also the furcation involvement in the molars are more frequent in smokers (Mullally and Linden, 1996).Though the mechanism behind smoking and progression of the disease remains unclear, few studies suggest that the local effect as in Vasco construction caused by nicotine along with the decreased oxygen tension can create a favourable environment for colonisation by anaerobic bacteria (Salvi *et al.*, 1997). Smoking also influences factors like chemotaxis, phagocytosis, antibody production which in turn causes progression of the disease (Palmer *et al.*, 2005). The CSTK levels are elevated in smokers with chronic periodontitis when compared to non-smokers (Gajendran, Parthasarathy and Tadepalli, 2018).

In chronic periodontitis, there is destruction of gingival, periodontal ligament, cementum, and the bone. There is a need to regenerate the lost tissue which according to previous studies have shown that stem cells are effective in self renewal and in differentiation to produce specialised tissues (Avinash and Malaippan, 2017).Growth factors such as platelet rich fibrin (PRF) are considered vital mediators in inducing differentiation, proliferation and migration of periodontal progenitor cells (Panda, Jayakumar and Sankari, 2014). The PRGF along with GTR has shown good results in improving clinical and radiographic parameters in patients with chronic periodontitis (Ravi *et al.*, 2017).

Previously our team had conducted numerous clinical trials (Kavarthapu and Thamaraiselvan, 2018),(Ramesh, Ravi and Kaarthikeyan, 2017),(Ramesh, Vellayappan and Ravi, 2019), (Priyanka, Kaarthikeyan and Nadathur, 2017) ,(Ramesh, Varghese and Doraiswamy, 2016) over the past 5 years. Now we are focusing on retrospective studies. The idea for the current study stemmed from current interest in our community.Our team has rich experience in research and we have collaborated with numerous authors over various topics in the past decade (Deogade, Gupta and Ariga, 2018; Ezhilarasan, 2018; Ezhilarasan, Sokal and Najimi, 2018; Jeevanandan and Govindaraju, 2018; J *et al.*, 2018; Menon *et al.*, 2018; Prabakar *et al.*, 2018; Rajeshkumar *et al.*, 2018, 2019; Vishnu Prasad *et al.*, 2018; Wahab *et al.*, 2018; Dua *et al.*, 2019; Duraisamy *et al.*, 2019; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Gheena and Ezhilarasan, 2019; Malli Sureshbabu *et al.*, 2019; Mehta *et al.*, 2019; Panchal, Jeevanandan and Subramanian, 2019; Rajendran *et al.*, 2019; Ramakrishnan, Dhanalakshmi and Subramanian, 2019; Sharma *et al.*, 2019; Varghese, Ramesh and Veeraiyan, 2019; Gomathi *et al.*, 2020; Samuel, Acharya and Rao, 2020)

Thus, the current study was conducted to find the pattern of tooth mobility in smokers and non-smokers.

MATERIALS AND METHODS

The study was conducted in a Private dental College, Chennai which is a University set up. The population chosen for the study included patients with chronic periodontitis and tooth mobility with two groups; 1. Patients having a habit of smoking and 2. Patients who don't have the habit of smoking. The data was collected from the hospital digital database. Two examiners were included in the study

The study is a retrospective study. The data was collected over a period of nine months- from June 2019 to March 2020. The sample size was 100, of which 50 were smokers and 50 were non-smokers. The collected data was cross- verified with photographs. The inclusion criteria was all patients with chronic periodontitis and tooth mobility. The exclusion criteria was insufficient or unavailable data on habits and periodontal status.

Data collection

The collected data was based on patients having periodontitis with tooth mobility. The population was divided into 2 groups namely; (i)Smokers and (ii) Non- smokers. The tooth loss pattern was studied under the sub headings; SITE-(i) anterior, (ii) posterior and (iii) both, JAWS- (i) maxilla, (ii) mandible, and (iii) both.

Statistical analysis

The collected data was entered in an excel sheet and tabulated statistically using SPSS software (version 23: IBM Corporation NY USA). Pearson Chi square test was performed and the level of significance was set at 0.05.

Ethical approval

The ethical approval for the retrospective study was obtained from the institutional ethical committee.

RESULTS AND DISCUSSION

Comparing smokers and non-smokers with sites of tooth mobility, it was found that in smokers, tooth mobility was prevalent in the posterior region (16%) for which the P value was found to be statistically significant (0.011) (Figure 1). Association between smokers and non-smokers with jaws was done, it was found that tooth mobility was prevalent in the maxilla and both the jaws (11% & 23% respectively), however the P value was found to be not statistically significant (Figure 2). Comparing the tooth mobility with site and jaws in smokers, it was found that the tooth mobility in the posterior region was more prevalent in maxilla (10%),anterior region was common in mandible (20%) and prevalence for both the sites in both the jaws (26%) (Figure 3). The p value was found to be 0.004 which was statistically significant (<0.05). Smokers in the age group 53-62 years had more prevalence of tooth mobility in the maxilla and mandible (12% & 16% respectively) and 40-52 years age group had prevalence in both the jaws (20%) (Figure 4). The P value was found to be statistically not significant (>0.05). The age group 53-62 years had more prevalence of tooth mobility in anterior, posterior and both the regions (12%,12% and 20% respectively). The P value was found to be statistically not significant (>0.05). (Figure 5). Comparing the tooth mobility with site and jaws in non-smokers, it was observed that, tooth mobility in the posterior region was prevalent in maxilla (6%), anterior region was prevalent in mandible (34%). The P value was found to be statistically significant (0.000) which is <0.05 (Figure 6). Non- smokers in the age group 41-52 years had prevalence for maxilla and both the regions (6% & 22% respectively) and the age group 25-40years had prevalence for mandible region (14%). The P value was found to be statistically not significant (>0.05) (Figure 7). The age group 41-52 years had prevalence for both the sites (28%) and the age group 25-40 years had prevalence for anterior and posterior region (18% & 4% respectively). The P value was found to be statistically not significant (>0.05) (Figure 8).

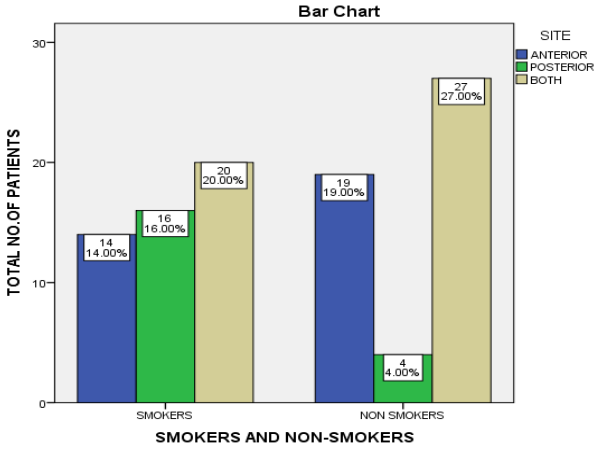

Fig.1: Bar graph showing association of tooth mobility between smokers and non smokers with site. The X axis represents tooth mobility in smokers and non smokers with site and the Y axis represents total number of patients with tooth mobility. It is observed that, in smokers, tooth mobility was more common in the posterior region (green) than the anterior region (blue). In non-smokers, tooth mobility was more common in the anterior region (blue) and both the sites (grey). Chi- square test was done. Pearson Chi-square value-9.000, df-2, p value-0.011, which means there is significant association of tooth mobility between smokers and non smokers with site

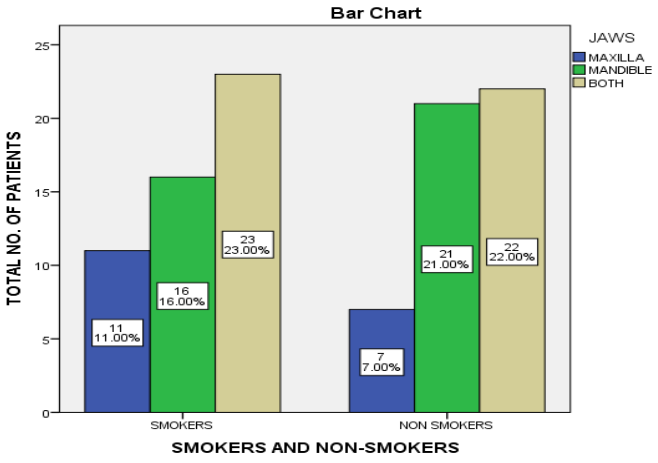

Fig.2: Bar graph showing association of tooth mobility between smokers and non smokers with jaws. The X axis represents smokers and non smokers and the Y axis represents total number of patients with tooth mobility. It is observed that, in smokers, tooth mobility was more prevalent in the maxilla (blue) and both the jaws (grey) than in mandible (green) which was prevalent in non smokers. However, the association is statistically not significant (Pearson Chi square value-1.587, df-2, p value-0.452).

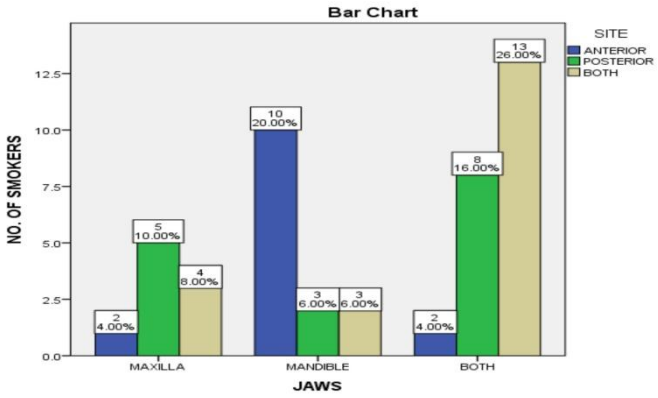

Fig.3: Bar graph showing association of tooth mobility between the site and jaws in smokers. X axis represents jaws and Y axis represents the number of smokers with tooth mobility in anterior, posterior and both the regions. Tooth mobility was seen in both maxilla and mandible with both the sites prevalence. Chi square test was done. There is statistically significant association between the site and jaws in smokers (Pearson Chi-square value-15.209, df-4, p value-0.004).

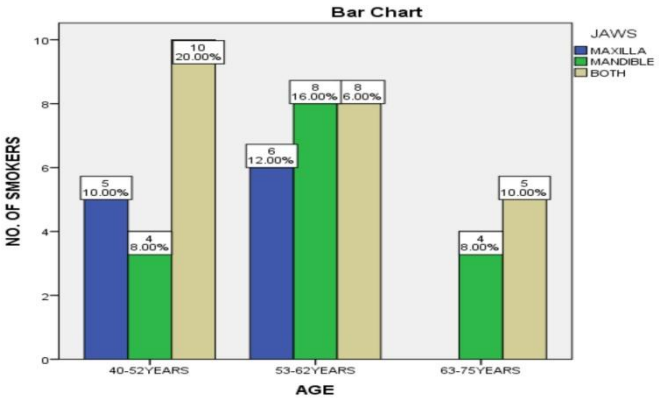

Fig.4: Bar graph showing association of tooth mobility between age and jaws in smokers. X axis represents age and the Y axis represents the number of smokers. Patients in the age group of 53-62 years had prevalence of tooth mobility in maxilla (blue) and mandible (green). Chi square test was done. Pearson Chi square value-4.501, df-4, p value-0.342.However, there is no statistically significant association of tooth mobility between age and jaws in smokers.

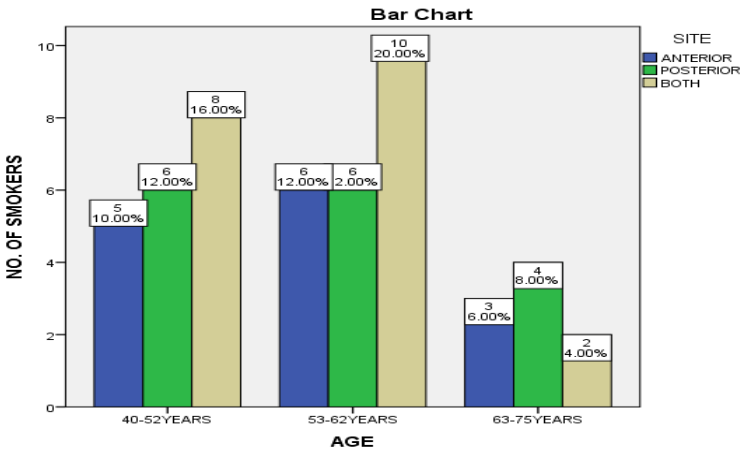

Fig.5: Bar graph showing association of tooth mobility between age and site in smokers. X axis represents age Y axis represents the number of smokers. Patients in the age group of 53-62 years had prevalence of tooth mobility in all three sites observed; anterior, posterior and both the sites (blue, green and grey respectively). Chi square test was done. Pearson Chi square value-1.601, df-4 p value-0.809. However, there is no statistically significant association of tooth mobility between age and site in smokers.

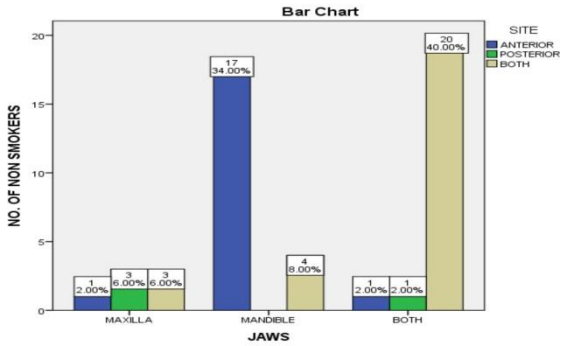

Fig.6: Bar graph showing association of tooth mobility between the site and jaws in non- smokers. X axis represents jaws and Y axis represents the number of non-smokers with tooth mobility in anterior, posterior and both the regions. Tooth mobility was more prevalent in the anterior region of the mandible (blue). Chi square test was done.Pearson Chi-square value-40.813, df-4, p value-0.000. There is statistically significant association between the site and jaws in smokers.

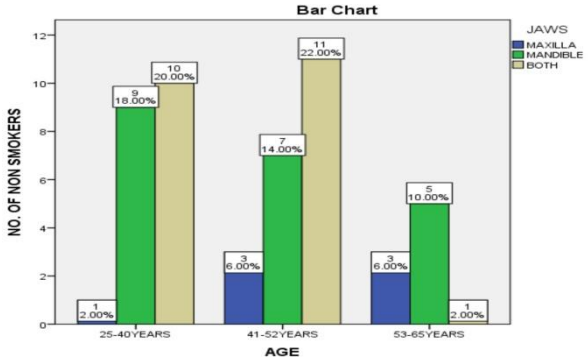

Fig.7: Bar graph showing association of tooth mobility between age and jaws in non- smokers. X axis represents age and the Y axis represents the number of non-smokers. Patients in the age group of 41-52 years had prevalence of tooth mobility in maxilla (blue) and both the jaws (grey) observed. Chi square test was done. Pearson Chi square value-7.085, df-4, p value-0.131. However, there is no statistically significant association of tooth mobility between age and jaws in non smokers.

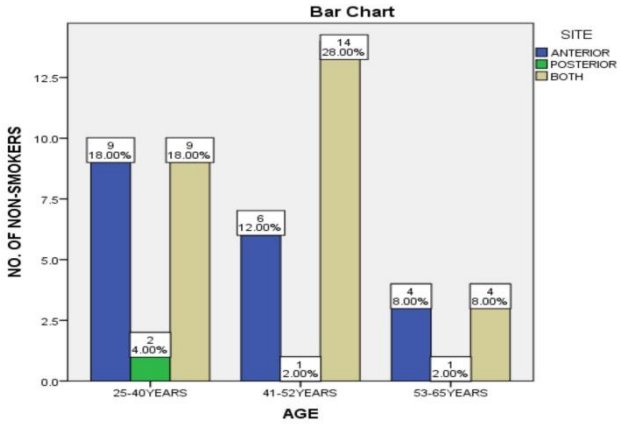

Fig.8: Bar graph showing association of tooth mobility between age and site in non smokers. The X axis represents the age Y axis represents the number of non-smokers. Patients in the age group of

41-52 years had prevalence of tooth mobility in both the sites (grey) observed. Chi square test was done. Pearson Chi square value-2.408, df-4 p value-0.661. However, there is no statistically significant association of tooth mobility between age and site in non smokers.

From the study it is observed that, in smokers, tooth mobility was prevalent in the posterior region (16%) ($p<0.05$) and was prevalent in the maxilla and both the jaws (11% & 23% respectively). In smokers, the tooth mobility in the posterior region was more prevalent in maxilla (10%),anterior region was common in mandible (20%) and both the sites had prevalence of 26% and non-smokers, it was observed that, tooth mobility in the posterior region was prevalent in maxilla (6%), anterior region was prevalent in mandible (34%) for which the P values were found to be statistically significant (<0.05).

From Maddipati S et al study, it was observed that the smokers had more teeth with mobility (29%) when compared to non smokers (16%) (Sreedevi, Ramesh and Dwarakanath, 2012). This study is in accordance with the present study. In Ankola A et al study, smokers in the age group 55-60 years had 12.7 % tooth mobility and non-smokers in the age group 55-60 had 11.1% tooth mobility (Pankaj *et al.*, 2007). The current study is in agreement with their study.

According to Smith S et al study, there was a male prevalence among the population, which is in accordance to our study, and also found that the vertical bone loss was more in smokers than in non- smokers (Smith *et al.*, 2019). According to Bergstrom J et al, smokers have significantly greater probing depth, clinical attachment loss and tooth mobility than non smokers (Bergström, Eliasson and Preber, 1991). From Lucinara I et al study, it is observed that there was a tendency for upper tooth loss in smokers and lower tooth loss in non smokers (Luzzi *et al.*, 2007) which is in agreement with the current study where there is 34% of tooth mobility in mandible among non smokers and 10 % tooth mobility in maxilla among smokers. The study also showed a male predominance which is in accordance with our study.

From M Razali et al study, it is observed that smokers had more prevalence for tooth loss and the age group 45 years and above was the most commonly affected group (Razali *et al.*, 2005), which is in accordance with the present study. Surekha V et al study states that smoking increases the periodontal destruction, commonly in the maxillary anterior and premolar region (Velidandla *et al.*, 2019) to which our study shows a similar association.

From Murugan T et al study, it is observed that the coronally advanced flap was found to be a predictable treatment for isolated Miller,s class I and II recession defects (Thangakumaran, Gadagi and Arthie, 2015). Few studies show that the salivary TNF-alpha levels are significantly higher in patients with chronic periodontitis (Varghese, Thomas and Jayakumar, 2015). Archana M et al, observed that there is an elevated serum IL-21 levels in patients with chronic periodontitis (Mootha *et al.*, 2016). According to Waleed K et al, serum ET-1 is increased in chronic periodontitis (Khalid, Varghese and Sankari, 2017),(Khalid, Vargheese and Lakshmanan, 2016). Study conducted by Asha R et al, discussed the role of neutrophils in periodontitis which shows hyper/hypo activity to bacterial stimuli (Ramesh *et al.*, 2016).

Thus it is observed that the present study is in accordance with the previous literature and was found to be statistically significant. It can be used as a reference in clinical practice. Though the study was found to be statistically significant, the limitations faced in the study was smaller sample size. Thus, future studies should be done with a larger sample size and equal distribution of study parameters for a better view on the point of study.Our institution is passionate about high quality evidence based research and has excelled in various fields ((Pc, Marimuthu and Devadoss, 2018; Ramesh *et al.*, 2018; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Ramadurai *et al.*, 2019; Sridharan *et al.*, 2019; Vijayashree Priyadharsini, 2019; Mathew *et al.*, 2020)

CONCLUSION

Within the limits of the study, it can be concluded that smoking causes increased periodontal destruction to the surrounding tissues, with tooth mobility and tooth loss observed in the posterior region of maxilla and posterior region in both the jaws. Thus, Progression of disease can be prevented by early diagnosis and by tobacco cessation programmes.

AUTHOR CONTRIBUTION

Preetha Parthasarathy carried out the retrospective study, planning the study design, collection and analysis of data and drafted the manuscript. Dr. Jeevitha and Dr. Sree Devi aided in conception of the topic, supervision and appraisal of the manuscript.

ACKNOWLEDGEMENT

The study was supported by the Institution who provided the insights and expertise that greatly assisted the study. We would also like to thank the reviewers of the articles for these insights.

Conflict of interest

Authors have no conflict of interest.

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