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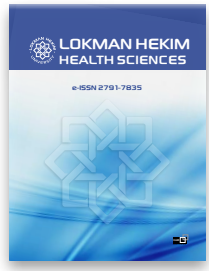

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ORIGINAL ARTICLE

The Impact of Orthodontic Treatment Choice on Quality of Life and Parent/Caregiver Perception in Adolescent Patients: Clear Aligners or Fixed Appliances?

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Abstract

Introduction: This study aimed to compare the effects of traditional fixed orthodontic treatment and clear aligner therapy on the satisfaction levels of adolescent patients and their parents/caregivers.

Methods: Data were prospectively collected from children aged 12–18 years diagnosed with malocclusion. Participants were divided into two equal groups: Group A received traditional fixed orthodontic treatment, and Group B received clear aligner therapy. At the end of treatment, the COHIP-SF19 questionnaire was administered to the children, the P-CPQ to their parents/caregivers, and the FIS-8 to their parents. Data were analyzed using SPSS version 27.0.

Results: This study included 114 children; group A consisted of 57 children and group B 57. Children treated with clear aligners had significantly lower COHIP-SF19 scores compared to those treated with fixed appliances (Median: 14.0 vs. 33.0, $p<0.001$). Similarly, P-CPQ scores were lower in the clear aligner group (Median: 6.0 vs. 12.0, $p<0.001$). FIS-8 scores were also significantly lower in the clear aligner group (Median: 4.0 vs. 10.0, $p = 0.001$).

Discussion and Conclusion: Clear aligner therapy was associated with improved oral health-related quality of life in adolescent patients and more positive perceptions among parents/caregivers compared to fixed orthodontic treatment. Lower scores across all scales in the clear aligner group may reflect advantages in aesthetics, comfort, and ease of maintaining oral hygiene.

Keywords: Adolescent orthodontics; Clear aligners; Fixed orthodontic treatment; Malocclusion; Quality of life; Parental/Caregiver satisfaction

Malocclusion is a common and multifactorial oral health condition that results from interactions among anomalies in the shape, size, and position of the maxilla and mandible, occlusal relationship disorders between the jaws, and skeletal deformities of the face.[1,2]

The traditional fixed orthodontic treatment, long regarded as the standard approach to correcting malocclusion, is an effective method that aims to control tooth movement using brackets and archwires. However, this treatment modality has been criticized due to aesthetic concerns,

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difficulties in maintaining oral hygiene, and limited patient comfort. In recent years, clear aligner therapy has been increasingly preferred among children and adolescents as an alternative developed to overcome these limitations.[3]

This modern treatment approach, which does not involve brackets or wires, has been developed through the integration of multidisciplinary fields such as computer-aided design (CAD), rapid prototyping technologies, dentistry, and biomedical engineering.[4,5] The positions of teeth can be simulated with high precision using three-dimensional digital models, allowing the biomechanical planning process to be conducted with great accuracy.[6] These advantages of accuracy and predictability offered by clear aligner technology have led to its widespread adoption in contemporary orthodontic practice.[3,7]

Orthodontic treatments should be evaluated not only based on their success in correcting occlusal irregularities but also in terms of how they influence the individual's overall quality of life. In children who are still developing, oral and dental health plays a vital role not only in physiological processes but also in shaping social interactions, psychological balance, and functional abilities.[8] Therefore, assessing how orthodontic treatment affects the quality of life in adolescent patients necessitates a comprehensive and multidimensional approach.

In recent years, validated self-reported measurement tools developed within this context have allowed for the inclusion of patient-centered evaluations alongside clinical findings.[9] Nonetheless, existing literature includes only a few studies that directly compare the impacts of fixed braces and clear aligner systems on the oral health-related quality of life (OHRQoL) of children. Most existing studies either focus on a single treatment modality or are conducted in adult populations.[4] Yet, the success of orthodontic treatment is closely associated not only with the clinician's technical competence but also with the child's motivation towards treatment, the family's support throughout the process, and the perceived burden of the treatment.

In this regard, this study is designed to evaluate and contrast the outcomes of fixed braces and clear aligner systems on the satisfaction levels of adolescent patients and their parents. The study seeks to analyze not only the clinical outcomes of these two different orthodontic approaches used in the treatment of malocclusion but also their psychosocial effects based on patient and family perceptions.

Materials and Methods

Study Design

The research was carried out at a single center, a prospective, comparative clinical investigation between May 2022 and May 2023 at a private dental clinic located in Ankara, Türkiye. The study received approval from the Clinical Research Ethics Committee of Gazi University (approval no: 2022.08-01, date: 21.04.2022) and was carried out in strict accordance with the ethical principles outlined in the Declaration of Helsinki (2013). All participants and their parents or caregivers received comprehensive information regarding the study, and written informed consent was obtained before enrollment. This study was designed to assess the OHRQoL of adolescent patients treated with clear aligners or fixed orthodontic appliances, as well as to examine the satisfaction levels of parents/caregivers throughout the treatment process.

Participant Selection

The study was conducted using data from children diagnosed with malocclusion and aged 12–18 years.

Participants were categorized into two groups according to the orthodontic treatment method they received:

Group A: The children receiving traditional fixed orthodontic treatment.

Group B: The children receiving clear aligner therapy.

Inclusion Criteria

- Availability of an informed consent form signed by the parents or guardians,
- Absence of any systemic diseases in participants,
- Presence of a clinical indication requiring orthodontic treatment,
- Initiation of either fixed orthodontic or clear aligner therapy,
- Regular follow-up throughout the treatment process,
- Absence of any mental or psychological disorders.

Exclusion Criteria

- Voluntary withdrawal from participation at any stage of the treatment process,
- Presence of severe oral-dental diseases or advanced periodontal problems,
- History of cognitive or psychiatric disorders,
- Diagnosis of severe systemic illness,
- Presence of harmful oral parafunctional habits.

Table 1. Baseline characteristics and distribution of IOTN–DHC grades between treatment groups

Variable	Clear aligners (n=57)	Fixed appliances (n=57)
Age (years), mean±SD	15.2 ± 1.3	15.4 ± 1.2
IOTN–DHC grades, n (%)		
Grade 1–2 (no or little need)	11 (20%)	17 (30%)
Grade 3 (borderline need)	37 (65%)	34 (60%)
Grade 4–5 (definite need)	9 (15%)	6 (10%)

IOTN–DHC: Index of Orthodontic Treatment Need – Dental Health Component.

Data Collection and Sample Size

All patients were monitored through regular clinical follow-ups during the treatment period. Upon completion of the treatment, the Child Oral Health Impact Profile – Short Form 19 (COHIP-SF19) was administered to the children, while the Family Impact Scale – 8 Item Short Form (FIS-8) and the Parental-Caregiver Perceptions Questionnaire (P-CPQ) were administered to their parents. The P-CPQ was applied to the caregivers of the children as well. The average treatment duration was approximately 1.5 to 2 years for the clear aligner group and around 3 years for the fixed appliance group. All orthodontic procedures, including both fixed appliances and clear aligner treatments, were performed by the same experienced orthodontist to ensure consistency in treatment protocols and reduce inter-operator variability.

In this study, the baseline severity of malocclusion was assessed using the Dental Health Component of the Index of Orthodontic Treatment Need (IOTN-DHC), originally introduced by Brook and Shaw.[10] This index classifies treatment need according to the most significant occlusal characteristic observed in the patient. Within this system, Grade 1 represents no treatment need, Grade 2 indicates a minor need, Grade 3 corresponds to a borderline need, while Grades 4 and 5 identify individuals with a considerable requirement for orthodontic intervention. To ensure interrater reliability, all IOTN-DHC evaluations were independently reviewed by a second examiner. The outcomes of this comparison are summarized in Table 1.

Before the initiation of the study, an a priori power analysis was conducted using G*Power software (version 3.1.9.7). Due to the limited data available on the comparison of OHRQoL outcomes between clear aligners and fixed orthodontic appliances in adolescent populations, we referred to the cross-sectional study by Azaripour et al.,[11] which examined gingival parameters and patient satisfaction in individuals treated with either fixed appliances or Invisalign®. This study reported a moderate effect size for the outcomes assessed. Based on this reference, we adopted a moderate effect size (Cohen's f = 0.25), with a significance level (α) of 0.05 and a power (1–β) of 0.80. The minimum required sample size for a comparison between two independent groups was calculated as 102 participants. Our study included 114 participants, with 57 individuals in each group, thereby achieving sufficient statistical power to detect meaningful differences.

Treatment Procedures

Before treatment, all participants underwent routine panoramic radiographs, and professional ultrasonic dental cleaning was performed to ensure standardized oral hygiene conditions.

Group A – Traditional Fixed Orthodontic Treatment

The participants in this group were treated with conventional straight-wire metal brackets (0.022″ × 0.028″ slot, MBT prescription; 3M Unitek, Monrovia, CA, USA). Following acid etching and air drying, brackets were bonded to the tooth surfaces using composite adhesive. The archwire sequence included 0.014″ and 0.016″ NiTi wires in the initial stages, followed by 0.017×0.025″ NiTi and 0.019×0.025″ stainless steel archwires for progressive tooth movement. Based on individual treatment requirements, auxiliary mechanics such as Hyrax Rapid Maxillary Expansion (RME), temporary anchorage devices (TADs), and intermaxillary elastics were applied. The treatment progress was then evaluated through monthly follow-up visits.

Group B – Clear Aligner Therapy

Each participant's treatment plan was digitally prepared using three-dimensional intraoral scanners and treatment planning software. Clear aligners (Invisalign®, Align Technology Inc., San Jose, CA, USA) fabricated from SmartTrack® material were used. Standard Invisalign® protocols, including the placement of composite attachments and interproximal reduction (IPR), were followed where necessary. Aligner changes were scheduled biweekly, and patients were monitored during monthly clinical visits. In selected cases, Mandibular Advancement (MA) features and TADs were incorporated to support sagittal correction and provide additional anchorage.

Questionnaires and Scales Used

In this research, three well-established and reliable scales were utilized to evaluate both the OHRQoL of adolescent patients and their parents' perceptions of the treatment process.

Table 2. Median scale scores according to orthodontic treatment groups

Scale	Clear aligners median (IQR)	Fixed appliances median (IQR)	Clear aligners Min–Max	Fixed appliances Min–Max	U	p	r
COHIP-SF19	14.0 (10.0)	33.0 (21.0)	0–60	8–50	549.5	<0.001	0.571
P-CPQ	6.0 (7.0)	12.0 (7.0)	0–20	0–20	785.5	<0.001	0.445
FIS-8	4.0 (4.0)	10.0 (10.0)	0–17	0–20	1083.0	0.001	0.287

Statistical test: Mann–Whitney U test. Values are presented as median (interquartile range, IQR) and minimum–maximum. Effect size (r) calculated as Z/√N.

Child Oral Health Impact Profile – Short Form 19 (COHIP-SF19)

In this study, three validated instruments were employed to assess how adolescent patients perceive their oral health status and how their parents evaluate the treatment process.

One of these tools, the Child Oral Health Impact Profile - Short Form 19 (COHIP-SF19), was specifically adapted for adolescent use and consists of 19 items categorized into the following domains: Oral health, Functional status and psychosocial status.

Responses are recorded using a Likert scale with five response options, ranging from "never" (0) to "almost always" (4). The cumulative score spans between 0 and 76, where higher scores correspond to a more negative perception of oral health. The Turkish version of this scale, verified for reliability and validity, was adapted by Tuğcu in 2020.[12]

Parent-Caregiver Perception Questionnaire (P-CPQ)

The P-CPQ is a validated instrument designed to capture parents' and caregivers' perceptions of their children's OHRQoL. In this study, the abbreviated 8-item version (P-CPQ-8) was employed. The scale comprises four primary subdomains: Pain, functional limitations, emotional status and social status.

Each item is rated using a five-point Likert scale ranging from 0 to 4. Higher scores indicate that parents or caregivers perceive the child's oral health as having a more substantial adverse effect on their overall quality of life. Notably, a recent Turkish study validated the Turkish adaptation of the P-CPQ, confirming that the scale's subdomains demonstrated robust internal consistency among children aged between 6 and 14 years.[13]

Family Impact Scale (FIS-8)

The FIS-8 was developed to assess the impact of children's oral health problems on the daily lives of family members. The scale consists of 8 items and focuses on the following domains: Emotional well-being of the family, daily time management, social life and family roles.

The scale is scored using a Likert scale (0–4), and the total score ranges from 0 to 32. Higher scores indicate a greater burden experienced by the family. The FIS-8 is a short version of the Impact on Family Scale (IPFAM), which has been validated and tested for reliability in Turkish.[14]

Statistical Analysis

The statistical analysis in this study was performed using IBM SPSS Statistics for Windows, Version 27.0 (IBM Corp., Armonk, NY, USA). To evaluate the normality of continuous variables was assessed through the Shapiro-Wilk test. Variables conforming to a normal distribution were analyzed using parametric tests, while non-parametric methods were applied for those that deviated from normality. Results for normally distributed variables were reported as mean±standard deviation, and those without normal distribution were described using median values alongside their minimum and maximum ranges.

As the scores from the COHIP-SF19, P-CPQ, and FIS-8 scales were not normally distributed, comparisons between groups for these variables were conducted using the Mann-Whitney U test.

For all statistical analyses, a p-value below 0.05 was regarded as indicative of statistical significance.

Results

The study was conducted using data from a total of 114 children aged 12–18 years who had been diagnosed with malocclusion. Participants aged between 12 and 18 years were included in the study. The mean age was 15.2±1.3 years in the clear aligner group and 15.4±1.2 years in the fixed appliance group. Half of the patients underwent traditional fixed orthodontic treatment (Group A, n=57), while the other half received clear aligner therapy (Group B, n=57).

Scale Scores According to Orthodontic Treatment Groups

The perceptions of both adolescent patients and their families regarding the treatment process in each group

Table 3. Comparison of COHIP-SF19 subdomain scores between clear aligners and fixed appliances

Subdomain	Clear aligners median (IQR)	Fixed appliances median (IQR)	Clear aligners Min–Max	Fixed appliances Min–Max	U	p	r
Psychosocial well-being	6.0 (4.5–8.5)	13.0 (7.0–17.0)	0.0–12.0	0.0–27.0	570.5	<0.001	0.427
Functional well-being	1.0 (0.0–2.0)	5.0 (2.0–8.0)	0.0–4.0	0.0–16.0	415.5	<0.001	0.520
Oral Health	4.0 (2.0–6.0)	8.0 (5.0–11.0)	0.0–10.0	1.0–18.0	537.0	<0.001	0.447

Statistical test: Mann–Whitney U test. Values are presented as median (interquartile range, IQR) and minimum–maximum. Effect size (r) calculated as Z/√N. Positive r values indicate higher scores in the Fixed Appliances group.

Table 4. Comparison of P-CPQ subdomain scores between clear aligners and fixed appliances

Subdomain	Clear aligners median (IQR)	Fixed appliances median (IQR)	Clear aligners Min–Max	Fixed appliances Min–Max	U	p	r
Pain	2.0 (2.8)	3.0 (2.0)	0–6	0–7	814.5	<0.05	0.420
Functional limitations	0.0 (2.0)	3.5 (2.0)	0–7	0–8	722.5	<0.05	0.469
Emotional well-being	0.5 (2.8)	3.0 (3.0)	0–8	0–8	1016.0	<0.05	0.312
Social well-being	0.0 (1.0)	1.0 (3.0)	0–8	0–7	1200.5	<0.05	0.214

Statistical test: Mann–Whitney U test. Medians are presented with interquartile ranges (IQR) and minimum–maximum values. Effect size (r) calculated as Z/√N. Positive r values indicate higher scores in the Fixed Appliances group.

were assessed using the COHIP-SF19, P-CPQ, and FIS-8 scales. The median scores of the relevant measurements are presented in Table 2. According to the data presented in Table 2, COHIP-SF19, P-CPQ, and FIS-8 scores of children who received clear aligner therapy were significantly lower compared to those who were treated with fixed orthodontic appliances

Comparison of COHIP-SF19 Scores

When comparing the total COHIP-SF19 scores between the groups, the Mann-Whitney U test was applied due to the non-normal distribution of the data.

The statistical comparisons identified a highly significant distinction between the groups ($p<0.001$). Children treated with clear aligners reported more favorable perceptions regarding their overall oral health and well-being.

Comparison of P-CPQ Scores

Similarly, since the data were not normally distributed, the Mann-Whitney U test was used to compare total P-CPQ scores.

Statistical comparisons identified a highly significant distinction between the groups ($p<0.001$), indicating that clear aligner therapy was perceived more positively by parents/caregivers.

Comparison of FIS-8 Scores

For the comparison of total FIS-8 scores, the Mann-Whitney U test was applied, as the data in both groups did not follow a normal distribution.

Statistical analysis revealed a significant difference between the groups ($p=0.001$). This finding indicates that clear aligner therapy has a less negative impact on family life compared to fixed orthodontic treatment.

Subdomain Analysis of COHIP-SF19, P-CPQ, and FIS-8

To provide a more nuanced understanding of the specific domains affected by different orthodontic treatment modalities, subdomain-level analyses were conducted using COHIP-SF19, P-CPQ, and FIS-8 instruments. The results are presented in Table 3, Table 4, and Table 5, respectively.

According to the COHIP-SF19 subdomain scores (Table 3), clear aligner users demonstrated significantly better outcomes in psychosocial well-being, functional status, and oral health perception compared to those treated with fixed appliances. The most pronounced difference was observed in the functional well-being domain, indicating that clear aligners may exert a less negative impact on children's daily functional abilities during treatment.

Table 5. Comparison of FIS-8 subdomain scores between clear aligners and fixed appliances

Subdomain	Clear aligners median (IQR)	Fixed appliances median (IQR)	Clear aligners Min–Max	Fixed appliances Min–Max	U	p	r
Emotional well-being	1.0 (1.0)	2.0 (2.0)	0.0–3.0	0.0–4.0	710.5	<0.001	0.318
Daily time management	1.0 (1.0)	1.0 (2.0)	0.0–3.0	0.0–4.0	959.0	<0.05	0.167
Social life	0.0 (0.0)	1.0 (2.0)	0.0–1.0	0.0–4.0	655.0	<0.001	0.352
Family roles	0.0 (1.0)	1.0 (2.0)	0.0–4.0	0.0–4.0	976.5	<0.05	0.156

Statistical test: Mann–Whitney U test. Medians are presented with interquartile ranges (IQR) and minimum–maximum values. Effect size (r) calculated as Z/√N. Positive r values indicate higher scores in the Fixed Appliances group.

P-CPQ subdomain analysis (Table 4) similarly revealed that parents or caregivers of children treated with clear aligners reported lower negative impacts across all domains—pain, functional limitations, emotional well-being, and social well-being. These results suggest that clear aligner therapy may be perceived by families as less disruptive to children's daily comfort and emotional stability.

The FIS-8 results (Table 5) indicated that the overall burden on families was lower for the clear aligner group. Specifically, clear aligners were associated with less interference in family emotional well-being, daily time management, social activities, and family roles. These findings underscore the broader social advantages of clear aligner therapy, not only for patients but also for their families.

Collectively, these subdomain-level findings provide further evidence that clear aligner therapy may offer meaningful quality-of-life benefits over conventional fixed appliances, particularly in psychosocial and emotional domains.

Discussion

This study evaluated the effects of clear aligner therapy versus traditional fixed orthodontic treatment on the OHRQoL of adolescent patients and their families' perceptions of the treatment process. Our findings demonstrate that clear aligner therapy has a more positive impact on children's quality of life compared to traditional fixed orthodontic treatment. The results obtained from the COHIP-SF19 scale demonstrated significantly lower scores in children treated with clear aligners, indicating a better OHRQoL and suggesting that this treatment modality offers greater advantages from the patient's perspective. This finding aligns with previous studies in the literature. For example, in a retrospective study by Shen et al.,[15] OHRQoL and patient satisfaction were significantly higher in the clear aligner group, with overall satisfaction rates reported as 98.25% for clear aligners and 69.64% for fixed orthodontic appliances.

Similar outcomes were observed in the P-CPQ and FIS-8 scores reported by the parents of children in the clear aligner group, indicating a lower psychosocial burden on families in this group. The validity and reliability of the COHIP-SF19, P-CPQ, and FIS-8 scales used in this evaluation process have been confirmed by numerous previous studies.[3,9,11,12,14,15] The results obtained are consistent with the literature, which also highlights that clear aligners enhance patient satisfaction due to their aesthetic, comfort, and hygiene benefits.[15,16] Particularly in growing children, it is emphasized that the choice of orthodontic treatment should not be limited to clinical outcomes alone but must also consider the psychosocial and daily life impacts of the treatment.[7,17]

Furthermore, the more favorable P-CPQ and FIS-8 scores observed in the clear aligner group in terms of parental perceptions suggest that clear aligners are more easily integrated into daily family life. This may be attributed to the removable nature of clear aligners and the ease with which they provide in maintaining oral hygiene.[18]

Another important finding of this study is the difference in parental satisfaction between orthodontic treatment modalities. In fixed orthodontic treatments, difficulties in maintaining oral hygiene, aesthetic concerns, soft tissue irritations, and reduced comfort during eating can lead to both physical and psychosocial discomfort in adolescent patients. Consequently, families perceive the treatment process as more challenging. This finding is consistent with the results reported by Sonbol et al.[19] in their 2018 study.

Similarly, a systematic review conducted by Kaklamanos et al.[20] in 2023 reported that clear aligner therapy may be associated with better OHRQoL scores compared to traditional fixed appliances. In line with this, a cross-sectional study by Qi Wang et al.[21] demonstrated that children and adolescents undergoing clear aligner treatment had significantly better scores in the subdomains of functional limitations, emotional well-being, and social well-being, as

well as in overall quality of life, when compared to those treated with fixed orthodontic appliances. These findings align with the outcomes of our study, where both child and parent perceptions revealed more favorable quality of life scores in the clear aligner group. Notably, the subdomain analyses of the COHIP-SF19, P-CPQ, and FIS-8 instruments further support this result.

It is important to note that, at the beginning of treatment, the severity of malocclusion was higher in the clear aligner group compared to the fixed appliance group. Despite this, both groups reached optimal occlusal and aesthetic outcomes after treatment. Therefore, the advantages observed in OHRQoL among aligner users are not attributable to less severe initial malocclusions but rather highlight the inherent benefits of clear aligner therapy in terms of comfort, hygiene, and the patient-centered nature of treatment.

In a systematic review published by D'Antò et al.[18] in 2025, it was reported that children and adolescents undergoing clear aligner therapy demonstrated better oral hygiene compliance, lower gingival index scores, and more favorable short-term periodontal outcomes. These findings are consistent with the positive feedback observed in our study from participants in the clear aligner group compared to those treated with fixed appliances. The ease of oral care and improved gingival health associated with aligners appear to be key factors contributing to higher satisfaction levels among both children and their parents.

Studies comparing clear aligners and fixed orthodontic appliances in the literature have reported significant differences in terms of pain and comfort.[22,23] A systematic review further demonstrated that patients treated with clear aligners experienced reduced use of analgesics, less soft tissue irritation, and more comfortable eating behaviors.[24] These findings align with the results of our study, in which both children and their parents in the clear aligner group reported more favorable OHRQoL scores.

Studies comparing clear aligners and fixed orthodontic appliances have also highlighted notable differences in treatment duration.[22,25,26] Findings in the literature suggest that clinical chair time is significantly shorter in the clear aligner group. Additionally, there is evidence indicating that overall treatment time tends to be shorter with clear aligners compared to fixed appliances.[22] This observation is consistent with our study results, where the clear aligner group exhibited a shorter average treatment duration, suggesting that this method may offer a time-efficient advantage for both patients and their families.

Limitations

This study has several limitations. Firstly, although adjunctive mechanics such as Rapid Maxillary Expansion (RME), Mandibular Advancement (MA), and temporary anchorage devices (TADs) were used according to clinical needs and reflect real-world orthodontic practice, their presence may have influenced patient experiences and thus affected the OHRQoL outcomes. Secondly, the study was conducted at a single center with a relatively short follow-up period, which may restrict the generalizability of the results and fail to capture long-term changes in OHRQoL. Additionally, potential confounding factors—such as socioeconomic status, baseline malocclusion severity, and patient compliance—may have influenced the findings despite efforts to minimize them through initial interviews and standardized treatment planning. Future multicenter studies with longer observation periods and more diverse samples are necessary to validate and expand upon these results, allowing for a more comprehensive understanding of the factors affecting OHRQoL in adolescent orthodontic patients.

Conclusion

This study comparatively evaluated the effects of traditional fixed orthodontic treatment and clear aligner therapy on OHRQoL and treatment satisfaction in adolescent patients and their parents. Clear aligner therapy yielded more favorable outcomes for patient quality of life, parental perception, and family functioning, with lower psychosocial burden reported by parents. In conclusion, clear aligners can be considered an effective, patient-centered alternative, particularly in adolescent cases where aesthetics and comfort are prioritized.

In order to enhance the applicability of the present results and achieve more comprehensive insights into the psychosocial effects of clear aligner therapy across different age ranges, future studies should include larger cohorts and longer follow-up periods.

Ethics Committee Approval: The Gazi University Faculty of Dentistry Ethics Committee granted approval for this study (date: 21.04.2022, number: 2022.08-01).

Informed Consent: Written informed consent was obtained from all participants and their parents or caregivers.

Conflict of Interest: None declared.

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