



Exploring Clinicians' and Patients' Knowledge, Attitudes, and Practices towards Tele-dentistry: Implications for Oral Health Access and Equity

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(Received: 07 January 2024

Revised: 12 February 2024

Accepted: 06 March 2024)

KEYWORDS

Teledentistry, oral health, awareness, cognitive, Lucknow, patient, dentist

ABSTRACT:

Introduction: The study explores the knowledge, attitudes, and practices of dental clinicians and patients towards tele-dentistry and digital health technologies, and how these factors influence equitable oral health access. By identifying potential barriers and facilitators, this investigation strives to contribute evidence-based insights for policymakers and oral healthcare stakeholders, fostering an inclusive and efficient tele-dentistry ecosystem. **Methods:** A cross-sectional questionnaire study was conducted amongst the Dental Clinicians and the patients for a duration of 4 months in the state of Uttar Pradesh, India. Ethical approval was obtained from the Institutional Ethical Committee. A list of dentists registered in the Dental Council of India, Uttar Pradesh was obtained from the DCI website. The chi-square test was used to analyze the inter-group data. **Result:** 500 dentists and 500 patients took part in the present questionnaire study. A total of 477 filled questionnaires were obtained from the Dentists and 489 filled questionnaires were obtained from the patients. SPSS version 2018 was utilized for statistical analysis.

INTRODUCTION

In recent years, the landscape of oral healthcare has witnessed a transformative paradigm shift with the emergence of tele-dentistry and digital health technologies. Tele-dentistry, characterized by using telecommunication and digital tools in dental care delivery, has revolutionized the conventional means of oral health access and delivery.^{1,2} With its potential to surmount geographical barriers, enhance patient-provider communication, and optimize service reach, tele-dentistry has garnered considerable attention in dental public health.^{3,4}

Ensuring equitable oral healthcare access for all segments of the population remains a persistent challenge in dental public health.⁵ Disparities in oral health outcomes are often rooted in socioeconomic disparities, geographical remoteness, and cultural barriers, which can impede individuals from receiving timely and appropriate dental care. Tele-dentistry has emerged as a promising solution to address these disparities and enhance access to oral health services for underserved and marginalized communities.^{6,7,8}

Dental clinicians play a pivotal role in the successful integration of tele-dentistry into routine practice.⁹ Their knowledge, attitudes, and practices toward these



innovative technologies can significantly influence their adoption and implementation. Studies have shown that dental professionals recognize the potential benefits of tele-dentistry, including improved efficiency in diagnosis, expanded patient outreach, and enhanced patient education.^{10,11} However, concerns regarding data security, legal complexities, and the need for appropriate training have been cited as barriers to widespread acceptance (American Telemedicine Association, 2019). Addressing these concerns is essential to fostering a supportive environment for the seamless incorporation of tele-dentistry into clinical workflows.^{12,13}

Moreover, the perspectives of patients regarding tele-dentistry are equally vital to its success. Patients' knowledge, attitudes, and practices toward digital health technologies impact their willingness to embrace virtual dental consultations and comply with prescribed treatment regimens.¹⁴ Research has indicated that patients generally hold positive attitudes toward tele-dentistry, especially in underserved rural areas with limited access to traditional dental care. Nonetheless, ensuring patient satisfaction and instilling trust in remote care necessitate the assurance of data privacy, reliable virtual interactions, and patient-centered care delivery.¹⁵

This study explores the knowledge, attitudes, and practices of dental clinicians and patients towards tele-dentistry and digital health technologies, and how these factors influence equitable oral health access. By identifying potential barriers and facilitators, this investigation strives to contribute evidence-based insights for policymakers and oral healthcare stakeholders, fostering an inclusive and efficient tele-dentistry ecosystem. In conclusion, the integration of tele-dentistry, when judiciously employed, presents a key step towards equitable oral healthcare access, addressing disparities, and improving oral health outcomes for diverse populations.

AIMS

1. To Assess the Knowledge of Dental Clinicians and Patients regarding Tele-dentistry and Digital Health Technologies: The primary aim of this study is to evaluate the level of awareness and understanding among dental clinicians and patients about tele-dentistry and digital health technologies. By exploring their knowledge base, the study seeks to

identify gaps and areas where further education and training might be required for effective utilization of these technologies.

2. To Examine the Attitudes of Dental Clinicians and Patients towards Tele-dentistry: The study aims to investigate the perceptions and attitudes of dental clinicians and patients towards tele-dentistry. Understanding the attitudes of both groups is crucial as positive attitudes can foster acceptance and successful integration of tele-dentistry into routine dental practices and patient care.
3. To Explore the Practices and Utilization of Tele-dentistry by Dental Clinicians and Patients: Another key objective of the study is to assess the current practices and utilization patterns of tele-dentistry among dental clinicians and patients. This involves understanding how often tele-dentistry is employed, the specific services offered through virtual platforms, and the extent of patient engagement in remote oral healthcare.
4. To Identify Barriers and Facilitators for the Implementation of Tele-dentistry: The study seeks to identify the challenges and barriers faced by dental clinicians and patients in the adoption and implementation of tele-dentistry. These barriers may include technological limitations, legal and regulatory concerns, reimbursement issues, and patient acceptance. Additionally, the study aims to identify factors that facilitate the successful incorporation of tele-dentistry into dental practices and patient behaviors.

OBJECTIVES

1. To conduct surveys and interviews with dental clinicians to assess their knowledge, attitudes, and practices towards tele-dentistry and digital health technologies.
2. To conduct surveys and interviews with patients to understand their knowledge, attitudes, and practices related to tele-dentistry and their willingness to engage in virtual dental consultations.
3. To analyze the collected data to quantify the level of knowledge, attitudes, and practices among both dental clinicians and patients.
4. To identify the main barriers and challenges dental clinicians and patients face in adopting tele-dentistry.



5. To explore potential facilitators and strategies to overcome barriers to the successful integration of tele-dentistry into clinical workflow and patient care.
6. To provide evidence-based insights and recommendations for policymakers and dental health stakeholders to promote equitable oral healthcare access through tele-dentistry.

By accomplishing these aims and objectives, the study endeavors to provide valuable information that can inform policy decisions, guide the development of training programs and optimize the implementation of tele-dentistry to enhance oral healthcare access and equity for diverse populations.

METHODOLOGY

A cross-sectional questionnaire study was conducted amongst the Dental Clinicians and the patients for a duration of 4 months from April 2023 to July 2023 in the state of Uttar Pradesh, India

Ethical approval was obtained from the Institutional Ethical Committee.

A list of dentists registered in the Dental Council of India, Uttar Pradesh was obtained from the DCI website. (<https://dciindia.gov.in/DentistDetails.aspx>)

The state of Uttar Pradesh was divided into 5 zones, North Zone, South Zone, East Zone, West Zone, and Central Zone and an equal number of dentists were taken in the study from each zone.

A total of 500 Dental Clinicians and 500 patients were included in the study, which was in accordance with the sample size calculation.

INCLUSIONCRITERIA

1. Dentists registered with the Dental Council of India, Uttar Pradesh.
2. Dentists perusing Post-Graduation (M.D.S).
3. Dentists in the age group 28-50 years.
4. Patients undergoing/undergone Dental Treatment.
5. Patients who can interpret both Hindi and English language.
6. Patients in the age group 21-50 years.

EXCLUSIONCRITERIA

1. Dentists who did not give consent.
2. Patients who could not interpret both English and Hindi languages

Two self-administered, close-ended questionnaires consisting of 20 questions each were distributed among the Dental Clinicians as well as the patients to evaluate their knowledge, attitude, and practices toward Tele-Dentistry.

VALIDITY AND RELIABILITY OF THE QUESTIONNAIRE

The forward translation of the questionnaire into the Hindi language for the patients was done by the Principal investigator and co-investigator as they were natives of the place, while the back translation into the English language was done by an expert translator who was blinded to the pre-formed questionnaire.

The Face Validity of the questionnaire supplied to the Dental Clinicians was substantial as the Cohen's Kappa Index measured 0.71.

The Face Validity of the questionnaire supplied to the Patients was moderate as the Cohen's Kappa Index measured 0.60.

The questionnaires were repeatedly sent to the field experts to determine the content validity, estimated to be 0.56 according to the Content Validity Ratio as proposed by Lawshe.

The Reliability of both questionnaires was estimated to be good and acceptable according to Cronbach's Alpha, with numerical values of 0.82 and 0.63 respectively.

CONSENT

The Dental Clinicians were contacted by telephone and the questionnaire was mailed after obtaining the verbal consent of the clinicians.

The patients were explained about the study thoroughly. The questionnaire was translated into Hindi as well as in the English language. Informed verbal consent was obtained from every patient before administering the questionnaire.

PILOT STUDY

A pilot study was conducted on 70 Dental Clinicians, and 70 Dental Patients to obtain the preliminary data for the calculation of a sample size for the primary outcome.

DATA COLLECTION

The Dental Clinicians were requested to mail back the filled questionnaire, whereas the questionnaire



distributed to the patients was manually collected by the Principal investigator and the co-investigator.

SAMPLE SIZE ESTIMATION

The sample size was estimated based on the pilot study
 $N = Z^2 \times P \times (1-P) / C^2$

With N = sample size, Z = value corresponding to a given confidence level (1.96 for a confidence level of 95%-value commonly used), p = percentage of the primary indicator, expressed as a decimal (default 0.5), c = standard error, expressed as a decimal (0.05 or 0.10 in general).

It was estimated to be 426 for dentists and 485 for patients, which was rounded off to 500 each for incorporating attrition in the sample size.

RESPONSE RATE

A response rate of 95.4% and 97.8% was observed among the Dental Clinicians and patients, respectively.

STATISTICAL ANALYSIS

The chi-square test was used to analyze the inter-group data, whereas an independent t-test was utilized to analyze the data between the unrelated populations. SPSS version 2018 was used for statistical analysis and the master spreadsheet was prepared on Microsoft Excel.

RESULT

500 dentists and 500 patients took part in the present questionnaire study. A total of 477 filled questionnaires were obtained from the Dentists and 489 filled questionnaires were obtained from the patients.

The estimated mean age of the responding dental practitioners was found to be 38 years with a standard deviation of 3.2. Demographic data showed that the majority of the respondents were males (53.8%) when compared to females (46.2%) [Table 1]

Approximately 97.2% (464) of Dental Practitioners evidenced a commendable level of knowledge and acumen pertaining to teledentistry. A substantial 95% (453) demonstrated a sophisticated understanding of the utilization of computers, the internet, and technological modalities for remote diagnostics and dispensation of treatment advice. In terms of future professional endeavors, a noteworthy 81.7% (390) of Dental Practitioners conveyed an intention to integrate teledentistry into their prospective clinical practices. In

a nuanced perspective, a marginally smaller cohort, comprising 69.1% (330) of respondents, subscribed to the belief that teledentistry is efficacious for consulting with specialists concerning specific patient-centric issues. A predominant majority, encapsulating 76.1% (363) of Dental Clinicians, attested to the instrumental role of teledentistry in augmenting accessibility to oral health care. The inquiry posing, "Integrating Teledentistry into dental practice can enhance the delivery of Oral Health Care," elicited a robust response rate of 81% (386). Impressively, 83.1% (396) of the surveyed individuals manifested a favorable disposition towards the prospective incorporation of teledentistry into their clinical repertoire.

Similarly, 71% (339) of Dental Clinicians articulated an aspiration to establish teledentistry and telemedicine infrastructure at the grassroots level. In contradistinction, a substantial 89% (425) of Dental Clinicians pinpointed a deficiency in literacy and awareness as a formidable impediment constraining the broader adoption of teledentistry within the dental community.

A total of 489 responses were garnered from patients, encompassing inquiries categorized into knowledge, attitude, and practice. The respondents exhibited a moderate level of knowledge and awareness concerning teledentistry. Notably, 63% identified as male, while 37% identified as female. Of the participant pool, 71.1% demonstrated awareness of teledentistry, with 28.9% lacking such awareness. In terms of utilization, 57.7% of respondents reported using teledentistry and expressing satisfaction, while 42.3% deemed it not useful. The majority (51.9%) considered teledentistry beneficial for individuals aged between 25 and 35 years, whereas 48.9% favored those above 55 years.

Regarding infrastructure, 55.2% acknowledged that teledentistry necessitates a sophisticated setup, while 44.8% expressed a contrary view. A substantial proportion (68.8%) agreed that teledentistry enhances access to oral healthcare in rural areas, with 31.2% dissenting.

In terms of cost efficiency, 57.7% of respondents concurred that teledentistry is cost-effective, while 42.3% disagreed. Moreover, 71.3% affirmed that teledentistry promotes awareness among illiterate individuals, with 28.7% holding a different perspective. When asked about India's status in teledentistry development, 82.4% acknowledged a lag, while 17.6%



disagreed. Interestingly, a significant majority (83.8%) expressed a willingness to recommend teledentistry to their friends, contrasting with 16.2% who opposed the idea.

59% of the respondents were satisfied with the use of teledentistry as a means of consultation with the Dentist, whereas 41% of the patient population were not fully satisfied with the virtual consultation.

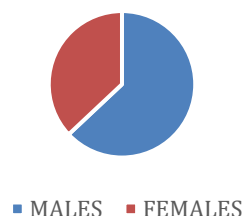
88.3% of the patient population agreed to the usefulness of teledentistry during COVID-19.

66.7% of the patient population responded to the positive effect of teledentistry in reducing the anxiety and fear of visiting a Dentist post initial session with the Dentist through teledentistry.

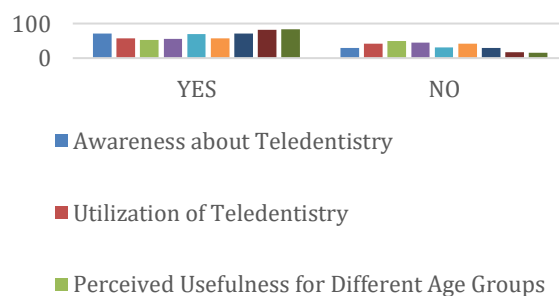
Statistically significant results were obtained with the age ($P=0.014$) and years of experience ($P=0.018$) among the practicing Dentists. A Prominent association was found between integration of teledentistry into everyday practice ($P=0.015$) and elimination of rural areas as a road block towards oral health care ($P=0.020$).

While results obtained from the patient population demonstrated a significant association between teledentistry and reduction of anxiety ($P=0.012$), ease of access to quality oral and dental health care ($P=0.016$), and reduced cost of travelling to an urban settled Dentist for initial consultations ($P=0.018$).

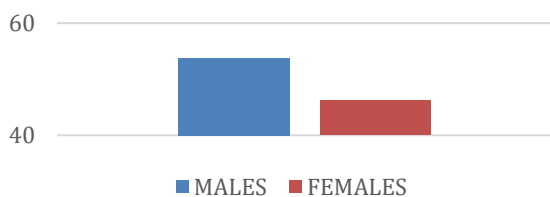
DEMOGRAPHIC DATA OF PATIENTS (Table 2)



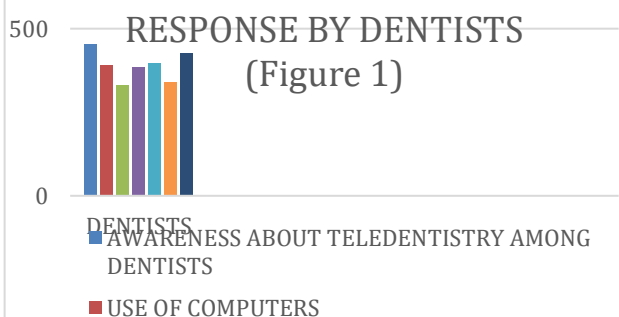
RESPONSE BY PATIENTS (Figure 2)



DEMOGRAPHIC DATA (Table 1)



RESPONSE BY DENTISTS (Figure 1)



DISCUSSION

The exploration of the cognitive dispositions, inclinations, and behaviors of dental professionals and patients toward tele-dentistry represents a noteworthy stride in the realm of advancements, particularly in relation to extending Dental Consultancy accessibility to communities and populations currently devoid of such services. Consequently, this study adopts a meticulously structured protocol to gauge the perspectives of both Dental Clinicians and patients concerning Tele-Dentistry.

In the current investigation, a substantial 97.2% of Dental Practitioners demonstrated awareness of teledentistry, a figure that aligns coherently with the outcomes of a study conducted by Pradhan et al.¹⁶ The average age of the participating dental practitioners in this study stands at 38 years, exhibiting a contrast to the average age of 46.3 years reported in a study by Giraudeau et al. in 2022.¹⁷ Noteworthy is the fact that



81.7% of the dentists in the present study expressed concurrence with the favorable outcomes associated with the integration of teledentistry into their routine practices, a trend that mirrors the findings of studies by Pradhan et al. and Fahim et al.^{16,18}

Teledentistry emerges prominently as a crucial tool for patient referral in the perception of the majority of practicing dentists in this study, a finding consistent with pivotal observations in studies conducted by Balasaraf et al. in 2015 and Nyodu et al. in 2022.^{19,20}

Among the dental patients participating in this study, 71.1% demonstrated an awareness of teledentistry, a statistic in close accordance with the findings of a study by Francis et al. in 2021.²¹ The present study unequivocally establishes that dental patients comprehend the significance of teledentistry in rural areas, a sentiment harmonious with the findings of the study conducted by Francis et al., where 77.85% of the patient population recognized the importance of teledentistry in rural settings.²¹

A significant 88.3% of the patient population acknowledged the utility of teledentistry during the COVID-19 pandemic, a reflection of results observed in a study by Sunter N et al. in 2020.²² Furthermore, the positive impact of teledentistry on reducing levels of anxiety and stress among the patient population, a phenomenon also corroborated in a study by Wajiha et al. in 2022.²³ Patient satisfaction with teledentistry, as indicated in the present study, finds resonance with outcomes from a study by Amitha et al. in 2021, where multiple avenues were provided for patients to articulate their satisfaction.²⁴

This investigation comprehensively addresses diverse facets of teledentistry, taking into account both dental practitioners and the patient population. While the provision of dental consultations through virtual streaming is a boon, it is imperative to recognize existing impediments such as the requirement for high-speed internet and basic literacy, which persist as notable challenges in many rural agglomerations of India

CONCLUSION

Teledentistry, a concept introduced in the era of internet proliferation, gained prominence during the widespread impact of COVID-19. This was particularly evident as patients faced restrictions on physical travel to dental facilities, necessitating initial consultations for

emergency and timely relief. Our investigation comprehensively examined the perspectives of both dental practitioners and patients. The findings underscored the clinical efficacy of incorporating teledentistry seamlessly into routine dental practices, offering dentists a valuable tool. Additionally, patients residing in rural settings were found to benefit from utilizing teledentistry to access high-quality oral and dental care.

RECOMMENDATIONS

The assimilation of teledentistry into standard dental practices necessitates a proficient understanding of computer technology. Propagating this integration mandates that emerging dentists acquire requisite computer literacy during their dental education and seamlessly incorporate this proficiency into their routine dental practice.

CONFLICT OF INTEREST

There is no conflict of interest between the authors.

ACKNOWLEDGEMENT

I would like to acknowledge all the contributing authors for their help and support in the process of data collection and further processing of the present research. I would also like to extend gratitude to all the authors whose articles have been used as references in the present research study.

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