

PROGRESSION OF GINGIVITIS IN PATIENTS WITH CROWDING UNDERGOING ORTHODONTIC TREATMENT- A RETROSPECTIVE CROSS SECTIONAL STUDY

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Abstract: Orthodontic treatment is done to ensure proper alignment of the teeth thereby to restore the quality of oral functions such as mastication, facial aesthetics and speech by improving the occlusal and jaw relationship. Periodontal health serves to be an important factor that may be used to evaluate the success of orthodontic treatment. Like any other treatment modalities, orthodontic treatment also has its own risks and complications. The main challenge faced during the orthodontic treatment is the maintenance of periodontal health. Periodontal complications are the most common side effects associated with orthodontic treatment. Such complications mainly involve the destruction of the periodontal tissues leading to gingivitis at an early stage and periodontitis due to severe gingival recession at later stages. The aim of this study was to estimate the progression of gingivitis in patients with crowding of teeth undergoing orthodontic procedure. The data of 86000 were collected from archived records and they were screened for the patients who underwent orthodontic treatment for crowding of teeth. The collected data was tabulated in excel sheet and imported to spss software for statistical analysis. For the study 200 patients between the age group of 15-30 years who underwent treatment for crowding using fixed orthodontic appliances for a duration of 1 year were chosen out of which 101 patients were males and 99 patients were females. The predominant gender was male. Among the different age groups, group 1[5-20 years] had 74 patients, group 2[21-25 years] had 20 patients and group 3[26-30 years] had 106 patients. The predominant age group was group 3[26-30 years]. To determine the progression of gingivitis, patients were divided based on the treatment duration into two groups, 1-6months and 7-12 months and gingival scoring was given for the status of gingival health. The results were statistically analysed to estimate if there was a progression of gingivitis in due course.

Keywords: Orthodontic Treatment, Crowding, Gingivitis, Periodontitis, Malocclusion, Teeth Alignment

INTRODUCTION:

The combined approach of orthodontic and periodontal interactions can greatly enhance the dentofacial aesthetics and periodontal health. In general, orthodontic treatment aims at providing acceptable aesthetics and functional jaw movements that significantly improves the quality of life. These movements are specifically related to the teeth and the supporting periodontal tissues. Controlled forces on the teeth given by the orthodontic appliances are responsible for the teeth movement. The application of orthodontic force results in the compression of the periodontal ligament and the alveolar bone on one side and stretching on the

other side. The continuous force produced by the appliance associated with bone deposition and resorption simultaneously leads to the alignment of teeth in desired position[1]. During this procedure there is a small amount of inflammatory response that is produced on the periodontal structures. Patient factors such as improper oral hygiene maintenance and smoking can aggravate the inflammatory response leading to complications such as gingivitis, periodontitis and gingival recession. Orthodontic procedures are known to induce both positive and negative responses on the periodontium. Oral hygiene maintenance and mastication is much easier in properly aligned teeth. The commonest complication of orthodontic treatment is the inflammation of the gums also called Gingivitis[2]. The most significant factor in the development of gingivitis is the accumulation of dental plaque. Orthodontic elastics and brackets interfere with the removal of plaque, thus increasing the risk of gingivitis. Studies suggest that the equilibrium of the oral microflora is affected during the orthodontic treatment by increasing the bacterial retention[3]. In a study by Ristic et al., growth of bacteria pathogenic to the periodontium was observed in adolescent patients during the orthodontic treatment[4]. Various studies have suggested that orthodontic procedures lead to the formation of pseudo-pockets which progresses during the treatment and slowly regresses in a few months after the removal of brackets[5].

Periodontal structures function by sending proprioceptive signals to the brain and withstand compressive forces during masticatory movements. During orthodontic movements, the periodontal ligament gets compressed causing neurogenic inflammation leading to the release of neuropeptides. So completing the orthodontic treatment with least effect on the periodontium and the root becomes a challenging factor. Majority of the patients with healthy gingiva experience a small amount of gingival inflammation following the placement of brackets for the treatment of crowding which is mostly transient in nature and does not involve periodontitis or attachment loss[6]. A few studies have also indicated that gingival recession following gingivitis could interfere in the success of orthodontic treatment. A review of existing previous existing studies also supports the fact that fixed orthodontic treatment rarely results in localised gingivitis which may progress into periodontitis during the course of the treatment. These complications can be significantly reduced by proper brushing techniques and oral hygiene maintenance[7,8]. Previously our team had conducted numerous clinical trials, in vitro studies, surveys and reviewed various aspects of orthodontic procedures over the past five years[9-23]. This study aims to estimate the progression of gingivitis in patients between the age group of 15-30 years with crowding of teeth undergoing orthodontic procedure.

Materials And Methods:

Sampling:

Non-probability sampling was performed and data was collected from June 2019 to March 2020. The patient records of those above 15 years of age who had reported to Saveetha Dental college for Orthodontic treatment due to crowding were reviewed from the digital archives. The external validity was good, as it is generalisable among patients of the same ethnic origins within the state and country.

Ethical approval

Ethical approval was obtained from the Institutional Ethical Committee and scientific review board [SRB] of Saveetha Dental College. SDC/SIHEC/2020/DIAS/DATA/0619-0320

Data Collection:

The data selected from June 2019 to March 2020 after screening 86000 study subjects and their records were based on the parameters such as patient's name, age, gender, diagnosis and the type of treatment done. Among the 86000 records, patients with crowding who underwent fixed orthodontic treatment between 15-30 years of age for the duration of 1 month and a healthy gingiva at the beginning of the procedure were isolated and checked for the status of gingiva during and after the procedure to estimate the gingival status. The sample size of the study was 200 patients. The data was collected and tabulated in the excel sheet and imported to spss software for statistical analysis.

Statistical analysis:

The data was imported to spss software, IBM version 25.0 for Windows OS in which the output variables were defined. The independent variables were age and gender whereas the dependent variables were the type of treatment, duration and the statistical mean value obtained. The statistical test used to establish the results was the chi-square test.

Methodology:

The study patients who underwent orthodontic treatment for crowding were collected from DIAS records and divided into two groups based on the duration of treatment, 1-6 months and 7-12 months. The gingival scoring was done based on the intensity of bleeding on probing.

SCORE 0- No bleeding

SCORE 1-Mild bleeding

SCORE 2-Moderate bleeding

SCORE 3-Severe bleeding on probing from the gingival sulcus.

By using the difference in scoring value during the course of treatment, the progression of gingivitis can be estimated and statistically analysed.

RESULTS AND DISCUSSION:

From the study it was estimated that among 200 patients who underwent treatment for crowding of teeth using fixed orthodontic appliances for a duration of one year, 101 patients were males and 99 patients were females. From figure 2, it can be estimated that the predominant gender was male. Among the age groups, group 1[5-20 years] had 74 patients, group 2[21-25 years] had 20 patients and group 3[26-30 years] had 106 patients. From figure 1, it can be estimated that the predominant age group was group 3[26-30 years]. To study the progression of gingivitis, patients were divided into two groups based on the duration of the treatment as 1-6 months and 7-12 months. The gingival scoring was given as score 0,1,2 and 3 based on healthy gingiva, mild, moderate and severe bleeding respectively. Among the study population, 72 patients had score 0, 92 patients had score 1, 36 patients had score 2 during the first 6 months of the treatment and 14 patients had score 0, 126 patients had score 1, 60 patients had score 2 during the last 6 months of the treatment which is represented in Figure 3 and 4. Figure 5 bar graph denotes the association between the duration of the treatment(1-6months) and the progression of gingival scoring among the three age groups. Chi-square test was done and p value obtained was 0.43 ($p < 0.05$), thus was statistically significant. Based on figure 5 it can be inferred that as the duration of treatment increases, severity of the disease also increases and thus the majority of cases with score 0 during the beginning of the treatment gradually increased to score 1 and score 2 during the first six months. Figure 6 bar graph denotes the association between the duration of the treatment(7-12months) and the progression of gingival scoring among the three age groups. Chi square test was done and p value obtained was 0.12 ($p < 0.05$), this was statistically significant. Based on figure 6 it can be inferred that as the duration of treatment increases, severity of the disease also increases and thus majority of cases with score 0 and score 1 during the end of first 6 months of the treatment gradually increased to score 2 during the second six months. It can also be observed that gingivitis was higher among the age group 3(26-30 years). No patients with score 3 were identified during the study. Thus from the study it can be concluded that there is a progression in gingivitis during the course of orthodontic treatment which is mild in the majority of patients below 25 years and moderate to severe in patients between 25-30 years.

In a study by Rajan K.Mahindra et al., it was observed that there is an increase in the gingival and plaque index among patients undergoing fixed orthodontic treatment by 65% which coincides with our study[24]. As discussed earlier, orthodontic treatment causes the formation of pseudo pockets which leads to localised gingival inflammation at specific sites. A study by Alparslan Dilsiz et al., confirms that this localised inflammatory response during fixed appliance treatment is common in lower anteriors than in posterior region[25]. A study by Shivakumar et al., have estimated that nearly 40% of the adolescent population who underwent orthodontic treatment were diagnosed with gingivitis at the end of the procedure which coincides with our study[26]. A systematic review by Bollen AM et al on the adverse effects of orthodontic treatment on periodontium indicates gingivitis as the commonest complication which coincides with our study[27]. Alexander et al reported lack of periodontal and gingival destruction over a long period of time among patients wearing fixed appliances which does not coincide with this study[28]. A study by Kloehn et al has estimated that about 70% of patients reported with gingivitis after orthodontic treatment which coincides with our study[29]. Therefore proper maintenance gingival and periodontal health is necessary to ensure good prognosis of the orthodontic procedure.

Conclusion:

In this study, it was found that the majority of patients with normal gingival and periodontal health during the commencement of orthodontic procedure, were diagnosed with gingivitis leading to mild to moderate level of bleeding on probing from the gingival sulcus at the end of the treatment. This is mainly because of improper oral hygiene among the patients during the treatment. Fixed orthodontic treatment done for correcting the malocclusion of the teeth and jaws functions by causing the movement of the teeth by inducing an inflammatory response in the periodontal structures. Insufficient oral hygiene maintenance leads to increased complications thus increasing the viability of gingival diseases. Oral screening and monthly checkups must be done to diagnose gum diseases at the earliest so that necessary steps can be taken to prevent or treat the condition thus ensuring good prognosis of the orthodontic treatment.

Author Contributions:

First author [Nivesh Krishna R] performed analysis, interpretation and wrote the manuscript. Second author [Dr.Sumathi Felicita A] contributed to conception, data designs, analysis, interpretation and critically revised the manuscript. Third author [Dr.Arvind S] participated in the study and revised the manuscript. All the three authors have discussed the results and contributed to the final manuscript.

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Conflict Of Interest: Nil.

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FIGURES:

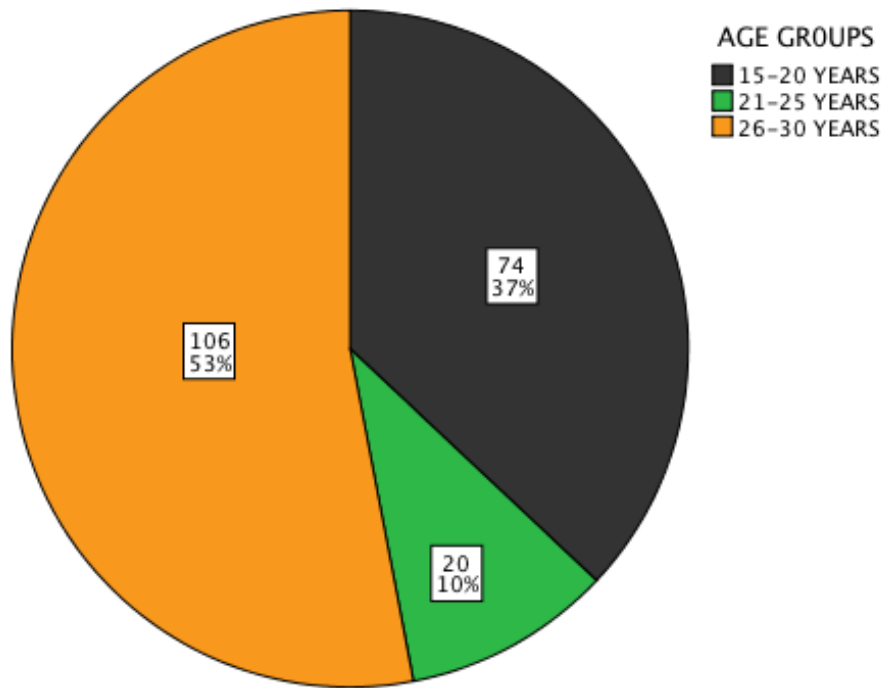


Figure 1 pie chart denotes the distribution of study population based on age group. Sample size was 200 patients between the age group 15-30 years. The patients are divided into 3 age groups. Among the age groups, group 1[5-20 years] had 74 patients, group 2[21-25 years] had 20 patients and group 3[26-30 years] had 106 patients. The predominant age group was group 3[26-30 years].

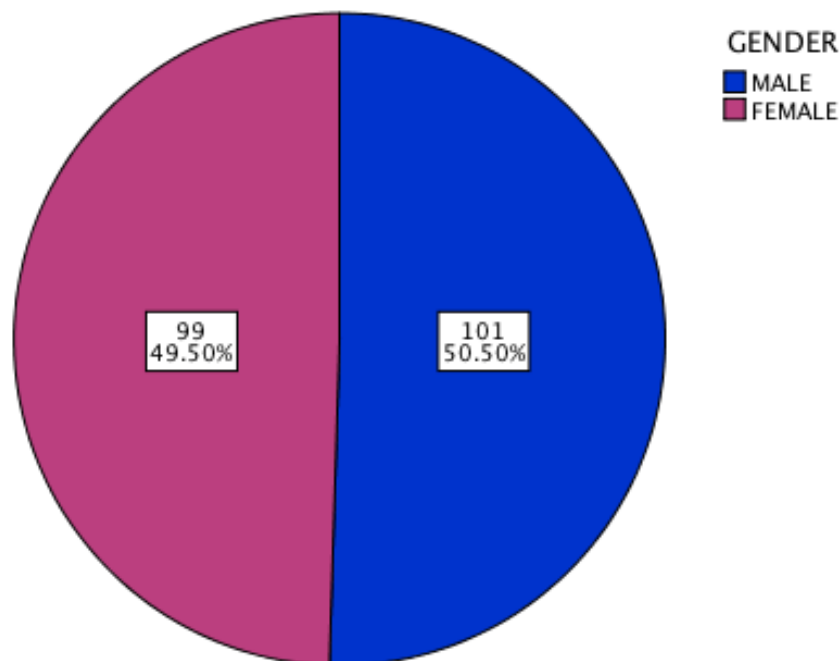


Figure 2 pie chart denotes the distribution of study population based on gender. Sample size was 200 patients. Among the study population, 101 patients were males and 99 patients were females. In the above pie chart, blue colour denotes the percentage of male patients [50.5%] and pink colour denotes the percentage of female patients [49.5%]. The predominant gender was male.

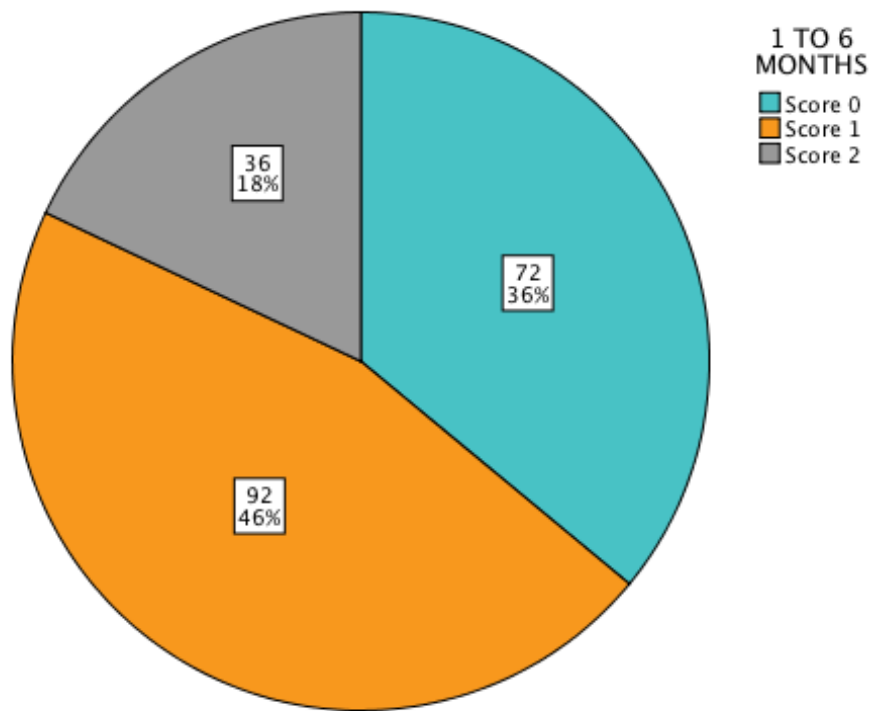


Figure 3 pie chart denotes the gingival scoring for the period of 1-6 months during the orthodontic treatment duration. Among the study population, 72 patients had score 0, 92 patients had score 1 and 36 patients had score 2 during the first 6 months of the treatment. In the above pie chart, colour green represents score 0 (36%), colour orange represents score 1 (46%) and colour grey represents score 2 (18%).

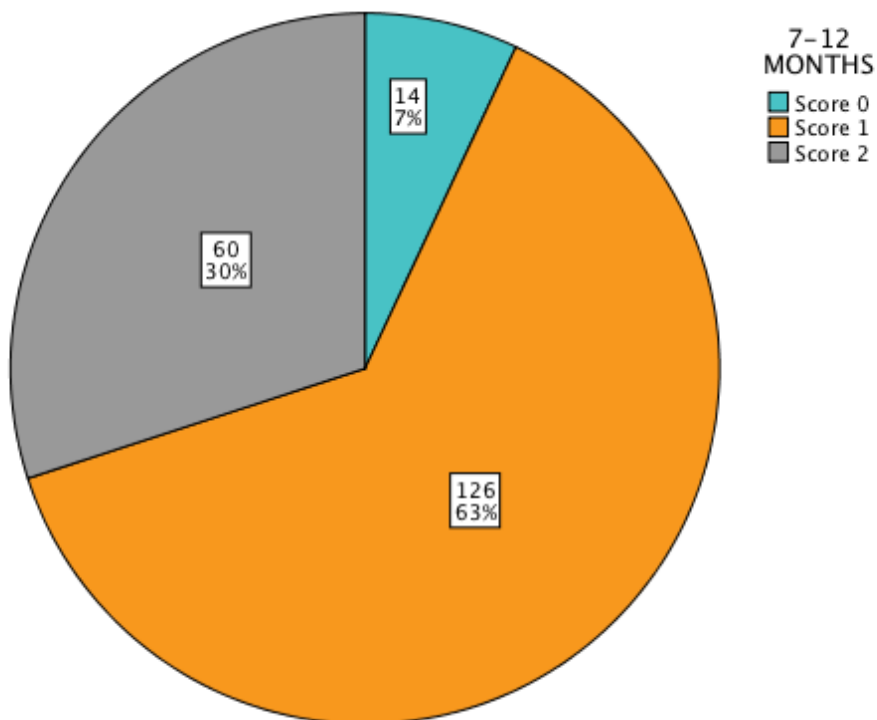


Figure 4 pie chart denotes the gingival scoring for the period of 7-12 months during the orthodontic treatment duration. Among the study population, 14 patients had score 0, 126 patients had score 1 and 60 patients had score 2 during the last 6 months of the treatment. In the above pie chart, colour green represents score 0 (7%), colour orange represents score 1 (63%) and colour grey represents score 2 (30%).

CORRELATION BETWEEN AGE GROUP AND GINGIVAL SCORING FOR 1-6 MONTHS

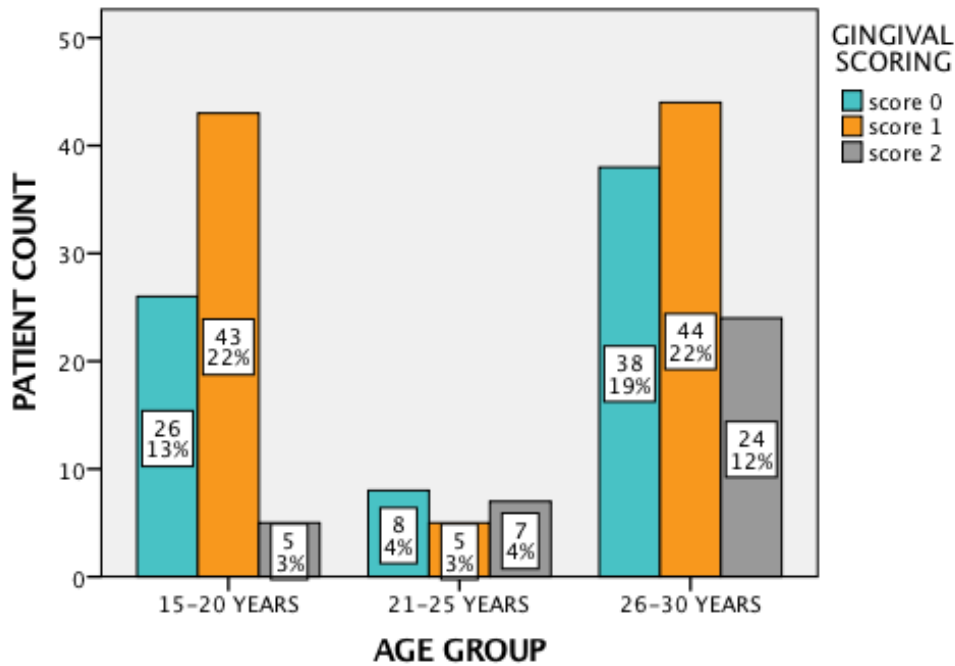


Figure 5 bar graph denotes the association between the duration of the treatment(1-6months) and the progression of gingival scoring among the three age groups. X axis indicates the age group of the 200 patients and Y axis indicates the number of patients who underwent orthodontic treatment. In the figure, colour green denotes score 0, orange represents score 1 and grey represents score 2. Chi square test was done and p value obtained was 0.43 ($p < 0.05$), thus was statistically significant. Based on figure 5 it can be inferred that as the duration of treatment increases, severity of the disease also increases and thus majority of cases with score 0 during the beginning of the treatment gradually increased to score 1 and score 2 during the first six months. It can also be observed that gingivitis was higher among the age group 3(26-30 years). The association was statistically significant.

CORRELATION BETWEEN AGE GROUP AND GINGIVAL SCORING FOR 7-12 MONTHS

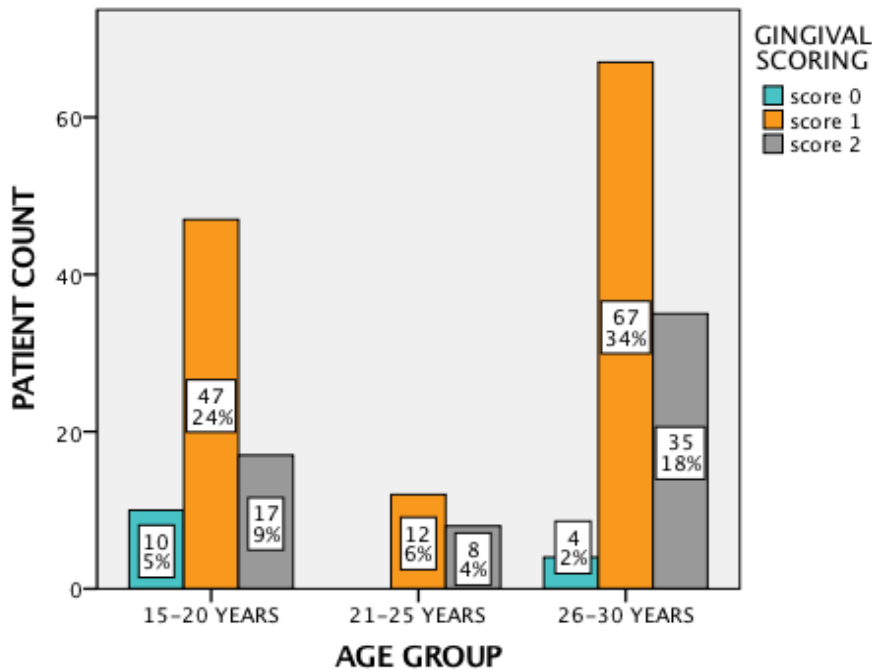


Figure 6 bar graph denotes the association between the duration of the treatment(7-12months) and the progression of gingival scoring among the three age groups. X axis indicates the age group of the 200 patients and Y axis indicates the number of patients

who underwent orthodontic treatment. In the figure, colour green denotes score 0, orange represents score 1 and grey represents score 2. Chi square test was done and p value obtained was 0.12 ($p < 0.05$), thus was statistically significant. Based on figure 6 it can be inferred that as the duration of treatment increases, severity of the disease also increases and thus majority of cases with score 0 and score 1 during the end of first 6 months of the treatment gradually increased to score 2 during the second six months. It can also be observed that gingivitis was higher among the age group 3(26-30 years).The association was statistically significant.

