

Prevalence of Bleeding on Probing between Smokers and Non-Smokers

Running Title: Bleeding on probing between smokers and non-Smokers

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Gingivitis and periodontitis are the two most common diseases affecting the periodontal tissues. The main etiological factor for these two diseases are microorganisms in the plaque. Various risk factors increase the susceptibility of an individual for these two diseases. Smoking is one of the common risk factors that facilitates development and progression of periodontal diseases. Bleeding on probing is a sensitive indicator of early periodontal diseases. It is an important diagnostic tool and clinical sign which indicates periodontal condition and disease progression. Smoking habit by itself can influence the vascular changes in the gingival tissues. Hence, the aim of the study was to assess the prevalence of bleeding on probing between smokers and non-smokers. Data were collected from the dental records of the patients attending Saveetha Dental College, Chennai. The data was extracted, organised and analysed using SPSS software. From the present study it can be concluded that Association between smoking status and bleeding on probing was statistically significant (p-value: 0.005). Also, there was a statistically significant association between the prevalence rate of bleeding on probing in different age groups and gender among the selected population (p-value: 0.000). Bleeding on probing was more prevalent among the smokers than the non-smokers and it was highly noted in patients in the age group of 26 to 35 years and mostly present in males than females.

Keywords: Bleeding on probing; Non-smokers; Prevalence; Smokers.**INTRODUCTION**

Smoking is a recognized risk factor which causes various diseases and affects human health. (Jalayer Naderi, Semyari and Elahinia, 2015) Smokers constitute one-sixth of the world population. (World Health Organization, 2003) Numerous cross sectional studies demonstrated increased prevalence of periodontal disease among smokers. (Haber *et al.*, 1993; Baumert Ah *et al.*, 1994) Cigarette addiction remains the most harmful habit that facilitates the development and progression of periodontal diseases. (Al-Bayat *et al.*, 2013; Ashik Ahamed, Dinesh Prabu and Ganapathy, 2019) Gingivitis is characterised by bleeding on probing, redness, and swelling of the gingival tissues. (Baser *et al.*, 2014) Even though microbial pathogens form a crucial component in the etiopathogenesis of gingivitis to periodontitis, there is a growing body of evidence suggesting that oxidative stress also plays a vital role in the disease initiation and progression. (Ramesh,

Sheeja Saji Varghese, *et al.*, 2016) Periodontitis is a destructive inflammatory disorder of the periodontium caused by the destruction of periodontal tissues namely the PDL, cementum, alveolar bone, and gingiva. (Ramesh, Sheeja S. Varghese, *et al.*, 2016; Avinash, Malaippan and Dooraiswamy, 2017) Periodontal disease can be a risk factor for cardiac disease and chronic obstructive pulmonary disease. (Priyanka *et al.*, 2017) Cytokines play an important role in the pathogenesis and progression from gingivitis to periodontitis. (Varghese *et al.*, 2015; Khalid *et al.*, 2016, 2017; Mootha *et al.*, 2016) It becomes imperative to manage periodontal disease effectively, to achieve optimal periodontal health and regenerate lost tissue. Platelet rich fibrin and growth factors offer advantage over other forms of treatment in achieving these objectives. (Panda *et al.*, 2014; Thamaraiselvan *et al.*, 2015; Ravi *et al.*, 2017) However, early diagnosis and proper treatment planning can prevent the progression from gingivitis to periodontitis. (Ramesh, Ravi and Kaarthikeyan, 2315

2017; Kavarthapu and Thamaraiselvan, 2018) Bleeding on probing has been used to indicate the presence of an inflammatory lesion and it is considered to be the most sensitive early indicator of gingival diseases.(Polson and Caton, 1985; Armitage, 2000) Bleeding on probing is considered to be an important early diagnostic criteria for gingivitis(Ramseier *et al.*, 2015)

The potential promise of the topic was to compare the effect of smoking and its associated changes in periodontal disease with non-smokers. Previous studies have shown that smoking has a negative effect on plaque microbiota and alters the immune system which are cytotoxic to periodontal therapy.(Kaur and Kumar, 2017)

This research was needed because smoking influences the inflammatory response and smokers have lower mean value of bleeding on probing.(Nair *et al.*, 2003; Ramseier *et al.*, 2015) It also increases the depth of periodontal pockets and attachment loss(Carranza, Takei and Newman, 2006) Smoking also has an effect on epithelial thickness.(Villar and de Lima, 2003; Ramesh *et al.*, 2019). Therefore, the aim of the present study was to assess the prevalence of bleeding on probing in smokers and non-smokers with respect to age and gender variation and to correlate with the oral hygiene status.

Main objectives of the study include:

- To assess bleeding on probing between smokers and non-smokers
- To assess bleeding on probing with respect to gender
- To assess bleeding on probing in different age groups
- To assess the oral hygiene status in smokers

MATERIALS AND METHODS:

The current study was an institution based study performed on patients who had undergone treatment at Saveetha Dental College and Hospitals, Chennai. The pros include data availability and similar ethnicity. The cons were the data was not location specific. A total number of two examiners were involved in this study.

The retrospective study sampling was done. The samples were collected from June 2019 to March 2020. The data's were obtained by analyzing the case histories of patients who came to Saveetha Dental College for their dental treatment. All the case sheets in the specified time period were reviewed. Cross verification of data for errors was done by complete case record analysis by one calibrated examiner. To minimise sampling bias, a simple random technique was followed which includes all available data and no sorting process. The internal validity of the sample was selection of patients to whom bleeding on probing was elicited. The external validity of the sample involves gender, oral hygiene status and well defined age groups. The management of incomplete or censored data was done by patient recall or by telephonic communication. Patients in the age group between 15 and 65 years were included in this study and the others were excluded.

Ethical approval

The necessary approvals in gaining the data were obtained from the institutional ethical committee (SDC/SIHEC/DIASDATA/0619-0320).

Data analysis

A total number of 35524 patients in the age group of 15-65 years were evaluated with bleeding on probing during the specified time period out of which 20642 patients were males and 14882 patients were females. The independent variables were demographics such as

age and gender. The dependent variables were patients elicited with bleeding on probing. The data collected was then examined by one reviewer, and then they were entered in the Microsoft Excel sheet. The data was imported, transferred to a host computer and processed using SPSS version 20.0 for software analysis and the variables were defined in the software.

Statistical analysis

The statistical tests used were descriptive statistics and inferential statistics. The statistical Software used was IBM SPSS version 20.0. The type of analysis used

were descriptive (percentage, mean and standard deviation) and inferential test (Chi square test). The steps followed in software analysis includes transferring the data to a host computer and processing it using SPSS version 20.0 and tabulation of results were done.

RESULTS AND DISCUSSION:

From table 1, it was found that among the total population, 1695 patients were smokers and 33829 patients were non-smokers accounting for about 4.77% and 95.23% respectively.

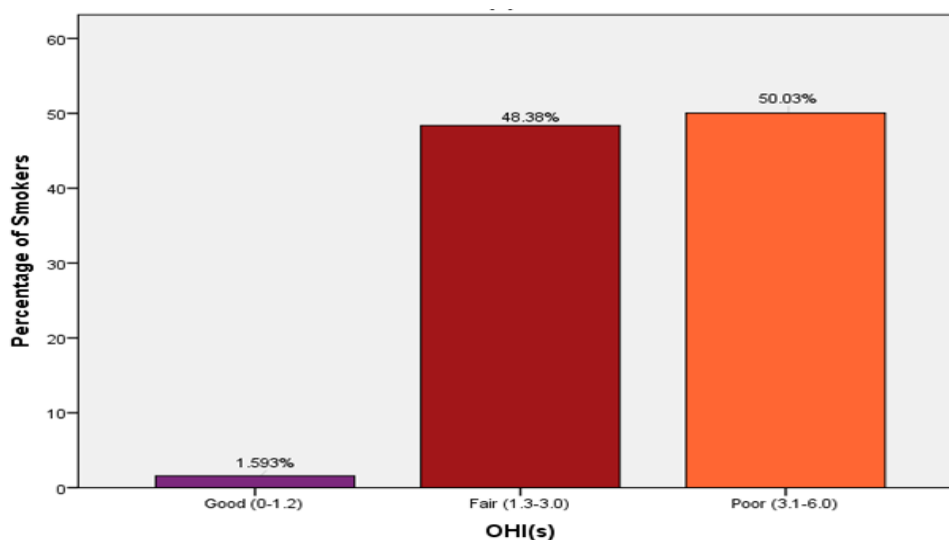
Smoking Status	Total Number of Patients (100%)	Bleeding on Probing	P-value
Smokers	1695 (4.77%)	1683 (99.3%)	0.005
Non-Smokers	33829 (95.23%)	33299 (98.4%)	

Table 1: shows the proportion of smokers and non smokers among the population with bleeding on probing. Chi-square test was done and the difference in bleeding on probing between smokers and non-smokers was found to be statistically significant. (p-value: 0.005, < 0.05).

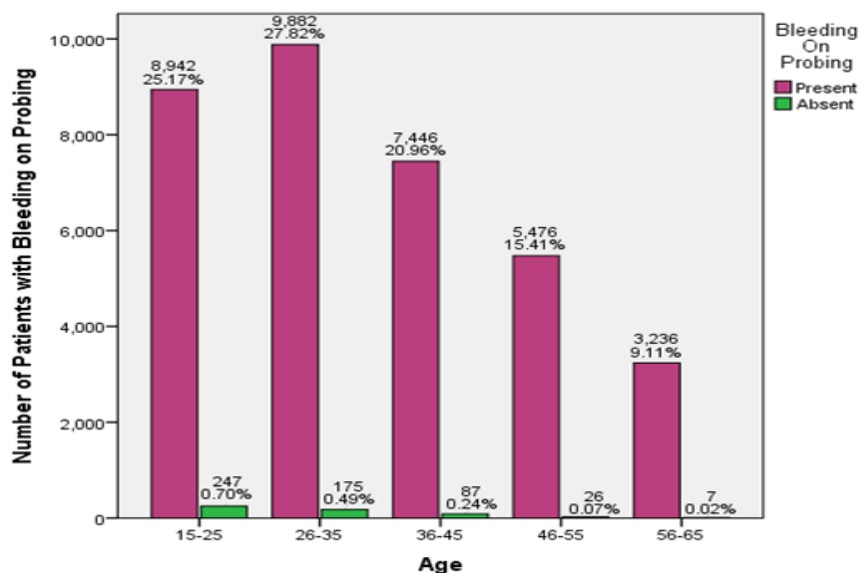
Out of smokers, 1686 patients were males and 9 patients were females. Among the total smoking population, 99.3% showed bleeding on probing. Among the total non-smoking population, 98.4% showed bleeding on probing in this study. Association

between bleeding on probing status and smoking status in the Chi-square test was found to be statistically significant. (Chi-square value: 7.922; p-value: 0.005).

From graph 1,



Graph 1: Bar showing frequency of oral hygiene status in smokers where X-axis represents oral hygiene status and Y-axis represents percentage of smokers. Violet color denotes good, maroon denotes fair and orange denotes poor. The oral hygiene status of smokers was mostly poor (orange) followed by fair (maroon). It was found that the oral hygiene status of smokers and good (1.59%). From graph 2, were mostly poor (50.03%) followed by fair (48.38%)



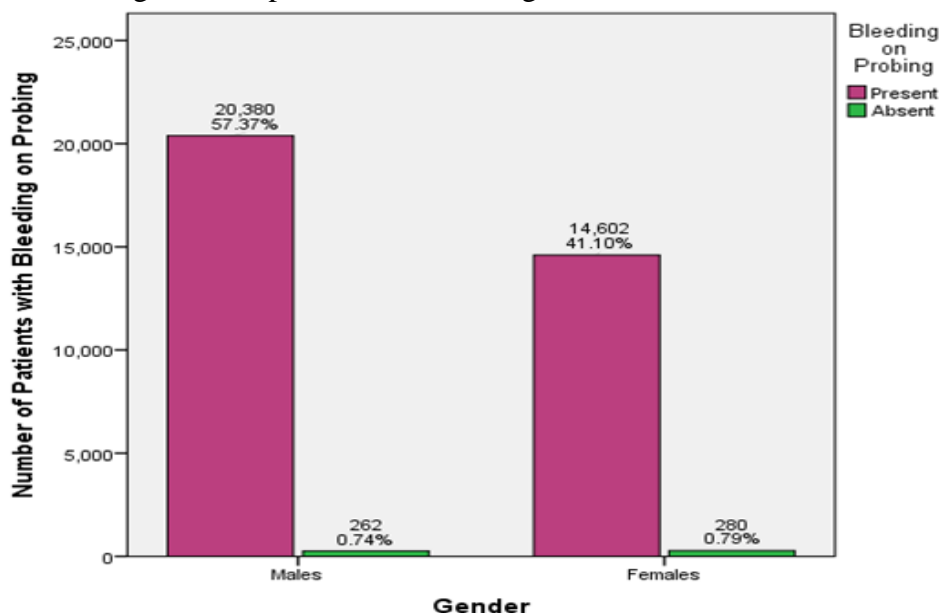
Graph 2: Bar chart showing relationship between age of the patient and bleeding on probing status. X-axis represents the different age groups and Y-axis denotes the number of patients with bleeding on probing. Magenta colour denotes present and green denotes absent. Chi-square test was done and found to be statistically significant. (Chi-square value: 170.242; p-value: 0.000), hence proving that bleeding on bleeding was more prevalent in the age group of 26 to 35 years.

It was found that bleeding on probing was more prevalent in patients in the age group of 26 to 35 years

accounting for about 27.82% of total population followed by 15 to 25 years (25.17%), 36 to 45 years (20.96%), 46 to 55 years (15.41%) and 56 to 65 years (9.11%).

on probing status in the Chi-square test was done and found to be statistically significant. (Chi-square value: 170.242; p-value: 0.000). From graph 3,

Association between age of the patient and bleeding



Graph 3: Bar chart showing relationship between gender and bleeding on probing status. X-axis represents the gender and Y-axis denotes the number of patients with bleeding on probing. Magenta colour denotes present and green denotes absent. Chi-square test was done and found to be statistically significant. (Chi-square value: 21.572; p-value: 0.000), hence proving that bleeding on probing was more prevalent in males than females.

It was found that in this study, bleeding on probing was most commonly noted among males accounting for about (57.37%) of total population followed by females (41.10%). Association between gender and bleeding on probing status in the Chi-square test found to be statistically significant. (Chi-square value: 21.572; p-value: 0.000).

Prevalence of bleeding on probing in smokers and non-smokers was well known and documented. In this study, smoking was more prevalent in males than females. Similar results were obtained in a study done

by Chinwong et al., in 2018, which concluded that smoking was found to be 15 to 20 times higher among men than women.(Chinwonget al., 2018)

In the present study, bleeding on probing was seen more among smokers compared to non-smokers. This may be due to less number of smokers compared to non-smokers in this study. In contrast to our research, certain studies done by Jogezeai et al., concluded that incidence of bleeding on probing was found to be 53.5% in non-smokers and 31.7% in smokers.(Jogezeai, Maxood and Khan, 2013) Souza et

al., stated that the prevalence of sites with BOP was 2.9 times higher in the nonsmoker group compared with smokers.(de Souza, Bianchini and Ferreira, 2012) In this study, most of the smokers had poor oral hygiene. This is similar to the results obtained in a study done by Jiun et al., which concluded that the percentages of poor oral hygiene and high halitosis were significantly higher in smokers.(Jiunet al., 2015)Arowojolu et al., stated that smoking is associated with increased severity of gingival disease.(Arowojoluet al., 2013)Bachtiar et al., in his study concluded that the oral hygiene condition of smokers was poor.(Bachtiar, Putri and Bachtiar, 2019). In a study by Ramamurthy et al., it was concluded hiora and chlorhexidine mouthwashes were equally effective in the treatment of gingivitis and helps in maintaining proper oral hygiene.(Ramamurthy and Mg, 2018)

In the present study, bleeding on probing was more prevalent in patients in the age group 26 to 35 years. This is contradicted in a study done by Sun H et al., in 2020, which states that bleeding on probing was more prevalent in patients in the age group of 55 to 64 years.(Sun et al., 2020) In our study, bleeding on probing was found to be more prevalent among males than females. The results were similar to a study done by Furuta et al., which states that many epidemiologic surveys had shown bleeding on probing was more prevalent among males than females.(Furutaet al., 2011)

Smoking had a strong suppressive effect on gingival bleeding.(Dietrich, Bernimoulin and Glynn, 2004) Previously most of the studies have analysed the effect of smoking on periodontal health and compared bleeding on probing between smokers and non-smokers which showed decrease in bleeding on probing and reduced inflammatory response among smokers.(Tonetti, 1998; Rivera-Hidalgo, 2003; Kumar and Faizuddin, 2011)

This study has certain limitations when compared to previous studies as it is a retrospective study and only representatives from an institution who were assessed during a specified period of time were taken into study. Further prospective studies could be done, and a wider general population could be assessed in order to draw more accurate results.

CONCLUSION:

From the present study, it can be concluded that the association between smoking status and bleeding on probing was statistically significant. There is a significant association between the prevalence rate of bleeding on probing status among patients in different age groups. Similarly association between gender and bleeding on probing status was statistically significant. Bleeding on probing was more prevalent among the smokers than the non-smokers, in the age group of 26 to 35 years, when compared with other age groups and more in males than females.

AUTHOR CONTRIBUTIONS:

First author (AshikAhamed A) performed the analysis, interpretation and wrote the manuscript. Second Author (Jayakumar N D) contributed to conception, data design, analysis, interpretation and critically revised the manuscript. Third author (Rakshagan V) was involved in the correction and revised the manuscript. All the three authors have discussed the results and contributed the final manuscript.

CONFLICT OF INTEREST:

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