

Assessment of the knowledge and attitude of dentistry students in teledentistry in dental education

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Abstract

Teledentistry constitutes a contemporary field that merges the domains of dental care, technology, and communication. The method of providing dental care, guidance, and education via information technology, as opposed to traditional in-person interactions with patients, is commonly known as remote dental care. Teledentistry can be very helpful and can offer a cutting-edge way to keep the dental practice going both during and after the epidemics of this study to evaluate dental students' attitudes and knowledge regarding teledentistry. More specifically, it aims to: (1) present the respondent profile in terms of gender, age, and year level; (2) evaluate the perception of dentistry students about knowledge and attitude; and, (3) test the discrepancy of responses between the profile and perception of students in teledentistry. Methods: The study used a descriptive type of research. Results: The responses varied significantly by year level, indicating that students' understanding and appreciation of teledentistry during the pandemic are limited. The study suggests incorporating the subject of teledentistry into the dental curricula and utilizing it in community and hospital dentistry.

Keywords: attitude, dentistry students, knowledge, teledentistry, dental education

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1. Introduction

Even though COVID-19 has posed various problems in the health and economic fields around the world, the pandemic has increased the use of technology. The government's health protocol also led to the cancellation of classes at higher education institutions on campus. In the world of mixed learning, what was once a gradual adoption of emerging learning modalities has been a significant change. Dental education is a program based not only on the acquisition of knowledge but also on the development of skills. Amid the increasing incidence of COVID-19, there is solid evidence that the trajectory of this pandemic does not suggest an imminent solution. The virus has been found to have the potential to evolve into an endemic pathogen with a long-term presence, posing a persistent threat to public health. If this presumption is correct, to ensure the continuity of the dental training program and reduce the potential for cross-contamination, the dental training program needs to be overhauled and modernized (Ghai, 2020). Teledentistry has the potential to offer significant advantages and present a groundbreaking approach for maintaining dental procedures in the present pandemic and beyond that.

Teledentistry refers to the delivery of dental care, consultation, and education through information technology, rather than traditional face-to-face clinical interactions with patients. Various aspects of teledentistry such as teleconsultation, telediagnosis, teletriage, and telemonitoring play an important role in dental practice. Many barriers hinder the widespread adoption of teledentistry between dentists and patients, which needs urgent attention and resolution (Ghai, 2020). The emerging field of teledentistry is the integration of telecommunications technology and dental care. Due to significant advances in technological capabilities, remote dentistry is showing the ability to fundamentally change current dental care practices and the industry landscape (Chhabra, 2011). Also, according to Mihailovic et.al. (2011), The multifaceted effort of networking, digital information exchange, teleconsultation, interpretation, and diagnostic analysis is managed by a specialized field of telemedicine focused on the dental field, often called "Teledentistry".

The COVID-19 global pandemic has caused significant disruption in dental education, leading to the closure of many dental schools and universities around the world in response to the outbreak. Teledentistry represents a distinct branch of the broader field of telemedicine, serving as a means of supporting distance education, counseling, and diagnostic support through the use of telemedicine, and modern technology equipment such as video conferencing. The use of teledentistry holds the promise of advancing dental education by facilitating the delivery of teaching materials, creating clinical training opportunities, and improving patient care (Farooq et.al. 2020). Teledentistry can help continue dental education during COVID-19 by using modern equipment and innovations for the changing times. This study assessed dental students' knowledge and attitudes about teledentistry in the field of dental education. It is important to know if this activity contributes to the achievement of the organization's program educational goals (PEOs) and to update the curriculum with new advances and innovations in the use of teledentistry in education. In addition, there was a limited study conducted in the Philippines among university students to assess knowledge, awareness, and attitudes about teledentistry.

Objectives of the research - This study aimed to assess the knowledge and attitudes of Dentistry students in teledentistry in the field of education; more specifically, to (1) present the profile of the respondents in terms of gender, age, and year level, (2) assess the perception of the Dentistry students as to knowledge and attitude and, (3) assess the relationship between the profile and the perception of the students in teledentistry. Subsequently, the investigator proffered an actionable scheme predicated on the findings of the investigation.

2. Methods

This study utilized a descriptive survey method to assess the knowledge and attitudes of the Dentistry students in teledentistry in the field of dental education using a survey instrument. A descriptive quantitative analysis investigated variables in a single sample and tests, explains, and interprets them in a systematic manner (Bloomfield & Fisher, 2019). The respondents of the study were Dentistry students enrolled in the 1st and 2nd semesters of the school year 2020-2021. The researcher utilized the total population of 239 Dentistry students from different year levels to attain the validity of the study. The instrument used was adapted from the study of Alipour, Farsadhabibi & Karimi (2020), on the Knowledge and Attitudes of Dentistry Students Toward Teledentistry was used, adapted from earlier studies that were both valid and reliable. A structured questionnaire that could be self-administered was created and given to a group of 16 students for feedback on its language clarity. The students were chosen based on convenience. The value of Cronbach's coefficient was calculated as 0.86.

The survey was created to gather information from dental students about their views and understandings of teledentistry. The survey consists of three parts, with Part 1 focusing on general demographics through five questions. Part 3 consists of 17 questions aimed at assessing dental students' views on distance dentistry. The statements provided were rated based on the participants' level of agreement using a 5-point Likert scale with options ranging from strongly disagree to strongly agree. Upon the approval of the proposal, the researchers sought data gathering. The COVID-19 pandemic has enforced diverse quarantine limitations, compelling the researcher to employ an online survey form disseminated via Facebook Messenger and other social media accounts to contact the respondents. After collecting the information, the researcher utilized Microsoft Excel to record and organize the data. The data was analyzed using SPSS. More specifically, frequency and percentage were used to present the profile of respondents. Thus, weighted mean and rank were used to determine the profile of the respondents and in the assessment of their responses in the knowledge, attitude, and awareness regarding teledentistry. The study utilized an Independent Sample t-test and Analysis of Variance (ANOVA) to determine if there were any noteworthy distinctions. Additionally, the outcomes were analyzed with the assistance of SPSS version 26, a statistical program. The researchers ensured full confidentiality and privacy of the data and all the personal information gathered. To guarantee maximum collaboration, the researchers sought approval and consent from the college dean and chief of clinics to conduct the study among the dental students. Using the consent form, the researchers discussed with the participants the study's goals and methodology. Upon obtaining their consent, an email was sent for their responses to the survey. Answering the questionnaire was voluntary and strictly confidential.

3. Results and discussion

Table 1

Percentage Distribution of the Respondents' Profile

Sex	Frequency	Percentage (%)
Male	44	18.40
Female	195	81.60
Age		
18 – 22 years old	211	88.30
23 – 27 years old	26	10.90
28 – 32 years old	2	.80
Year Level		
1st year	42	17.60
2nd year	49	20.50
3rd year	72	30.10
4th year	13	5.40
5th year	7	2.90
6th year	37	15.50
More than 6 years	19	7.90

Table 1 presents the percentage distribution of the respondents' profiles. The sample population predominantly comprised female respondents, accounting for 81.60%, while males made up 18.40% of the total. The result implies that the Dentistry program was more popular for the female group because after graduation they will have a better opportunity to manage their time between family and profession, in addition to this, the prestige of having the title of "Doctor". As cited in the study of Kabil, Allam, and El-Geleel (2018), the rationales behind the pursuit of dentistry may take diverse forms, encompassing lifestyle preferences, the prospect of engaging in private practice, a fascination with pathologies, a broad range of professional opportunities, an inclination towards scholarly pursuits, or an ambition for financial gain.

The age range of the respondents was 18-22 years with 88.30% followed by 23-27 years old with 10.90% and the least was 28-32 years old with 0.80%. This shows that most of the respondents were of the millennial age and some of the respondents chose Dentistry as their second course. Kabil, Allam, and El-Geleel (2018) posit that the career preferences of dentistry students are impacted by the models they look up to in the field.

Based on the year level, most respondents were in the third year at 30.10%, followed by the second year at 20.50% and the first year at 17.6%. The least number of students responding were sixth year (7.9%), fourth year (5.4%), and fifth year (2.9%). This implies that levels 1, 2, and 3 are more responsive to learning than higher-level students because lower levels of learning tend to be less stressful than students at higher levels. According to a study by Kabil, Allam, and El-Geleel (2018), respondents at higher years displayed more assertiveness and experience than those at lower levels.

Table 2

Knowledge about Teledentistry in Education

Indicators	VM	VI	Rank
1. I am familiar with the concept of teledentistry.	2.69	Neutral	11
2. I know about teledentistry applications in the health sector.	2.61	Neutral	12
3. I know the advantages of teledentistry technology.	2.70	Neutral	10
4. Teledentistry is the practice of the use of computers, the internet, and intraoral camera technologies to diagnose and provides advice about treatment over distance.	3.41	Agree	1
5. Tele-dentistry is not a face-to-face interview.	2.99	Neutral	2
6. Teledentistry will help to consult with an expert about a specific patient's problem.	2.99	Neutral	3
7. Teledentistry is good for dental education over the Internet and for training primary care dentists.	2.78	Neutral	7
8. Teledentistry is useful for educational goals for inexperienced dentists.	2.76	Neutral	8
9. Teledentistry can help to monitor my patient's oral health.	2.96	Neutral	5
10. Teledentistry can be applied in every branch of dentistry	2.74	Neutral	9
11. Teledentistry can be useful in improving access to oral healthcare	2.97	Neutral	4
12. Teledentistry has the potential to be integrated into our current dental services.	2.80	Neutral	6
Composite Mean	2.87	Neutral	

Legend: 4.21-5.0= Strongly Agree, 3.41-4.21= Agree, 2.61 – 3.40 = Neutral/ I don't know; 1.81 – 2.60 = Disagree; 1.00 – 1.80 = Strongly Disagree

Table 2 presents the respondents' ratings of knowledge of teledentistry in education. The composite mean value of 2.87 indicates that the respondents rated it as neutral or I don't know. Of the items cited, the only item that was verbally interpreted as agree was "teledentistry is the practice of the use of computers, the internet, and intraoral camera technologies to diagnose and provides advice about treatment over a distance " with the highest mean score of 3.41.

The reason for this is that during the COVID-19 pandemic, people were under lockdown and limited access to healthcare. Most patients can only consult via computer and mobile phone. The results are consistent with the findings of Almamazroo et al. (2020). By 2021, a large portion of the participants were already using computers in their dental clinics, as well as digital health records that included the integration of radiographic and clinical imaging. Clinical records obtained from patients are used as a means of communication and consultation. They recognize that teledentistry is a growing tool that has the potential to improve the delivery of diagnostic dental services to underprivileged or unreached communities without access to dental specialists. However, items assessed as neutral were advantages of teledentistry technology (2.70), familiarity with the concept of

teledentistry (2.61) and teledentistry applications in the health sector (2.69) rated the least. The result implies that the concept of teledentistry was unfamiliar before the pandemic and documentation of its benefits was relatively scarce (Menhadji, 2021). Al-Khalifa's (2020) research findings indicate that dental professionals are increasingly prepared to adopt the teledentistry approach to enhance communication, receive guidance, and refer new patients amidst the changing landscape of dental practice. This progress is marked by a growing acceptance of the potential benefits offered by such technology.

Table 3

Attitude Towards Teledentistry in Education

Indicators	WM	VI	Rank
1. I want to use Teledentistry.	2.85	Neutral	10
2. The use of Teledentistry increases the career opportunities of hospital dental staff.	2.90	Neutral	7
3. Teledentistry can provide me with a good understanding of the patient's oral health problem over the Internet.	2.82	Neutral	9
4. Using teledentistry, I will be able to monitor my patient's condition well.	2.74	Neutral	14
5. I think dental examinations are accurate via computers and intraoral cameras as in the traditional office setting.	2.65	Neutral	17
6. I think children and parents would be receptive to having a dental examination done via computers and intraoral cameras	2.70	Neutral	15
7. Teledentistry is a convenient form of oral health care delivery which makes dental examination easier.	2.78	Neutral	12
8. Teledentistry will be a standard way of oral health care delivery.	2.68	Neutral	16
9. Teledentistry can be an addition to the regular care we (the dentists) provide.	3.1	Neutral	2
10. Teledentistry can reduce costs for dental practices.	2.80	Neutral	11
11. Teledentistry can save time for me.	2.99	Neutral	5
12. Teledentistry can be considered a solution to reduce medical travel.	3.1	Neutral	3
13. I think Teledentistry can increase the accessibility of specialists to rural and underserved communities for their dental needs.	2.99	Neutral	4
14. Teledentistry can improve the shortage of dental professionals in medical centers.	2.88	Neutral	8
15. Tele-dentistry provides the necessary information to make it easier to diagnose.	2.78	Neutral	12
16. Teledentistry can improve diagnosis skills and dentist's knowledge through continuous professional development.	2.95	Neutral	6
17. Lack of awareness and infrastructure are the main challenges of Teledentistry.	3.4	Neutral	1
Composite Mean	2.89	Neutral	

Legend: 4.21-5.0= Strongly Agree, 3.41-4.21= Agree, 2.61 – 3.40 = Neutral/ I don't know; 1.81 – 2.60 = Disagree; 1.00 – 1.80 = Strongly Disagree

Table 3 depicts the assessment of the respondents on attitudes towards teledentistry in education. The composite mean of 2.89 indicates that the respondents assessed it as neutral or I don't know in general. All the items cited were viewed as neutral. First in the ranking is the lack of awareness and infrastructure are the main challenges of teledentistry, followed by, teledentistry can be an addition to the regular care where that dentists can provide, and third, teledentistry can be considered as a solution to reduce medical travel. This goes to show that the respondents have little awareness of what is teledentistry and its application because its popularity was only enhanced during the pandemic due to the lack down and limited access to face-to-face modality of communication.

Another reason is that Dentistry is a skill-based profession, and teledentistry was never practiced or introduced in dental school before the pandemic. Soegyanto et. al. (2022) revealed key findings about dental practice in Indonesia. The study suggests inadequate infection prevention in Indonesian dental practices. Moreover, the study emphasizes continuous education of dental professionals in infection control for improved health and safety of patients and staff. In 2022, the authors posited that teledentistry is associated with a favorable perception regarding its potential to enhance dental practice and provide benefits to patients.

Indicators, I think children and parents would be receptive to having a dental examination done via computers and intraoral cameras (rank 15), Teledentistry will be a standard way of oral health care delivery (rank 16), and Using teledentistry, I will be able to monitor my patient's condition well (rank 17) showed that the respondents are aware of the benefits that teledentistry can bring to the dental health of the patients. According to

the study conducted by Soegyanto (2022), most of the participants acknowledged the efficacy of teledentistry in enhancing dental services and promoting advantageous outcomes for patients. Some apprehensions have been raised regarding teledentistry regarding the threats of digital falsification and technical incompatibility.

Table 4*Summary Table on Teledentistry in Education*

	Weighted Mean	Verbal Interpretation	Rank
1. Knowledge	2.87	Neutral	2
2. Attitude	2.89	Neutral	1
Composite Mean	2.88	Neutral	

Legend: 4.21-5.0= Strongly Agree, 3.41-4.21= Agree, 2.61 – 3.40 = Neutral/ I don't know; 1.81 – 2.60 = Disagree; 1.00 – 1.80 = Strongly Disagree

Table 4 displays the summary of the assessment of the respondents on knowledge and attitudes in teledentistry in education. The composite mean of 2.30 indicates that the respondents assessed it as neutral in general. This shows that the respondents have limited knowledge and the right attitude toward teledentistry. This may be due to a lack of computer skills, infrastructure, and the impossibility of providing dental services online. It was only made popular during the pandemic when the respondents have limited access to health care. This result agrees with the findings of Nassani et. al (2021), who found that the respondents in Saudi Arabia had poor knowledge and practice of teledentistry. However, participants showed positive attitudes towards teledentistry. But contrary to the findings of Chaudhary's (2022) investigation with other participants from Saudi Arabia and Pakistan in the more recent study.

Table 5*Difference of Responses on Teledentistry in Education When Grouped According to Profile*

Sex	t/F - value	p-value	Interpretation
Knowledge	1.691	0.092	Not Significant
Attitude	0.869	0.386	Not Significant
Age			
Knowledge	1.967	0.142	Not Significant
Attitude	1.405	0.247	Not Significant
Year Level			
Knowledge	5.560	0.000	Highly Significant
Attitude	3.862	0.001	Highly Significant

Legend: Significant at p-value < 0.05

Table 5 reveals the comparison of responses on teledentistry on education when grouped according to profile. It was observed that there was a significant difference when grouped according to year level since the computed p-values were less than the alpha level of 0.5. Responses differed statistically. Post hoc tests showed those with over 6 years of schooling rated teledentistry higher. This indicates that even before the pandemic, students, specifically dental clinicians who had the experience of live patients, were proficient in using and grasping the principles of teledentistry while treating real patients. The utilization of teledentistry proves advantageous for enhancing the dental healthcare treatment of patients and promoting cooperation among dental experts.

As asserted by Kabil, Allam, and El-Geleel (2018), juvenile learners are in the process of constructing their decision-making skills and determining their perspectives about the application of teledentistry in their future. Furthermore, in the investigation conducted by Chaudhary et.al. (2022), it was established that teledentistry has the potential to enhance interprofessional communication and facilitate efficient patient referrals. Furthermore, the study participants concurred that teledentistry represents a cost-effective option for patient care, facilitates enhanced communication among healthcare providers and patients, affords patient education opportunities, obviates the need for travel, enables remote monitoring, and ultimately confers benefits upon patients residing in remote geographical regions.

Table 6

Proposed Action Plan

KRA	Strategies	Performance Indicator	Persons Involved
Knowledge			
To incorporate the topic of Teledentistry in Community and Hospital Dentistry and Oral Diagnosis subjects.	Apply the basic knowledge of Teledentistry in dental health education and diagnosis of oral disease in community interaction.	Recording community outreach initiatives utilizing teledentistry in the community.	Clinical Instructors, Dental Clinicians
Attitude			
To cultivate a more effective and impactful way of thinking about leadership among those participating in the survey.	Include the practice of teledentistry in the field of community and hospital dentistry as well as clinical dentistry	Documentation of community extension programs using teledentistry in the community.	Clinical Instructors, Dental Clinicians
To enhance the research capabilities of the respondents in the field of teledentistry	create research topics that center on teledentistry	produce a research study in teledentistry	Research coordinator, dental clinicians

4. Conclusion and recommendation

It was revealed that the female gender constituted a significant proportion of the participants, primarily on the third-year education level, and largely within the age bracket of 18 to 22 years. Most of the surveyed individuals possess insufficient understanding and inclination toward the concept of teledentistry. Students with over 6 years of schooling had a higher assessment of teledentistry. Dental educational institutions advance the utilization of telecommunication technology in dental services through the facilitation of instructional lectures and scholarly investigations on the subject matter. Promotion of holistic and integrated healthcare, aimed at enhancing the standard of dental care while reducing costs to both patients and providers. The utilization of teledentistry for dental healthcare services can be enhanced through cost-effectiveness research. Enhancing the accessibility of superior dental healthcare services in economically deprived regions through the employment of teledentistry. Additional investigation is required to assess the efficiency of this instrument.

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