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Research Article

**THE EFFECTIVENESS OF INVISALIGN TREATMENT AND
ITS DISADVANTAGES AMONG ORTHODONTIC PATIENTS
IN KSA**

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Abstract:

The aim of the present study is to explore the effectiveness of Invisalign treatment and its disadvantages among orthodontic patients in KSA. The study adopted a qualitative approach that used questionnaires to collect data from 650 orthodontic practitioners from selected orthodontic clinics. The practitioners were asked a number of questions relating to the effectiveness and advantages of Invisalign. They answered the questions based on the experiences they had with their patients, and also based on their own professional experience. Data was analyzed descriptively using Microsoft Excel. The results indicates that most patients prefer Invisalign because effective in treating various dental conditions that include overbite, cross bite, crowded teeth, and gap teeth. The study concluded that Invisalign devices are associated with reduced negative aspects and toxic reactions from gingival tissue, reducing the risk of periodontal disease. This makes them e most preferred orthodontic treatment compared to other orthodontic treatment option.

Keywords: Invisalign, orthodontic, orthodontic patients, orthodontic practitioners, effectiveness, advantages

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INTRODUCTION:

Over the past few years, innovative changes have been witnessed in the dentistry sector, resulting in various options being discovered that can correct malaligned teeth. Ansari et al. (2020) points out that experts have created innovative solutions to solve aesthetic needs of patients that include braces, ceramic, clear aligners, and lingual orthodontics. According to Ansari et al. (2020), the most preferred treatment for aesthetic orthodontic is clear aligners. The demand for Invisalign continues to increase daily because of the high number of patients who do not prefer wearing the normal orthodontic appliances. Patients looking for orthodontic treatment are encouraged by esthetic considerations that they can make. A high number of patients that do not like labial fixed devices are increasing opting for esthetic treatment options such as lingual orthodontics and Invisalign applications (Weir, 2017). As observed by Weir (2017), Invisalign technology has continued to attract a lot of public interest since it was emerged in 1999. Many patients prefer Invisalign devices owing to their esthetic attractiveness that is associated by transparency.

Developers of Invisalign technology claim that technology is able to treat various dental conditions that include overbite, cross bite, crowded teeth, and gap teeth and under bite (Invisalign, 2021). As noted by Hennessy & Al-Awadhi (2016), Invisalign technology uses computer-aided manufacturing (CAM) technology and computer-aided design (CAD) (Hosny et al. 2021). These new technologies have improved the way the devices work to the degree that patients would not need new impression for each tooth movement. Invisalign applies a tooth alignment technology that allows different tooth designs from a one impression. However, current Invisalign is the most preferred choice of patients in orthodontic treatment little research has been done to prove its effectiveness, advantages, and disadvantages when used by orthodontic patients. Very few studies have been done to show the effectiveness of the Invisalign in treatment of particular issues. Therefore, the current research was necessary to establish the effectiveness of Invisalign treatment and its disadvantages among orthodontic patients in the Kingdom of Saudi Arabia (KSA). The next sections of the study underlines the problem statement, the aim and objectives of the study, a brief literature review of previous studies, the methodology part, findings from the study, discussion and lastly conclusion.

Problem Statement:

After doing a web search on the success of Invisalign therapy and its downsides among Saudi orthodontic

patients, there were no clear answers. Only a few study publications on the overall efficacy of Invisalign could be discovered. Invisalign treatment, on the other hand, has been available for more than two decades and is extensively utilized throughout the Kingdom of Saudi Arabia. According to the bulk of published research, adult orthodontic patients prefer Invisalign over traditional teeth alignment methods (Khosravi et al., 2017; Papadimitriou, Mousoulea, Gkantidis, & Kloukos, 2018). As a result, understanding the technique's efficacy and the consequences of employing it is crucial for students, patients, and professionals. Regrettably, there is little evidence that the technique is successful in achieving its goal. More research is needed to evaluate the effectiveness of the Invisalign treatment method in correcting crooked teeth, as well as its downsides.

AIM AND OBJECTIVES:

The study aims at ascertaining the efficacy of Invisalign therapy and its drawbacks among orthodontic patients in the Kingdom of Saudi Arabia.

Objectives:

- i. To identify and study the effects of Invisalign therapy on orthodontic patients in the Kingdom of Saudi Arabia.
- ii. To investigate the effects and efficacy of Invisalign therapy on orthodontic patients in the Kingdom of Saudi Arabia.
- iii. To detect and assess the drawbacks of Invisalign therapy.

Literature Review:

Despite the fact that just a few studies on the technique's efficacy are accessible, several research investigations on Invisalign therapy have found that adult orthodontic patients prefer Invisalign to conventional teeth alignment treatments (Khosravi et al., 2017; Papadimitriou, Mousoulea, Gkantidis, & Kloukos, 2018; Galan-Lopez, Barcia-Gonzalez, & Plasencia, 2019). According to the literature examined by Papadimitriou et al. (2018), with the exception of non-extraction treatment of mild to moderate malalignments in non-growing persons, there are no clear therapeutic recommendations to be made based on excellent scientific findings. The study recommended that the results of the accumulated literature be interpreted with care due to their significant heterogeneity. Galan-Lopez, Barcia-Gonzalez, and Plasencia (2019) discovered only seven studies with intermediate evidence and five with insufficient evidence in a systematic review aimed at determining the precision and efficiency of tooth motions following Invisalign treatment. Ansari et al.

(2020) also acknowledged that, despite existing recommendations about the types of tooth malalignments/malocclusions that may be corrected with Invisalign, few clinical research have investigated the efficiency of this procedure. Currently, studies have limited sample sizes, and the majority of them do not contain a control group for comparative reasons. Hennessy and Al-Awadhi (2016) also cautioned that there is little or no clinical data to back up Invisalign's claims of efficacy. According to Rossini, Parrini, Castrolorio, Deregibus, and Debernardi (2015), clear aligner therapy (CAT) efficiently reduces some but not all-orthodontic tooth movement. However, because of the quantity, heterogeneity, and poor quality of the studies considered in the research, the conclusions of this comprehensive investigation should be regarded with care. Aljabaa (2021) conducted a narrative review on the indications and contraindications of CAT, including its efficiency and drawbacks, patient comfort and acceptability, and root resorption, periodontal health, and stability. The study revealed that CAT has improved over the previous 18 years and continues to improve (Aljabaa, 2021). As a result, it is an area with minimal study on several dimensions.

METHODOLOGY:

Because of its flexibility and subjectivity, this study was conducted retrospectively using a qualitative research technique. Because the study's purpose is to examine the effectiveness and drawbacks of Invisalign therapy among orthodontic patients in the Kingdom of Saudi Arabia, data from medical practitioners with experience in this field would be the most credible. This information gave in-depth understanding on the subject. To collect data, interview questionnaires were provided to several orthodontic medical

practitioners in the Kingdom of Saudi Arabia (See Appendix 1). In addition, a literature study on the subject was undertaken in order to have a deeper grasp of the issue, and several healthcare journal databases will be consulted in this case. The most relevant articles were chosen and segregated from the collection of publications used to give evidence on the problem.

Data collection:

The questionnaire was administered to 676 patients who participated in the study. The response rate was high since 651 questionnaires were fully answered and reamed. The questionnaire were administered across selected orthodontic medical clinics, and it involved orthodontic medical practitioners who had in the last year administered Invisalign and other related systems on patients.

Ethical consideration:

When dealing with human being, it is necessary to observe ethical conduct in order to protect the participants. Thus, the consent of the participants was sought first, and their personal information protected. The information obtained was also held confidentially, and only used for the study. The researcher also followed the ethical requirements set by the university when carrying out a study.

Findings:

In the study, majority of the patients preferred Invisalign treatment (51.2%) for their teeth malignment or malocclusion. The second preferences were replacement of the rare teeth (31.0%), followed by use of braces at 11.2%. Only 6.7% participant stated none of the above

Table 1: Technique do patients who come to your hospital prefer the most in treating teeth malalignment/ Malocclusion.

Technique	Frequency	Percentage
Replacement of the rare teeth	202	31.0
None of the above	42	6.7
Invisalign Treatment	333	51.2
Braces	73	11.2

The above results (from the table) are presented in the graph below. As it can be seen, Invisalign treatment is the most preferred by the orthodontic patients followed by replacement of the rare teeth, then braces.

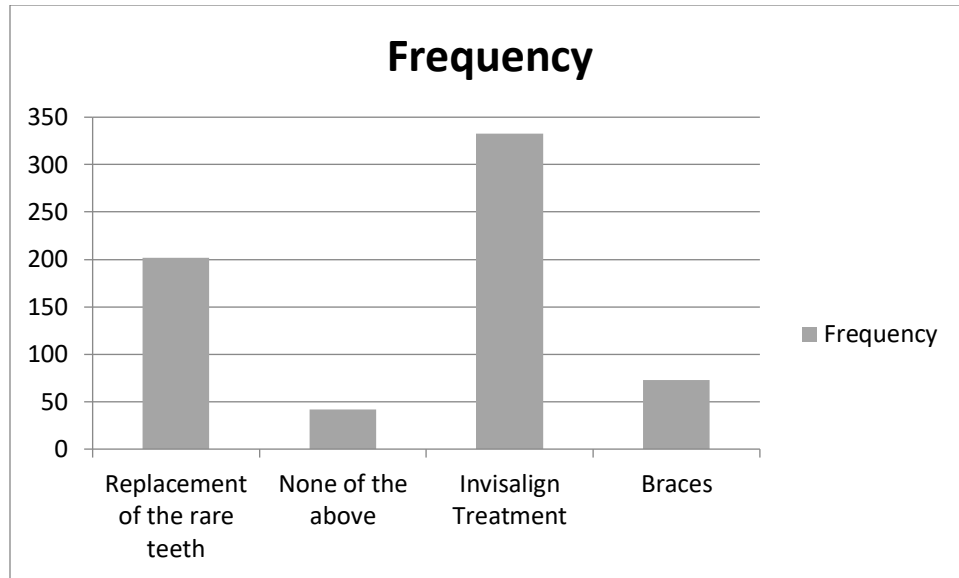


Figure 1: Showing the different orthodontic techniques

Most of the orthodontic medical practitioners had handled between 10 and 50 cases from different patients in the last one The practitioners who asked to provide some statistics (cases) they have had handled in the last year. 69 practitioners had handled less than zero cases, 56 practitioners stated that they had handled less than 10 cases, 146 stated they handled 11-20 cases, and 182 reported handling 20-50 cases.

Similarly, 151 practitioners stated that they had handled 51-100 cases. Those who had handled over 100 cases were 46. The chart below shows the results when asked if patients had received complains about the ineffectiveness of Invisalign treatment, majority of the dentist answered "no", how a significant number had received complains from some patients concerning the effectiveness of the Invisalign.

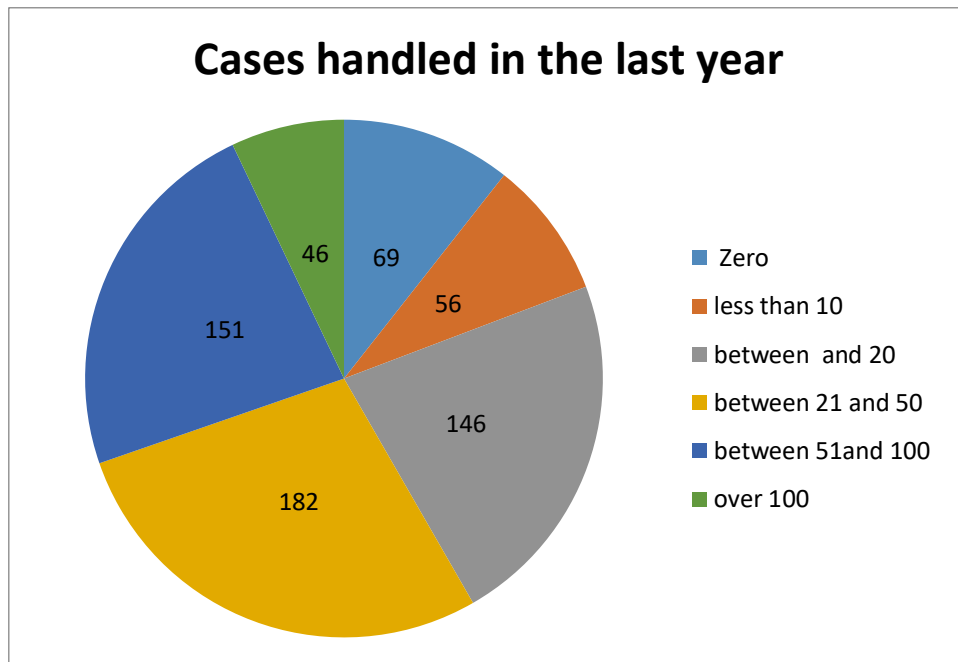


Figure 2: complains about the ineffectiveness of Invisalign treatment

Table 2: Cases of patients complaining about the ineffectiveness of Invisalign treatment

Complaints from patients	Yes	No
Number	482	168
Percentage	74.2	25.8

For the orthodontic medical practitioners, who received complaints from the patients, they were asked that frequency of these complaints. Majority of the orthodontic medical practitioners stated between 11 and 20, and this was followed by 21-51. The frequency of 1-10 was also reported though few, and the least was the frequency of between 50 and 100.

The orthodontic medical practitioners were also asked if they had received any compliments about the effectiveness of Invisalign from the patients. An overwhelming majority of 82.6% reported that many patients had given good compliments about Invisalign as shown in the Table 3 below.

Table 3: Complimenting on the effectiveness of Invisalign treatment by patients

Complimentary from patients	Yes	No
Numbers	537	113
Percentage	82.6	17.4

When asked to rate the effectiveness of Invisalign on the scale of 1-10, majority of the respondent gave a score of over 5, just a few of the respondents gave a rating of below 5. Similarly, doctors were asked to give their position on the general effectiveness of Invisalign, 24.7% stated that it highly effective, while 41.2% felt it was moderately effective. This implies that 66% of the doctors felt that Invisalign is effective.

Table 4: Position or opinion on the general effectiveness of Invisalign treatment

Response	Number	Percentage
Highly effective	161	24.7
Moderately effective	268	41.2
Narrowly effective	178	27.4
Not effective	43	6.6

DISCUSSION:

There are clear advantages that arise from the use of Invisalign, which were reported from the findings and from the literature review. Generally, from the study, the ideal patients who receive Invisalign devices are adult patients with incisor, placing, crowding, or flaring.

The results from the study indicate that majority of patient's preferred Invisalign braces. These results relates to those of Ansari et al. (2020) who noted that Invisalign is the most recommended treatment for different forms of tooth malalignments/malocclusions. A study by Ilijazi Shahiqi et al. (2021) reported that an advantage of Invisalign is that they have little or no negative reactions on the gingival tissues. Similarly, Nahoum (2014) found that Invisalign appliances had a positive effect on the concerned teeth, and this lowers the possibility of periodontal diseases and hypomineralization since they are do not usually cause oral hygiene measures. This was also established in a study carried out by Kim et al. (2014) they concluded that Invisalign caused minimal negative events to a patient already experiencing periodontal diseases.

More so, it has been found that the Invisalign do not affect the movement of the tongue, this is better compared to the lingual fixed appliances (Haralur et al., 2014).

The findings from the current study showed the patients from all ages that were survey commonly selected Invisalign. Similar results were reported by Iharbi (2020) who found that patients suffering from esthetic and speech problems preferred the use of Invisalign. A literature review carried out by Shahiqi et al. (2021) also revealed that Invisalign are normally associated with little discomfort since the braces are regularly removed giving enough opportunity for periodontal ligament to heal in the course of eating, drinking and cleaning of the Invisalign.

A study by Azeem and Hamid (2017), Chen Wan & You (2018) underlined that Invisalign systems ought to be considered basing on symptoms presented by the patient. The situation should also be considered in cases where Invisalign is has limited effectiveness. In the current study, orthodontic medical practitioners reported receiving compliments from a many patient

who had received Invisalign underlining the effectiveness of Invisalign (Hansa et al., 2021). This finding echo those of Khosravi et al. (2017) who also reported improvement with buccal occlusions and Invisalign on aligning the anterior of the mouth. The study found that the incisors closing improved, and there was also improvement in mandibular and maxillary extraction sites (Khosravi et al., 2017). Similarly, previous study by Papadimitriou et al. (2018) also revealed that patients that had no extraction when exposed to two-week activation regimes together with low baseline peer assessment rating scores reported improvement after a single management through aligner modality. The researchers also noted that Invisalign might not be effective in treatment of some malocclusions as well as some clinical manifestation, underlining its ineffectiveness in some instances.

The current study also established that a high number of patients are going for Invisalign as indicated by the responses from the questionnaires. Indeed, past studies have evidence concerning the effectiveness of applying Invisalign systems in contrast to other treatment systems. Generally, studies have revealed that the management results with Invisalign systems are inferior compared to fixed appliances. Studies have also shown that issues concerning optimization of the occlusal defects and management of discrepancies arising from anteroposterior skeletal cannot be addressed using Invisalign systems (Almasoud, 2018; Haralur et al., 2014). This implies that in some cases Invisalign is not effective. This relates well with the findings from the study where practitioners reported that some patients was not satisfied with Invisalign.

Though Invisalign are effective and have clear advantages, they also have some limitations. For example Han (2015); Lanteri et al. (2018) points that Invisalign systems are restricted by the complexity to change the device after it has been developed and set for installation. Likewise, a review by Galan-Lopez, Barcia-Gonzalez, & Plasencia (2019) established there is no c Invisalign was not a clear recommended therapeutic recommendations to be made based on excellent scientific findings solution for malalignments in non-growing persons, There may be need to use extra aligners in cases where the patient is not satisfied (Wiedel & Bondemark , 2015; Anthony, Zimba & Subramanian 2018). Like Han (2015), Gao, et al. (2021) also noted that though Invisalign may be preferred by most patients, this advantage may be hindered by the long duration required by the approaches same to other appliances.

CONCLUSION:

The present study sought to examine the effectiveness of Invisalign in treatment of malaligned teeth in KSA. In the recent past innovative changes have taken place in the dentistry sector that has led to various innovative ways of solving aesthetic requirements of the patient. Generally, the patients who get Invisalign set-ups are adults suffering from different dental cases such as crowding, spacing, and incisor and flaring. Invisalign devices are associated with reduce negative aspects and toxic reactions from gingival tissue, reducing the risk of periodontal disease. Invisalign has been more effective, and this is underlined by the fact that many patients prefer this solution compared to available options.

Recommendations:

From the findings, the first solution for the treatment of orthodontic patients should be Invisalign because of its effectiveness. However, this effectiveness can be enhanced by the use of removable Invisalign devices to provide orthodontic treatment.

Future research:

Future research should focus on the patient's views regarding the reasons behind preferring Invisalign to validate the views of orthodontic medical practitioners.

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