

Patient's Awareness on Impact of Smoking during Orthodontic Treatment - A Questionnaire Survey

Research Article

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Abstract

Tobacco use is related to increased periodontal disease, tooth loss, decreased success of orthodontic appliances and may even inhibit orthodontic tooth movement. Most smokers start during adolescence. As most cessation attempts fail, prevention appears necessary. The aim of this study is to assess the awareness of the impact of smoking on orthodontic treatment among the patients undergoing orthodontic therapy. A cross-sectional questionnaire study was conducted among the patients undergoing orthodontic therapy with smoking habits. The sample size of 200 patients were selected. A close ended questionnaire was used to assess the patients awareness on the impact of smoking on patients undergoing orthodontic therapy. A survey software was used to reduce sampling bias. Repeated answers or questioning were avoided. All patients undergoing orthodontic treatment were included in the study. Majority of the patients involved in the study belonged to the age group of 18 - 25 years (59.5%). It was observed that the majority of the smokers had prolonged orthodontic treatment period (51%) and noticed bleeding gums (79%) during brushing followed by gum inflammation and receding gums. It was also found that a majority of the smokers had tooth staining (47.5%) followed by bad breath and mobility of tooth. Within the limitations of the study, the majority of the smokers were found within the age group of 18 - 25 years and a significant association between smoking and prolonged orthodontic treatment period was also found among the smokers.

Keywords: Tobacco; Smoking; Orthodontic Treatment; Inhibition; Tooth Movement.

Introduction

Smoking and tobacco consumption is considered a major health problem [1]. Nicotine is one of the harmful substances in tobacco smoke affecting human health and among the 7000 poisonous chemicals discovered in tobacco [2]. The effects of nicotine on bone remodeling were investigated in many studies using different methods of assessment [3]. Smoking remains the number one cause of preventable death, disease, disability in the United States [2, 3] and costs the nation over 300 billion dollars annually in direct medical expenditures and lost productivity [4]. Early intervention is to prevent tobacco use among youth since 88% of adult smokers start by 18 years of age [5].

Deleterious effects of nicotine and tobacco smoke are often investigated and discussed regarding their interrelationship with cancer as well as chronic conditions of the cardiovascular system such as atherosclerosis and respiratory diseases such as chronic obstructive pulmonary disease (COPD), which can affect adults and children all the same [6]. However, limited attention has been given regarding possible effects on the oral health, particularly in association with orthodontic treatment. Teeth are linked to their surrounding alveolar bone socket of the jaw via connective tissue, the periodontal ligament, also known as dento-alveolar joint [7]. In orthodontics, tooth movement is therapeutically induced by fixed or removable orthodontic intraoral appliances to enhance

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position and alignment of permanent teeth for improved masticatory and phonetic function, psychological and esthetic reasons. A physiological, defined mechanical force is applied to the respective teeth, which results in the creation of tension and pressure zones within the periodontal ligament [8]. This triggers a pseudo-inflammatory, immunological, multicellular process instigated by periodontal fibroblasts resulting in increased osteoclast differentiation and bone resorption in direction of movement as well as bone formation by osteoblasts in zones of tension [8]. In some cases, osteoclast activity during orthodontic tooth movement also turns against the tooth itself, causing orthodontically induced inflammatory dental root resorptions (OIIRR), which are a rather frequent and unpredictable side effect during orthodontic treatment of varying severity and unknown etiology [9, 10].

According to the World Health Organization, the use of tobacco is the single most preventable cause of death and disease worldwide and Europe has the highest prevalence of tobacco smoking among adults (28%) and some of the highest prevalence of tobacco use by adolescents (11%-12%) with prevalence rates in America ranging between 13% and 22% in adults and in India, the prevalence of tobacco habits is high with 34% using bidis, 31% cigarettes, 19% chewing tobacco, 9% hookah and 7% other forms respectively [11].

Literature says that adolescents constitute the majority of orthodontic patients and the number of adults requiring orthodontic treatment are continuously rising [12]. Orthodontists are frequently confronted with patients smoking regularly [13]. Of the more than 4000 chemicals contained within tobacco smoke, nicotine seems to play a major role regarding tobacco-induced pathological effects on the periodontal apparatus [14]. Nicotine has already been shown to cause an inflammation of the periodontal ligament and subsequent loss of alveolar jaw bone with increased risk of tooth loosening [15]. This can increase the malposition and misalignment of permanent teeth by pathological tooth migration which at the same time also increases the need for orthodontic treatment [16]. The aim of the present study was to assess the awareness about the impact of smoking among the patients undergoing orthodontic treatment.

Materials and Methods

Study design and setting

The study setting is university based study. A cross sectional study was conducted on 200 patients undergoing orthodontic therapy who visited Saveetha dental College and hospitals. The advantage of this study was that the study population belonged to the same ethnic group and also can be used to create awareness among clinicians regarding the field of study. However, the drawback of this study was patient participation, only patients who were ready to cooperate were included in the study. The internal validity of the study was carried out by analysing all patients under orthodontic therapy. The external validity was homogenization and replication of the experiment.

Data collection

A survey software was used to reduce sampling bias. Repeated answers or questions were avoided. All patients undergoing or-

thodontic treatment and had a habit of smoking were included in the study. Data collection was done using a self structured questionnaire consisting of 10 questions. Google forms were used to collect the data and circulate among the patients. Age group was the only variable which was collected. Data was assessed based on age groups. File charts were used to represent each variable. Questions were based on patient experience, opinion and whether it is useful. Data analysis done using SPSS by IBM.

Statistical Analysis

After tabulation using MS Excel, the data was exported to IBM SPSS software [Version 19: IBM Corporation NY USA] for statistical analysis. Descriptive statistics and inferential statistics was done to assess the responses given by the patients. The dependent variable was all the patients undergoing orthodontic treatment with smoking habits. The independent variable was age group.

Ethical Approval

The present study was approved by the Institutional ethical committee [IEC] (Ethical approval number: SDC/SIHEC/2020/DIASDATA/0619-0320) and was in accordance with the ethical standards that were stipulated.

Results and Discussion

A total of 200 patients who had undergone orthodontic therapy and had the habit of smoking were involved in the study. Out of which majority of the patients involved in the study belonged to the age group of 18 - 25 years (59.5%) followed by 26 - 35 years (25%) and 36 - 45 years (15%) (Figure 1). For the question, use of any tobacco or nicotine products, 90% of the patients have responded that they don't use any tobacco or nicotine products and 10% of the patients have responded that they use tobacco or other nicotine products (Figure 2). Among the smokers, 54.5% of the patients have responded that they smoke less than 5 times a day and 45.4% of the patients have responded that they smoke more than 5 times a day (Figure 3). For the question, the age at which they started smoking, 64% of the patients developed the habit of smoking after 18 years and 36% of the patients developed the habit of smoking before 18 years (Figure 4).

Among the patients, 22% were aware of delayed tooth movement whereas 28% were not aware of delayed tooth movement and 49% were not sure (Figure 5). For the question, whether they had prolonged orthodontic treatment period, 51% of the patients have responded they they had prolonged orthodontic treatment period whereas 25% of patients have responded that they did not experience any delayed treatment period and 24% of the patients have responded they were not sure about it (Figure 6). Among the patients, 79% of the patients have responded that they had noticed bleeding gums during brushing whereas 10% had noticed gum inflammation and receding gums during brushing (Figure 7). For the question, whether they had noticed any changes in oral health, 46% of patients had responded that they had noticed staining of teeth, 36% of patients had noticed bad breath and 16.5% of the patients had noticed mobility of tooth (Figure 8). Among the patients, 83% have responded that they were willing to quit smoking whereas 17% have responded that they were not willing to quit smoking.

Figure 1. Bar graph represents the distribution of patients included in the study by age group. X axis denotes the age group of the patients and the Y axis denotes the number of responses. Majority of the patients included in the study were found within the age group of 18 - 25 years (Purple) followed by patients in 26 - 35 years (Dark blue) and 36 - 45 years (light blue).

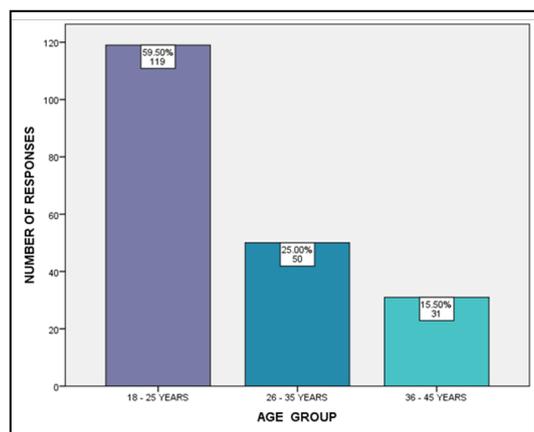


Figure 2. Bar graph represents the responses for the question, regarding the use of any tobacco or nicotine products in addition to smoking. X axis denotes the response options and Y axis denotes the number of responses. The graph shows that a majority of patients were not using any tobacco or nicotine products (green) in addition to smoking.

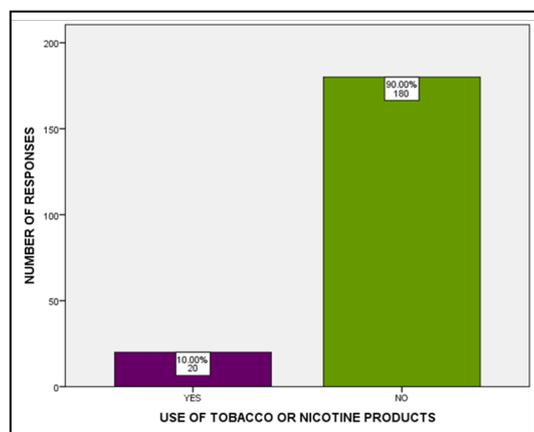
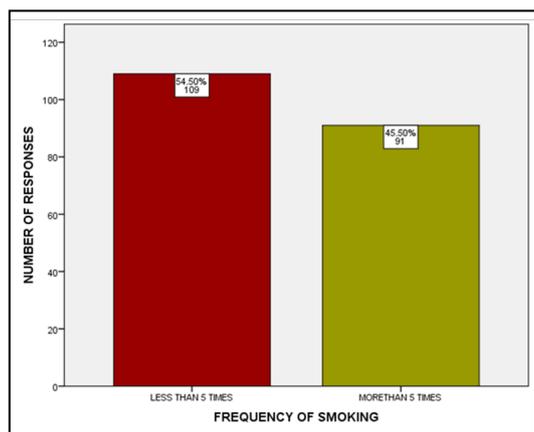


Figure 3. Bar graph represents the responses for the question, regarding the frequency of smoking. X axis denotes the response options and Y axis denotes the number of responses. The graph shows that the majority of patients were found to smoke less than 5 times a day (red).



In the present study it was observed that the majority of the patients who smoked responded that they had prolonged treatment periods were in the age group of 18 to 25 years (32%) followed by 26 - 35 years (13%) and 36 - 45 years (6%) which was found to be significant. Chi square test was done. (p value - 0.000 (p < 0.05), hence it is statistically significant (Figure 10). Majority of the patients have responded that they had bleeding gums were in the age group of 18 - 25 years (53%) followed by 26 - 35 years (19%) and

36 - 45 (6.65) years and their association found to be statistically significant (p value - 0.000 (p < 0.005) (Figure 11)). Majority of the patients have responded that they were willing to quit smoking were in the 18 - 25 (49%) years followed by 26 - 35 years (19%) and 36 - 45 years (14.5%), which was found to be statistically significant (p value - 0.02 (p < 0.005) (Figure 12).

In a study conducted in Myanmar 89.9% of the respondents were aware of tooth staining due to smoking and this result is similar to

Figure 4. Bar chart represents the responses for the question, regarding the age at which they started smoking. X axis denotes the response options and Y axis denotes the number of responses. The graph shows that the majority of the patients have developed the habit of smoking after 18 years of age.

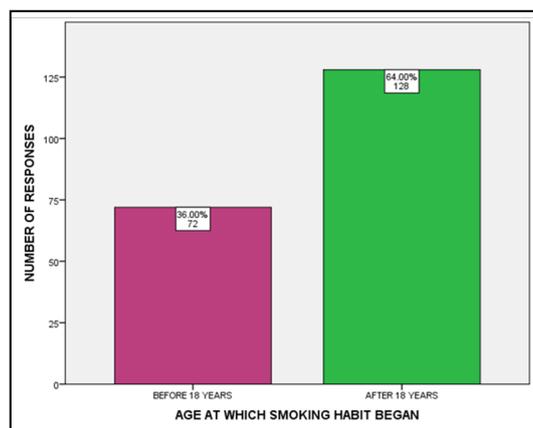


Figure 5. Bar chart represents the responses for the question, whether they are aware of the delayed tooth movement during smoking. X axis denotes the response options and Y axis denotes the number of responses. The graph shows that the majority of the patients were not sure (blue) followed by the patients who were not aware (green) and patients who were aware (indigo).

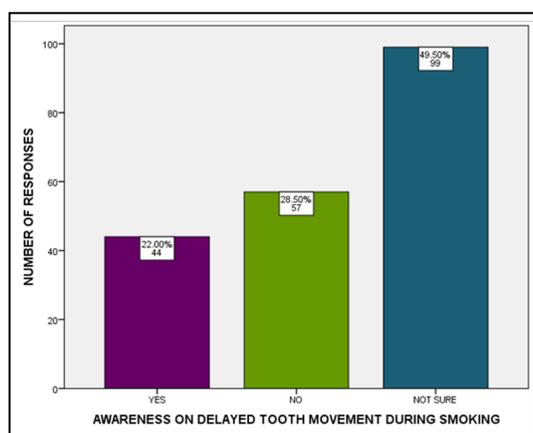
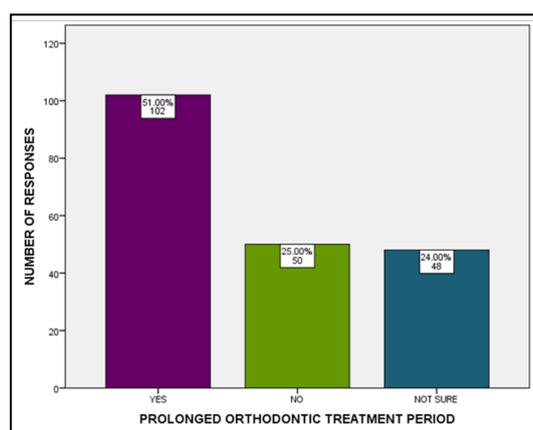


Figure 6. Bar chart represents the responses for the question, whether they had prolonged orthodontic treatment period. X axis denotes the response options and Y axis denotes the number of responses. The graph shows that the majority of the patients who smoked had prolonged orthodontic treatment period (violet).



a study performed in Ireland [17, 18] which supports our study results. In a study performed in Germany, 50% of the respondents were aware of the effects of smoking on gums and periodontal tissues [19]. This result was also found to be similar to our study, Shintcovsk et al reports that nicotine decreases the number of osteoclasts cell during orthodontic movement which supports our study results [20]. Dental patients knowledge and attitudes on the effects of smoking and overall oral health have been studied

in many countries [21]. In Northern Ireland, patients at 27 dental practices had good knowledge of the effects of smoking on general health, but smokers were significantly less aware of the relationship between smoking and gum disease and on their own healing [22]. Moreover, 45% of military personnel in the USA are unaware of the systemic or intraoral hazards of tobacco use [23]. Among dental patients in Kuwait, smokers were significantly less aware of the oral health health effects of smoking [18].

Figure 7. Bar chart represents the responses for the question, whether they had noticed any changes during brushing. X axis denotes the response options and Y axis denotes the number of responses. The graph shows that a majority of patients who smoked had noticed bleeding gums (Red) during brushing followed by gum inflammation (green) and receding gums (yellow).

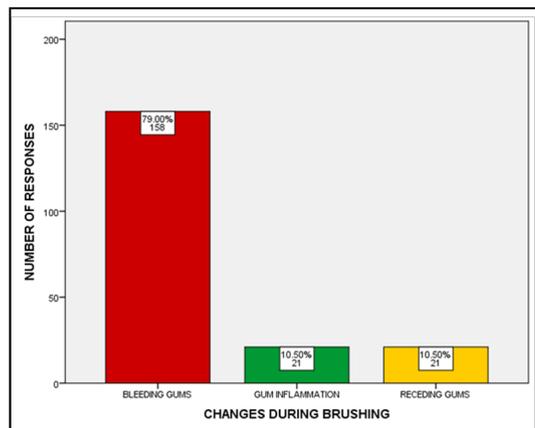


Figure 8. Bar graph represents the responses for the question, whether they had noticed any changes in their oral health. X axis denotes the response options and Y axis denotes the number of responses. The graph shows that a majority of patients who smoked had tooth staining (red) followed by bad breath (yellow) and mobility of tooth (violet) due to smoking.

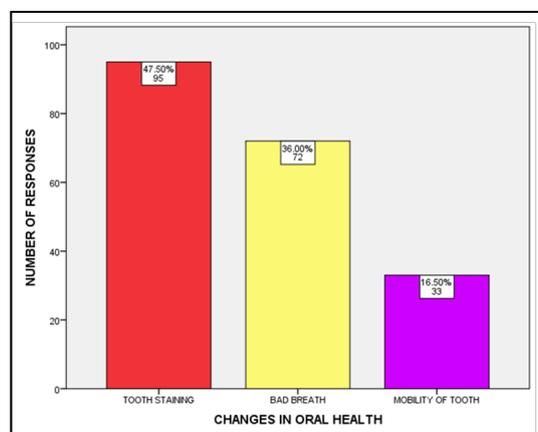
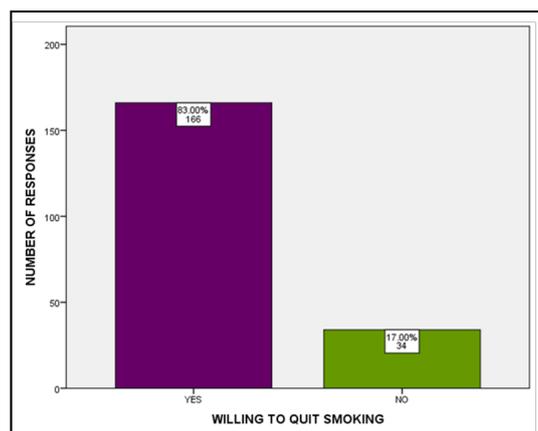


Figure 9. Bar graph represents the responses for the question, whether they were willing to quit smoking. X axis denotes the response options and Y axis denotes the number of responses. The graph shows that a majority of patients were willing to quit smoking (indigo) when compared to the patients who were not willing to quit smoking (green).



General risk factors for smoking initiation among youths are due to various factors like increased exposure of tobacco, advertisements and media portrayal of smoking, family and peers use or approval of tobacco, low socio-economic factors, low academic achievement, low self-esteem, aggressive behaviour and a lack of tobacco refusal skills. While physicians are often tasked with preventing smoking among their young patients [24]. Paediatric dentists and orthodontists are in a good position to do the same, due to frequent contact with their patients [25]. Tobacco preven-

tion is relevant for dental clinicians as tobacco use damages oral health through increased periodontal diseases, tooth loss and decreased success of orthodontic appliances [26][27]. Further, inhibited tooth movement from exposure to tobacco smoke has been demonstrated in animal models [17]. Previously our team has conducted numerous studies which include in vitro studies [28], review [29], case report [30], survey, microscopic studies [31] and clinical trials [30, 32-42]. The future scope of the study focuses on dental professionals having the responsibility to educate the patients on the adverse effects of tobacco use on oral

Figure 10. Bar graph represents the association between age group and the response regarding the prolonged orthodontic treatment. X axis depicts the age group and Y axis depicts the number of responses from patients undergoing orthodontic treatment. Majority of the patients across all the age groups experienced prolonged orthodontic treatment (indigo). Pearson Chi square test, p value - 0.000 ($p < 0.005$) hence, the association between age and the period of orthodontic treatment was found to be statistically significant.

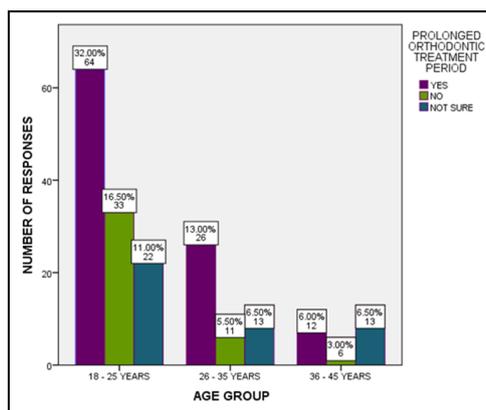


Figure 11. Bar graph represents the association between age group and the response regarding the changes seen in oral cavity during brushing. X axis depicts the age group and Y axis depicts the number of responses from patients undergoing orthodontic treatment. Majority of the patients across all the age groups experienced bleeding gums (red). Pearson Chi square test, p value - 0.000 ($p < 0.005$) hence, the association between age and changes during brushing was found to be statistically significant.

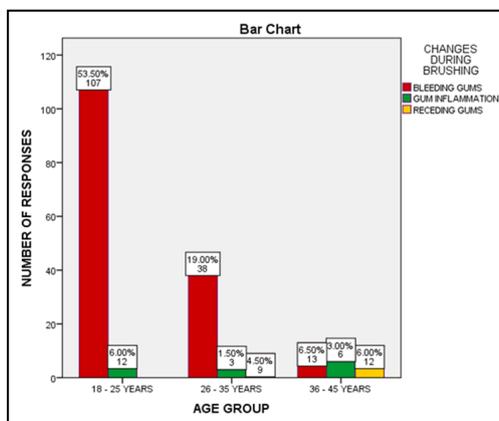
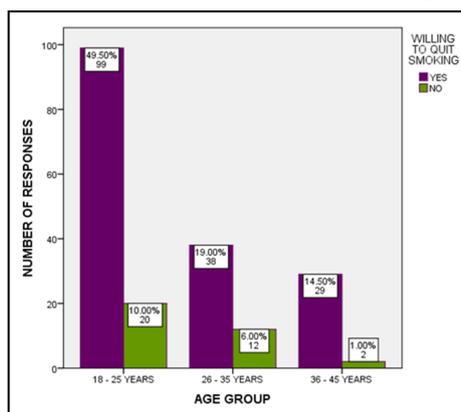


Figure 12. Bar graph represents the association between age groups and the response regarding willing to quit smoking. X axis depicts the age group and Y axis depicts the number of responses from patients undergoing orthodontic treatment. Majority of the patients were willing to quit smoking (indigo) in 18 - 25 years followed by 26 - 35 years and 36 - 45 years. Pearson Chi square test, p value - 0.02 ($p < 0.005$) hence, the association is statistically significant.



health. Knowledge on tobacco related oral problems should be a part of routine oral health education for all patients regardless of the smoking status. This may prevent nonsmokers from taking up smoking and assist smokers to stop smoking. Moreover, high prevalence of smoking among young adults is of concern suggesting the urgent need to strategize effective anti smoking campaigns, especially among adolescents for early prevention and complete cessation.

Conclusion

Within the limitations of the study, a negative impact of smoking on orthodontic treatment was observed through the responses of the patients included in the study. Majority of the patients were found to be smokers in the age group of 18 - 25 years and had noticed prolonged orthodontic treatment period. It was also observed that the majority of patients who smoked had bleeding gums during brushing followed by gum inflammation and reced-

ing gums.

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