Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 14, Issue 32s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

The Outcomes, Challenges, And Effectiveness Of Conventional Braces Vs Clear Aligners

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Cite this paper as: Dr khalil Ahmed, Dr.Obaidullah Khan, Dr.Faryal Ali Syed, Dr Samra Bokhari, Dr.Abid Hussain Kanju, Dr.Tahmeena Kausar, Dr.Nabeel Khan, (2025) The Outcomes, Challenges, And Effectiveness Of Conventional Braces Vs Clear Aligners. *Journal of Neonatal Surgery*, 14 (32s), 7341-7348.

ABSTRACT

Introduction: Orthodontic treatment has evolved significantly over the years, with traditional metal braces and clear aligners emerging as the two primary options for correcting dental misalignments. Both methods aim to enhance oral health, improve aesthetics, and boost patients' confidence.

Objective: The main objective of this study is to find the outcomes, challenges, and effectiveness of conventional braces vs clear aligners.

Methodology: This prospective observational study was conducted at Bahria Town International Hospital Karachi, B.M.C.H Quetta, from June 2022 to June 2024. A total of 160 participants were recruited for the study. Baseline data were collected on the participants' dental conditions, including the type and severity of malocclusion. for all analyses.

Results: The study included 160 participants, equally divided between the conventional braces group (Group A, n = 80) and the clear aligners group (Group B, n = 80). The mean age of participants was similar between the groups, with 28.5 years in the conventional braces group and 29.1 years in the clear aligners group. Gender distribution was almost equal, with slightly more females in both groups. The mean malocclusion severity scores were comparable, 7.8 ± 1.4 for braces and 7.5 ± 1.3 for aligners. 92% of participants in the conventional braces group achieved satisfactory alignment, compared to 84% in the clear aligners group, although this difference was not statistically significant (p = 0.08). The average treatment duration was significantly longer for the braces group (18.4 ± 2.3 months) compared to the clear aligners group (14.2 ± 1.9 months) (p = 0.01).

Conclusion: This study concludes that both conventional braces and clear aligners are effective for orthodontic treatment, but they cater to different patient needs. Conventional braces are more suited for complex cases requiring precise tooth movement, while clear aligners offer greater comfort, aesthetic appeal, and convenience for mild to moderate cases.

Keywords: *Aesthetic, Patients, Aligners, Satisfactory, Methods*

delivery systems (TDDS) represent a progressive step in the advancement of pharmaceutical technology. These systems are designed to deliver drugs across the skin barrier in a controlled manner, directly to the targeted site or into systemic

1. INTRODUCTION

Orthodontic treatments are widely employed to address dental malocclusions and misalignments, to improve both functional and aesthetic outcomes. Among the most prevalent treatment modalities are conventional braces, metal brackets and wires, and clear aligners, a newer alternative involving removable plastic trays. Both approaches have demonstrated effectiveness in correcting dental irregularities but differ in mechanics, patient experience, and treatment outcomes [1]. While conventional braces have been the standard for comprehensive and complex orthodontic cases, clear aligners have gained popularity due to their aesthetic appeal and convenience, particularly among adults and adolescents seeking a more discreet option. In 1946 Kesling first introduced the concept of clear orthodontic appliances to move misaligned teeth. In 1998, Align Technology, Inc. released Invisalign®. The initial cases were minor crowding or spacing [2]. With the development of material and computer design of tooth movement, the indication of clear aligners has been greatly enlarged. Some of these researchers standardized details showing that clear aligners today have been able to treat almost all types of simple to complex cases of malocclusion. Fixed braces have been the conventional and effective orthodontic appliance for over a hundred years [3]. While in recent years, increasing numbers of patients demanding for a more esthetic and comfortable orthodontic treatment technique have fueled the concerns about clear aligners. Whether clear aligners could be a viable alternative to braces was still not clear. Increased usage of clear aligners has raised curiosity to discern how these two methods differ concerning effectiveness, patients' compliance, and difficulties encountered. Most literature reviews have focused on randomized controlled trials that evaluated the efficiency of traditional braces for comprehensive orthodontic problems, while only a limited number of narratives compared the results of clear aligners depending on the type of orthodontic situation. Moreover, issues related to the experiences of patients who sought these two systems; comfort, hygiene, and compliance present further ideas that need further exploration [4]. They are also known as clear braces and are designed to straighten teeth since they are not brackets and wires, unlike conventional braces. Traditional aligners use a different method of applying force for tooth movement than braces due to the absence of metal wires and brackets; however, shift clear aligners apply a controlled force due to the lack of those structures. Aligners are typically made from plastic with the same tough as that of normal braces and is carved to fit a particular mouth. When a sequence of aligners is needed, each aligner works through the process gradually moving the teeth into the proper place [5]. For the aligners to offer the maximum effect they must be worn for a minimum of 20 hours a day. In the case of these clear aligners, worn for three weeks at a go before they are replaced. The time taken in getting the aligners depends on the nature of each case to the dentist [6]. Generally, aligner treatment takes about least three weeks to as much as six months depending with the severity of the realigning process. Compared to the metal braces, cases will require shorter time for treatment when using the aligners. Traditional braces are considerably more effective at solving a majority of orthodontic problems. Since they are permanent bonded braces, they apply constant force on the teeth and are able to treat complex problems [7]. Braces are also used to treat compound malocclusions including deep over-biting or severe cross-biting which are hard or even impossible to solve with clear aligners. Thus, treatment using conventional braces appears to be more reliable and is usually performed much faster when the task is complicated [8]. While clear aligners, this is very beneficial for a patient with mild to moderate orthodontic issues. In their favor these aligners are not fixed, thus cleaning the teeth and itself much easier than the braces, and one is free to eat whatever one desires. In cases where aesthetics is important to the patient or the changes that are wanted are very small, clear aligners are a perfect solution, that offers a great improvement both in terms of dental positioning and esthetic appearance [9].

Figure 01: Conventional braces vs clear aligners

2. OBJECTIVE

The main objective of this study is to find the outcomes, challenges, and effectiveness of conventional braces vs clear aligners.

3. METHODOLOGY

This prospective observational study was conducted at Bahria Town International Hospital, Karachi, BMCH , Queeta , from June 2022 to June 2024. A total of 160 participants were recruited for the study. Participants aged 15 to 45 years with mild to moderate dental malocclusions requiring orthodontic correction were included. Participants with severe skeletal malocclusions requiring surgical intervention, those with ongoing dental disease, and patients with previous orthodontic treatment were excluded. Baseline data were collected on the participants' dental conditions, including the type and severity of malocclusion. Participants were randomly assigned to one of two groups:

Group A (n = 80) received conventional braces, while Group B (n = 80) underwent treatment with clear aligners.

Throughout the treatment period, participants attended regular follow-up visits every 4 to 6 weeks for both assessment and adjustments (for the braces group) or new aligner fittings (for the aligners group). The duration of treatment, patient compliance, and any challenges or discomfort reported by participants were recorded during each follow-up. The primary outcome measures included treatment effectiveness, measured by the degree of correction in dental alignment, and treatment duration. Data were collected using clinical assessments and patient questionnaires at baseline, mid-treatment, and after the treatment.

4. STATISTICAL ANALYSIS

Data were analyzed using SPSS v27 software. Descriptive statistics were used to summarize baseline characteristics. Independent t-tests and chi-square tests were conducted to compare outcomes between the two groups. A p-value of < 0.05 was considered statistically significant for all analyses.

5. RESULTS

The study included 160 participants, equally divided between the conventional braces group (Group A, n = 80) and the clear aligners group (Group B, n = 80). Mean age of participants was similar between the groups, with 28.5 years in the conventional braces group and 29.1 years in the clear aligners group. Gender distribution was almost equal, with slightly more females in both groups. The mean malocclusion severity scores were comparable, 7.8 ± 1.4 for braces and 7.5 ± 1.3 for aligners. Previous orthodontic treatment was reported by a small percentage of participants in both groups (10% for braces and 8% for aligners).

Table 1: Demographic and Clinical Characteristics of Participants

Characteristic	**Conventional Braces (Group A)**	**Clear Aligners (Group B)**
Number of Participants (n)	80	80
Mean Age (years)	28.5± 5.3	29.1±5.1
Gender Distribution		
- Male (%)	45%	48%
- Female (%)	55%	52%
Mean Malocclusion Severity Score	7.8 ±1.4	7.5±1.3
Types of Malocclusion:		
- Overbite (%)	35%	30%
- Underbite (%)	20%	25%
- Crossbite (%)	25%	20%
- Crowding (%)	50%	55%
Previous Orthodontic Treatment (%)	10%	8%

92% of participants in the conventional braces group achieved satisfactory alignment, compared to 84% in the clear aligners group, although this difference was not statistically significant (p = 0.08). The average treatment duration was significantly longer for the braces group (18.4 ± 2.3 months) compared to the clear aligners group (14.2 ± 1.9 months) (p = 0.01). Additionally, 85% of participants with braces achieved full malocclusion correction, whereas only 72% of the clear aligner group reached this outcome, with a statistically significant difference (p = 0.04).

Table 2: Comparison of Treatment Effectiveness

Outcome Measure	Conventional Braces (Group A)	Clear Aligners (Group B)	p-Value
Satisfactory Alignment (%)	92%	84%	0.08
Average Treatment Duration (Months)	18.4±2.3	14.2±1.9	0.01
Full Malocclusion Correction (%)	85%	72%	0.04

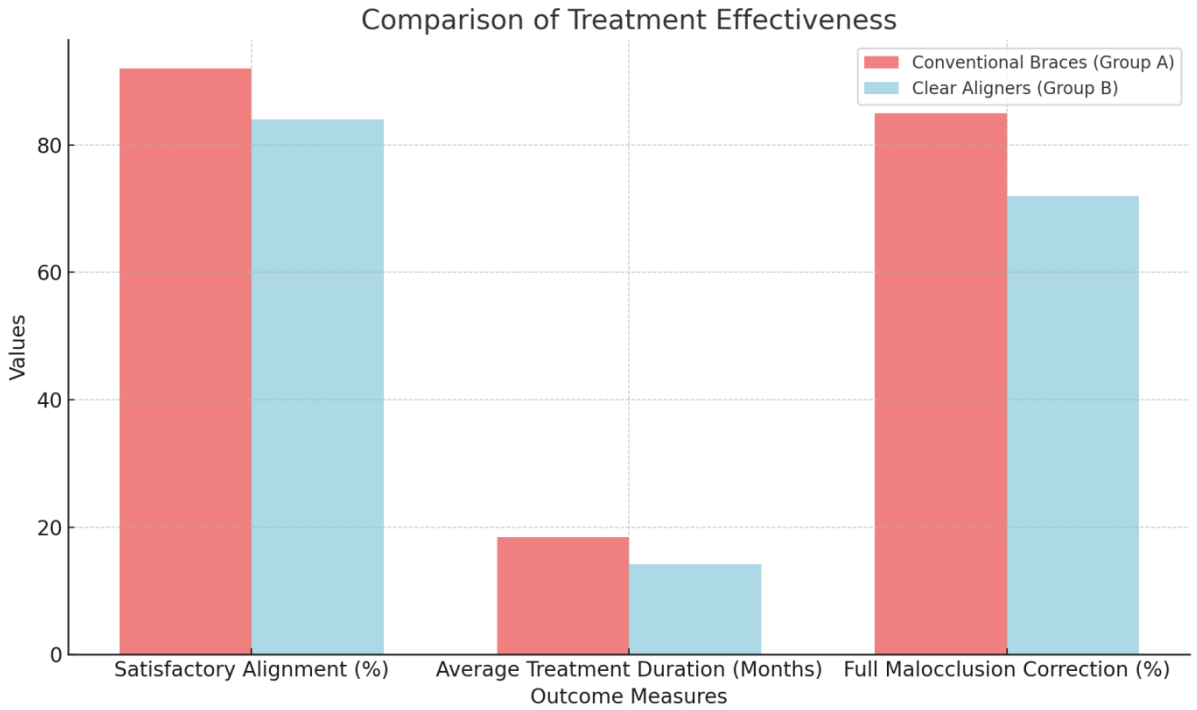

Figure 02: Comparison of treatment effectiveness in both groups

Participants in the conventional braces group reported significantly higher discomfort, 3.8 ± 0.7 compared to the clear aligners group, 2.4 ± 0.6 ($p < 0.01$). Oral hygiene was more challenging for braces users, with a difficulty score of 4.2 ± 0.5 versus 1.9 ± 0.4 for aligners ($p = 0.01$). The use of pain relief was more common in the braces group (65%) compared to the aligners group (25%) ($p < 0.01$), and gum inflammation was reported in 20% of braces patients compared to only 5% in the aligners group ($p < 0.01$).

Table 3: Patient-Reported Challenges

Challenge	Conventional Braces (Group A)	Clear Aligners (Group B)	p-Value
Discomfort Score (1-5)	3.8± 0.7	2.4 ± 0.6	< 0.01
Oral Hygiene Difficulty Score (1-5)	4.2 ± 0.5	1.9 ± 0.4	0.01
Use of Pain Relief (%)	65%	25%	< 0.01
Gum Inflammation Cases (%)	20%	5%	< 0.01

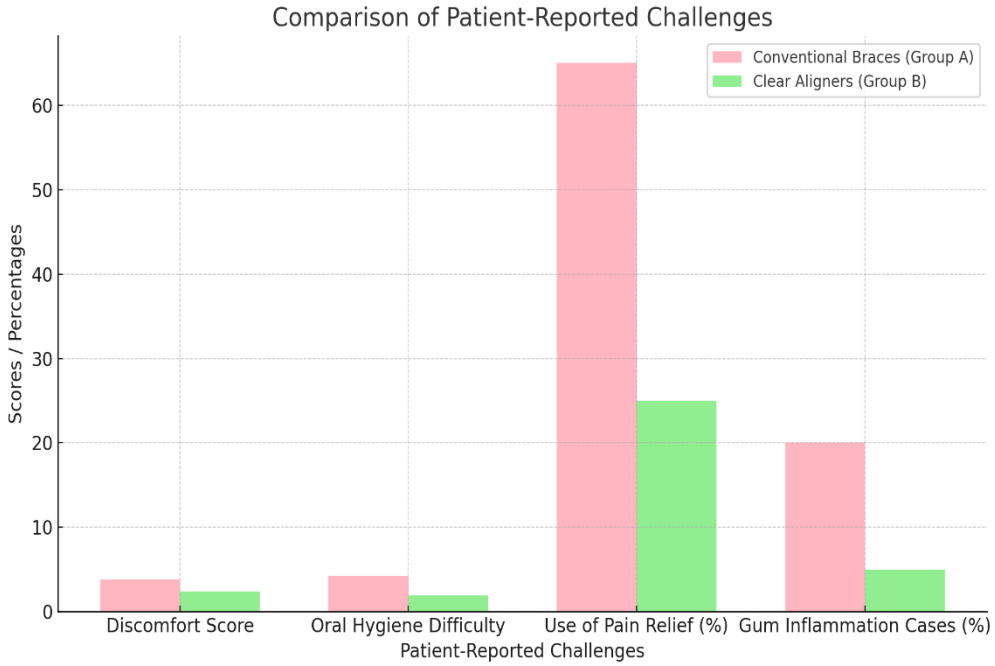

Figure 03: Comparison of patient reported challenges in both groups

The results show that compliance with treatment was perfect for conventional braces (100%) as they are fixed, whereas 70% of clear aligner patients adhered to the recommended wear time. Extended treatment due to non-compliance was more common with aligners (30%) compared to braces (10%) ($p = 0.02$). Overall satisfaction was higher in the clear aligner group (4.4 vs. 3.6, $p = 0.01$). Participants with braces reported greater difficulty following dietary restrictions (60% vs. 5%, $p = 0.01$) and lower aesthetic satisfaction (30% vs. 95%, $p = 0.01$). Clear aligners were also rated higher for ease of cleaning (90% vs. 20%, $p = 0.01$), convenience and comfort (85% vs. 35%, $p = 0.01$), fewer emergency visits (90% vs. 40%, $p = 0.01$), and the ability to eat without restrictions (100% vs. 25%, $p = 0.01$).

Table 4: Patient Compliance, Satisfaction, and Treatment-Specific Advantages

Measure	**Conventional Braces (Group A)**	**Clear Aligners (Group B)**	**p-Value**
Compliance with Treatment (%)	100% (fixed appliance)	70% (wore aligners 20-22 hrs)	
Extended Treatment Due to Non-Compliance (%)	10%	30%	0.02
Overall Satisfaction Score (1-5)	3.6	4.4	0.01
Difficulty Following Dietary Restrictions (%)	60%	5%	0.01
Aesthetic Satisfaction (%)	30%	95%	0.01
Ease of Cleaning and Oral Hygiene (%)	20%	90%	0.01
Convenience and Comfort (%)	35%	85%	0.01
Fewer Emergency Visits (e.g., Broken Parts) (%)	40%	90%	0.01
Ability to Eat Without Restrictions (%)	25%	100%	0.01

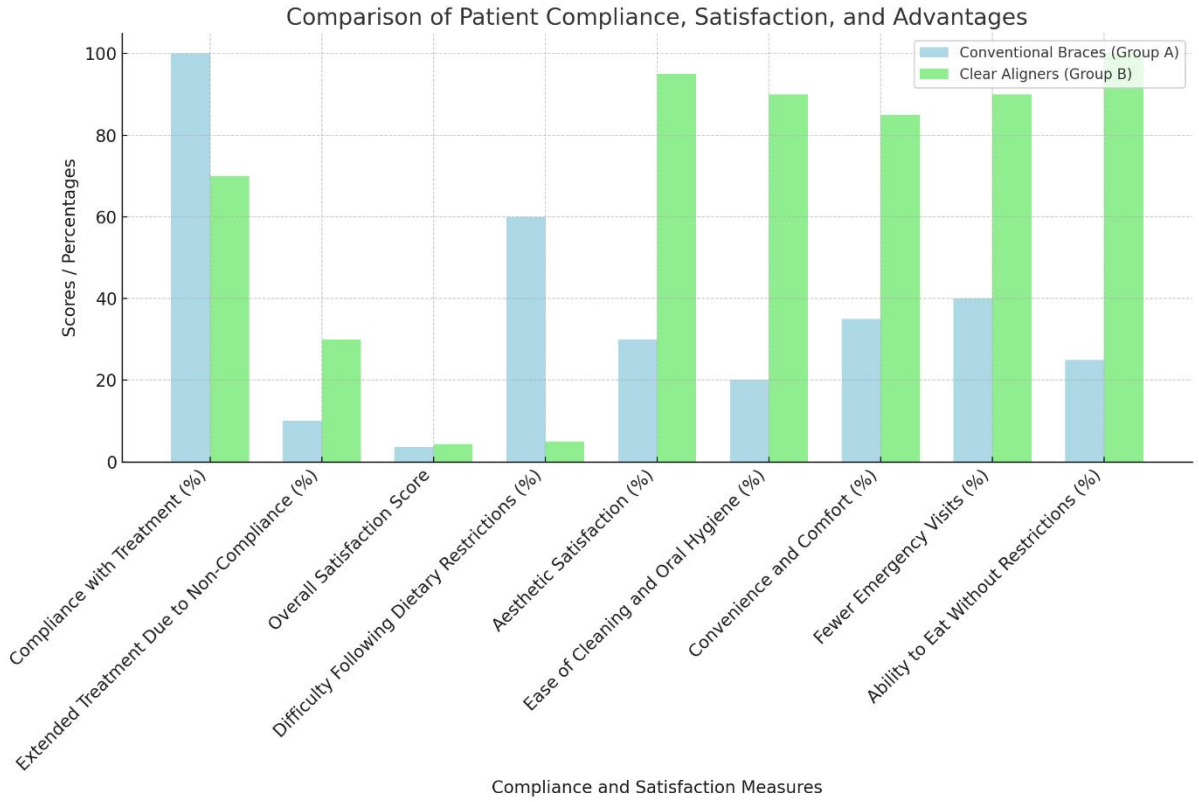

Figure 04: Comparison of patient compliance, satisfaction and advantages in both groups

6. DISCUSSION

The findings of this study provide valuable insights into the comparative outcomes, challenges, and effectiveness of conventional braces and clear aligners in orthodontic treatment. Both treatment modalities are effective in correcting malocclusions, but there are notable differences in patient experience, treatment duration, and overall satisfaction that must be considered when choosing the appropriate method for orthodontic care. Conventional braces demonstrated a higher rate of full malocclusion correction (85%) compared to clear aligners (72%), particularly in more complex cases, such as overbites and crossbites [11]. This aligns with previous research, which suggests that conventional braces offer greater control over tooth movement, especially in severe cases where vertical alignment and root movement are crucial. The fixed nature of braces allows for continuous force application, leading to more predictable and precise outcomes [12]. Clear aligners, however, were highly effective in treating mild to moderate malocclusions, with 84% of participants achieving satisfactory alignment. The shorter average treatment duration (14.2 months for aligners vs. 18.4 months for braces) reflects the efficiency of clear aligners in such cases. These results are consistent with other studies that highlight the advantages of aligners in terms of faster treatment for less severe orthodontic issues [13]. However, the marginal difference in effectiveness ($p = 0.08$) suggests that aligners may be a suitable alternative to braces in less complex scenarios, particularly when aesthetics and convenience are prioritized. One of the most striking differences between the two groups was in patient-reported challenges, particularly discomfort and difficulty maintaining oral hygiene. Participants using conventional braces reported significantly higher discomfort levels (mean score of 3.8 vs. 2.4 for aligners, $p < 0.01$), mainly due to the physical irritation caused by the brackets and wires, as well as the discomfort following wire adjustments [14]. This finding is consistent with previous studies that have identified discomfort as a major concern for braces users. Oral hygiene was another significant challenge for the braces group, with 80% of participants reporting difficulties in cleaning around the brackets and wires. This is in stark contrast to the clear aligners group, where only 5% of participants experienced hygiene challenges. The ability to remove aligners during meals and for brushing/flossing contributed to better oral hygiene and fewer cases of gum inflammation ($p < 0.01$). This advantage may reduce the risk of long-term dental issues, such as cavities or gum disease, which are often associated with poor oral hygiene in braces users. However, the effectiveness of clear aligners is closely tied to patient compliance [15]. Approximately 30% of participants in the aligners group admitted to not wearing their aligners for the recommended 20-22 hours per day, which resulted in delayed treatment. This underscores a key limitation of clear aligners treatment success is highly dependent on patient adherence, and non-compliance can compromise the overall outcomes. Patient satisfaction was significantly higher among the clear aligners group, with an average satisfaction score of 4.4 compared to 3.6 for braces ($p < 0.01$) [16]. The aesthetic appeal of aligners, their comfort, and the lack of dietary restrictions contributed to this higher satisfaction. The ability to maintain normal eating habits and avoid visible metal appliances was

particularly valued by adult and adolescent participants, who often experience self-consciousness with traditional braces [17]. Conversely, while braces were more effective in complex cases, their appearance and associated challenges with discomfort and oral hygiene detracted from patient satisfaction. These results are consistent with other studies that emphasize the growing preference for clear aligners among patients seeking a more convenient and less intrusive orthodontic experience [18]. This study has a few limitations. First, the sample size, while sufficient for this study, could be expanded in future research to include more diverse populations and longer follow-up periods to assess long-term outcomes, such as relapse rates. Additionally, the study relied on patient-reported outcomes for aspects like discomfort and compliance, which may introduce subjective bias.

7. CONCLUSION

This study concludes that both conventional braces and clear aligners are effective for orthodontic treatment, but they cater to different patient needs. Conventional braces are more suited for complex cases requiring precise tooth movement, while clear aligners offer greater comfort, aesthetic appeal, and convenience for mild to moderate cases. Patient satisfaction and compliance play a significant role in treatment success, particularly with clear aligners

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