

The Effects of Duration of Fixed Orthodontic Treatment on DMFT Index

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Abstract

Aim: The purpose of this study was to assess the effects of duration of fixed orthodontic treatment on decay-missing-filled teeth (DMFT) index. **Materials and Methods:** Sixty patients (47 females and 13 males aged between 16 and 20 years) who were undergoing fixed orthodontic treatment participated in this study. None of the patient required orthodontic tooth extraction. The World Health Organization (WHO) criteria were utilized to diagnose the carious status (DMFT) of the subjects by a single observer. Subjects were divided into three groups according to treatment durations (Group A: 0–18 months, Group B: 18–30 months, and Group C: more than 30 months) and DMFT score was charted at the start of the treatment (T1) and at completion of the treatment (T2). **Results:** The mean DMFT score for the study group at T1 and T2 was 2.98 ± 1.50 and 5.32 ± 1.76 , respectively, which was statistically highly significant ($P < 0.001$). Although the mean DMFT scores increased for all Group A, Group B, and Group C patients from T1 to T2, Group-A witnessed minimal changes in DMFT score, which however was statistically significant ($P < 0.05$). **Conclusion:** The results showed that young patients aged between 16 and 20 years undergoing fixed orthodontic treatment with treatment extending over 30 months were at higher risk for increase in DMFT index at the completion of the treatment.

Keywords: Dental caries, DMFT index, Fixed orthodontic appliances.

INTRODUCTION

Development of dental caries is a common iatrogenic effect seen in patients undergoing fixed orthodontic treatment. Individuals with malocclusions often have many plaque retention sites due to the irregularities of their teeth. Orthodontic treatment with fixed appliances and complex loop designs further increases the risk for development of caries due to the creation of additional retention sites on surfaces generally not susceptible to caries.^[1] Furthermore, the parts of fixed appliances such as brackets, bands, and wires have irregular surfaces that limit the naturally occurring self-cleansing mechanisms of the oral musculature and saliva.^[2] Despite intensive efforts to educate patients about effective oral hygiene procedures, dental caries associated with fixed orthodontic appliances remains a significant clinical problem.^[1]

Patients undergoing treatment with fixed orthodontic appliances have a rapid increase in the volume of dental plaque and such a plaque has a lower pH than that found in non-orthodontic patients.^[3,4] There is a rapid shift in the composition of the

bacterial flora of the plaque following the introduction of orthodontic appliances.^[4] More specifically, the levels of acidogenic bacteria, such as *Streptococcus mutans*, become significantly elevated in orthodontic patients. If these bacteria have an adequate supply of fermentable carbohydrates, acid by-products will be produced a lower pH of the plaque.^[5] Some previous studies showed increased caries frequency with a higher prevalence of fillings in subjects receiving orthodontic treatment, whereas more recent investigations did not confirm such correlation.^[6,7]

There is no consensus in the literature about the effect of orthodontic treatment length on the caries risk. Richter *et al.*^[8] determined that duration of orthodontic treatment was

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a significant factor for White Spot Lesion (WSL) development. Chapman *et al.*^[9] found that longer treatment duration was significantly related to increased number of non-cavitated lesions. On the other hand, some authors^[10,11] suggested that treatment length was not a significant factor in WSL/caries development. The present study thus aims to evaluate the effect of orthodontic treatment length on decay-missing-filled teeth (DMFT) Index.

MATERIALS AND METHODS

The multi-centric study was performed in Bihar. A sample of 60 patients (47 females and 13 males) aged between 16 and 20 years, requiring non-extraction of teeth and willing to participate in the study, was included in the study. Informed consent was obtained from all participants and their parents before study. The patients with any systemic disease, smoking habits, plaque accumulation and pre-existing periodontal disease, dental fluorosis, no brushing habits before bedtime, high caries activity (such as low saliva secretion rates, DMFT >7), and who had orthodontic treatment before were excluded from the study.

All patients were treated with 0.018 inch slot MBT fixed orthodontic appliances (Equi-librium® 2, Dentaaurum, Germany), and their teeth were bonded with a light cured composite resin and adhesive (Transbond XT; 3M Unitek, Monrovia, Calif, USA). Each patient was given the same instructions with respect to oral hygiene.

Caries risk level (DMFT) assessment was performed before (T1) and after (T2) fixed orthodontic treatment using a plane mouth mirror and blunt and sickle probe with the aid of a dental chair light on dried teeth by a single examiner. The sickle probe was used to remove debris, check restoration margins, and detect cavitations. In clinical examination, diagnosis of caries was made only when there was clear evidence of loss of tooth substance. The congenitally missing or extracted teeth were excluded from data collection. Therefore, a maximum of 28 teeth were examined per subject for DMFT index score.

The subjects were divided into three groups according to the treatment time (Group A: 0–18 months, Group B: 18–30 months, and Group C: more than 30 months) after recording of all data at the completion of the treatment. All the data collected were analyzed using SPSS version 17.0 (SPSS Inc, Chicago, IL, USA). Because the scoring system was used for determination, non-parametric tests were used for statistical analysis.^[10] Unpaired *t*-test was used to compare the DMFT scores.

RESULTS

A total of 60 patients (47 females and 13 males) between 16 and 20 years of age with a mean age of 17.68 years participated in the study. The mean DMFT index recorded for female participants at T1 and T2 was 2.89 ± 1.46 and 5.11 ± 1.72 , respectively, while that for male patients at T1 and T2 was 3.31 ± 1.54 and 6.01 ± 1.64 , respectively. The mean DMFT

score for the study group at T1 and T2 was 2.98 ± 1.50 and 5.32 ± 1.76 , respectively (Table 1 and Chart 1). The change in DMFT scores was statistically highly significant ($P < 0.001$) for all the groups at both the intervals.

For Group A patients, the change in DMFT score from T1 to T2 was the least, increasing from 2.50 ± 1.62 to 3.68 ± 1.39 ; however, it was statistically significant ($P < 0.05$) (Table 2 and Chart 2). For both Group B and Group C patients, the change in DMFT score from T1 to T2 was statistically highly significant ($P < 0.001$).

DISCUSSION

The purpose of the present study was to assess the effect of fixed orthodontic treatment duration on DMFT index. It is well

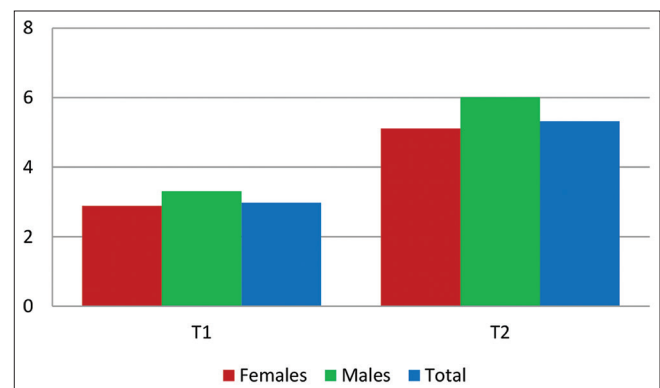


Chart 1: Changes in mean DMFT scores for female, male, and all patients recorded at T1 and T2

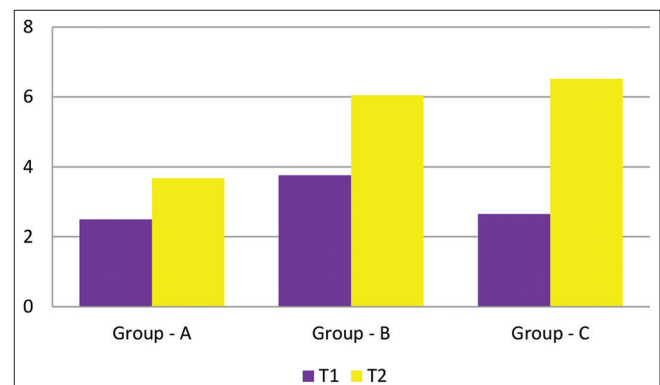


Chart 2: Changes in mean DMFT scores for Group A, Group B, and Group C patients recorded at T1 and T2

Table 1: Mean DMFT and standard deviation recorded for female, male, and all patients at T1 and T2

Subjects	Mean DMFT±SD at T1	Mean DMFT±SD at T2	P-value
Females (47)	2.89±1.46	5.11±1.72	<0.001**
Males (13)	3.31±1.54	6.01±1.64	<0.001**
Total (60)	2.98±1.50	5.32±1.76	<0.001**

**statistically highly significant

Table 2: Mean DMFT and standard deviation recorded for Group A, B, and C patients at T1 and T2

Groups	(n)	Mean DMFT at T1	Mean DMFT at T2	P-value
Group A (0–18 months)	22	2.50±1.62	3.68±1.39	<0.05*
Group B (18–30 months)	21	3.76±1.31	6.05±1.21	<0.001**
Group C (more than 30 months)	17	2.65±1.08	6.52±0.92	<0.001**

*statistically significant, **statistically highly significant

known that past caries experience is the strongest predictor of the future caries development among school children and adolescents. Since the incidence and prevalence of caries are greater in fixed orthodontic patients, clinicians need a head start in this field such as various tools and methods other than clinical findings to predict the occurrence of new caries before frank cavitation.

There is also a need for clinical flexibility while predicting caries according to DMFT scores at baseline and at the end of the treatment.^[8] On the other hand, accurate evaluation of demineralized WSL during orthodontic treatment is important, so they might implement early prevention and/or treatment.^[12] The reported incidence and prevalence of WSL between males and females have been found to be inconclusive.^[10,13]

Our results showed that males had higher mean DMFT values than females at two time points. One possible explanation for these results is that females are generally more compliant orthodontic patients.^[13] However, there is recently some evidence to suggest that the higher DMFT values among females may also attributed to changes in salivary rates and composition induced by hormonal fluctuations among females.^[14]

The present study demonstrated that changes in mean DMFT scores were statistically significant in all the treatment duration groups. For Group A patients (0–18 months), the DMFT score increased significantly ($P < 0.05$) from T1 to T2 from 2.50 ± 1.62 to 3.68 ± 1.39 ; however, for both Group B patients (18–30 months) and Group C patients (>30 months), the mean DMFT scores witnessed highly significant increase ($P < 0.001$) from T1 to T2 (Table 2). Some authors Richter *et al.*^[8] Cantekin *et al.*^[15] suggested that orthodontic treatment with a fixed appliance may be associated with an increased incidence of caries which is in accordance to our study. While some other researchers found no such relationship between fixed orthodontic treatment and caries experience.^[9,16]

Cantekin *et al.*^[15] suggested that DMFT counts increased in a group of young dental patients undergoing orthodontic therapy. Only Ahmed *et al.*^[17] found increased prevalence of caries with

the time period of orthodontic treatment. According to their report, the prevalence of caries was 33% in 6 months and 61% in 12 months duration of orthodontic treatment.

CONCLUSION

The results of the present study showed that patients undergoing orthodontic treatment are at higher risk for increase in mean DMFT index. To prevent such developments, orthodontists should assess each patient's risk factors before and during treatment and modern orthodontic treatment should also be supported by local fluoride treatment, tooth-brushing instructions, and supervision of the oral hygiene of patients.

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