



MDJ

Periodontal health status and treatment need among Iraqi orthodontic patients wearing fixed appliance

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Abstract

Back ground/Aim: Orthodontic treatment enables the establishment of functional occlusion and improvement of oral health, however, it increases the risk of periodontal disease development through plaque retention and difficulty of keeping a good oral hygiene. So the present study was performed to evaluate the periodontal health status and determination of treatment need among Iraqi orthodontic patients wearing fixed appliance.

Material and method: A total number of 224 orthodontic patients wearing fixed appliance were enrolled in the study. They were attending Al-Mustansiria teaching hospital at college of dentistry/Al-Mustansiria University /department of orthodontics, pedodontics and preventive dentistry for follow up visits of their orthodontic fixed appliances in addition to the patients attending the private clinic of the researchers. Evaluation the periodontal health status and determination of treatment need **were achieved using CPITN** (Community Periodontal Index for Treatment Need), the **degree of gingival enlargement and high frenal attachment**. The sample was divided into 2 groups according to age factor (adolescents and adults).

Results: The total number & percentages of CPITN scores for the total sample were calculated. The highest number and percentage were of **(scores 0, 1 &2), {258 (19.19 %), 250 (18.60 %) & 800 (59.52 %)}** respectively with highly significant difference of score 2 from other scores. The percentages of scores (0, 1 & 2) in the two age groups (adolescents and adults). The percentages of scores (0, 1 & 2) in the adolescents were **(17.32 %, 20.47 % & 60.67 %)** respectively with highly significant difference of score 2. The percentages of scores (0, 1 & 2) in the adults were **(30.51 %, 27.69 % and 39.90 %)** respectively with significant difference of score 2. The treatment need for the whole sample was 100% for codes 1 and 2 of treatment need (oral health instructions & scaling and root planing) also these codes of treatment were higher than other codes significantly, especially code 3 (complex treatment, deep scaling ,surgical intervention) in adolescents and adults were **(4.5% and 3%)** respectively. Regarding the gingival enlargement the numbers and percentages of the enlargement scores (0, 1, 2 & 3) of the total sample were **115 (43%), 85 (31%), 52 (19%) and 14 (5.26%)** respectively.

Introduction

Orthodontic therapy may affect the periodontium by favoring plaque

retention, by direct injury to the gingiva as a result of overextended

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bands, and by creating excessive forces, unfavorable forces, or both on the teeth and supporting structures⁽¹⁾. Orthodontic appliances not only tend to retain bacterial plaque and food debris, resulting in gingivitis, but also are capable of modifying the gingival ecosystem. An increase in *Prevotella melaninogenica*, *Prevotella intermedia*, and *Actinomyces odontolyticus* and a decrease in the proportion of facultative microorganisms was detected in the gingival sulcus after the placement of orthodontic band⁽²⁾. More recently, *aggregatibacter actinomycetemcomitance* was found in at least one site in 85% of the children wearing orthodontic appliances⁽³⁾. In a study⁽⁴⁾ about the change of the composition of plaque after removal of orthodontic appliances, periodontal health improved, and the carriage and amount of subgingival *P. gingivalis* decreased. Nevertheless, the amount of subgingival *P. gingivalis* remained high for 6 months after appliance removal, and this finding might imply a potential risk to periodontal health in certain patients. Treatment with fixed appliances in adolescents may transitionally increase the values of all periodontal indices and stimulate the growth of periodontopathogenic bacteria, but without destructive effects on deep periodontal tissues⁽⁵⁾. Importance of oral hygiene in orthodontic patients is always intensified to prevent any further periodontal disease. In the absence of oral hygiene maintenance, plaque accumulation on orthodontic appliance components is paving way to destruction of periodontal tissues^(6,7). Due to greater tooth area covered and complex nature of the orthodontic appliances make it difficult to maintain oral hygiene. Maintaining oral hygiene during orthodontic treatment will help in good gingival health, which reflects

in final orthodontic treatment outcome. But the level of gingival health knowledge among orthodontic patients is not adequate. Poor maintenance of oral hygiene is due to either lack of knowledge or negligence by patients themselves. Patients are not given proper instructions^(8,9,10), may be one big reason for patient's noncompliance. However, despite receiving appropriate instructions, many individuals fail to follow instructions; also many of them lack knowledge on maintenance. It is important to motivate them to compile the instructions and maintain oral health. It is always needed to assess the knowledge of orthodontic patients on gingival health. The patients undergoing fixed appliance orthodontic treatment produces chronic inflammatory gingival enlargement originates as a slight ballooning of the interdental papilla and/or the marginal gingiva. In the early stages it produces a life preserver-shaped bulge around the involved teeth. The need for reliable indices that not only assess the causative factors of the disease, but also provide a virtual image on the financial resources seems to be implemented by Community Periodontal Index for Treatment Need (CPITN) proposition in 1982 and the rapid acceptance of this index that gives the scientific community with huge amount of epidemiological data⁽¹¹⁾. The CPITN has proven to be a useful tool for planning the periodontal treatment needs, establishing population periodontal health goal, and evaluating changes in the periodontal status of a given population after a program implementation⁽¹²⁻¹⁵⁾.

The present study was conducted because of recognition of a clear, obvious deterioration and inflammation of the periodontium in orthodontic patients wearing fixed appliance and the desire to assess the

amount of periodontal breakdown and treatment need using CPITN which is used for the first time in Iraq in respect to the evaluation of periodontal health status and treatment need. (This is according to the best of our knowledge)

Materials and methods

Collection of data in the present study lasted about (2 years) due to relatively high number of the sample. A total number of (224) orthodontic patients wearing fixed appliance were enrolled in the study and were attending Al-Mustansiria teaching hospital/department of orthodontics, pedodontics and preventive dentistry at college of dentistry/Al-Mustansiria University/Baghdad – Iraq, for follow up visits of their orthodontic treatment with fixed appliances in addition to the patients attending the private clinic of the researchers. The total sample was allocated into 2 groups according to the age (**adolescents and adults**). The present study was carried out using CPITN. This index was designed to assess the periodontal health and periodontal treatment needs of specific groups. It can be used as a screening monitoring tool to determine the periodontal treatment needs of either a community or individuals. Only six measurements per person are recorded, so it is time saving when a large samples are examined. The whole dentition is divided into 6 sextants in each sextant only one tooth is examined; the index teeth are maxillary right central incisor, with left and right maxillary first molars, with their corresponding mandibular first molar teeth and mandibular left incisor. A color coded can be used and the periodontal treatment needs can be reported as the number or percentage in each treatment need category. The examination of the patients was

achieved by dental mirror and WHO periodontal probe. Collection of data was achieved by filling annexure that contains information and 2 tables (each one contains 6 cells representing the 6 sextants of patient dentition) that filled by the scores of CPITN and gingival enlargement. The total sample was also allocated into three groups according to the duration of wearing the fixed appliance (6 months, 12 months and 18 months) approximately, the CPITN scores were also recorded for these 3 groups.

The CPITN scores are:

- 0 = Healthy periodontium.
- 1 = Bleeding observed, directly or by using mirror, after gentle probing.
- 2 = Supra & subgingival calculus felt during probing, but entire black area is visible.
- 3 = Pocket 4-5mm (gingival margin is located on black area of probe).
- 4 = Pocket greater than 6mm (black area of probe not visible).

For each patient, 6 scores of 6 sextants were recorded and the treatment need for each patient was determined by taking the highest score of CPITN with corresponding code of treatment need. The treatment need codes are:

- 0 = No treatment need. (score 0 in CPITN).
- 1 = Oral hygiene instructions OHI. (score 1 in CPITN).
- 2 = OHI+ scaling and polishing + elimination of plaque retentive margins (2&3 CPITN).
- 3 = OHI + scaling and root planing.
- 4 = Complex periodontal therapy that may include surgical intervention and/or deep scaling and root planing.

Also high frenal attachment which was thick, fibrous and may cause central diastema was recorded. The gingival enlargement was also assessed

in the study by an index includes 4 grades ⁽¹⁶⁾.

Grade 0: No signs of gingival enlargement.

Grade I: Enlargement confined to interdental papilla.

Grade II: Enlargement involves papilla and marginal gingiva.

Grade III: Enlargement covers three quarters or more of the crown.

Results

The distribution of the sample according to the age and gender is revealed in (Table: 1). The range of the age was (13-37 years) and the average of the age was (19.43 years) The sample was divided into 2 groups (**adolescents and adults**). (Table 2) demonstrates the total number & percentages of CPITN scores for the total sample. The highest number and percentage were of (**score 0 , 1 & 2**), **258 (19.19 %)**, **250 (18.60 %)** & **800 (59.52 %)** respectively with highly significant difference from other scores.

In (Tables 3 & 4), the adolescent and adult group showed that the number of scores (**1,2&3**) were also higher than other scores significantly (**score 2 was the highest significantly P value < 0.01**). In adolescent group number & percentages of CPITN scores were (**score 0 =159 17.32 %**), (**score 1= 188 (20.47%)**) & (**score 2 = 557 (60.67 %)**). In adult group the number & percentages of CPITN scores were (**score 0 =130 (30.51 %)**), (**score 1= 118 (27.69 %)**) & (**score 2 = 170 (39.90 %)**). Table 5 illustrates the treatment need for the whole sample, it was **100% for codes 1 and 2 of treatment need (oral health instructions & scaling and root planing)** also these codes of treatment were higher than other codes significantly **P value < 0.01**. Regarding code 3 (complex treatment,

deep scaling, surgical intervention) in adolescents and adults were (**4= (2.61%)**, **3= (4.22%)**) respectively. In respect to the gingival enlargement (table 6) revealed that the numbers and percentages of the enlargement scores (**0,1,2&3**) of the total sample were **48 (21.42%)**, **91 (40.62%)**, **74 (33.03%)** and **11 (4.91%)** respectively. (Table 7) shows the number & percentages of CPITN scores for the total sample according to the duration of wearing the appliance and it is obvious that the number & percentages of CPITN scores increased in positive relation with the duration of wearing the appliance. (Figure 1 bar chart) illustrates the percentages of high frenal attachments in maxilla and mandible. For maxilla the number & percentage of high frenal attachments were **29 (11.88%)** while for the mandible it was **7 (3.12)**. (Figure 2 a photograph shows the gingival enlargement with degrees (1,2 and 3). Figure 3 shows the high frenal attachment that required surgical removal).

Discussion

The present study revealed alarming findings regarding the periodontal conditions of the patients wearing fixed orthodontic appliances. In fact, we felt that it is very necessary to carry out this study to evaluate the periodontal health status and treatment need, this was because of observation of increased prevalence of the gingivitis among fixed appliance wearing patients to threatening states for the final outcome of the treatment and according to the best of our knowledge that there is no recent comprehensive study that assess the **periodontal tissue conditions and treatment need especially using CPITN and the evaluation included the degree of gingival enlargement in**

addition to determination of the prevalence of maxillary & mandibular high frenal attachment in one study for Iraqi patients wearing fixed orthodontic appliances. The study was performed to assess the status of the periodontium clinically not only around the brackets but also around the bands placed on the molars during the course of the orthodontic treatment. The hypothesis of study was that there is a change in the periodontal status of the patients receiving fixed orthodontic treatment. The study results supported this hypothesis and showed a highly significant change in periodontal status of the patients ($p < 0.00$). There was a marked change in the CPITN score (Bleeding On Probing, presence of calculus) after the placement of fixed appliances. These findings are in agreement with the results of Naranjo et al ⁽¹⁷⁾, who reported that the placement of brackets influenced the ecological environment by the accumulation of the bacterial biofilm at the retentive sites. There was a **(marked increase in scores 0,1 & 2)** in all groups resulting in more bleeding and gingival inflammation. Similar results were observed by Ristic and coworker 2008 ⁽¹⁸⁾ as there was a marked increase in both the clinical and microbiological parameters in 3 months time after the fixed appliance placement. The obvious high percentages of the scores (0-2) indicated that the major change with orthodontic appliance is gingivitis which did not progress to the deeper tissues and this result is in accordance with the studies of Honda et al 2006 & Miller 2013 ^(19,20). The periodontal disease (PDD) is accumulative in nature i.e. the PDD progressed with the age and in the present study the patients were mostly young, this may also confirm the marked increase of scores 0-2 and a low percentages of scores (3 & 4). The periodontal disease

also is episodic in nature and a lot of gingivitis sites may remain arrested for a long period of time ⁽²¹⁾. In terms of treatment need evidence based dentistry over the last few decades found that non surgical treatment (scaling & root planing) was found to have equal results as surgical treatment even in deep pockets as 7-8 mm ⁽²²⁾. In the present study gingival enlargement has been measured and recorded using an index of 4 grades which resulted in specification and accuracy of the distinguishing the severity and distribution of gingival enlargement. The current study revealed that grade 1 and 2 were the higher grades of the gingival enlargement, Thus gingivectomy are required in advanced enlargement that restricts the oral hygiene procedure and causes discomfort for the patients esthetically and functionally.

There was also a marked difference in the scores as the time progressed in all study groups ($p < 0.05$). It was therefore determined that the placement of fixed appliances resulted in the increase in the CPI scoring in both anterior as well as posterior segment showed change in the CPI score ($p < 0.05$). Therefore it was found that not only the brackets but also the bands influence the periodontal health. Similar observations were reported by many others ⁽²³⁻²⁴⁾. This indicates that the plaque accumulation may be risk factors for the increase in the clinical parameters i.e. BOP, Plaque accumulation and pocket depth. Mostly the young patients are referred for orthodontic treatment and they often suffer from plaque related gingivitis. Obvious signs of periodontal disease in adults are a hindrance to being referred for orthodontic treatment. Almost every fixed orthodontic patient develops gingival disease at some time during treatment ⁽²⁵⁾. Gingival enlargement and inflammation is often

transient and resolves within weeks of rebonding. Contemporary bonded orthodontic appliances cause less gingivitis than banded appliances⁽²⁶⁾. Adolescents have certainly been shown to suffer worse gingivitis than adults during orthodontic treatment. Primary aim before any orthodontic intervention should be to stabilize the periodontal condition⁽²⁷⁾. Stable gingival health status throughout the orthodontic treatment would deliver accurate treatment results. Delivering proper instructions on gingival health maintenance to orthodontic patients plays vital role in this aspect. Motivating and making them to practice oral hygiene measures in young age groups will certainly enhance the levels of oral hygiene standards^(28,29). Many patients do not exactly know how to maintain high oral hygiene standards which may be conducive to excellent orthodontic treatment outcomes⁽³⁰⁾. Proper brushing is ideal for good gingival health, while prolong brushing may distort the gingival tissues. Wasting diseases like abrasion are mainly caused by improper brushing. On awareness of gingival health, comparatively very few are having awareness while most of them are not aware of that⁽³¹⁾. An orthodontic oral health promotion OHP program for patients undergoing fixed appliance orthodontic treatment produces a short-term reduction (up to 5 months) in plaque and improvement in gingival health. No particular OHP method a greater short term benefit to periodontal health during fixed appliance orthodontic treatment further studies using appropriate methods and in particular longer follow up periods are required⁽³²⁾.

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(Table: 1) The distribution of the sample according to the age and gender.

Total	Female	Male	Sample age
153	88	65	Adolescents
71	48	23	Adults
224	136	88	Total

(Table: 2) The total number & percentages of CPITN scores for the total sample.

Percentages of scores	Total number of scores	CPITN scores
19.19 % *	258	0
18.60 %	250	1
59.52 %	800	2
1.93 %	26	3
0.74 %	10	4

* The % were calculated as No. of score 0 (258 from 1344 the total No. of all scores of total sample = 224 patients x 6 = 1344 scores

(Table:3) The number & percentages of CPITN scores for the adolescent sample.

Percentages of scores	number of scores adolescents	CPITN scores
17.32 %*	159	0
20.47 %	188	1
60.67 %	557	2
1.08 %	10	3
0.43 %	4	4

* The % was calculated as No. of score 0 (159 from 918 the total No. of all scores of adolescent sample = 153 patients x 6 = 918 scores

(Table: 4) The number & percentages of CPITN scores for the adult sample.

Percentages of scores	number of scores adult	CPITN scores
30.51 % *	130	0
27.69 %	118	1
39.90 %	170	2
1.17 %	5	3
0.70 %	3	4

* The % were calculated as No. of score 0 (130 from 426 the total No. of all scores of adult sample = 71 patients x 6 = 426 scores

(Table 5) The number & percentages of PD treatment need codes.

No.& % of adult patients	No.& % of adolescent patients	PD treatment need codes
0	0	0
71 (100%)	153 (100%)	1
71 (100%)	71 (100%)	2
3 (4.22%)	4 (2.61%)	3

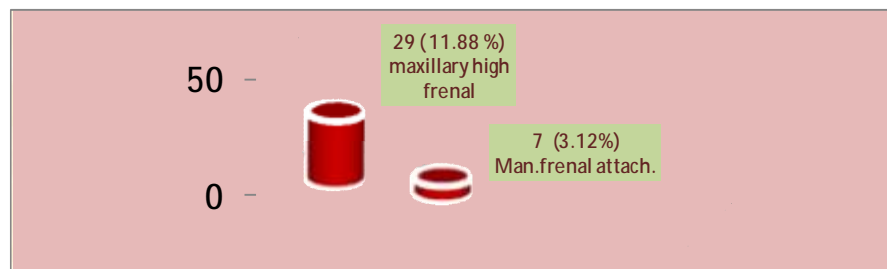
(Table: 6) The number & percentages of gingival enlargement degrees of the two patient samples & the total sample .

No.& % of total patients	No.& % of adult patients	No. & % of adolescent patients	Degree of G. enlargement
48 (21.42%)	28 (12.5%)	20 (8.92%)	0
91 (40.62%)	23 (10.26%)	68 (30.35 %)	1
74 (33.03%)	15 (6.69%)	59 (26.33 %)	2
11 (4.91%)	5 (2.23%)	6 (2.67%)	3

(Table 7) The numbers and percentages of CPITN scores according to the duration of wearing fixed appliance.

18 months	1 year	6 months	CPITN scores
104 (40.31%)	89 (34.49%)	65 (25.19%)*	0
112 (44.80%)	68 (27.20%)	70 (28.0 %)	1
400 (50.0%)	202 (25.25%)	198 (24.75%)	2
10 (38.46%)	9 (34.61%)	7 (26.9%)	3
5 (50.0%)	3 (30.0%)	2 (20.0%)	4

* = The percentages were calculated = 65 score 0 from the total number of score 0 (258)scores



(Figure 1) The No. & percentages of high maxillary & mandibular frenal attachments that required frenectomy.



Fig. 2. High frenal attachment



Fig. 3 Gingival enlargement (Grade 1, 2, 3,)