https://doi.org/10.29309/TPMJ/2023.30.05.7395

The Professional Medical Journal
www.theprofesional.com
2023, Volume, 30 Issue, 05

ORIGINAL ARTICLE

The effect of orthodontic fixed appliance treatment on periodontal health of among patients reporting to Khyber College of Dentistry, Peshawar.

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Article Citation: Iqbal A, Amir M, Gulmeena, Majeed K, Ayaz MH, Khan TA. The effect of orthodontic fixed appliance treatment on periodontal health of among patients reporting to Khyber College of Dentistry, Peshawar. Professional Med J 2023; 30(05):649-653. https://doi.org/10.29309/TPMJ/2023.30.05.7395

ABSTRACT… Objective: To determine effect of orthodontic fixed appliance treatment on periodontal health. **Study Design:** Quasi Experimental. **Setting:** Khyber College of Dentistry, Peshawar. **Period:** 1st January 2021 to 30th July 2022. **Material & Methods:** This study was conducted 385 patients by non probability consecutive sampling technique. The inclusion criteria was both males and females, age 15-25 years, and having full complement of permanent dentition including first and second molars. Patients who were under medications affecting periodontal health, systemic conditions, para-functional habits and previous orthodontic treatment were excluded. Age and gender of patients were recorded. Community periodontal index (CPI) was recorded before the placement of orthodontic fixed appliances and after six months using CPI probe. Paired samples t-test was run to compare the CPI score before and after 6 months of orthodontic treatment. **Results:** The mean age was 22±4.95 year. The females were 200(62%) and males were 185(48%). The mean CPI score was statistically ($p<0.001$) highest after six months (2.88±1.19) than pre treatment (0.90±0.65). Among all age groups the CPI score increase statistically ($p<0.001$). The mean change (95% CI) in CPI score was 2.67(2.44, 2.90) in age group 15-20 years while 2.51(2.31, 2.70) in age group 21-25 years. In both males and females the results were statistically significant. **Conclusion:** Orthodontic fixed appliance treatment can adversely affect the periodontal health of the patients.

Key words: Community Periodontal Index, Fixed Orthodontic Appliances, Orthodontic Treatment, Periodontal Status.

INTRODUCTION

The orthodontic care is provided to patients to correct skeletal and dental malrelations, obtain functional efficiency, and bring esthetic harmony.[1] Fixed appliances consists of brackets, arch wires and other auxillaries can carried out three dimensional movement to bring dentition to the ideal position.[2] These appliances are effective in performing all sort of movements including root position correction, extrusion, rotation and bodily movement.[3] Though the fixed Orthodontic appliances are standard of care to execute accurate tooth movement but it also associated with some demerits. The problems with fixed appliances are orthodontics pain, white spot lesion, and periodontal issues.[4,5]

Sometimes the orthodontic treatment is carried out to correct crowding which can aid in easy cleaning of dentition and ultimately good periodontal health.[6] In case of gingival recession extraction of incisors or premolars and inward movement of teeth can bring robust periodontium by increasing thickness of gingiva.[7]

The fixed orthodontic appliances can adversely affect the periodontal and gingival health.[8] Oral hygiene is more difficult with these appliances due to accumulation of food in their network.[9] Oral microbes grow in plaque attached to the appliances which consequently produce gingivitis and gingival hyperplasia. The uncontrolled gingivitis can results in periodontitis.[10]

Gingivitis is a reversible condition due to inflammation of gingiva arising from plaque

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Article received on: 28/12/2022
Accepted for publication: 02/03/2023

accumulation.[11] The hallmarks of gingivitis is bleeding on probing, erythema, edema and excessive gingival crevicular fluid.[12] Periodontitis is on other hand the outcome of untreated gingivitis characterized by loss of attachment and can be seen with either increased pocket depth of root exposure.[13]

In literature there are studies regarding periodontal status of orthodontic patients like one study in Nepal by Piya et al. reported mean CPITN scores for maxillary right central incisor and maxillary right molar at the start of fixed appliance treatment was 0 and after 6 months was 0.75±0.70 for maxillary right molar and 0.40±0.65 for maxillary right central incisors. The mean scores for CPI Index were statistically significant ($p < 0.05$).[14] Moosa et al. reported in his study regarding periodontal status of orthodontic patients at Sir Syed College of Medical Sciences that in the orthodontic group, 58% had periodontal pockets (CPITN scores 3 and 4), whereas only 16% in the non-orthodontic group had pockets (CPITN scores 3 and 4). There was a statistically significant association between the orthodontic and non-orthodontic groups in periodontal pocket depth ($p <0.01$).[15]

The rationale of this study is to determine the changes in the periodontal status of patients undergoing fixed appliance therapy. To our knowledge there is a paucity of local data regarding this relationship. This study is providing essential information about periodontal status of patients before and during active orthodontic therapy. Further by identifying periodontally susceptible individuals, aggravation of existing periodontal condition will be minimized thus ensuring a safe orthodontic therapy. The study can provide local data to the clinicians regarding periodontal health; an often overlooked but very important component of orthodontic tooth movement.

The objective of this study was to determine the effect of orthodontic fixed appliance treatment on periodontal health of patients reporting to Khyber College of Dentistry, Peshawar.

MATERIAL & METHODS

This quasi experimental study was conducted on 385 patients reporting to Orthodontics department, Khyber College of Dentistry, Peshawar for 1st January 2021 to 30th July 2022 by non probability consecutive sampling technique. The sample size was calculated by using WHO calculator using mean CPITN index score of 0.75±0.7013 with 95% confidence level and 7% margin of error. The total sample size was 385.

Verbal informed consent was obtained from all patients and ethical approval was obtained before the initiation of study (1238 -AD/PG/R/Khyber College of Dentistry). The inclusion criteria was both males and females, age 15-25 years, and having full complement of permanent dentition including first and second molars. Patients who were under medications affecting periodontal health like phytoin and calcium channel blockers, systemic conditions like diabetes mellitus, or blood dsycrasia, para-functional habits causing trauma from occlusion and previous orthodontic treatment were excluded.

Age and gender of patients were recorded. Community periodontal index (CPI) was recorded before the placement of orthodontic fixed appliances and after six months using CPI probe. The CPI scoring was done as: 0-healthy periodontium, 1-bleeding on probing, 2- black band of the probe is visible and there is presence of calculus, 3-pocket depth of 4-5mm and 4-pocket depth is ≥6mm. The highest score was recorded from each tooth in sextant.

Instruction about regular oral hygiene was given to all participants for maintaining optimal oral health.

Data analysis was done in SPSS 22. Descriptive statistics in form of mean with SD for continuous and frequencies with percentages for qualitative data were calculated. Paired samples t test was run to compare the CPI score before and after 6 months of orthodontic treatment. The significance level was set at $p \leq 0.05$.

RESULTS

The mean age was 22±4.95 with range from 15 to 25 years. The most common age category was

21-25 years having 235(61.1%). The females were 200(62%) and males were 185(48%). (Table-I)

The mean CPI score was statistically ($p<0.001$) higher after six months (2.88±1.19) than pre treatment (0.90±0.65). (Table-II & Figure-1)

Comparison of periodontal health before and after fixed orthodontic treatment stratified by age group shows in all age groups the CPI score increase statistically ($p<0.001$). The mean change (with 95% CI) in CPI score was 2.67(2.44, 2.90) in age group 15-20 years while 2.51(2.31, 2.70) in age group 21-25 years. (Table-III)

In both males and females the results were statistically significant. Details are given in Table-IV.

Variable	Characteristics	N (%)
Age	15-20 years	150 (38.9%)
	21-25 years	235(61.1%)
Gender	Male	185(48%)
	Female	200(62%)

Table-I. Distribution of age and gender

Pre Treatment CPI Score	Six Months Treatment CPI Score	Mean Diff (95% CI)	P-Value*
0.90±0.65	2.88 ± 1.19	2.1 (1.9, 2.2)	<0.001

Table-II. Comparison of periodontal health before and after fixed Orthodontic treatment
***paired t test**

DISCUSSION

This study was conducted to determine the effect of fixed appliance treatment on periodontal health during initial six months treatment. Our findings show that orthodontic fixed appliance treatment can adversely affect the periodontal health.

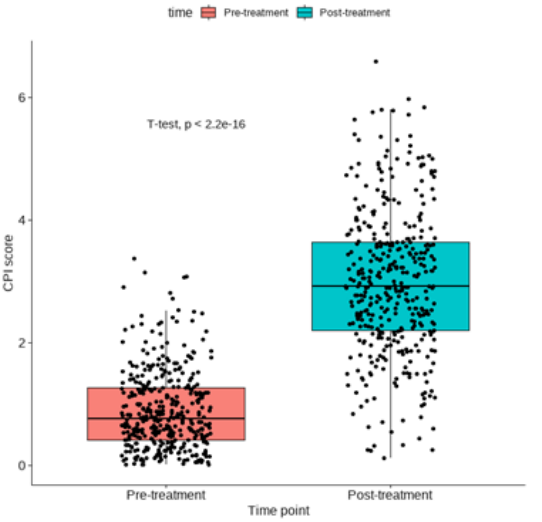

Figure-1. Comparison of CPI score at pre treatment and after six months

In our study the females were more than males. This can be due to more conscious among females to receive orthodontic treatment than males. The other factors can more prevalence of malocclusion among females than males. Previous study also reported similar findings that more females are presenting for orthodontic treatment than males.[16]

We followed our patients for initial six months to record periodontal status. In most the orthodontic patients the crowding is relieved in initial six months. More periodontal threats are present in this treatment duration.[17]

The current study revealed that CPI score statistically increased with six months orthodontic fixed treatment.

Age Group	Pre Treatment CPI Score	Six Follow up CPI Score	Mean Diff(95%CI)	P-Value*
15-20 years	0.33 ± 0.91	2.81 ± 1.14	2.67(2.44, 2.90)	<0.001
21-25 years	0.39 ± 0.86	2.90 ± 1.21	2.51(2.31, 2.70)	<0.001

Table-III. Comparison of periodontal health before and after fixed Orthodontic treatment stratified by age group
***Paired T test**

Gender	Pre Treatment CPI Score	Six Months Follow up	Mean Diff (95%CI)	P-Value*
Male (n=185)	0.95±0.62	3.00±1.24	2.0(1.8,2.3)	<0.001
Female (n=200)	0.85±0.67	2.96±1.13	2.1(1.9, 2.3)	<0.001

Table-IV. Comparison of periodontal health before and after fixed Orthodontic treatment stratified by gender

A previous study by Piya et al[14] also the reported the mean CPI score increased from 0 to 0.75±0.70 at six months and the difference was statistically significant. Another study by Moosa et al.[15] comparing the periodontal health of orthodontic and non-orthodontic group and they reported that CPI score 3 and 4 was 58% in orthodontic group and 16% in non-orthodontic group and this difference was statistically significant. Another comparative study by Pandey et al.[18] the frequency of periodontal pockets (CPI score 3 and 4) was 35% in patients receiving orthodontic treatment and 1% without orthodontic treatment and their results were statistically different. A longitudinal study by Gastel et al.[19] on 24 patients wearing fixed appliances reported that periodontal pocket depth increases significantly with orthodontic treatment.

A prospective longitudinal study by Ristic et al.[20] on 32 orthodontics patients reported that Orthodontic treatment do not increase periodontal pocket depth. The difference in results can be due to their small sample size and more good oral hygiene measures among their patients.

The limitations of this study are the lack of control group and recording other periodontal parameters like microbial count, bacterial types, and short follow up time of 6 months duration.

CONCLUSION

Orthodontic fixed appliance treatment can adversely affect the periodontal health of the patients. Use of more regular oral hygiene with adjunctive chlorhexidine and fluoride should be considered to obviate this adverse outcome.

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2	Mashal Amir	Revision and corresponding author, Introduction writing.	
3	Gulmeena	Discussion writing.	
4	Komal Majeed	Data collectiona and analysis.	
5	Muhammad Hasnain Ayaz	Abstract writing.	
6	Tariq Ali Khan	Critical review of manuscript, Expert research opinion.