

PERCEPTIONS OF TELE-ORTHODONTICS APPLICATION DURING THE COVID-19 PANDEMIC AMONG UNIVERSITY OF NORTH SUMATRA DENTAL STUDENT

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ABSTRACT

Orthodontics is a dentistry specialty that addresses the diagnosis, prevention, management, and correction of mal-positioned teeth and jaws, and misaligned bite patterns which treatment usually takes a long time. Restrictions on direct dental oral health services during the COVID-19 pandemic have encouraged the use of online oral health services via tele-orthodontics over the past few years. This study aimed to investigate tele-orthodontics perceptions among dental students. subjects from various sources of information, not only relying on knowledge in school. This study uses a descriptive cross-sectional method. A total of 106 dental students who is in their fourth year participated in this cross-sectional descriptive survey. Data were collected using a validated self-reported questionnaire to measure knowledge, beliefs, and attitudes toward tele-orthodontics. It was observed 85.38% of students had knowledge regarding teledentistry, and tele-orthodontics. It showed that as many as 80.37% of University of North Sumatra Dental Student had a positive perception of the tele-orthodontics application during the COVID-19 pandemic. The overall beliefs and attitude of teledentistry were found to be 75.36%. Generally, dental students have positive perception towards tele-orthodontics application during the COVID-19 pandemic.

Introduction

Corona Virus Disease 2019 (2019-nCoV or COVID-19) is a respiratory system disease caused by a new type of corona virus (SARS-CoV-2) (Amtha et al., 2021); (Saccomanno et al., 2020). This virus was detected for the first time at the end of 2019 in Wuhan, China, and rapidly widespread so that the World Health Organization (WHO) declared the COVID-19 outbreak as a global pandemic (Saccomanno et al., 2020); (Indonesia, 2020). SARS-CoV-2 can be transmitted through droplets from the nose or mouth when talking, coughing or sneezing. Patients infected with this virus usually show symptoms such as fever, fatigue,

cough, conjunctivitis, intestinal disorders, loss of sense of smell and taste, blood clots, and heart failure. In some complex cases, patients can suffer from long-term sequelae of infection or even death (Indonesia, 2020); (Rokom, 2021).

Overall, this condition has resulted in crises in various fields, one of which is dentistry. Dentists are one of the professions most vulnerable to contracting the SARS-CoV-2 virus.3.4 Based on PB PDGI data, 39 dentists in Indonesia died due to infection with SARS-CoV-2.4 The use of standard dental care procedures that generate aerosols such as hand pieces, turbines, and scalers will create droplets

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that containing blood from the patient, which can spread to all objects in the dental practice room. Thus, the main risk factor for a dentist when carrying out his profession is direct contact with droplets from patients suspected of COVID-19, and indirect contact through dental instruments and the surface of various solid objects in and around the dental practice room.

In response to this, the Indonesian Dental Association (PDGI) issued a Circular Letter Number: 2776/PB PDGI/III-3/2020, regarding service guidelines in dentistry. In these guidelines, it is stated the need to limit direct oral health services. In addition, the Indonesian Medical Council (KKI) also issued the Indonesian Medical Council Regulation No. 74 of 2020 concerning Clinical Authority and Medical Practice through telemedicine during the COVID-19 Pandemic in Indonesia. The application of telemedicine in the field of dentistry is called teledentistry. The implementation of teledentistry as an oral health care project was initiated by the United States military in 1994 to serve US army.^{1,5} In 1997, teledentistry was defined as the practice of using video-conferencing technology to diagnose, and provide advice treatment remotely. In other words, teledentistry is the use of communication, information, technology for dental health services, consultation, and education with the same methods as telehealth and telemedicine. Teledentistry can be applied to various fields of dentistry (Boringi et al., 2015).

Teledentistry in the field of orthodontics or tele-orthodontics, with technological advances, and the demands of social distancing due to the COVID-19 pandemic, was adopted for consultation, and monitoring the progress of orthodontic patient care without a visit to the clinic. Although its implementation has not completely replaced conventional visits, teledentistry can be used for initial consultations: explaining diagnosis and treatment plans; monitor leveling and aligning,

evaluate maxillary expanders, functional appliances, clear aligners, and removable appliances; monitor patient compliance with the use of elastics; guide the patient in some minor emergencies that occur at home (Park et al., 2021).

Despite the benefits, it is undeniable that there are treatment procedures that require intervention, and direct contact to the patient's mouth that cannot be done via teledentistry. Clinical examination of the patient remains the main and irreplaceable basis of orthodontic treatment. The use of teledentistry is highly dependent on the patient's comfort with the technology, and the platform chosen for orthodontic clinical practice (Park et al., 2021).

Perception is the ability of the five senses to translate a stimulus or process to translate the incoming stimulus into the human senses. In his perception, every human being always has a different point of view in sensing which perceives something as a good thing or a positive perception or a negative perception that will affect real human actions in the future (Ikhsan Fuady, Hadi Suprpto Arifin, 2017).

Based on the description above, it can be seen that teledentistry has several advantages as an alternative to conventional clinic visits. However, so far its potential in the orthodontic field has not been fully utilized, and its application during the COVID-19 pandemic is still minimal. In fact, the literature that discusses tele-orthodontics is found in very limited numbers. In addition, there has been no study conducted on Indonesian dental students regarding their perceptions of the application of tele-orthodontics during the COVID-19 pandemic, so author are interested in conducting study to find how University of North Sumatra dental students perception including knowledge, beliefs, and attitudes toward the application of tele-orthodontics during the COVID-19 pandemic.

Methods

1. Study design and population

The present study is a descriptive cross-sectional survey. This study was conducted online through google form. A validated self-reported, close-ended questionnaire consisting 15 questions were included to evaluate the knowledge, attitudes, and awareness among dental students. The study population comprised 106 dental students who are in their fourth year.

2. Inclusion and exclusion criteria

All the students willing to participate in the study were considered in the inclusion criteria. The exclusion criterion included students who did not complete the questionnaire.

3. Ethical approval and informed consent

The study protocol was approved by the University of North Sumatera health study ethics committee and ethical approval was obtained. A digitalized informed consent form was also obtained from all the participants.

4. Data collection and analysis

The questionnaire was distributed by a single investigator. The students were told

to approach the investigator immediately in case of any doubts regarding any of the questions in the questionnaire. The questionnaire comprised of two parts which included as follows:

- Part 1: Sociodemographic details
- Part 2: Questions relating to knowledge, beliefs and attitudes regarding teledentistry

The study was conducted between the time period of May 2022. The data were collected, compiled, arranged in a systematic manner, and analyzed in terms of frequencies (yes/no).

Result and Discussion

1. Result

A total of 106 person responded to the questionnaire and the data were analyzed in term of frequencies (yes/no). The sample criteria in this study were University of North Sumatera dental students who is in their fourth year and met the inclusion criteria. Demographic data showed that the majority of the respondents were females (80.2%) when compared to males (19.8%).

Table 1. Responses in knowledge-related questions

Knowledge-related questions		Yes (%)	No (%)
Q1.	Is teledentistry about the practice of using computers, internet and technologies to diagnose and provide advice remotely?	100%	0%
Q2.	Does teledentistry helps to monitor the patient's oral health?	95,3%	4,7%
Q3.	Can teledentistry be applied in any branch of teledentistry?	38,7%	61,3%
Q4.	Do you think that teledentistry is a good tool for oral hygiene training?	91,5%	8,5%
Q5.	Do teledentistry helped patient for an orthodontic consultation and diagnosis in COVID time?	88,7%	11,3%
Q6.	Do you think teledentisty can help doctor deliver dental health education in an orthodontic patient?	98,1%	1,9%

The results for the first question showed that all students (100%) gave a positive response to the question of whether teledentistry is an oral health service

practice using computers, the internet, and technology for diagnosis, and provide advice treatment remotely. The results of the study on the question of whether

teledentistry is a device that helps dentists to monitor oral health, showed that 95.3% were aware of the fact that teledentistry is a device that helps dentists to monitor patients' oral health. Students' knowledge about the application of teledentistry in all fields of dentistry is low, 38.7% out of 106 students know that teledentistry can be applied to all fields of dentistry.

The percentage of students who gave a positive response to the question whether

teledentistry is a good tool for oral hygiene training was 91.5%. More than two-thirds of the students (94 people) in this study knew that teledentistry could be used for orthodontic consultation and diagnosis during the COVID-19 pandemic. Majority of students (98.1%) gave a positive response to the question whether teledentistry can be used for dental health education for orthodontic patients.

Table 2: Responses in beliefs and attitudes-related questions

Beliefs and attitudes-related questions		Yes (%)	No (%)
Q7.	Do you think that teledentistry can increase accessibility to rural and underserved communities for their dental needs?	87,7%	12,3%
Q8.	Do you think that teledentistry is a convenient form of oral health-care delivery that makes dental examination easier?	69,9%	30,1%
Q9.	Does teledentistry helps to monitor fixed or removable orthodontic patient?	73,6%	26,4%
Q10.	Can teledentistry be used to give instruction to help patient managing orthodontic emergencies?	70,8%	29,2%
Q11.	Do you think dental examinations via computers and intraoral camera are as accurate as in traditional office setting?	6,6%	93,4%
Q12.	Do you think teledentistry saves time for the dentist?	98,1%	1,9%
Q13.	Do you think teledentistry can help reducing costs for dental practices?	89,6%	10,4%
Q14.	Do you think teledentistry guarantee patient's privacy?	85,8%	14,2%
Q15.	In the future, will you practice teledentistry?	96,2%	3,8%

Majority of students (87.7%) agreed that teledentistry can improve the accessibility of oral health services, especially orthodontics in rural communities or remote areas. The percentage of students who perceive tele-orthodontics as a form of service, and high-quality oral health care is 69.9%. A total of 78 students (73.6%) believed that tele-orthodontics could be used to monitor orthodontic treatment of fixed appliances or patients. Similarly, 70,8% students showed a positive response to the question whether teledentistry can be used by dentists to guide patients in emergency cases that occur at home.

The percentage of students' perceptions about the accuracy of dental examinations via computers, smartphones, and intraoral cameras is low. The negative response obtained from this question is quite high, as many as 99 people (93.4%) perceive that there is a difference in the accuracy of dental examinations via computers, smartphones, and intraoral cameras with conventional clinical examinations. The percentage of students who believe the application of tele-orthodontics can increase time efficiency is 98.1% (104 people) and about 89.6% (95 people) considered the application of tele-orthodontics to be financially feasible for

the patient. Most of the respondents (85.8%) believed that the use of tele-orthodontics for oral health care would not have a negative impact on the security of

patient privacy. Majority of students (96,2%) showed a positive attitude, and had a desire to apply teledentistry in their practice in the future.

Table 3. Perceptions of dental students toward tele-orthodontics application in COVID-19 pandemic

Perception	Positive (%)	Negative (%)
Knowledge	85,38	14,62
Beliefs and attitudes	75,36	24,64
Mean	80,37	19,63

Table 3 shows the percentage of students' perceptions towards tele-orthodontics application during the COVID-19 pandemic. The results showed that 80.37% of University of North Sumatera dental students had a positive perception of the application of tele-orthodontics during the COVID-19 pandemic, and 19.63% University of North Sumatera dental students had a negative perception of the application of tele-orthodontics during the COVID-19 pandemic. This study shows that the University of North Sumatera dental students who is in their fourth year perception towards the application of tele-orthodontics during the COVID-19 pandemic is overall positive.

2. Discussion

Teledentistry is defined as the use of telecommunications in oral health services, and dental education remotely.⁵ Teledentistry has proven to be effective, and reliable for screening, diagnosis, consultation, and treatment planning for many years. Teledentistry is also recommended as an alternative in dealing with the COVID-19 pandemic (Lin et al., 2022). Although, COVID-19 case reports have decreased significantly, this does not mean that the COVID-19 pandemic has ended so it is important to know the knowledge, beliefs, beliefs, and attitudes of students as future dentists to achieve good

teledentistry implementation (Aboalshamat, 2020).

All students showed positive responses to the question of whether teledentistry is an oral health service practice using computers, the internet, and technology for diagnosis, diagnosis, and provide advice treatment remotely. Similar results were seen in a study conducted by Devina et al. As many as 96.2% of postgraduate students are aware of the fact that teledentistry is an oral health service practice using computers, internet, and technology for diagnosis, and diagnosis, and provide advice treatment remotely.¹⁰ This is also supported by study by Galvin et al, and Aboalshamat et al. Galvin et al report that while developed countries have benefited from the implementation of teledentistry, and are expanding this technology by encouraging remote health consultation and monitoring with efficient online registration systems, telemedicine and teledentistry in developing countries are still in their infancy (Lin et al., 2022).

COVID-19 pandemic is driving the development of teledentistry and provide opportunities for developing countries to optimize the use of teledentistry. Aboalshamat et al found that more than half of the sample of students in their study had used smartphones for consultation, and one-fifth of the sample had received training in teledentistry systems. Arabian dental

students and dentists have also used social media to communicate with patients (Aboalshamat, 2020).

The results of the study on the question of whether teledentistry is a device that helps dentists to monitor the oral health of patients showed a positive response of 95.3%. This is in accordance with the study of Aboalshamat et al. The results showed that as many as 62.42% of students had knowledge of teledentistry abilities in monitoring patients' oral health (Aboalshamat, 2020). This is also supported by the study of Tella et al. Tella et al stated that with teledentistry, patients can routinely document their oral condition, and if the scan results show suspicious oral lesions, they can be sent to the dental practitioner for diagnosis and appropriate treatment. These patient care measures can be continued with regular follow-up via teledentistry where the specialist can assess the patient and decide on the next course of action (Tella et al., 2019).

The sample of this study showed a negative response to the application of teledentistry in all fields of dentistry, only 41 students (38.7%) knew that teledentistry could be applied to all fields of dentistry. Similar results were seen in a study conducted Devina et al. The sample also gave positive responses to almost all questions regarding knowledge about teledentistry, except on the question of whether teledentistry can be applied to all fields of dentistry. The sample shows skepticism about the application of teledentistry in all areas of dentistry. Only 46.8% of postgraduate dentistry students in Kanpur City approved the application of teledentistry in all fields of dentistry.¹⁰

Different results were found in a study conducted in Kerala, as many as 90% of orthodontists agreed to apply teledentistry in all fields of dentistry other than orthodontics.¹² This difference could

be due to specialists and professionals having experience, a deeper level of knowledge about oral diseases compared to students, greater confidence when diagnosing and treating patients. Students, even though they are young people who have knowledge, and skills in the use of digital systems, have limited experience and knowledge about oral and dental disease (Lin et al., 2022). This allows students to consider teledentistry to be less safe to be applied in all fields of dentistry.

The results of the study on the question of whether teledentistry is a good tool for oral hygiene training showed a positive response of 91.5%. The results of this study are supported by study by Devina et al. which showed that 77.9% of postgraduate students had knowledge of the function of teledentistry for oral hygiene training (Pradhan et al., 2019). Similar results have been obtained in study conducted by Tella et al. With teledentistry, dental hygienists in Arizona, USA are able to provide oral health care for the community by transmitting diagnostic digital data remotely. The adoption of teledentistry in developing countries could improve oral hygiene prophylaxis in rural and remote communities (Tella et al., 2019).

In this study, students showed positive responses to the use of teledentistry for consultation, and orthodontic diagnosis during the COVID-19 pandemic (88.7%), and dental health education (98.1%). The results of this study are consistent with the results of a study in Kerala where 82% orthodontist approved the use of teledentistry for consultation, and orthodontic diagnosis during the pandemic, and 92% orthodontists considered teledentistry to help with dental health education (George et al., 2021). Tella et al reported the use of teledentistry in orthodontics; screening for orthodontic

patient referral, consultation, diagnosis and management of orthodontic emergency cases (Tella et al., 2019).

The results of the study on the question of whether teledentistry can improve the accessibility of oral health, especially orthodontics in rural communities or remote areas, showed as many as 87.7% of students in this study agreed that teledentistry could improve the accessibility of oral health, especially orthodontics in rural communities or remote areas. The results of this study are supported by study by Julienne et al, as many as 83.5% of professional dental practitioners agree that teledentistry reduces the isolation of specialist dentists (Murererehe et al., 2017).

About 69.9% of students agreed that tele-orthodontics is a form of service, and high-quality oral health care is. The results of this study are consistent with a study in Italy, where positive responses to the question of whether tele-orthodontics is a form of service, and high-quality oral health care were as many as orthodontists (96.25%) and patients (81.25%).¹⁴ The reason for the discrepancy in the results of this study could be due to the use of teledentistry in different countries. Aboalshamat et al reported that developing countries face many challenges in using teledentistry, such as general distrust of e-business, privacy concerns, cultural factors, and technological infrastructure (Aboalshamat, 2020). Opinions about tele-orthodontics are not a form of service, and high-quality oral health care signifies the potential of this application is still underestimated in developing countries (Dalessandri et al., 2021).

Teledentistry is very important for monitoring the patient's condition (tele-monitoring). The majority of students in this study gave a positive response to the use of teledentistry in monitoring orthodontic treatment of fixed and

removable appliances (73.6%), The results of this study are in accordance with the study of Pradeep et al, as many as 75.3% of orthodontists agreed that teledentistry helps in monitoring orthodontic treatment. fixed and removable devices (Pradhan et al., 2019). This is also in line with study conducted by Domenico et al, and Cinzia et al.

Domenico et al reported that few physicians recognized the potential of tele-monitoring systems to monitor patients, and more than half of the sample had implemented them. Overall, many dental practitioners have been involved in teledentistry, and some of the samples revealed its availability for photographic documentation, and weekly routine check-ups.¹⁴ Cinzia et al describe tele-monitoring as an effective tool for maintaining control of care in situations where patients are unable to go to the clinic (Maspero et al., 2020).

Majority of students in this study responded positively to the use of teledentistry to assist patients in orthodontic emergencies. This is in accordance with study conducted by Nicholas et al in France. As a result of the COVID-19 lockdown, many dentists are interacting with their patients with smartphones to stay in touch with patients, answer emergency calls, and send prescriptions after consultations. Nicolas et al found tele-consultation, and emergency orthodontic management is the main teledentistry activities known to the respondents (Giraudeau et al., 2022). Teledentistry has been used to treat minor orthodontic emergencies arising from rubber ligature displacement, discomfort, and buccal irritation easily at the patient's home without a visit to the dental clinic (Maspero et al., 2020).

When examining the frequency and percentage of students regarding the accuracy of dental examinations via

computer, and intraoral cameras compared to conventional clinical examinations, the data obtained from this study showed that the majority of students (93.4%) showed skepticism about the accuracy of clinical diagnoses made during teledentistry consultations. In contrast to this study, the results of study conducted by Devina et al which showed that only 27.2% of the sample showed a negative response to the accuracy of online dental (Pradhan et al., 2019). This is also supported by study by Heather et al., and Chaudhary et al. Heather et al evaluated the reliability and accuracy of tele-monitoring applications for DM in orthodontic patients at the Virginia Commonwealth University. The results showed that there was a measurement difference of less than 0.5 mm between measurements via tele-orthodontics and conventional examinations. In addition, no significant difference was found in the measurement of the intermolar width on dental monitoring, digital models and clinical examination (Moylan et al., 2019).

In their literature study, Chaudhary et al also found that the results of the teledentistry examination were consistent with the results of conventional examinations. This study demonstrates the ability of teledentistry to detect dental caries. The interpretation, and accuracy of teledentistry diagnosis depends on the quality of the devices, images, and training of health workers (Chaudhary et al., 2022). The difference in study results may be due to the fact that Virginia, United States as one of the cities of developed countries with information, communication, and technology has reached a higher level in the health sector.¹³

In this study, students agreed that teledentistry can increase time efficiency (98.1%), and is financially feasible (89.6%). The results of this study are consistent with the results of a study in

Kerala where 116 orthodontists (77.3%) agreed that teledentistry could save time, and 107 orthodontists (71.3%) considered teledentistry to help reduce the cost of practicing dentistry.¹²

Majority of students (85.8%) in this study gave a positive response to ensuring the safety of patient privacy in the use of tele-orthodontics. This is different from the study conducted by Aboalshamat et al, which only 37.58% of students agreed that teledentistry can ensure the security of patient privacy.⁵ Generally, there is significant variation in terms of data confidentiality, privacy, consent, malpractice, liability, license, and jurisdiction between countries. This difference raises medicolegal and copyright issues. This is because there are still no guidelines for the use of teledentistry in relation to guaranteeing the privacy of patient data.¹¹

The respondents of this study showed a positive response in the question of whether you will practice teledentistry in the future, as many as 102 students (96.2%) indicated a desire to practice teledentistry. This is in accordance with a study conducted at Columbia, where as many as 76.75% of students are interested in implementing teledentistry in the future. Aboalshamat et al stated that this is an indication that students are involved in teledentistry as part of the country's digital transformation along with the increasing use of smartphones, and social media in both personal and professional life.⁵ In the future, when the COVID-19 pandemic ends, the use of teledentistry can become routine in the dental practice strategy (Plaza-Ruiz et al., 2021).

The results of the study in table 4 show that students' perceptions of the application of tele-orthodontics during the COVID-19 pandemic were positive (80.37%), and negative (19.63%). The

results of this study are in accordance with the study of Rasmidar et al, the respondents's perception of the application of teledentistry is positive (80.5%).¹⁹ This is also supported by a study in Canada. Naomi et al explored patients' perceptions of teledentistry during the COVID-19 pandemic, and found that the majority of patients' perceptions of teledentistry were overall positive. In addition, most patients also expressed their desire to continue using teledentistry in the future (Rahman et al., 2020).

In present study, it was found that 85.38% of students had knowledge regarding teledentistry, and tele-orthodontics. It showed that as many as 80.37% of University of North Sumatra Dental Student had a positive perception of the tele-orthodontics application during the COVID-19 pandemic. The overall beliefs and attitude of teledentistry were found to be 75.36%.

Conclusion

Generally, University of North Sumatera dental students have positive perception towards tele-orthodontics application during the COVID-19 pandemic.

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