ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

International Journal of Dental Science and Innovative Research (IJDSIR)

IJDSIR : Dental Publication Service

Available Online at: www.ijdsir.com

Volume – 6, Issue – 6, November - 2023, Page No. : 33 - 51

Teledentistry: Future of Dentistry?

[1]Shrushti Shah, BDS, MPH, STATinMED Research LLC, Los Angeles

[2]Suyog Pote, BDS, MSHM, California State University, Los Angeles

[3]Ashvi Patel, BDS, Goregaon Dental Centre, Mumbai

[4]Aishwarya Sonawane, MHM, BDS, California State University, Los Angeles

Corresponding Author: Shrushti Shah, BDS, MPH, STATinMED Research LLC, Los Angeles

Citation of this Article: Shrushti Shah, Suyog Pote, Ashvi Patel, Aishwarya Sonawane,"Teledentistry: Future of Dentistry?", IJDSIR- November - 2023, Volume – 6, Issue - 6, P. No. 33 – 51.

Type of Publication: Review Article

Conflicts of Interest: Nil

Abstract

Objective: Teledentistry offers the potential to improve access to dental care, enhance communication between patients and dentists, and provide cost-effective solutions. This study aimed to assess the perceptions and knowledge of dental professionals regarding teledentistry, identifying regional and experience-based disparities.

Methodology: A systematic review and meta-analysis were conducted, adhering to PRISMA guidelines. Cross-sectional studies from 2000 to 2023 were analyzed, focusing on dental professionals' awareness and understanding of teledentistry.

Results: The 27 reviewed studies revealed that dental professionals generally perceive teledentistry positively, recognizing its potential to save time for both dentists and patients. While many dentists acknowledged the cost-saving benefits, concerns about its accuracy in providing clinical diagnoses and challenges in implementation and usage were noted. Knowledge and awareness levels of teledentistry varied among regions, influenced by factors like the introduction of teledentistry during the COVID-19 pandemic. Understanding of teledentistry regulations and drug prescribing was limited among dental professionals.

Conclusion: To successfully integrate teledentistry into dental practice, it is crucial to address dental professionals' concerns, increase knowledge and awareness, and establish clear regulations and privacy measures. Addressing concerns can facilitate the integration of teledentistry into dental practice, ultimately improving patient care and access to dental services.

Keywords: Covid – 19, PRISMA, Crucial.

Introduction

In the recent era, the need to maintain oral health has increased dramatically. In a country with a vast majority of the population in the rural area, access to specialty dental care is much reduced due to varied reasons such as the economy, the distance of the rural area from the

urban area, awareness of oral health, and negligence [1]. To bridge the gap between urban and rural populations, a vast number of researches are being carried out [1].

During the COVID-19 pandemic, teledentistry aided in preventing the delay and disruption of dental care. Virtual encounters helped patients, especially older and immunocompromised, access dental care without leaving the safety of their homes, reducing their potential exposure [2]. During the pandemic, initial and follow-up, teledentistry visits helped to increase patient compliance and establish a stronger patient-provider relationship [2].

The spread of infection within oral healthcare facilities can be reduced through contactless consultations between patients and oral health professionals with the use of audio-visual telecommunication technology [3]. The types of care and services that can be done online include, but are not limited to, an initial assessment/preliminary diagnostic to determine the severity of a dental condition and scheduling an appointment, providing oral health education counseling, and reviewing cases [3].

A protective physical barrier can be created, making use of teledentistry in the COVID-19 surge, and a screening protocol can be established where a practitioner can conduct the audiovisual examination on a stable patient via video conferencing. Implementation of such programs can be an efficient and cost-effective way to ensure the safety of patients and clinicians during the pandemic. This strategy can be helpful in lifting strain from healthcare facilities [4].

However, the efficacy of this method is largely dependent on the level of awareness amongst health professionals, as shown by previous evidence that those with prior experience with telemedicine were able to adopt it comfortably in the context of the COVID-19 pandemic, whilst those without prior experience required help with the clinical and technical issues associated with video-conferencing [5].

Herein, yet another application of this concept in such situations could be in the formal online education of dental students, which may comprise either of the two modalities: Web-based self-instruction and interactive video conferencing [6]. It can also be used as a tool for the continual dental education of professionals to keep them up-to-date with advances in the field of practice [6]. Additionally, both healthcare workers and patients can feel safe by reducing non-essential contact and the psychosocial effects of fear and anxiety [7].

Teledentistry can be used in all the specialties of dentistry [8]. Berndt *et al.* conducted a study on underprivileged children, wherein orthodontic treatment was monitored from a distance through teledentistry and the results were found to be promising [8]. Another study by Park *et al.* stated that the advances and availability of smartphone technology could lead to the use of telemedicine in oral and maxillofacial surgery [8]. Furthermore, effective results were also found in cases of tobacco cessation counseling through teledentistry in a study conducted by Myung *et al* [8].

One limitation of this technology is the poor resolution of the images provided by the patients or the stability and quality of the internet connection, which can adversely affect the proper evaluation by the dentist. Therefore, it has been identified that this diagnostic tool is palliative and cannot be used in all cases [5].

The study aims to identify disparities and gaps in perceptions, awareness, and knowledge among different groups of dentists, including variations between regions and across experience levels. Understanding these disparities can help tailor interventions and training programs to address specific needs.

Methodology

Protocol and Registration

The systematic review and meta-analysis protocol was registered at the International prospective register of systematic reviews (PROSPERO-CRD42022306061) and performed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis-(PRISMA) checklist [9].

Study Design

This study used a five-step integrative review process that included (1) problem identification, (2) literature search, (3) data evaluation, (4) data analysis, and (5) presentation and interpretation of the findings.

Eligibility Criteria

Inclusion Criteria: The inclusion criteria were as follows:

- **Study design:** Only cross-sectional studies that compared teledentistry to standard care or to caring by other e-health methods; that used any e-health intervention.
- **Participant characteristics:** Dental professionals, dental technicians, patients.
- **Outcome measurements:** Perception and knowledge/ awareness towards dentistry.
- Articles written in the English language.
- Articles published from 2000-2023 and available as free full text.

Exclusion Criteria: The exclusion criteria were as follows:

- Non-clinical studies, in-vitro studies, and animal studies. Studies reporting about a single intervention were also excluded.
- Studies done on individuals less than 18 years of age.
- Studies not fully available in the database.
- Article reporting only abstracts were also excluded.
- Studies not reporting primary outcomes of accuracy, sensitivity, and specificity as well as where primary outcomes are not possible to calculate from the given raw data.

Search Protocol and Study Selection

A comprehensive electronic search was performed till 31st October 2023 for the studies published within the last 23 years (from 2000 to 2023) using the following databases: PubMed and EBSCOhost to retrieve articles in the English language. The searches in the clinical trials database, cross-referencing and grey literature were conducted using Google Scholar, Greylist, and OpenGrey. In addition to the electronic search, a hand search was also made, and reference lists of the selected articles were screened.

Search Strategy

Appropriate key words and Medical Subject Heading (MeSH) terms were selected and combined with Boolean operators like AND. The search strategy used was as follows: (teledentistry AND telecommunication AND telehealth AND dental technology), (dental professionals AND dental education. Citation pearl growing technique was employed and reference articles of the selected article were referred to.

Data Extraction

All the citations that were imported into the bibliographic software Mendeley were double-checked, and duplicates were eliminated. Excel spreadsheets (Microsoft Office 2019®, MS, Redmond, WA, USA) were used to assess each publication. The following information was gathered using a standardized form: (1) authors' names and publication year; (2) study design; (3) study goal; (4) methods; (5) main findings; and (6) conclusions. The PRISMA statement rules were followed during the literature selection procedure.

Results

Literature Research: A total of 287 papers were identified using the search method. The first screening of articles began by removing duplicate articles, in which 105 articles were excluded and 182 articles were obtained. The authors individually screened the abstracts, in order to identify the papers that were relevant to the aims of the research and in accordance with the inclusion criteria. After eliminating 140 titles, 42 articles were screened for eligibility. After the full-text reading of the remaining studies, 15 publications were eliminated because they did not meet the inclusion criteria or did not match the outcomes of this paper. As a result, a total of 27 publications were included in this review. The study selection flow was also presented in the PRISMA-Scr chart (Figure 1).

Table 1 provides an overview of the 27 studies included in this systematic review, outlining key information about each study's author, year, study design, location, sample size, mean age (Ma), age range (Ar), timeframe, and perception and knowledge/awareness towards teledentistry. Among the twenty-seven articles analyzed, ten articles focused on assessing dentists' perceptions of teledentistry, eight articles delved into dentists' knowledge of teledentistry, and nine articles comprehensively explored both dentists' perceptions and knowledge of teledentistry. These studies collectively provide valuable insights into the multifaceted landscape of teledentistry, shedding light on how dental professionals perceive and understand this innovative approach to delivering dental care.

Table 2 presents a comprehensive review of dentist perceptions towards teledentistry, revealing diverse attitudes and beliefs regarding its potential impact. Several studies, such as Chaudhary et al. (2022) and Abbas et al. (2020), underscore the favorable view of teledentistry's potential benefits, including shortened waiting lists and increased practice efficiency [3,4]. However, apprehensions surfaced in various aspects. Maqsood et al. (2021) highlighted concerns about the costs of teledentistry equipment and doubts about its diagnostic accuracy, reflecting skepticism in the dental community [11]. Khokhar et al. (2022) reported a positive consensus on waitlist reduction but also revealed doubts regarding diagnostic accuracy [16]. Similarly, while Sen et al. (2017) recognized the time-saving potential of teledentistry, challenges related to usage, such as illiteracy and infrastructure limitations, were noted [22].

In Table 3, the knowledge and awareness of teledentistry among dental professionals varied across studies. While some, like Mathivanan et al. (2020) [1], reported high awareness, others, including Save et al. (2020), Boringi et al. (2015), and Kamalakannan et al. (2022), noted limited knowledge, suggesting that while many had heard of teledentistry, their understanding was limited [6,12,13]. Pradhan et al. (2019) highlighted a strong correlation between awareness and accurate knowledge [8], and Gupta et al. (2023) reinforced this trend [20]. However, Plaza-Ruiz et al. (2021), Nassani et al. (2021), and Sen et al. (2017) reported significant gaps in awareness and knowledge among different groups of dental professionals, emphasizing the need for education and training in this emerging field [14,17,22]. These findings collectively underline the nuanced landscape of dentist perceptions and knowledge regarding teledentistry, with implications for practice integration and education in the dental community.

Discussion

Our analysis indicates that the perception of dental professionals towards teledentistry varies across different regions and timeframes. The majority of dental

professionals surveyed in several studies held positive views about teledentistry, particularly with regard to its potential for saving time. For example, Chaudhary et al. (2022), Abbas et al. (2020), and Ata et al. (2009) reported that a significant percentage of respondents believed that teledentistry could save time for both dentists and patients [3,4,10]. This perception of time-saving is particularly significant given the busy schedules and demands of dental practices.

Moreover, the perceived potential of teledentistry to reduce costs for dental practices was also a recurring theme. Chaudhary et al. (2022), Ali et al. (2020), and Murererehe et al. (2017) reported agreement among dental professionals in this regard [3,21,28]. Cost-effectiveness is a crucial factor in the adoption of new technologies, and this positive perception could drive further interest in teledentistry.

Despite these positive views, some concerns were raised. The cost of equipment for implementing teledentistry was mentioned as a barrier in several studies [11,18,29]. This perception of high initial costs could be a significant deterrent to the widespread adoption of teledentistry. Additionally, concerns about the accuracy of diagnoses made through teledentistry were raised in multiple studies [3,16,21]. This issue warrants further attention, as the reliability of teledentistry in clinical settings is essential for its success.

Difficulty in using teledentistry was also a common concern among dental professionals [21,22,29]. This underscores the need for user-friendly interfaces and comprehensive training for dental professionals to ensure a seamless transition to teledentistry.

The level of knowledge and awareness regarding teledentistry varied across the studies. While some studies reported high levels of awareness and knowledge [4,8,23], others showed lower levels, with several participants having never heard of teledentistry [13,17]. This discrepancy might be attributed to differences in regional adoption and educational programs.

Most dental professionals who were aware of teledentistry recognized it as a remote practice involving computers and technology. However, knowledge about regulations, such as those related to drug prescribing through teledentistry, was limited in some studies [5,18]. These findings highlight the importance of providing dental professionals with comprehensive training, guidelines, and education on teledentistry practices and regulations.

Furthermore, there were notable concerns in some studies regarding the potential violation of patient privacy through teledentistry [20,27,29]. Addressing these concerns and establishing robust privacy and security measures will be essential to foster trust in teledentistry.

Limitations

This systematic review has several limitations. First, the included studies have different methodologies and come from various geographic regions, potentially introducing heterogeneity. Second, the timeframes and circumstances during which the studies were conducted vary, which can influence responses. Additionally, the studies vary in sample size and representativeness. Future research should focus on addressing the concerns raised by dental professionals, especially regarding cost-effectiveness and diagnostic accuracy. Efforts should also be directed towards increasing knowledge and awareness through education and training programs. Standardization of regulations and privacy measures will be essential to ensure the safe and effective implementation of teledentistry.

Conclusion

The findings of this systematic review suggest that dental professionals have varying perceptions and levels of knowledge regarding teledentistry. While many hold positive views about its potential to save time and reduce costs, concerns regarding initial costs, accuracy of diagnosis, and the ease of use should be addressed. Increasing knowledge and awareness, providing training, and establishing clear regulations are crucial steps towards the successful integration of teledentistry into dental practice. The evolution of teledentistry will depend on addressing these concerns and building confidence among dental professionals.

Reference

1. Mathivanan A, Gopalakrishnan JR, Dhayanithi A, Narmatha M, Bharathan K, Saranya K. Teledentistry: Is It the Future of Rural Dental Practice? A Cross-sectional Study. J Pharm Bioallied Sci. 2020;12(Suppl 1):S304-S307. doi:10.4103/jpbs.JPBS_91_20
2. Tiwari, T., Diep, V., Tranby, E. *et al.* Dentist perceptions about the value of teledentistry. *BMC Oral Health* 22, 176 (2022). https://doi.org/10.1186/s12903-022-02208-z
3. Chaudhary FA, Ahmad B, Javed MQ, et al. Teledentistry awareness, its usefulness, and challenges among dental professionals in Pakistan and Saudi Arabia. DIGITAL HEALTH. January 2022. doi:10.1177/20552076221089776
4. Abbas B, Wajahat M, Saleem Z, Imran E, Sajjad M, Khurshid Z. Role of Teledentistry in COVID-19 Pandemic: A Nationwide Comparative Analysis among Dental Professionals. Eur J Dent. 2020;14(S 01):S116-S122. doi:10.1055/s-0040-1722107
5. Raucci-Neto W, de Souza Pereira M, Cerqueira NM, Louzada VG, de Castro Raucci LMS, Leoni GB. Knowledge, Perception, and Experience of Dentists About Teledentistry. Int Dent J. 2022;72(4):456-462. doi:10.1016/j.identj.2021.07.007
6. Save SS, Singh SS, Kalra DD, Jhaveri ST, Avhad SK. An overview of teledentistry with a cross-sectional study on relevant knowledge and attitude of dentists in Mumbai. J Global Oral Health 2020;3(2):101-9.
7. Rahman N, Nathwani S, Kandiah T. Teledentistry from a patient perspective during the coronavirus pandemic. Br Dent J. 2020:1–4.
8. Pradhan D, Verma P, Sharma L, Khaitan T. Knowledge, awareness, and attitude regarding teledentistry among postgraduate dental students of Kanpur city, India: A questionnaire study. J Educ Health Promot. 2019;8:104. Published 2019 May 14. doi:10.4103/jehp.jehp_363_18
9. Salameh JP, Bossuyt PM, McGrath TA, Thombs BD, Hyde CJ, Macaskill P, et al. Preferred reporting items for systematic review and meta-analysis of diagnostic test accuracy studies (PRISMA-DTA): Explanation, elaboration, and checklist. BMJ. 2020;14:370.
10. Ata, S. O., & Özkan Yıldırım, S. (2009 0). Information technology in oral health care: Attitudes of dental professionals on the use of teledentistry in Turkey.
11. Afsheen Maqsood, Muhammad Shahrukh Khan Sadiq, Daud Mirza, Naseer Ahmed, Abhishek Lal, Mohammad Khursheed Alam, Mohamad Syahrizal Bin Halim, "The Teledentistry, Impact, Current Trends, and Application in Dentistry: A Global Study", BioMed Research International, vol. 2021, Article ID 5437237, 9 pages, 2021. https://doi.org/10.1155/2021/5437237

12. Boringi,M.Waghray,S.Lavanya,R.Babu,D.B.,Badam ,K.,Harsha,N.Garlapati,K.Chavva,S.(2015). Knowledge and Awareness of Teledentistry among Dental Professionals – A Cross Sectional Study,J Clin of Diagn Res. 9(8), ZC41-ZC44.
13. Kamalakannan R, Nagappan C, Krishnaveni M, Arun Prasad N C, Kumar S V, Mahesh J. Awareness, Knowledge and Attitude of Teledentistry Among Dentists in Kanchipuram District – A Cross-Sectional Survey. Adv Hum Biol 2022;12:174-9
14. Plaza-Ruíz SP, Barbosa-Liz DM, Agudelo-Suárez AA. Impact of COVID-19 on the Knowledge and Attitudes of Dentists toward Teledentistry. JDR Clinical & Translational Research. 2021;6(3):268-278. doi:10.1177/2380084421998632
15. Nath A, Aoghiz S, Nnagbo C, et al. The Outcome of a New Teledentistry Initiative in Response to the COVID-19 Pandemic: A Cross-sectional Study. J Contemp Dent Pract. 2022;23(3):284-288. Published 2022 Mar 1.
16. Romaisa A. Khokhar, Waleed A. Ismail, Adnan Sunny, Gul M. Shaikh, Sundas Ghous, Moeez Ansari, Syed Hamza Zia, Soban Arshad, Mohammad Khursheed Alam, "Awareness regarding Teledentistry among Dental Professionals in Malaysia", BioMed Research International, vol. 2022, Article ID 3750556, 8 pages, 2022. https://doi.org/10.1155/2022/3750556
17. Nassani MZ, Al-Maweri SA, AlSheddi A, et al. Teledentistry-Knowledge, Practice, and Attitudes of Dental Practitioners in Saudi Arabia: A Nationwide Web-Based Survey. Healthcare (Basel). 2021;9(12):1682. Published 2021 Dec 4. doi:10.3390/healthcare9121682
18. Aboalshamat KT. Awareness of, beliefs about, practices of, and barriers to teledentistry among dental students and the implications for Saudi Arabia Vision 2030 and coronavirus pandemic. J Int Soc Prevent Communit Dent 2020;10:431-7.
19. Ngwu, C. C., Fadare, A. S., Ene, C. K., & Adamu, V. E.(2021). Awareness and use of teledentistry among dental health care professionals atAlex EkwuemeFederal University Teaching Hospital (AEFUTH), Abakiliki, Nigeria.Orapuh Journal, 2(2), e816.
20. Gupta., et al. "Teledentistry: Knowledge, Attitude and Practices in North India". Acta Scientific Dental Sciences 7.1 (2023): 03-09.
21. Ali I, Kumari M. Knowledge, attitude and awareness of teledentistry among dental students in Ghaziabad – A cross-sectional study. J Adv Med Dent Scie Res 2020;8(4):142-145.
22. Sen,N et al.2017, Knowledge, Attitude & Awareness Among Dental Students About Teledentistry In kolkata, West Bengal, India – A Cross Sectional Study. Int J Recent Sci Res. 8(3), pp. 15952-15956.
23. Noopur Narayane et al. Ijsrm.Human, 2021; Vol. 17 (4): 58-71.
24. Al-Khalifa KS, AlSheikh R (2020) Teledentistry awareness among dental professionals in Saudi Arabia. PLoS ONE 15(10): e0240825. https://doi.org/10.1371/journal.pone.0240825
25. Shakoor A, Ansari W, Choudhry, Fatima N, Mumtaz A, Raja HZ, Saleem MN. Prospectives of Teledentistry for Professional Stakeholders of Health Professional Dental Education in Pakistan; A Cross-Sectional Survey. 2023; 4(2): 145-151. doi: http://doi.org/10.37185/LnS.1.1.286
26. Tayşi NM, Amasya H, Yıldırım S. Evaluation of attitudes of dental professionals toward teledentistry

during and after the pandemic. Essent Dent. 2023;2(1):14-19.

27. Priyanka, Boddeda Suma; Reddy, L. Vamsi Krishna; Parlapalli, Vineela; Pydi, Siva Kumar; Pottem, Nagarjuna; Rachuru, Yaswanth Sai. Teledentistry: Knowledge, Attitude, and Perception Among Undergraduate and Postgraduate Dental Students. Journal of Indian Association of Public Health Dentistry 20(4):p 393-397, Oct–Dec 2022. | DOI: 10.4103/jiaphd.jiaphd_133_21
28. Murererehe J, Uwambaye P, Isyagi M, Nyandwi T, Njunwa K. Knowledge, attitude and practices of dental professionals in Rwanda towards the benefits and applications of teledentistry Rwanda J Ser Filol Med Health Sci. 2017;4:39–47
29. Soegyanto AI, Wimardhani YS, Maharani DA, Tennant M. Indonesian Dentists' Perception of the Use of Teledentistry. Int Dent J. 2022;72(5):674-681. doi:10.1016/j.identj.2022.04.001
30. Alsharif, A., & Al-Harbi, S. S. (2020). Dentists' self-perception on teledentistry: The changing landscape driven by technological booming in the 21st century. Open Dentistry Journal, 14(1), 291-297. https://doi.org/10.2174/1874210602014010291

Legend Figure and Tables

Figure 1: Flowchart of the study selection process. PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analyses)

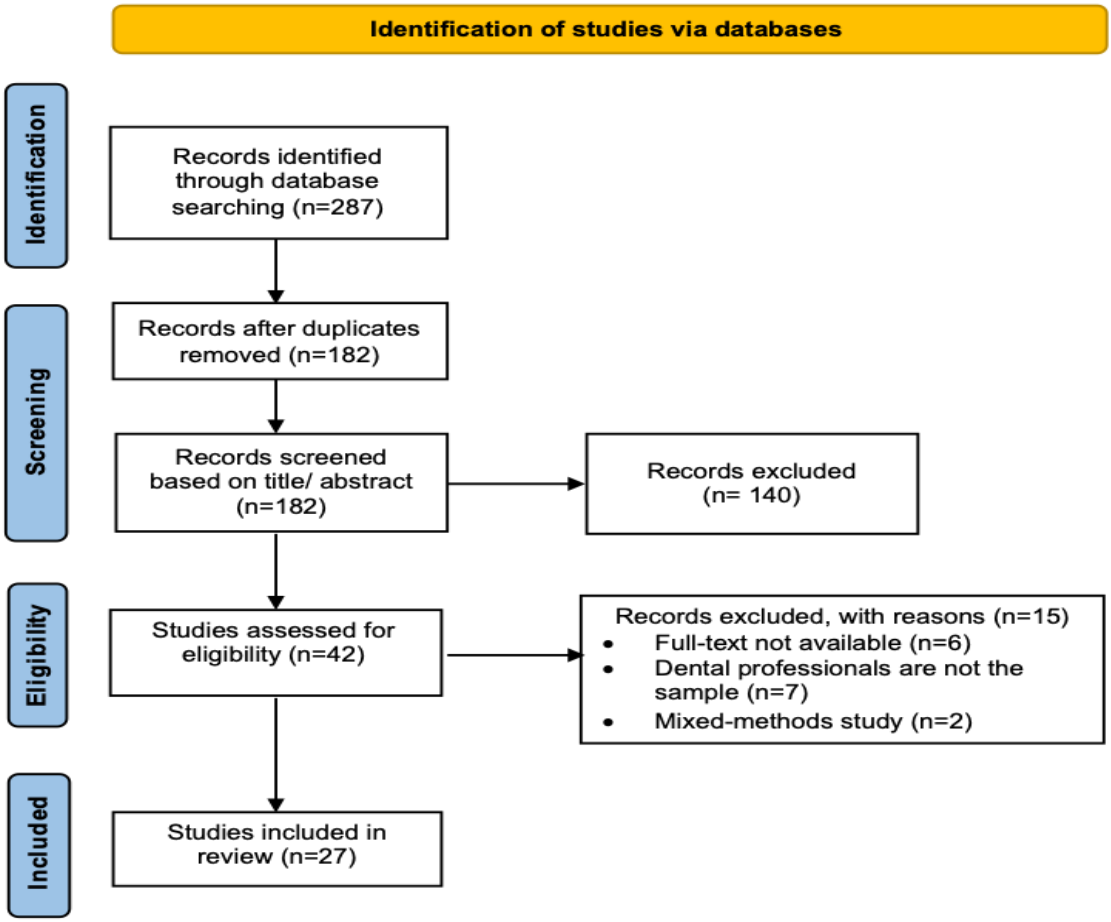

Table 1: Characteristics of included studies.

Author and Year	Study Design	Location	Sample Size (n)	Mean Age (Ma), Age Range (Ar)	Timeframe	Perception towards Teledentistry	Knowledge/ Awareness towards Teledentistry
Mathivanan et al. (2020) [1]	Cross-sectional Study	India	73	NA	NA		Yes
Chaudhary et al. (2022) [3]	Cross-sectional Study	Pakistan, Saudi Arabia	190	Ar = 20 - 64 years	During Covid	Yes	
Abbas et al. (2020) [4]	Cross-sectional Study	Pakistan	510	NA	During Covid	Yes	Yes
Raucci-Neto et al. (2021) [5]	Cross-sectional Study	Brazil	575	NA	During Covid	Yes	Yes
Save et al. (2020) [6]	Cross-sectional Study	India	151	Ma = 25.72 years Ar = 22 - 65 years	During Covid		Yes
Pradhan et al. (2019) [8]	Cross-sectional Study	India	77	Ma = 30.9 years Ar = 20 - 50 years	Pre-Covid		Yes
Ata et al. (2009) [10]	Cross-sectional Study	Turkey	219	Ma = 35 years	Pre-Covid	Yes	
Maqsood et al. (2021) [11]	Cross-sectional Study	Global	506	Ar = 20 - 64 years	During Covid	Yes	
Boringi et al. (2015) [12]	Cross-sectional Study	India	406	Ar = 20 –> 65 years	Pre-Covid		Yes
Kamalakannan et al. (2022) [13]	Cross-sectional Study	India	520	NA	During Covid		Yes
Plaza-Ruiz et	Cross-sectional	Colombia	5,370	Ma = 45 years	During		Yes

al. (2021) [14]	Study			Ar = 22 - 82 years	Covid		
Nath et al. (2022) [15]	Cross-sectional Study	USA	266	NA	During Covid	Yes	
Khokhar et al. (2022) [16]	Cross-sectional Study	Malaysia	310	Ar = 25 –> 65 years	During Covid	Yes	
Nassani et al. (2021) [17]	Cross-sectional Study	Saudi Arabia	603	Ma = 28.8 ± 5.8 years Ar = 21 - 60 years	During Covid		Yes
Aboalshamat et al. (2020) [18]	Cross-sectional Study	Saudi Arabia	314	Ma = 23.06 years	Pre-Covid	Yes	Yes
Ngwu et al. (2021) [19]	Cross-sectional Study	Nigeria	60	Ar = 20 - 60 years	NA	Yes	Yes
Gupta et al. (2023) [20]	Cross-sectional Study	India	160	Ma = 27 years Ar = 18 –> 45 years	Post-Covid		Yes
Ali et al. (2020) [21]	Cross-sectional Study	India	197	NA	Pre-Covid	Yes	Yes
Sen,N et al. (2017) [22]	Cross-sectional Study	India	140	Ar = 18 –≥ 25 years	Pre-Covid	Yes	Yes
Noopur Narayane et al. (2021) [23]	Cross-sectional Study	India	394	Ar = 18 –≥ 50 years	During Covid	Yes	Yes
Al-Khalifa & AlSheikh (2020) [24]	Cross-sectional Study	Saudi Arabia	286	Ar = 20 –> 65 years	During Covid	Yes	
Shakoor et al. (2023) [25]	Cross-sectional Study	Pakistan	428	Ar = 20 - 60 years	Post-Covid	Yes	
Tayşi NM et al. (2023) [26]	Cross-sectional Study	Turkey	57	Ar = 21 - 59 years	Post-Covid	Yes	

Priyanka et al. (2022) [27]	Cross-sectional Study	India	250	NA	Post-Covid	Yes	Yes
Murererehe et al. (2017) [28]	Cross-sectional Study	Rwanda	103	Ar = 21 –> 40 years	Pre-Covid	Yes	Yes
Soegyanto et al. (2022) [29]	Cross-sectional Study	Indonesia	652	Ar = 20 –≥ 65 years	During Covid	Yes	
Alsharif et al. (2020) [30]	Cross-sectional Study	Saudi Arabia	620	Ar = 20 –≥ 45 years	Pre-Covid	Yes	

Table 2: Dentists' perceptions of teledentistry.

Author and Year	Teledentistry would help shorten the waiting list	Teledentistry would reduce costs for the dental practices	Teledentistry would necessitate an extra appointment for taking photographs	Additional costs incurred to provide facilities/equipment for teledentistry	Teledentistry would provide an accurate diagnosis in a clinical setting	Difficulty in using teledentistry
Chaudhary et al. (2022) [3]	75.2% of dentists in Pakistan and Arabia agree	N/A	N/A	Only 20% Saudi Arabian and Pakistani respondents agreed that teledentistry equipment is expensive	Only 23.7% of Pakistani and Saudi Arabian respondents agreed that teledentistry can produce accurate diagnoses	N/A
Abbas et al. (2020) [4]	84.10% dentists believe that teledentistry a time-saving technique	N/A	N/A	N/A	53.50% dentists reported that teledentistry helps provide a good understanding of patient's oral health problem over the Internet	N/A
Raucci-Neto et al.	N/A	N/A	N/A	N/A	48.9% of respondents believed teledentistry would not be effective	N/A

(2021) [5]					for diagnosis	
Ata et al. (2009) [10]	83 % (181/219) have anticipated that teledentistry would save time	Question 6 (72% or 157/219) and Question 11 (66% or 144/219) show that the majority of the participants thought teledentistry would be cost-effective	N/A	N/A	N/A	N/A
Maqsood et al. (2021) [11]	79.64% of dentists agree	69.96% of dentists agree	59.28% of respondents agreed	24.50% of respondents felt that the procurement of teledentistry equipment was expensive	50.6% of respondents did not want to use teledentistry for patient diagnosis	N/A
Nath et al. (2022) [15]	N/A	N/A	N/A	N/A	N/A	N/A
Khokhar et al. (2022) [16]	The majority of respondents agreed (77%)	42% of respondents agreed	65% agree	There was a mixed response to the procurement of teledentistry equipment being too expensive (36% neutral, 32% disagree, 32% agree)	42% of respondents doubted the accuracy of diagnosis using teledentistry	N/A

Aboalshamat et al. (2020) [18]	34.39% strongly agree and 24.52% agree that teledentistry saves time for the dentist	17.52% strongly agree and 20.7% agree that teledentistry helps in reducing costs of dental practices	35.99% strongly agree and 22.29% agree that teledentistry can be in addition to regular dental care	42.04% participants feel there is high cost of teledentistry infrastructure	23.57% strongly agree and 11.46% agree that dental examinations via computers and intraoral camera are as accurate as dental clinic exams	N/A
Ngwu et al. (2021) [19]	68% agreed and strongly agreed that teledentistry saves time compared to a physical appointment	56% agreed	N/A	50% agreed that teledentistry would be too expensive to set up	43.33% agreed and strongly agreed teledentistry provides accurate diagnosis as seen in the clinical setting	N/A
Ali et al. (2020) [21]	83.2% agreed that teledentistry saves time for the dentist	68% agreed teledentistry can help in reducing costs for the dental practices	N/A	N/A	84.3% agreed that dental examinations are accurate via computers and intraoral camera as in the traditional office setting	87% have difficulty in using teledentistry as in India, major challenges in teledentistry are illiterates, population below the poverty line, and lack of infrastructure
Sen,N et al. (2017) [22]	69% agreed that teledentistry saves time for the dentist	41% were neutral, while 38% agreed that it can reduce cost	N/A	N/A	55% agreed that dental procedures can be done more accurately with the help of computers and intraoral camera	65% have difficulty in using teledentistry as in India, major challenges in teledentistry are

						illiterates, population below the poverty line and lack of infrastructure
Noopur Narayane et al. (2021) [23]	56.3% agreed think that teledentistry saves time for the dentist	43.7% agreed while 37.7% were neutral	N/A	N/A	40.4% disagreed and only 36.5% agreed	N/A
Al-Khalifa & AlSheikh (2020) [24]	71% of dentists agree and strongly agreed	54% of dentists agree and strongly agreed	54% agree and strongly agree	35% disagree and strongly disagree that procurement of facilities for teledentistry is expensive (34% neutral; 31% agree & strongly agree)	38% were neutral and 32% disagreed that teledentistry can produce an accurate diagnosis like a direct examination	N/A
Shakoor et al. (2023) [25]	51.2% dentists believe that it can be time saving	63.3% dentist believe that it can reduce the cost of dental practice	N/A	N/A	71% dentists believe that it can provide a good understanding of health problems	N/A
Tayşi NM et al. (2023) [26]	39.1% of participants agreed that teledentistry would help save time	75% of the participants in the age groups 21-49 years agreed that teledentistry would reduce costs for dental practices	N/A	N/A	60% agreed that patients have enough information and proper diagnosis using teledentistry	

Priyanka et al. (2022) [27]	61.4% of postgraduates believe that teledentistry can save time in dental practice	46.1% BDS students agreed that teledentistry can save them money for dental practice	N/A	N/A	49.2% of BDS students agreed that the dental examination done through teledentistry is as accurate as face-to-face consultations	40.9% of BDS students agreed on how teledentistry equipment is difficult for them to use. The majority of postgraduates, 61.4%, think in India, the major challenges in teledentistry are illiterates, population below the poverty line, and lack of infrastructure
Murererehe et al. (2017) [28]	79.6% agreed that teledentistry can save time	55.3% agreed that teledentistry can reduce the costs of dental services	N/A	N/A	58.3% agreed that dental examination done through teledentistry is as accurate as face to face consultation	45.6% agreed that equipment for teledentistry will be difficult for me to use. Major challenges in teledentistry use are illiteracy, poverty (i.e. population below the poverty line) and lack of infrastructures
Soegyanto et al. (2022) [29]	The majority of dentists agreed (91.7%)	Most respondents agreed (63.6%)	78.2% agreed	47.1% of respondents were skeptical that procurement of	Only 1/3 of respondents agreed that teledentistry can provide an accurate	N/A

				equipment for teledentistry was expensive (only 22.3% answered in the affirmative)	diagnosis (37.8%).	
Alsharif et al. (2020) [30]	65% agreed that teledentistry shortened waitlists	51% respondents agreed that teledentistry could potentially reduce costs	48% agreed, while 30% were neutral	Under half (41%) of the respondents were unclear about their views concerning whether teledentistry is expensive to set up. Only 31% agreed	49.7% agreed that diagnosis is accurate of intra-oral images as in traditional clinical setting	N/A

Table 3: Dentists' knowledge/ awareness of teledentistry.

Author and Year	Have knowledge/awareness of teledentistry	Know the definition of teledentistry	Knowledge of teledentistry regulations	Knowledge related to drug prescribing through teledentistry
Mathivanan et al. (2020) [1]	N/A	• 95% of respondents agreed teledentistry is a practice that provides care advice remotely • 95% of dentists stated that teledentistry is not a face-to-face interview	N/A	N/A
Abbas et al. (2020) [4]	72.4% are aware about teledentistry	N/A	N/A	N/A
Raucci-Neto et al. (2021) [5]		N/A	Most dentists had low knowledge of teledentistry resolution in Brazil (38.9%)	Majority of dentists do not know how to prescribe medication through teledentistry (63%)
Save et al. (2020) [6]	Only 55.6% of respondents were aware of the concept of teledentistry and only 43% of	N/A	N/A	N/A

	respondents were aware of the modalities that can be used for teledentistry			
Pradhan et al. (2019) [8]	96.1% of respondents had heard of and knew about teledentistry	96.2% of respondents knew that teledentistry is the practice of using computers, the internet, and technology for remote diagnosis and treatment planning	N/A	N/A
Boringi et al. (2015) [12]	The level of teledentistry awareness and knowledge of post-graduate dental students is low (7.23%)	N/A	N/A	N/A
Kamalakannan et al. (2022) [13]	Only 36.9% were aware about teledentistry, while 39.2% have heard but not aware about teledentistry	62.1% participant know that teledentistry is a virtual interaction between dentist and patient	N/A	N/A
Plaza-Ruiz et al. (2021) [14]	25.75% of respondents had heard of teledentistry before the COVID-19 pandemic and increased to 62.72% during the COVID-19 pandemic.	N/A	N/A	N/A

Nassani et al. (2021) [17]	• Only 32.4% of general practitioners and 60% of specialists have heard of teledentistry • Only 32.7% of general practitioners and 53.7% of specialists know what teledentistry is	70.1% of general practitioners and 83% of specialists agreed that teledentistry is the practice of using computers, the Internet, and technology for remote consultation and treatment planning	N/A	N/A
Aboalsham at et al. (2020) [18]	17.2% participants who had previously heard of teledentistry	14% were able to identify the true meaning of "teledentistry"	N/A	N/A
Ngwu et al. (2021) [19]	68.33% have heard about teledentistry	66% agreed and strongly agreed that teledentistry is the practice and use of computers, the internet, and tele-advice about treatment over a distance	N/A	N/A
Gupta et al. (2023) [20]	85.63% have heard about dentistry	85.63% know that teledentistry is the practice of use of computers, internet ,telecommunication services, video conferencing and intraoral camera technologies to diagnosis and provide advice about treatment over a distance	48.13% agree that teledentistry can violate patient privacy	N/A
Ali et al. (2020) [21]	94.4% have heard about teledentistry	92.4% know that teledentistry is about the practice of use of computers, Internet, and technologies to diagnosis and provide advice about treatment over a distance	N/A	N/A

Sen,N et al. (2017) [22]	About 51% total participants had knowledge about teledentistry	Majority of the first(53.3%) and third BDS(53.3%) students had the knowledge about the definition of teledentistry, i.e it is the practice of use of computers, internet and intraoral camera technologies to diagnose and give advice over a distance, but 18% of postgraduates did not	N/A	N/A
Noopur Narayane et al. (2021) [23]	83.1% responded to having knowledge about teledentistry	84.7% know that teledentistry is about the practice of use of computers, Internet, and technologies to diagnose and provide advice about treatment over a distance	N/A	N/A
Priyanka et al. (2022) [27]	Postgraduate students, 78.9% had knowledge about teledentistry and how to improve the health education of the masses	Majority of postgraduate students, 77.2%, were more familiar with the definition of teledentistry than BDS students	45% postgraduate students agree that teledentistry can violate patient privacy	N/A
Murererehe et al. (2017) [28]	96.1% have Knowledge about teledentistry concept	89.3% Use in every branch of dentistry 85.44% Use for education and training of primary healthcare dentists	N/A	N/A