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# Prevalence of Gingivitis in Patients Undergoing Orthodontic Treatment Between Age Group Of 25-35 Years - A Retrospective Study

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**Abstract:** Malocclusion is the misalignment or incorrect relation between the teeth and the dental arches. It is one of the leading causes of progression towards poor oral hygiene. Fixed orthodontic treatment is preferred and the most common method for treating malocclusions. Fixed appliances such as brackets, bands, or fixed retention may complicate optimal oral hygiene, and this may result in accumulation of dental plaque and gingival inflammation. S. mutans is the most common bacteria seen in the gingival sulcus. Prevention can be done by adequate oral prophylaxis prior to the commencement of orthodontic treatment. Thus the aim of the study is to assess the prevalence of gingivitis in patients undergoing orthodontic treatment between age 25-35 years. Evaluation of patients reported to saveetha dental college for the purpose of undergoing orthodontic treatment were chosen. 463 Patients data records were collected and descriptive statistics was done using SPSS software version 23 and the results obtained were tabulated and statistically analysed using the chi square test. It is observed that patients who developed gingivitis during orthodontic treatment belong to the age group of 25-30 years (56.16%) and 30- 35 years (16.41%) and the results are statistically significant ($p<0.05$). Males (39.96%) were commonly affected with gingivitis when compared to females (32.61). Thus it is important to understand the importance of the maintenance of oral hygiene during orthodontic treatment and patients should be made aware about the consequences of the ignorance to adopt adequate oral hygiene measures.

**Keywords:** Gingivitis, Oral biofilm, Orthodontic treatment, Oral prophylaxis, Dental Plaque

## INTRODUCTION

Malocclusion is the misalignment or incorrect relation between the teeth and the dental arches. It is one of the leading causes of progression towards poor oral hygiene. Fixed orthodontic treatment is the preferred and most common method for treating malocclusion. Fixed appliances such as brackets, bands, or fixed retention may complicate optimal oral hygiene, and this may result in accumulation of dental plaque and gingival inflammation (Wennström, 1996). Esthetics is the major concern in patients undergoing orthodontic treatment and it has been found that gummy smile has been a prevalent esthetic disorder commonly affecting younger individuals due to various causes such as skeletal, dento-alveolar, or soft-tissue origin. It can be due to jaw deformities, altered passive eruption, or tooth malpositioning. Usually, the corrective measures incorporate orthognathic surgery and orthodontic treatment.(Ramesh et al., 2019) However, the effect of orthodontic treatment on the periodontal tissues in the long term is questionable. Bone loss may be observed during or immediately after termination of orthodontic treatment (Aass et al., 1988). It is well recognized that decreased oral hygiene measures have resulted in enamel decalcification and gingival inflammation. Such gingivitis has a detrimental potential for the young adult undergoing orthodontic care and should be minimized if possible (Alexander, 1991). The niches for bacterial accumulation can be eradicated by using the one-stage, full-mouth disinfection protocol before initiating orthodontic treatment(Ramesh, Ravi and Kaarthikeyan, 2017).

Oral cavity comprises more than 700 different species of microorganisms of which significant numbers exist as commensals. Some exist as opportunistic organisms. Streptococcus mutans is a member of the microbiota of the oral cavity, has been detected in 70% of the healthy subjects and in almost 90% of a periodontitis group along with different species like Porphyromonas gingivalis specifically linked to the cause of periodontitis by a specific PCR assay (Griffen et al., 1998). Streptococcus mutans, Staphylococcus species are also the most

common bacteria found in the supra gingival region of the patients undergoing orthodontic treatment and along with pathogenic organisms like P.gingivalis, which on a long term effect can cause destruction of the supporting structures of the periodontium. Gingivitis is the inflammation of the gingival tissue which occurs in 2-3 days after the plaque formation and microorganisms present in the plaque triggers host inflammatory response and the most predominant cell found in the gingival inflammation is the neutrophils (Dahlén, 2006). Before the orthodontic therapy is initiated, one should therefore carefully consider the bucco-lingual thickness of the soft tissue on the pressure side of the tooth which should have sufficient thickness. Furthermore, instructions in adequate plaque control measures should be given and controlled before, during as well as after the completion of the orthodontic therapy to avoid unnecessary inflammation to the tissue margin (Wennström, 1987).

The etiology for periodontal disease is multifactorial, with periodontopathogens being the major factor in the initiation and progression of the disease. Plaque build-up allows the growth of anaerobic bacteria.(Ramesh, S. S. Varghese, et al., 2016). Patients with orthodontic appliances are more prone to acquire periodontal disease caused by specific bacteria such as T. denticola, P. gingivalis, T. forsythia, and P intermedia etc (Lee et al., 2005). Disease progression occurs as a result of host-immune response to bacteria, leading to destruction of underlying connective tissue and surrounding alveolar bone. Pro-Inflammatory cytokines are released during these events and these cytokines are important in expression of the characteristics of the immune response to bacterial endotoxins (Mootha et al., 2016). Tumor necrosis factor-alpha (TNF-α) is an important pro-inflammatory mediator that causes destruction of periodontal tissues, whose levels are increased in gingival inflammation.(Varghese et al., 2015)

According to the in vitro microbiological studies, antimicrobial agents are capable of destroying these microorganisms when the bacterial biofilm is disturbed and these agents kill the organisms by exerting their bactericidal properties. Prevention of gingivitis can be done by adopting plaque control procedures like proper brushing technique, using orthodontic toothbrush. Existing gingivitis cases we have to do Scaling, prior to orthodontic treatment followed by oral hygiene maintenance by using mechanical plaque control and adjunct mouthwash like 0.12% chlorhexidine digluconate which can reduce the effects of inflammation and helps in plaque control which is the prime cause of gingivitis. Chlorhexidine digluconate is considered to be the gold standard because of its substantivity and plaque inhibitory potential. (Brightman et al., 1991). Furthermore, chemical agents have the ability to reach the interproximal areas that are difficult to clean and inhibit bacterial growth and subsequent biofilm formation on the soft tissue. Application of these chemical agents is safe and seems to have no effect on increasing resistant bacterial species(Ramamurthy and Mg, 2018). However extrinsic stains are reported for long term use of Chlorhexidine. Herbal medicines contain as active ingredient parts of the plants or other plant materials perceived to have therapeutic benefits(Ramesh, S. Varghese, et al., 2016) and can be used as dentifrice and mouthwash for plaque control. They don't have side effects but have low substantivity. Hence the understanding of gingival diseases during orthodontic treatment helps in employing better preventive measures and successful orthodontic treatment.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 aim of the study is to analyse the prevalence of gingivitis in patients undergoing orthodontic treatment between ages 25-35 years.

## MATERIALS AND METHODS

### Sample Collection:

The details of the patients who reported to clinic for orthodontic treatment were reviewed from the patients records of saveetha dental college and hospitals for the purpose of preservation and efficient analysis of patients details that contains data including pictures of oral cavity and treatments being done which is maintained in a secured manner and data of 463 patients were analysed between June 2019 and March 2020. This serves as proof and record for the conduction of retrospective studies.Cross verification was done with the help of photographs and radiographs. To minimize sampling bias all data were included. The exclusion criteria was patients with systemic illness, multiple missing teeth, Periodontitis etc

### Ethical Approval:

The study was commenced after approval from the scientific review board, and the ethical clearance was obtained from the ethical committee of the University with the following ethical approval number-SDC/SIHEC/2020/DIASDATA/0619-0320.".

**Statistical analysis:**
Data was downloaded and imported to excel sheet. All the relevant data necessary for our study were included and excel tabulation was done. The excel sheet was imported to spss software version 23 and data analysis was done using descriptive statistics and the results were obtained in the form of graphs and tables based on chi square test.

**RESULTS AND DISCUSSION**

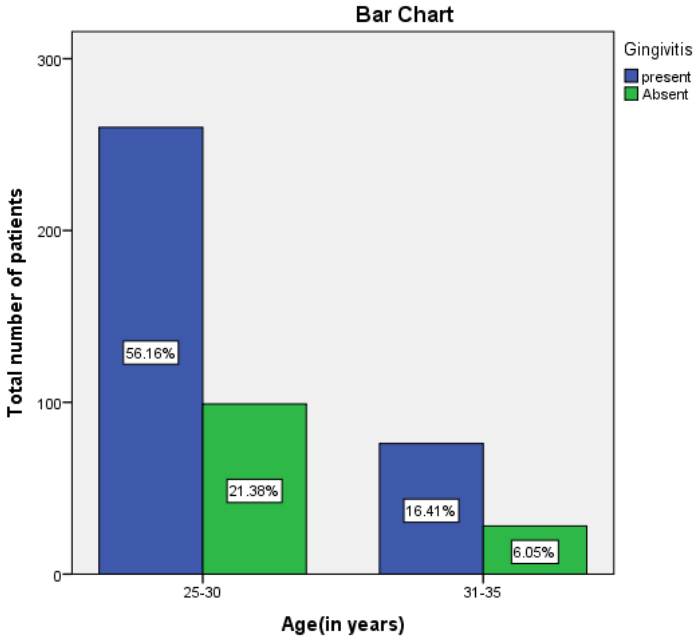


**Fig.1: Bar graph showing association between age distribution of patients undergoing orthodontic treatment and presence / absence of gingivitis . X-axis - Age of patient (in years) and Y-axis- Total number of patients. Among 359 patients in the age group of 25-30 years, 260 patients(56.16%) had gingivitis during orthodontic treatment than other age groups.(Chisquare test, p- 0.043, <0.05, significant)**

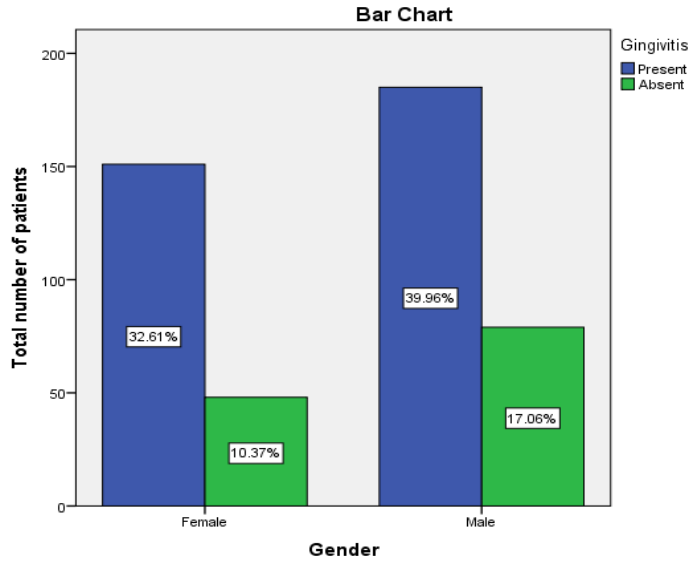


**Fig.2: Bar graph showing association between gender distribution of patients undergoing orthodontic treatment and presence / absence of gingivitis . X-axis represents the Gender of the patient and Y-axis represents the Total number of patients.Majority of patients of both the genders have gingivitis during orthodontic treatment (blue) than patients with clinically healthy gingiva (green)and the difference is also significant statistically.(Chisquare test, p -0.039, <0.05, significant)**

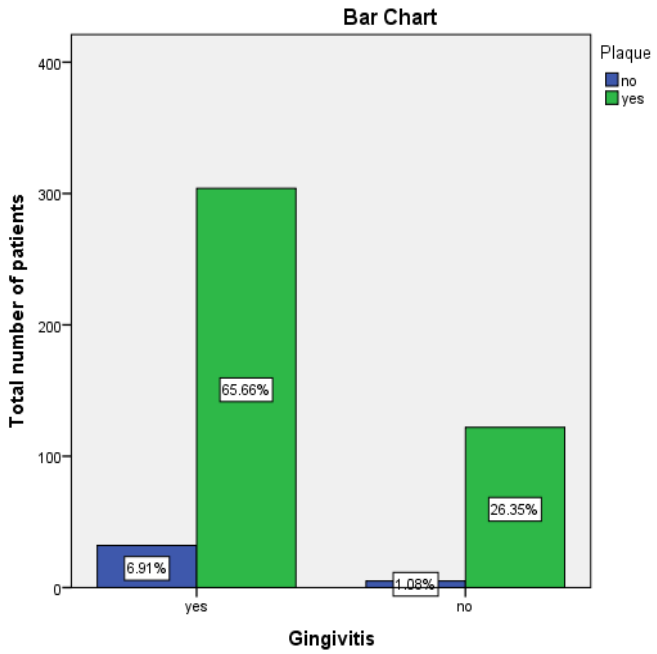


**Fig.3:Bar graph showing association between Plaque index and presence / absence of gingivitis . X-axis represents the presence / absence of gingivitis and Y-axis represents the Total number of patients. Majority of patients with gingivitis have plaque retention(green) than patients with clinically healthy gingiva (blue) and the difference was also statistically significant.(Chisquare test, p -0.048, <0.05, significant)**

**Table 1: Descriptive analysis between age distribution and gingivitis**

| | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| Pearson Chi-Square | 6.308[a] | 2 | .043 |
| Likelihood Ratio | 5.883 | 2 | .053 |
| Linear-by-Linear Association | 5.981 | 1 | .014 |
| N of Valid Cases | 463 | | |

Table 1 shows descriptive analysis of the correlation between age distribution and Presence/Absence of gingivitis in patients undergoing for orthodontic treatment. It is found that the results obtained are statistically significant; p-value: 0.043 ($p<0.05$), Significant.

**Table 2: Distribution of Study population based on Age and Gender.**

| Age (in years) | er | | otal number of ts |
|---|---|---|---|
| | | e | |
| | 4.5%) | 199(55.5%) | 9(77.5%) |
| | 2.5%) | | 4(22.5%) |
| | 7%) | 9(43%) | 3(100%) |

Table 2 shows the distribution of study population based on age and gender. Majority of the patients who have undergone orthodontic treatment were below 30 years. The total number of patients are 463 in which 359 patients(77.5%) belong to the age group of 25-30 years and 104(22.5%) patients belong to the age group of 30-35 years and 264 patients were males(57%) and 199 patients were females(43%).

In our study most of the patients developed gingivitis while undergoing orthodontic treatment. It is observed that patients who develop gingivitis during orthodontic treatment belong to the age group of 25-30 years (56.14%) and 30- 35 years (16.41%) and age group 25-30 years were more prevalent to develop gingivitis while undergoing orthodontic treatment and the results obtained are statistically significant ($p<0.05$) (Figure 1) (Table 1).

In our study, Among the 463 patients, there were 264 male patients and 199 female patients who participated in the study and it is observed that males (39.96%) were commonly affected with gingivitis when compared to females (32.61%). Therefore there is a male predilection (Figure 2).

In our study, the plaque index of the patients were observed and it was found that among the 463 patients, 336 patients had gingivitis in which 304 patients had plaque retention(65.66%) and 32 patients had no plaque retention(6.91%). 127 patients had healthy gingiva in which 122 patients had plaque retention(26.35%) and 5 patients had no plaque retention(1.08%). (Chisquare test, p -0.048, <0.05, significant) Majority of patients with gingivitis have increased plaque index than patients with clinically healthy gingiva (Figure 3).

In a follow-up study conducted among 12–35 years age groups after a comprehensive fixed appliance orthodontic treatment during adolescence, Sadowsky and BeGole demonstrated that orthodontic treatment in adolescence is not a major factor in determining long-term periodontal health status. They found no significant amount of either damage or benefit to the periodontal structures which could be directly attributed to orthodontic therapy.(Sadowsky and BeGole, 1981)

Liu et al says in his study that there was a significant increase in Pl.I and GI during the first 3 months of appliance placement but a significant decrease in Pl.I, GI, and PPD during the first 6 months after appliance removal. The carriage and relative quantity of subgingival P. gingivalis were high at the end of orthodontic treatment, and they decreased significantly after appliance removal thus proving the effect of orthodontic treatment on gingival status. (Liu et al., 2011). A study conducted by Cardoso et al on plaque accumulation and gingival inflammation on orthodontic self ligating and conventional brackets proves that there is no significant change in the periodontium during orthodontic treatment and self ligating brackets had less retention of plaque when compared to conventional brackets(Cardoso et al., 2015).

Some of the limitations of the study were inadequate sample size and the study was unicentered with predominant south indian population. The study can be further done with a large group of population with proper testing to ensure the specificity of the organism causing periodontal destruction during orthodontic treatment. Previously our team had conducted numerous clinical trials(Panda et al., 2014; Thamaraiselvan et al., 2015; Avinash, Malaippan and Dooraiswamy, 2017) and lab animal studies (Khalid et al., 2016; Khalid, 2017; Ravi et al., 2017)and in vitro studies(Priyanka and Ramamurthy, 2015; Priyanka et al., 2017; Gajendran, Parthasarathy and Tadepalli, 2018; Kavarthapu and Thamaraiselvan, 2018) over the past 5 years. Now we are focussing on epidemiological studies. The idea for this study stemmed from the current interest in our community.

Clinically, plaque retention is particularly observed on the cervical aspect of the brackets, below the leveling arch, and its accumulation is exacerbated by patient's difficulty in accessing these sites. In addition to improper

hygiene, gingivitis and gingival hyperplasia are commonly considered to be the main consequences produced by orthodontic treatment on the periodontium. When damage caused to the periodontium is considerable, the benefits that can be obtained from orthodontic treatment decreases in a great way. Comparing metallic and elastic ligatures, bacteriological findings slightly favor metallic ligatures. Plaque retention is more frequently observed in increased quantity in elastic ligatures upto 38%, when compared to metallic ligatures. This is a fact because the microorganisms that surround and settle in orthodontic appliances are a common problem and cause flaws and discoloration such as white spot lesions in the tooth enamel surface.

Therefore, Health care workers should educate the patient regarding the importance of maintenance of oral hygiene while undergoing orthodontic treatment to prevent further periodontal complications and take necessary precautions before the commencement of the orthodontic treatment. Oral prophylaxis such as scaling procedure should be done by dentists and advise the patient to maintain their oral hygiene after the bonding of the brackets with mechanical and chemical plaque control measures.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 gingivitis is more prevalent in patients undergoing orthodontic treatment. Further the patients who develop gingivitis while undergoing orthodontic treatment were predominantly of the age group 25-30 years. Among the gender, males were more predominantly affected than females. Thus it is necessary to adopt oral health education awareness programmes for all patients undergoing orthodontic treatment. Oral prophylaxis should be done to all patients before undergoing orthodontic treatment and dentists should make sure that patients maintain their oral hygiene when they appear for periodic visits to prevent them from developing periodontal disease in the future.

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## CONFLICT OF INTEREST

The authors would like to declare that there is no conflict of interests.

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