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Assessment of Pain Experience and Quality of Life in Patients Undergoing Fixed Orthodontic Treatment

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ABSTRACT

Background: The use of fixed orthodontic treatment has been successful in the correction of malocclusion and enhancement of oral aesthetics, but there are side effects such as pain and discomfort, which can adversely affect the oral health-related quality of life (OHRQoL) of patients. Knowing the degree of pain and its consequences on everyday functioning is crucial in enhancing patient-centered orthodontic care.

Objective: To determine the pain experience and its relationship with the oral health-related quality of life among patients receiving fixed orthodontic treatment.

Methodology: The study is an analytical cross-sectional study. Non-probability convenience sampling was used to enroll 152 patients who received fixed orthodontic treatment. Data analysis was done in SPSS version. Descriptive statistics were calculated, and the inferential statistics consisted of independent t-tests, one-way ANOVA, and the Pearson correlation coefficient. A p-value that was less than 0.05 was counted as significant.

Results: The average pain rating was 5.12 ± 1.98, with most of the participants experiencing moderate pain. The level of pain in women was much higher than in men ($p=0.041$). The patients with shorter treatment had a significantly higher level of pain and OHRQoL ($p<0.001$).

Conclusion: Pain is a common occurrence in fixed orthodontic treatment and greatly affects the quality of life of the patients. Pain management and patient education are needed to increase the treatment comfort, compliance, and patient satisfaction.

Keywords: *Fixed orthodontic treatment, pain perception, oral health-related quality of life*.

1. INTRODUCTION

The use of fixed appliances (braces) in orthodontic therapy is commonly regarded as a valid modality to treat malocclusion, enhance dental aesthetics, functioning, and ultimate oral health.[1] Nevertheless, in addition to its clinical advantages, fixed orthodontic treatment is often related to pain and discomfort that are ranked among the most frequently reported adverse experiences of patients who receive treatment.[2] Research has demonstrated that as many as 90% of orthodontic patients experience pain and discomfort as the most notable negatives relating to the treatment process, especially in the initial stages following the placement of the appliances and adjustments.[3]

The fixed orthodontic therapy is associated with painful experiences, which are usually caused by the biological reaction to the constant forces, which are caused by brackets and archwires, and cause the compression of the periodontal ligament and].

consequently the inflammatory response.[4] Such a nociceptive experience can be acute in the first 24-48 hours of the intervention and then gradually decreases in the next days. Clinical studies indicate that a significant percentage of patients (up to 85-95%) experience varying levels of pain or discomfort during the first stage of treatment, which has a substantial impact on typical functioning, including eating, speaking, and maintaining oral hygiene habits.[5

Notably, pain related to fixed appliances has been reported to have a significant impact on Oral Health-Related Quality of Life (OHRQoL), which is a multidimensional phenomenon that includes the pride in everyday activity (eating, sleeping, and social interaction), psychological health, self-esteem, and contentment with the state of oral health.[6] Individuals receiving fixed orthodontic treatment, as an example, complain of painful sensations of aching, difficulty in eating, speech change, and limited social activities, which, in turn, causes a sense of decreased quality of life.[7]

Although pain is very common and could negatively affect patient compliance, treatment satisfaction, and overall experience, it is a phenomenon that is undervalued in clinical practice.[8] Lots of orthodontists pay much attention to clinical results, including alignment and occlusion, when comparatively less attention is paid to the subjective experiences of pain and its psychosocial consequences. This disparity indicates the necessity of holistic evaluation and control measures that not only align teeth but also improve comfort and normal functioning of patients during treatment.

The pattern and severity of the pain, its effects on the day-to-day life and psychosocial well-being, is important to understand how to improve patient-centered care. Consideration of such experiences can guide clinicians on the timing and the type of interventions that can alleviate discomfort, which might increase the likelihood of compliance, decrease cases of appointment cancellation, and eventually increase the treatment outcomes. The study aimed to estimate the pain experience and the pain level in the patients receiving fixed orthodontic therapy, as well as to determine the effects of this pain on the quality of life of the patients.

2. METHODOLOGY

This analytical cross-sectional study was carried on in the Department of Orthodontics. The research objective was to identify pain experience and oral health-related quality of life in patients undergoing fixed orthodontics. The study period was one year, between the years 2024 and 2025. All participants gave written informed consent before the study was initiated

OpenEpi (Open Source Epidemiologic Statistics for Public Health), version 3.01, was used to calculate the sample size. This was calculated using a predicted prevalence of orthodontic pain of about 90% as was reported in past studies.[9] The assumed level of confidence was 95% and the margin of error was 5%. The estimation of the smallest size of sample size in the formula used to estimate the sample size in proportions was estimated as 138 participants, using the standard formula. A 10% contingency in case of non-response or missing respondents was included to give a final sample of 152 participants.

Participants were recruited using non-probability convenience sampling method. Patients who were present at their usual orthodontic follow-up visits in the course of the study were contacted one after the other and recruited until the desired sample size was obtained.

The patients were eligible provided they were in the range of 15 to 35 years of age, they were undergoing fixed orthodontic treatment using conventional stainless steel brackets, and had given at least three months of active orthodontic therapy. The study only involved the patients who were willing to participate and had informed consent. Patients were not eligible when they wore removable orthodontic appliances or other supplementary auxiliary appliances like bite plates, needed orthognathic surgery, had craniofacial anomalies or syndromes, were taking analgesic or anti-inflammatory medications during data gathering, or had systemic or neurological disorders that may affect pain perception.

A structured questionnaire whose administration occurred in the form of face-to-face interviews was used to gather data. The questionnaire was divided into three sections, including demographic data, pain scale, and oral health-related quality of life. The intensity of pain was measured by a Numeric Pain Rating Scale with a range of 0 (none) to 10 (the worst imaginable pain). The respondents were requested to mention the level of pain that they had felt after their last orthodontic adjustment. Oral health-related quality of life was measured using the validated Oral Health Impact sequel (OHIP-14) questionnaire, which was designed to measure the effect of oral conditions on functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap.[10] The questionnaire was administered to all participants in a supervised mode to ensure that it was clear and complete.

Data gathered were inputted and processed with the Statistical Package of Social Sciences (SPSS) version. Demographic characteristics, pain scores, and OHIP-14 scores have been summarized using descriptive statistics, which were presented as means, standard deviations, frequencies, and percentages. Inferential statistics were used to determine relationships among variables. The independent sample t-tests and one-way analysis of variance were employed in the comparison of mean pain and quality-of-life scores of various demographic and clinical groups as well. The relationship between the intensity of pain and scores of oral health-related quality of life was determined using the Pearson correlation coefficient. The p-value of less than 0.05 was regarded as statistically significant.

3. RESULTS

The participants in the study were 152 patients. Most of them were young adults between the ages of 21 and 25 years, with a slight majority of the females compared to the males. The duration of treatment among the participants was also varied, with the majority of patients having received a fixed orthodontic treatment ranging between three to twelve months. These characteristics are demographic and clinical, summarized in Table 1.

Participants generally experienced pain, with the majority of them stating that they felt moderate discomfort when having their orthodontics adjusted. A smaller percentage had either mild or severe pains, which shows the nature of individual pain. The overall effect of pain scores and oral health-related quality-of-life measures on daily functioning and well-being was moderate (Table 2). Analysis of the level of pain showed that the most common category was moderate pain, with the majority of patients reporting moderate levels of discomfort, but only a small number of patients reported severe levels of pain (Table 3).

Data analysis showed that gender and duration of treatment affected the extent of pain and quality-of-life outcomes. The women participants were found to report more pain and more decreases in oral health-related quality of life than the male participants. In the same manner, the patients who were in earlier stages of treatment by orthodontics reported the presence of more pain and severe effects on the quality of life than patients who were in late stages of orthodontic treatment. These patterns indicate the interdependence of personal factors, progression of treatment, and patient-reported results (Table 4).

Correlation analysis revealed that there existed a strong positive correlation between the intensity of the pain and the OHIP-14 scores, which indicated that the greater the pain, the greater the impairment on the daily activities and psychosocial well-being (Table 5). Domain-based measurement of OHIP-14 showed that physical pain, psychological discomfort, and functional limitation were the most impacted domains, whereas social disability and handicap were relatively less impacted (Table 6).

Table 1. Demographic and Clinical Characteristics of Participants (n = 152)

Variable	Category	n (%)
Age (years)	15–20	46 (30.3)
	21–25	58 (38.2)
	26–30	32 (21.1)
	31–35	16 (10.5)
Gender	Male	62 (40.8)
	Female	90 (59.2)
Duration of orthodontic treatment	3–6 months	54 (35.5)
	7–12 months	61 (40.1)
	>12 months	37 (24.3)

Table 2. Pain Intensity and Oral Health-Related Quality of Life Scores

Variable	Mean ± SD	Range
Pain score (NPRS)	5.12 ± 1.98	1–9
OHIP-14 total score	18.45 ± 7.63	4–38

Table 3. Distribution of Pain Severity Among Participants

Pain Severity (NPRS)	n (%)
Mild (1–3)	28 (18.4)
Moderate (4–6)	89 (58.6)
Severe (7–10)	35 (23.0)

Table 4. Comparison of Pain and OHIP-14 Scores According to Selected Variables

Variable	Category	Mean Pain Score ± SD	Mean OHIP-14 Score ± SD	p-value
Gender	Male	4.78 ± 1.89	16.92 ± 7.11	0.041*
	Female	5.36 ± 2.01	19.54 ± 7.81	
Duration of treatment	3–6 months	5.86 ± 1.94	22.10 ± 6.94	<0.001†
	7–12 months	5.09 ± 1.88	17.86 ± 7.21	
	>12 months	4.21 ± 1.73	14.02 ± 6.88	

* *Independent sample t-test*
† *One-way ANOVA*

Table 5. Correlation between Pain Intensity and Quality of Life

Variables	Pearson's r	p-value
Pain score vs OHIP-14 score	0.62	<0.001

Table 6. OHIP-14 Domain-Wise Mean Scores

Domain	Mean ± SD
Functional limitation	2.41 ± 1.21
Physical pain	3.92 ± 1.44
Psychological discomfort	3.35 ± 1.38
Physical disability	2.86 ± 1.29
Psychological disability	2.47 ± 1.18
Social disability	1.89 ± 1.05
Handicap	1.55 ± 0.98

4. DISCUSSION

In the current research, the experience of pain and oral health-related quality of life (OHRQoL) levels in patients receiving fixed orthodontic treatment were evaluated and revealing a mean intensity of 5.12 ± 1.98, with the majority of the participants experiencing moderate pain. This is consistent with the results of various modern studies that present moderate-to-high degrees of discomfort related to fixed appliance therapy. Li et al. (2023) found that fixed denture patients tended to have higher pain and worse OHRQoL than patients receiving clear aligners did, especially in the initial stages of treatment, which confirms the observation that fixed orthodontic therapy is inherently linked to apparent pain and effects of daily life.[6]

In comparison, Gao and colleagues (2021) discovered that patients undergoing conventional fixed appliance treatment reported more pain and anxiety during the first stage of treatment than those receiving clear aligner treatment, demonstrating that treatment modality has significant effects on patient experience.[11] These results support the idea that the structured forces of fixed systems may help to increase pain perception, a trend that is in line with our mean pain scores overall. Likewise, Correa et al. (2024) found that bracket systems had a substantial impact on OHRQoL during the first month of treatment, which highlights the disruptive nature of fixed appliances in the initial months of treatment on patient comfort.[12]

The current research revealed that the female patients experienced a higher score in terms of pain compared to male patients, which is in line with the literature. As an example, Naureen and Kiani (2025) have reported a substantial rise in the mean

pain scores after fixed appliance changes, with qualitative evidence indicating gender variation in the way pain is perceived and coped with.[13] Gender differences are not always reported, but these results indicate that experiences of pain during orthodontics could be manipulated by psychosocial factors.

In the quality of life, the overall OHIP-14 mean score of 18.45 ±7.63 demonstrates a moderate negative effect of fixed orthodontic treatment on everyday functioning. This is in agreement with self-reported OHRQoL outcomes in other cohorts. A 2024 study of Universitas Airlangga identified an average OHIP-14 score of 17.4 ± 8, with significant positive correlations among pain intensity and reduced OHRQoL, which is similar to our correlation results that found a significant relationship between higher pain scores and lower quality-of-life scores.[14]

The more important effect on the OHRQoL we have found in our research corresponds to the results of comparative research. A comparative study of traditional fixed braces and removable orthodontic aligners established that patients on the conventional fixed braces reported much more physical pain and poorer overall scores on OHIP-14, which suggests that appliance design has a role to play in the perceived quality of life of a patient.[15] Besides that, a new study carried out on the effects of clear aligners versus fixed brackets indicated that aligner patients had less pain and a more positive OHRQoL profile, especially concerning the domains that involved physical comfort and everyday activities. Such comparisons serve as consistent evidence of the conclusion that the use of fixed appliances is correlated with higher immediate discomfort and quality-of-life disturbances compared with newer aligner technologies.[16]

Our findings are also supported by the studies that explicitly investigate the changes over time. The longitudinal clinical study of 2023 found that the pain symptoms and OHRQoL scores were likely to be the highest in the first week of fixed appliance treatment and then steadily improve, which is consistent with our perceptions of the pain dynamics after orthodontic adjustments.[17] Similarly, cross-sectional data of an Egyptian cohort reported in 2021 revealed that orthodontic patients with fixed dentistry also demonstrated serious malfunctions in functional and psychological OHIP directions, which strengthens the multidimensional nature of pain beyond the sensation of the physical state.[18]

Although the negative effects of marijuana continue to be witnessed, other studies highlight that the effects are mostly short-lived. The systematic review by li et al. found that, despite the poorer OHRQoL that is related to the use of fixed appliance treatment in early stages of treatment, the differences in both the fixed and clear aligner treatments reduced with time as the patients adjusted. Correspondingly, the 2024 prospective pilot study performed on data reported significant changes in OHRQoL during the first month, but no persistent anxieties between fixed and aligner groups, which indicates that psychosocial effects might be decreased because of adaptation to treatment over the course of treatment.[12] Lastly, even though most of the new researches are conducted on populations of adults, mixed age-group studies have also supported the pain-related quality-of-life reduction with the help of the measures. As an example, the meta-analytic study by Li et al. incorporated heterogeneous age groups and remained consistent that fixed appliance therapy hurt the OHRQoL at early treatment phases in various studies.[6]

In general, the findings of the current study can be substantiated by the modern evidence of 2021-2025, which, taken collectively, prove that fixed orthodontic treatment is linked to clinically significant pain and adverse quality of life effects, especially in the initial stages of treatment and in subgroups with higher levels of pain. These lessons contribute to the significance of thorough pain management and counseling of the patient to reduce the level of discomfort and enhance the overall treatment experience.

5. LIMITATIONS

Some limitations of this study must be taken into account when interpreting the findings. One, the cross-sectional design did not allow for making any causal relationships, and assessing pain experience and quality of life changes at various phases of orthodontic treatment. Pain perception and oral health-related quality of life are dynamic processes likely to change over time, when adjusting their appliances, and when patients adapt to them, which could not be measured at a single-time factor. Second, self-reported questionnaires could have resulted in the risk of reporting and recall bias because the perception of pain is subjective and is determined by psychological and cultural influences. Third, the research used a convenience sampling method and was performed at one center, which can restrict the ability to generalize results to more significant populations. Also, the possible confounding variables, including anxiety levels, coping with pain methods, the type of archwires, and personal pain levels, have not been analyzed. Lastly, they provided no comparison across the various orthodontic modalities, i.e., clear aligners and self-ligating systems, which could have offered a greater understanding of the differences between the pain and quality-of-life outcomes.

6. CONCLUSION

The results of this research point to the fact that pain is a prevalent and influential cardinal experience in patients who have been undergoing fixed orthodontic therapy and that it has a quantifiable adverse effect on the quality of life based on oral health. The majority of patients had moderate pain, especially with respect to physical comfort, psychological, and functional. The results indicated that the intensity of pain is strongly positively associated with the decrease in the quality-of-life measurements, which stresses the necessity of managing pain as a part of orthodontic treatment. The findings are a reminder of the importance of orthodontists to use a patient-centered approach, offering them sufficient pre-treatment counseling, pain

management strategies, and constant reassurance during the treatment. Through awareness and effective prevention of issues related to pain, clinicians can improve the compliance, satisfaction, and overall experience of treatment by patients and eventually improve the therapeutic outcomes and quality of life of orthodontic patients..

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