"Impact of Telemedicine in Dentistry"-An Indian Perspective

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Authors' contributions

This work was carried out in collaboration among all authors. All the authors have contributed their part in the research review work equally towards the preparation of the manuscript. All authors read and approved the final manuscript.

Review Article

ABSTRACT

Combining telecommunications and dentistry, teledentistry entails the transmission of clinical data and photographs over vast distances for dental consultation and treatment planning. It has the power to increase oral healthcare delivery, increase accessibility, and decrease expenses. Additionally, it might end the discrepancies in oral healthcare between rural and urban areas of various parts of our country. In addition to reviewing the current information that is available in the literature, this article also discusses the history, justification, scope, foundation, and needs for teledentistry. This article also discusses the future of this alternative and cutting-edge approach to providing dental care, as well as the ethical and legal concerns associated with the practise of teledentistry. This focuses on the need for use of Telemedicine in India.

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1. INTRODUCTION

"Telemedicine" is the use of information-based technologies and communications systems to deliver healthcare across geographic distances. It uses electronic information to communicate technologies to provide and support healthcare when distances separate the participants [1]. Telemedicine is being used today in academic medical centers, community hospitals, managed-care companies, rural hospitals, and is used throughout our country. Advances in digital communication, telecommunication, and the Internet introduce an unprecedented opportunity to remote access to medical care. Today, the science of dentistry has advanced much farther than it ever could. The management of dental ailments can now be addressed effectively even when they are at a farther distance from medical accessibility and newer advancements.

"A branch of telemedicine that deals with dentistry is called as "TELEDENTISTRY," and it handles the complete process of networking, sharing digital information, remote consultations, workup, and analysis" [2].

2. METHODS OF TELECONSULTATION

1. "In order to arrive at a diagnosis within the same appointment, two-way interactive or Real-Time consultation/Synchronous Real-Time consultation involves video conferencing between a dentist and patient with simultaneous exchange of information, medical history, and reports. Two-way interactive technology enables obtaining live images or sound occuring in an originating site to a person in a remote or distant site. It also helps in the fast exchange of information and reporting with a peer dentist or specialist" [3].
2. "Asynchronous store-and-forward teledentistry; data is collected from one place, saved, and sent to the treating consultant at another location. Relevant data in the form of X-rays, photographs and scanned images are uploaded and forwarded to the consultant after screening it or storing it in the system" [3].
3. Remote monitoring of the patient Information on health and other medical data are transmitted from one location to another via electronic media for healthcare and supportive management.
4. "Mobile health (mHealth) : The use of mobile communication devices to support

public health practice and education by using devices such as cell phones ,tablets, computers, and personal digital assistants (PDAs)" [4].

3. TELEDENTISTRY SUBUNITS

Teletriaging: Patients can be grouped according to how quickly they need to receive treatment ,the credit for which goes to teletriaging which determines wether the situation requires elective or emergent management [3]. While handling non-emergent patients before they attend to a hospital, "Forward triage" lessens the workload of a caregiver by prioritising urgent cases, scheduling elective cases for teleconsultation at a convenient time, and postponing appointments. It anticipates potential crises and stops superfluous movements during pandemics [5].

The main element of the telehealth paradigm is teleconsultation, or interactive consultation with a clinician via telephone or video conference. A teleconsultation is a virtual visit that includes the exchange of the principal complaint, medical history, most current and prior laboratory reports, extraoral photographs, intraoral images, dental cast photographs, radiographs, and inspection [6]. Telediagnosis is a diagnosis made after an analysis of the data gathered during a teleconsultation. The patient is given a projected diagnosis and a developed treatment plan. In the past, Haron et al. made an effort to create "Mobile Mouth Screening Anywhere (MeMoSA®)" for the detection of oral cancer. "Telemonitoring Follow-ups and regular exams in dentistry have never been given as much importance by patients. Telecommunications can be used to monitor postoperative situations in an efficient manner" [7].

Taking the help from scheduled telephonic calls, video conferencing, or merely by filling e-forms about resolution of symptoms can pave the way for sound dental health and can anticipate any treatment failure to occur. Adoption of teledentistry in daily practice:

1. "Conduction of regular virtual continuous dental education programs and webinars for dentists to appraise various recent software and technological platforms as a medium for practicing teledentistry" [8].
2. Dissemination of approaches for adequate management by dentists can be delivered by hospital based software with stepwise triaging of patients. The hospital-based

software can also be converted into a self-help application with which patients can direct themselves according to their chief complaint and acquire help from a specialist by scheduling a call or initiating a conversation. Pediatric patients may have a variety of treatment needs that requires definitive operative, endodontic, orthodontic, or surgical intervention in a dental clinic/hospital. To reduce the requirement for dental clinic visits, we suggest a paradigm of teledentistry-assisted therapy of children dental issues during the COVID-19 pandemic that can be enhanced with video-based and live teleconsultation demonstrations [8]. It provides at-home suggestions for non-emergency issues that can be distributed to parents and caregivers via teleconsultation mode. This strategy's primary goal is to assist in the pandemic when patients are unable to receive professional treatment because of the risk of infection, overcrowded hospitals, and a lack of operating dental offices during lockdowns [7].

4. CHALLENGES RELATED TO ACCEPTANCE OF TELEDENTISTRY BY DENTISTS

The fact that dentists may find teledentistry complex and possibly tough to learning new skills is due their lack of acceptance of this practise. They can lack technology expertise, be sceptical of giving the wrong diagnosis, and worried about rising expenditures and expenses. Infrastructure-related limitations could include insufficient internet access, a lack of gear, a lack of training, and a lack of technical support and knowledge [9]. Other obstacles to teledentistry's adoption by dentists include organisational incompatibility with the healthcare system, insufficient financial reimbursement, poor guidelines, lack of coordination between the remote and core centres, and exorbitant setup costs. Other restrictions include the two-dimensional portrayal of lesions and inability to conduct tests like palpation and auscultation. The acceptance of teledentistry will rise as a result of dentists receiving proper training and education in this technology to address these issues. The dental school curriculum needs to be updated with infection control methods in light of the current pandemic, but it also needs to include regular instruction on teledentistry as a means of preventing the spread of illness. In addition, the healthcare systems will need to provide sufficient funding, payment, and authentication for teledentistry [10,11].

5. CHALLENGES RELATED TO ACCEPTANCE OF TELEDENTISTRY BY PATIENTS

Any module must have patient acceptance in order to succeed. Lack of face-to-face interaction may cause patients to fear they are not adequately communicating their difficulties to their dentists. It will take time to overcome these obstacles. Patients' acceptance of teledentistry will rise in lockstep with the overall acceptance of telemedicine, which is rising daily [12]. Teledentistry is becoming the most favoured option in India according to numerous polls.

The scope of Teledentistry is that it has the potential to increase accessibility to oral healthcare, and can enhance its mode of delivery as well as be cost-beneficial.Additionally, it might end the discrepancies in oral healthcare between rural and urban areas. The fastest and least expensive solution to close the health gap between rural and urban areas may be through teledentistry. Teledentistry can aid in bringing specialised healthcare to the most distant regions of the globe, especially in light of the enormous advancements made in the realm of information and communication technology [13]. Teledentistry will be crucial if dentist shortages predicted for the next ten years materialise, benefiting not only our urban and suburban populations but also those in rural areas. Improved interprofessional communication will also help dentistry's integration into the larger healthcare delivery system [14].

6. BASIS OF TELEDENTSITRY: THE INTERNET

Modern teledentistry systems are built on the Internet since it is quick, current, and capable of sending massive amounts of data. The Internet is the foundation for all modern teledentistry technologies and forms of remote consultation. Clinicians and information technology professionals have reevaluated teledentistry as a very important healthcare tool as a result of changes in data transfer speed and method over the previous ten years. Internet-enabled information and communication technology have largely taken over campus and college academic life. Students can select the location, timing, and

manner of learning through internet-based teledentistry instruction [15,16].

7. CURRENT EVIDENCE FOR TELEDENTISTRY

Role in oral medicine and diagnosis Torres-Pereira C et al. proposed that distant diagnosis, employing transmission of digital images via email, is an efficient substitute in the diagnosis of mouth lesions. The Northern Arizona University Dental Hygiene Department developed a teledentistry assisted, affiliated practise dental hygiene model that allowed dental hygienists to provide oral healthcare to underserved populations by digitally connecting up with a distant oral health team.According to Summerfelt FF. Duka M. et al. demonstrated that "the diagnostic assessment of the clinical diagnosis of impacted or semiimpacted third molars supported by the telemedicine technique was equal to the real-time assessment of clinical diagnosis in the field of oral and maxillofacial surgery" [17].

In order to adequately assess patients for dentoalveolar surgery under general anaesthesia and nasotracheal intubation, telemedicine consultations are as reliable as those carried out using conventional methods, according to Rollert MK et al. [18]. Telecommunication is an effective and affordable mechanism to provide pre-operative evaluation in circumstances where patient transport is challenging or expensive. Role in Endodontics According to Brullmann D et al. remote dentists can recognise root canal orifices based on photographs of teeth that have undergone endodontic access [19]. Zivkovic D. et al. showed that "teledentistry based on the Internet as a telecommunication medium can be effectively used in the diagnosis of periapical lesions of the front teeth, minimising the costs associated with remote visits and making urgent assistance available" [20].

Role in orthodontics According to Berndt F et al. "interceptive orthodontic treatments provided by sufficiently prepared general dentists and supervised remotely by orthodontic specialists through teledentistry are a viable approach to reducing the severity of malocclusions in disadvantaged children when referral to an orthodontist is not feasible" [21]. According to Favero L et al. "telemedicine in dentistry is especially helpful in the field of orthodontics because minor emergencies (rubber ligature displacement, discomfort from the appliance, and cheek irritation) can be easily resolved at home, assuring the patient and parents on the one hand and limiting visits to the dental office to cases of actual need on the other" [22]. "The use of videoconferencing for diagnosis and treatment planning for patients needing prosthetic or oral rehabilitation treatment was investigated by Ignatius E et al. They concluded that video-consultation in dentistry has the potential to increase the total number of dental specialist services in sparsely populated areas" [23].

8. ETHICAL AND LEGAL ISSUES

The transfer of medical histories and data, as well as general security difficulties with electronic information held in computers, raise questions regarding the confidentiality of dental information. Teledentistry professionals should exercise extreme caution to prevent unauthorised parties from invading patients' privacy [24]. Despite all attempts to maintain security, patients should be informed that their information will be transmitted electronically and there is a chance that it could be intercepted. Questions may also arise over the best way to notify patients of the potential transmission of their data. Everything that is included in a typical, conventional consent form should be covered by informed consent in teledentistry [25].

The patient should be made aware of the potential danger of incorrect diagnosis and/or therapy as a result of technological failure. Medical law and copyright concerns must also be taken into account when practising teledentistry. These challenges are mostly brought about by a lack of clear standards. There is currently no way to guarantee the accuracy, reliability, effectiveness, or efficiency of information or its exchange. With electronic commerce come privacy and security concerns, as well as pay, financial, and taxation challenges. Legislative or judicial bodies of numerous governments have not yet made a final decision on many legal problems, including licensure, jurisdiction, and malpractice [26].

9. DISCUSSION

The field of teledentistry is not a recent one. In actuality, it is a different way to provide the same dental treatments. It is impossible to overstate the value of teledentistry in far-off, isolated regions. Its application is crucial and highly valuable in rural and urban regions of India which does not have easy access to specialised

consultation. The usefulness and popularity of teledentistry, a new component of overall patient care, are rising quickly. "The patients of a primary care physician who makes use of the considerable experience made available by teleconsultation would benefit much from it. Information sharing will improve patient care, and being able to consult with colleagues more effectively will improve comprehension of the goals of treatment and the effectiveness of that treatment" [27-30].

"Family dentists can act as gatekeepers for specialist services, coordinating the dental care offered by other dental specialties, therefore effective use of teledentistry will lead to the successful development of family dentistry in the upcoming generation.. Although Internet-based Teledentistry has surpassed other forms of communication, there are still some potential drawbacks, including the need for appropriate training, the pressure for a quick response, message misunderstandings, privacy concerns, and the potential to overlook or ignore the messages" [31]. "The legal, technological, and ethical considerations that are related to this new practise medium must be understood by practitioners who choose to incorporate teledentistry into their practises. Dentists need to take the initiative and get acclimated to the digital environment. The price of the telecom equipment has also been a source of worry" [32].

It has been ten years since these cost-effectiveness studies were released, but they predicted that teledentistry's cost-effectiveness would increase with increased device use and familiarity. The payment of the medical experts who conduct teleconsultations is another significant topic that needs clarification. It might be appropriate to charge the same fee for telemedicine consultations as for traditional face-to-face ones. But in recent years, payment for teleconsultations has consistently been a problem [33-35].

10. CONCLUSION

With all the technology advancements in the teledentistry industry, practitioners may ultimately connect to virtual dental health clinics, ushering in a completely new era of dentistry. Future scenarios with long-term dental care shortages, such as space travel, maritime travel, and various rural places, may also involve remote telemedical control of robotized devices. The results obtained thus far are quite encouraging,

laying the foundation for further research. Before teledentistry can reach its potential, though, there are a number of issues that need to be resolved.

CONSENT AND ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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