

Orthodontic Patient's Perspectives, Attitudes, and Readiness Toward Teleorthodontics

Nasir H. Siti¹, Md Hasidin A. Nur², Ismail Azlini³

¹Department of Orthodontics, Kulliyah of Dentistry, International Islamic University Malaysia, ²Kulliyah of Dentistry, International Islamic University Malaysia, Kuantan Pahang, ³Department of Fundamental Dental & Medical Sciences, Kulliyah of Dentistry, International Islamic University Malaysia, Kuantan Pahang, Malaysia

Abstract

Aim: To evaluate the perspective, attitude, and readiness of orthodontic patients toward teleorthodontics. **Materials and Methods:** This prospective study was conducted at an orthodontic specialist clinic, Kulliyah of Dentistry, Kuantan Pahang, Malaysia, involving all 46 orthodontic patients requiring active orthodontic treatment from February to July 2021. Patients were offered four options of online consultation: telephone call, virtual meeting, WhatsApp messaging, and a combination of all three methods. An online survey was distributed after the online consultations to assess patients' perspectives, attitudes, and readiness toward teleorthodontics. Descriptive statistics were used to summarize the demographic data. Mann-Whitney *U* test and Kruskal-Wallis test were used to compare the patient's perspectives, attitudes, and readiness toward teleorthodontics based on their demographic background. A Spearman's correlation coefficient looked at the linear relationship between the perspective, attitude, and readiness toward teleorthodontics practice. **Results:** About 82.4% agreed that teleorthodontics was convenient. About 82% agreed that teleorthodontics should be practiced during the pandemic and 72% agreed that it should be practiced after the pandemic. About 89.1% agreed that teleorthodontics bring benefits during the pandemic, and 74% agreed that teleorthodontics might bring benefits after the pandemic. No significant difference was found between sociodemographic background with the total scores of patients' perspectives, readiness, and attitude toward teleorthodontics. **Conclusions:** The majority of the patients showed good perspective, attitude, and readiness toward teleorthodontics. Teleorthodontics on certain clinical procedures can be implemented postpandemic to reduce in-office orthodontic visits.

Keywords: COVID-19, Orthodontics, Pandemic, Telemedicine

Received: 06-Sep-2023, **Revised:** 21-Dec-2023, **Accepted:** 22-Dec-2023, **Published:** 26-Feb-2024.

INTRODUCTION

The outbreak of coronavirus 2019 (COVID-19) has caused massive mortality to millions of people around the world, putting the entire world's community in chaos, especially public health services.^[1] COVID-19 is a respiratory tract disease commonly transmitted via droplets and aerosols, hence, putting healthcare workers, especially dentists at an increased risk of being infected. Dental visits are at an increased risk of transmitting the virus because dental procedures typically generate saliva and blood-containing aerosols, in addition, proximity between patients and dentists is often necessary.^[2]

In response to this high-virulence disease, the World Health Organization has declared COVID-19 as a

pandemic and most countries have taken serious measures to control the spread of infection, such as implementing obligatory lockdowns and practicing social distancing. As an approach to reducing the number of affected individuals, dental associations in most countries decided to suspend all dental treatments to minimize direct contact between patients and doctors. According to the guidelines issued by the Malaysian Dental Council, only emergency cases are allowed to

Address for correspondence: Dr. Nasir H. Siti,
Department of Orthodontics, Kulliyah of Dentistry,
International Islamic University Malaysia, Jalan Sultan Ahmad Shah,
Bandar Indera Mahkota, 25200 Kuantan Pahang, Malaysia.
E-mail: drhajar@iium.edu.my

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

How to cite this article: Siti NH, Nur MHA, Azlini I. Orthodontic patient's perspectives, attitudes, and readiness toward teleorthodontics. *J Int Oral Health* 2024;16:82-9.

Access this article online

Quick Response Code:



Website:
www.jioh.org

DOI:
10.4103/jioh.jioh_203_23

be treated in the clinics, whereas non-emergency cases need to be deferred. This, unfortunately, has raised concerns for patients who require urgent and regular treatments in dental clinics, especially orthodontic patients who require long-term follow-ups. This cessation of treatment and possible problems that orthodontic appliance components create over this long period caused great concerns and confusion for both patients and orthodontists.^[3] Some precautions and recommendations for the management of orthodontic emergencies during the COVID-19 pandemic have been established and one of the recommendations includes the implementation of teledentistry, which is considered vital during these critical circumstances.^[4]

Teledentistry is defined as a method of providing dental care, advice, and treatment remotely using telecommunication technology without direct contact with patients.^[5] Systematic reviews and previously published studies reported positive results related to the use, accuracy, and cost-effectiveness of teledentistry.^[6,7] In this era, where technology is considered a necessity, smartphones, laptops, tablets, and other communication devices have become the most relevant medium to implement teledentistry.^[8] Online consultations can be carried out anytime and anywhere to patients by utilizing various video conferencing applications, such as Skype, GoogleMeet, Zoom, Facetime, or even online messaging applications, such as WhatsApp, Instagram, SMS, Messenger, and Telegram.^[9]

Teleorthodontics is the term where teledentistry is being applied to incorporate orthodontic care, advice, or treatment using information technology. Orthodontic services that allow the use of teleorthodontics usually involve consultation, initial screening, monitoring of oral hygiene and habit, assessing malocclusion, as well as drawing an initial diagnosis.^[10] A cross-sectional study about the satisfaction of patients and clinicians with virtual consultation during the COVID-19 pandemic has shown positive results and a high level of satisfaction.^[11] This shows that the implementation of teleorthodontics could be the best alternative, not only throughout the pandemic but maybe for future practice as well. Teleorthodontics can be an alternative method to solving orthodontic patients who require continuous follow-up during the lockdown period. Since teleorthodontics have never been conducted before the pandemic, it is crucial to take into consideration patients' responses and feedback concerning the implementation of teleorthodontics. It is hoped that this study will enable us to recognize the extent of teleorthodontics to promote its application.

Various studies have been conducted and published on the use of teleorthodontics since the emergence of COVID-19. Most of these studies focused on how it is practiced and the outcome of teleorthodontics. Some of these studies also evaluated the feedback of patients

on the practice of teleorthodontics.^[12] However, to our knowledge, none of these studies have looked at patients' perspectives, attitudes, and readiness toward the practice of teleorthodontics and the correlation of these factors in the Malaysian population. Hence, this study aimed to evaluate the perspective, attitude, and readiness of orthodontic patients toward teleorthodontics, and to find the correlation between the perspective, attitude, and readiness in the city of Kuantan, Malaysia. The null hypothesis would be that the perspective, attitude, and readiness toward the practice of teleorthodontic is unsatisfactory.

MATERIALS AND METHODS

Study population

This prospective study included all 46 active orthodontic patients seen in our orthodontic specialist clinic, Kulliyyah of Dentistry, International Islamic University Malaysia, Kuantan Campus, Malaysia. During this time, the mandatory lockdowns were still carried out in certain localities based on the total number of reported cases nationally. No sampling was done as we included all orthodontic patients scheduled for orthodontic appointments from February 2021 until July 2021. Only emergency orthodontic patients were given appointments to come to the clinic physically. Nonemergency orthodontic patients who required scheduled follow-ups were recruited based on the inclusion criteria. Patients were contacted through a telephone call, and a detailed explanation of the study was given. Digital informed consent for participation in the study and publication of the data for research and educational purposes were obtained from the patient and the legal guardian.

Inclusion and exclusion criteria

Patients who were willing to participate in this study were recruited based on the inclusion criteria. We included all active orthodontic patients who had received at least one telephone/virtual consultation and patients who were not willing to participate and who never received any online consultation were excluded.

Teleorthodontics methodology

The concept and procedures of virtual or telephone consultations were explained, and digital consent was taken from the patients before scheduling the online consultation slot. Patients were offered four options for online consultation: telephone call, virtual meeting, WhatsApp messaging platform, or a combination of telephone calls, virtual meetings, and WhatsApp messaging. Once the preferred online consultation platform was confirmed, the appointment date and time were given. For patients who chose virtual meetings, a link to the scheduled virtual meeting was sent before the consultation. Online consultations were given at

specific sessions through the desired platforms and patient's complaints were addressed during the online session. Once the complaints were rectified after the teleorthodontics session, a link to a survey on the experience of teleorthodontics was then given to patients through WhatsApp. On the other hand, patients who required subsequent follow-ups were given another appointment date for either a face-to-face treatment session or another online consultation.

Survey instrument

The questionnaire was adapted from two recently published studies of different populations^[11,12] and contained 21 items in total. The questionnaire was validated, and the reliability was tested. It was divided into four sections. The first part of the survey involved questions on patients' demographics; name, age, gender, family income, as well as previous experience with teleorthodontics. The second part of the survey assessed the patient's perspective toward teleorthodontics based on five domains: 1. patient's satisfaction; 2. ease of use; 3. effectiveness and increased access to clinical services; 4. reliability of the teleorthodontics system; and 5. usefulness for patients. The third and fourth parts of the survey assessed the attitude and readiness of patients toward teleorthodontics. The questionnaire used a visual analog scale ranging from 1 to 10, where 1 was "definitely disagree" and 10 was "definitely agree" to record the patient's experience with teleorthodontics. It was constructed in bilingual, which is in English and Malay. Questions were vetted by two orthodontic specialists and face-to-face validation was conducted with three respondents to ensure the clarity of the questions.

Statistical analysis

Data were analyzed using the SPSS statistical software version 21.0 (IBM Corp, Armonk, NY, USA). Descriptive statistics were used to summarize the demographic data. Mann-Whitney *U* test and Kruskal-Wallis test were used to compare the patient's perspectives, attitudes, and readiness toward teleorthodontics according to their demographic background. A Spearman's correlation coefficient was computed to assess the linear relationship between the total score perspective and total score attitude toward teleorthodontics practice as well as with the total score of patient's readiness toward this practice. A *P* value of less than 0.05 was considered significant.

RESULTS

Demographic data

A total of 46 participants were recruited for this study. Table 1 shows the demographic data of the subjects in this study. The majority of the participants were females (78.3%), aged 18 years old and above (60.9%). About half of the subjects came from the M40 group with middle

Table 1: Patients' demographic data

Variables	Frequency	
	N = 46	%
Gender		
Male	10	21.7
Female	36	78.3
Age (years old)		
17 and below	18	39.1
>18	28	60.9
Family income*		
<RM4850 (B40)	17	37.0
RM4850–RM10,959 (M40)	26	56.5
>RM10,959 (T20)	3	6.5
Telephone consultation		
Once	41	89.1
More than once	5	10.9
Virtual meeting consultation		
Once	40	87.0
Two to five times	3	6.5
Never	3	6.5

*The classification is based on the Department of Statistics, Malaysia

financial income (56.5%), 6.5% from the T20 group with high financial income, and the rest (37%) were from the B40 group, the low financial income group. About 89.1% of them received telephone consultations once, and 10.9% of them received more than once. As for the virtual consultation, 87% received virtual consultation once, 6.5% received it about two to three times, and 6.5% never.

Patients' perspectives on teleorthodontics

Table 2 illustrates the perspectives of patients toward teleorthodontics, where 82.4% of them agree that teleorthodontics were convenient for them, with the overall mean score ranging from 7 to 8. This signified that most of the respondents have good perspectives toward teleorthodontics.

Patients' readiness toward teleorthodontics

Table 3 shows the readiness of patients toward teleorthodontics. When asked about whether teleorthodontics should be practiced during the pandemic, 82% of them agreed with the statement (mean score of 7.39). Whereas 72% of them agreed (mean score of 6.80) that it should be practiced even after the pandemic.

Patient's attitude toward teleorthodontics

Table 4 demonstrates patients' attitudes toward teleorthodontics, where 89.1% of them agreed that teleorthodontics bring benefits to them during the pandemic, with a mean score of 7.74. About 74% of

Table 2: Patients' perspectives on teleorthodontics

Statement	Score										Mean	SD
	1 N (%)	2 N (%)	3 N (%)	4 N (%)	5 N (%)	6 N (%)	7 N (%)	8 N (%)	9 N (%)	10 N (%)		
1. I would use the virtual or telephone consultation again	2 (4.3)	0 (0)	0 (0)	1 (2.2)	5 (10.9)	6 (13.0)	4 (8.7)	11 (23.9)	4 (8.7)	13 (28.3)	7.59	2.286
2. The virtual or telephone consultation met my need	2 (4.3)	1 (2.2)	0 (0.0)	1 (2.2)	7 (15.2)	5 (10.9)	6 (13.0)	10 (21.7)	4 (8.7)	10 (21.7)	7.20	2.372
3. Teleorthodontics system was easy to use	2 (4.3)	0 (0.0)	1 (2.2)	2 (4.3)	4 (8.7)	5 (10.9)	4 (8.7)	7 (15.2)	7 (15.2)	14 (30.4)	7.61	2.454
4. I could easily listen and talk to the clinician	2 (4.3)	0 (0.0)	0 (0.0)	2 (4.3)	3 (6.5)	5 (10.9)	8 (17.4)	4 (8.7)	9 (19.6)	13 (28.3)	7.70	2.318
5. I was able to express myself effectively	1 (2.2)	2 (4.3)	0 (0.0)	2 (4.3)	3 (6.5)	7 (15.2)	8 (17.4)	4 (8.7)	11 (23.9)	8 (17.4)	7.33	2.300
6. I could talk to the clinician as effectively as in face-to-face consultations	1 (2.2)	3 (6.5)	0 (0.0)	4 (8.7)	1 (2.2)	5 (10.9)	5 (10.9)	6 (13.0)	8 (17.4)	13 (28.3)	7.46	2.588
7. I could talk to the clinician as effectively as in face-to-face consultations	1 (2.2)	3 (6.5)	2 (4.3)	2 (4.3)	2 (4.3)	5 (10.9)	5 (10.9)	6 (13.0)	8 (17.4)	12 (26.1)	7.30	2.649
8. I was able to access the virtual or telephone consultation	1 (2.2)	2 (4.3)	1 (2.2)	2 (4.3)	3 (6.5)	7 (15.2)	5 (10.9)	6 (13.0)	8 (17.4)	11 (23.9)	7.35	2.451
9. I did not have any internet connection or phone reception issue	0 (0.0)	1 (2.2)	0 (0.0)	2 (4.3)	3 (6.5)	2 (4.3)	3 (6.5)	7 (15.2)	11 (23.9)	17 (37)	8.33	2.001
10. The virtual or telephone consultation saves my time (in terms of travel, work or other commitments)	0 (0.0)	0 (0.0)	0 (0.0)	2 (4.3)	3 (6.5)	1 (2.2)	2 (4.3)	10 (21.7)	10 (21.7)	18 (39.1)	8.54	1.722
11. I would consider telephone or virtual consultations in the future	0 (0.0)	1 (2.2)	0 (0.0)	1 (2.2)	5 (10.9)	5 (10.9)	4 (8.7)	10 (21.7)	10 (21.7)	10 (21.7)	7.80	1.939

1 = definitely disagree, 10 = definitely agree, SD = standard deviation

Table 3: Patients' readiness towards teleorthodontics

Statement	Score										Mean	SD
	1 N (%)	2 N (%)	3 N (%)	4 N (%)	5 N (%)	6 N (%)	7 N (%)	8 N (%)	9 N (%)	10 N (%)		
Teleorthodontics should be practiced for orthodontic treatments throughout the COVID-19 pandemic	1 (2.2)	0 (0.0)	1 (2.2)	0 (0.0)	6 (13.0)	8 (17.4)	5 (10.9)	9 (19.6)	9 (19.6)	7 (15.2)	7.39	2.027
Teleorthodontics should be practiced for orthodontic treatments even after the COVID-19 pandemic	2 (4.3)	1 (2.2)	1 (2.2)	2 (4.3)	7 (15.2)	4 (8.7)	7 (15.2)	13 (28.3)	4 (8.7)	5 (10.9)	6.80	2.286

1 = definitely disagree, 10 = definitely agree, SD = standard deviation

Table 4: Patients' attitude toward teleorthodontics

Statement	Score										Mean	SD
	1 N (%)	2 N (%)	3 N (%)	4 N (%)	5 N (%)	6 N (%)	7 N (%)	8 N (%)	9 N (%)	10 N (%)		
Teleorthodontics bring benefit to me throughout the COVID-19 pandemic	1 (2.2)	0 (0.0)	0 (0.0)	2 (4.3)	2 (4.3)	7 (15.2)	7 (15.2)	8 (17.4)	8 (17.4)	11 (23.9)	7.74	2.016
Teleorthodontics bring benefits to me even after the COVID-19 pandemic	2 (4.3)	1 (2.2)	0 (0.0)	2 (4.3)	7 (15.2)	5 (10.9)	5 (10.9)	5 (10.9)	11 (23.9)	8 (17.4)	7.20	2.437

1 = definitely disagree, 10 = definitely agree, SD = standard deviation

them also agreed that teleorthodontics might bring benefits even after the pandemic, with a mean score of 7.20.

Perspective, readiness, and attitude toward teleorthodontics according to the sociodemographic profile of teleorthodontics patients

Table 5 displays the total mean score for perspective, readiness, and attitude toward teleorthodontics based on

patients' sociodemographic background. Females have a slightly higher total mean score for perspective and readiness for teleorthodontics as compared to males. In contrast to that, males showed slightly better attitudes toward teleorthodontics compared with females. The total mean score for perspective and attitude toward teleorthodontics was higher in the age group >18 years old compared with the age group of 17 years old and below. Concerning family income, respondents from B40 showed the highest mean score on their perspectives and attitudes

Table 5: Perspective, readiness, and attitude toward teleorthodontics according to the sociodemographic profile of teleorthodontics patients

Sociodemographic characteristics	N	Total score for perspective on teleorthodontics		Total score for readiness on teleorthodontics s		Total score attitude on teleorthodontic	
		Mean (SD)	P value	Mean (SD)	P value	Mean (SD)	P value
Gender			0.748		0.974		0.757
Male	10	83.70 (18.51)		14.10 (3.87)		15.00 (3.43)	
Female	36	84.33 (22.26)		14.22 (2.26)		14.92 (4.48)	
Age (years old)			0.399		0.801		0.767
17 and below	18	81.67 (21.08)		14.33 (4.44)		14.78 (4.17)	
>18	28	85.82 (21.67)		14.11 (4.01)		15.04 (4.36)	
Family income			0.799		0.697		0.763
<RM4850 (B40)	17	87.41 (20.12)		14.92 (3.88)		15.59 (3.76)	
RM4850–RM10,959 (M40)	26	82.04 (23.03)		13.62 (4.47)		14.46 (4.73)	
>RM10,959 (T20)	3	84.67 (13.87)		15.67 (2.08)		15.33 (2.31)	
Telephone consultation			0.486		0.396		0.633
Once	41	84.49 (21.94)		14.00 (4.21)		14.83 (4.28)	
More than once	5	81.80 (16.81)		15.80 (3.49)		15.80 (4.27)	
Virtual consultation			0.671		0.649		0.970
Once	40	83.63 (22.04)		13.97 (4.28)		14.90 (4.42)	
Two to five times	3	81.67 (15.14)		15.33 (4.04)		15.33 (4.04)	
Never	3	84.20 (21.30)		16.00 (2.00)		15.00 (2.65)	

Mann–Whitney *U* test for two groups comparisons and Kruskal–Wallis test for three or more groups comparisons. SD = Standard Deviations

toward teleorthodontics compared with M40 and T20 groups. As for readiness, those from the T20 group showed the highest mean score compared with those from the B40 and M40 groups.

Those who received telephone consultation once showed a higher mean score in perspectives toward teleorthodontics compared with those who received more than once. In contrast to that, the total mean score for readiness and attitude toward teleorthodontics was higher in those who received telephone consultation more than once compared with those who received only once. As for virtual consultation, those who never received virtual consultations have a slightly higher mean score in perspective, readiness, and attitude compared with those who received it once or two to five times is shown in Table 5.

However, the difference in the total mean score of perspectives, readiness, and attitude between the subcategory of age, gender, family income, and teleorthodontics experience using telephone and online consultation was not significant (*P* value > 0.05) as the *P* value is more than 0.05.

Associations between readiness and attitude with perspective

Table 6 shows the association between readiness and attitude with perspective toward teleorthodontics using Spearman's rank test. From the result, we found that there was a positive correlation between the total score

Table 6: Association between readiness and attitude with perspective

Total score perspective	Total score readiness	Total score attitude
Spearman's rank test	Correlation coefficient = +0.722, <i>P</i> < 0.001	Correlation coefficient = +0.858, <i>P</i> < 0.001

perspectives on teleorthodontics and the total score for patients' readiness toward this practice, $r_s(44) = 0.722$, $P < 0.001$. Similarly, there was a positive correlation between the total score perspectives on teleorthodontics and the total score for patients' attitudes toward this practice, $r_s(44) = 0.858$, $P < 0.001$.

DISCUSSION

This study investigated the perspective, attitude, and readiness of orthodontic patients toward teleorthodontics using an online survey to assess their feedback after the intervention of teleorthodontics. The data obtained from this study showed that patients portrayed positive perspectives, attitudes, and readiness toward teleorthodontics. Previous pieces of literature assessing the patient's perception of teleorthodontics reported both strengths and weaknesses of the system. To our knowledge, this is the first study that evaluated patients' perspectives, attitudes, and readiness, and analyzed the correlation between perspectives with attitude and readiness toward teleorthodontics.

Teledentistry is not a new concept but rather an innovative technology that was first introduced in 1994. Since its introduction, many studies have been conducted to investigate the use and application of this method in different specialties including orthodontics. A systematic review looking at the literature on teledentistry found that teledentistry has been carried out in 15 countries and its application included various purposes, such as education, diagnosis, consultations, and treatments in dentistry.^[13] Another systematic review also found that teledentistry is a useful platform in providing dental care for patients in rural areas as it can reduce cost, save time, and enhance access to clinical services, and the outcome was found to be as reliable as conventional dental visits.^[14] This is because the majority of dental practices were concentrated in cities and suburban areas, leaving those in the rural areas on a disadvantaged side. When COVID-19 struck, it became an obstacle for both patients and clinicians to carry out dental treatments, due to the risks of infections that it posed. However, with the availability of teldentistry, it has become the only solution available during the pandemic and this was confirmed by a study that concluded teledentistry is a useful solution to dental care during the COVID-19 pandemic.^[15]

Our study found that 82.4% showed good perspective, 81.5% showed good attitude, and 77% showed readiness toward the use of the teleorthodontics system, regardless of their socio-demographic background. This is consistent with a previous study that investigated the satisfaction of patients and clinicians on teleorthodontics. They found a high level of satisfaction with 76% of patients stating that teleorthodontics was more convenient for them compared with face-to-face consultations.^[11] Similarly, the majority of the clinicians in the United Kingdom found that teledentistry was helpful and patients agreed that it was comfortable to have a consultation from home rather than having to attend it physically.^[16] Dalessandri *et al.*^[17] have shown that both orthodontists and patients showed a positive attitude toward telemonitoring as it could reduce the number of in-office visits. The same positive attitude was also seen in a study where remote monitoring of orthodontic patients using WhatsApp and photos was conducted. Patients appreciate the fact that they are free to ask questions to their clinician whenever they have doubts about their treatment more easily as they can speak directly through WhatsApp.^[18] Moreover, a study by Aboalshamat *et al.*^[19] reported that most patients in their study would use teledentistry in the future and feel that it is a safer alternative than face-to-face visits during the COVID-19 pandemic. This may suggest that the readiness and attitude of patients toward teledentistry are strongly influenced by the perceptions of patients. This is in unison with our study where we also found that patients were keen to ask questions related to their oral condition when communicating through WhatsApp. This proved that

teleorthodontics increases oral care motivation in patients and at the same time improves the relationship between dentists and patients.

We encountered complaints, such as unfit retainers, loose retainers, gum swelling broken fixed, and removable appliances during the teleorthodontics sessions. Most of the complaints were resolved during the teleorthodontics, although some of the patients required more than one session. Patients were shown methods to improve appliance fit, such as lightly dipping the vacuum-formed retainer in warm water. On the other hand, patients with gum swelling due to poor oral hygiene were advised, and oral hygiene instructions were demonstrated. For cases that were not manageable during teleorthodontics, for example, broken orthodontic appliances, patients were given face-to-face appointments for the construction of new appliances. This was following a study that reported one of the problems that can be resolved through virtual consultation was unfit aligners.^[12] This proved that teleorthodontics worked in solving simple problems without requiring a face-to-face session, thus minimizing the risk of infection. Furthermore, the use of virtual communication can reduce dental anxiety in phobic patients especially in children, as the appointments assigned are usually shorter.^[20] This was evident in our study where the duration of each online session conducted was less than 15min per session. In addition, patients were sitting comfortably at their respective homes, thus, significantly reducing dental anxiety in patients. We did not encounter patients complaining about pain and the appearance of spaces compared with the complaints reported in another study. This may be because most patients tend to ignore their problems,^[21] they take medications, such as painkillers, for the pain, and a small number of patients were recruited due to technological limitations, such as poor internet connections.

Clinicians may also benefit from the practice of teleorthodontics. This includes reduced personal contact, lower risks of contamination, fewer missed appointments, more counseling opportunities, and significantly reduced chair-side time and cost.^[22] For the patient, it saves them more time, especially when they do not have to travel and wait compared with conventional follow-ups. A study by Hansa *et al.*^[23] found a reduction of 3.5 appointment visits when using teleorthodontics for clear aligners treatment. This was particularly true in our study where we managed to review all retainer-check appointments via teleorthodontics thus reducing the number of patients coming to the clinic. The impact of these benefits was significant in ensuring our patients were not abandoned during the pandemic. In addition, the reduction in missed appointments was also significant when we continued the regular reminders on appointments and oral hygiene instructions via text messages for other orthodontic patients who require visits to the clinic.

Nevertheless, teleorthodontics have some disadvantages too. We found that a few patients disagreed with the use of teleorthodontics because they faced difficulties when dealing with internet connections. In addition, non-face-to-face consultations, especially via WhatsApp may lead to miscommunications between clinicians and patients. Even though teleorthodontics allows clinicians to assess patients' oral condition through photos or videos, undeniably conventional visits are more accurate as clinicians can examine patients' oral condition more thoroughly.^[18] Previous studies also mentioned that the drawbacks of teleorthodontics include loss of the traditional relationship between doctor and patient,^[24] and less accurate virtual examinations.^[25]

We acknowledged the limitation of this study was the small number of participants recruited. This was caused by the mandatory lockdowns that led to the temporary closure of our clinic. All patients recruited for this study were from a localized orthodontic clinic. Thus, the data obtained may not represent the demographics in other parts of the world. Despite this limitation, we managed to get most of the orthodontic patients who attended our clinic to voluntarily participate in our study. It is also worth noting that the patient's experience and challenges of teleorthodontics were not analyzed and evaluated in this study.

Teleorthodontics has become an important tool for orthodontists to resolve orthodontic emergencies remotely. The results from our study also rejected the null hypothesis that the perspective, attitude, and readiness of patients toward teleorthodontics were unsatisfactory. In the era of digitalization, this method eases the challenges faced by patients who are unable to attend appointments physically. It is hoped that the technological element of teleorthodontics can be explored further to understand the factors that determine the intention to use the system by both patients and orthodontists, such as user-friendly interface and stable communication tools, to ensure a widespread use of the system.

Future scope/clinical significance

We have established that patients have a positive attitude toward teleorthodontics; therefore, we foresee the need and demand to implement teleorthodontics and investigate the appropriate methods to implement teleorthodontics during the later endemic stage. It is also good to extend on the challenges that they face and the readiness of dental institutions to increase implementation of teleorthodontics in the future.

CONCLUSION

The majority of the patients in this study showed good perspective, attitude, and readiness toward teleorthodontics, and there was no significant difference

between sociodemographic background with the total scores of patients' perspectives, readiness, and attitude toward teleorthodontics. Due to the benefits and increased accessibility, teleorthodontics should be implemented routinely on certain clinical procedures postpandemic to reduce the frequency, time, and costs of periodic in-office visits among orthodontic patients.

Acknowledgements

We would like to thank Assistant Professor Dr. Mohd Shafiq Bin Ibrahim for his guidance in data analysis and our greatest appreciation to all orthodontic patients who have voluntarily participated in this study.

Financial support and sponsorship

This study was funded by the International Islamic University Malaysia under research grant SRCG20-016-0016.

Conflicts of interest

Nil.

Authors contributions

Concept and Design: NHS and IA. Experimental Study: NHS and MHAN. Data Analysis: NHS, MHAN and IA. Manuscript writing: NHS, MHAN and IA.

Ethical policy and institutional review board statement

Ethical approval was obtained from International Islamic University Malaysia Research Ethics Committee (IREC 2021-025) on 22 Jan 2021. All the procedures have been performed as per the ethical guidelines laid down by the Declaration of Helsinki (2013).

Patient declaration of consent statement

Approval was obtained from International Islamic University Malaysia Research Ethics Committee (IREC 2021-025) on 22 Jan 2021.

Data availability statement

Not applicable.

REFERENCES

1. Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, *et al*; China Novel Coronavirus Investigating and Research Team. A novel coronavirus from patients with pneumonia in China, 2019. *N Engl J Med* 2020;382:727-33.
2. Kumar G, Rehman F, Al-Muzian L, Farsi D, Hiremath S, Global scenario of teledentistry during COVID-19 pandemic: An insight. *Int. J Clin Pediatr Dent* 2021;14:426-9.
3. Malekshoar M, Malekshoar M, Javanshir B. Challenges, limitations, and solutions for orthodontists during the coronavirus pandemic: A review. *Am J Orthod Dentofacial Orthop* 2021;159:e59-71.
4. Turkistani KA, Precautions and recommendations for orthodontic settings during the COVID-19 outbreak: A review. *Am J Orthod Dentofacial Orthop* 2020;158:175-81.

