

Teledentistry: A Mini Review

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Abstract

Oral health matters. Teledentistry is defined as the collective use of technology to address oral health issues at a distance. The practice teledentistry could possibly be ideal for underprivileged population in remote places where access to oral health services is limited. Teledentistry specifies oral health care assistance through consultation, diagnosis, prevention, treatment using audio, video and data communication. The use of Information and Communication Technologies (ICT) for the exchange of data and information in dentistry, providing health services in situations where it is necessary to overcome geographical, temporal, social and cultural barriers is called teledentistry.

Keywords: *Teledentistry, Telemedicine, E-health, Information and communication technology, Oral health.*

Introduction

Foundation of teledentistry is deeply rooted in telemedicine. The use of telemedicine was initiated for rural population in disadvantaged areas. An equitable and economical paradigm of oral health care is required to increase the opportunity in providing viable dental services to the poor, particularly those living in isolated regions⁽¹⁾. Government policies have persistently pushed the health practitioners, offering financial enticements, to consider job opportunities in rural locations. But, providing ample clinical guidance and support to the newly recruited personnel is a tough task. Thus, teledentistry can be used as a mode of providing access to specialist advice and education, which was previously unattainable⁽²⁾.

Global Scenario

Oral diseases are definitely amongst the most prevalent global public health problem. Oral health

pathologies are the most widespread on a global scale and have serious repercussions on general health⁽³⁾. The untreated dental caries of succedaneous dentition, in particular, accounts for 2.4 billion individuals worldwide which is almost 35% of the entire population⁽⁴⁾. Other oral health issues, namely, cancer of lips and oral cavity, periodontal disease and tooth loss have severe consequences which affect the quality of life of an individual⁽³⁾. It has already been acknowledged that oral health issues are a matter of grave concern for the low and middle income countries [LMICs] in terms of social, economic and commercial growth⁽³⁾.

The United States, Department of defense Total Dental Access venture is considered as the pioneer project in teledentistry⁽⁵⁾. Since its inception in 1994, a sequential shift in technological advancement is eminent. From the use of plain old telephone system [POTS] to the world wide web at present. A series of other technologies have also been used in the interim period, such as fax machines, file transfer via satellite and integrated services digital network [ISDN].

The substantial findings of the previous literature in teledentistry reveals a promising future towards bridging the rural-urban gap of dental health care opportunities. The several key findings of updated literature are presented in the following tables.

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Table 1: Substantial findings of the previous literature in teledentistry reveals a promising future towards bridging the rural-urban gap of dental health care opportunities.

Reference	Study Design	Context	Key Findings
Teoh et al. ⁽⁶⁾ 2018 AUSTRALIA	Economic analysis	Teledentistry in providing specialist care for cleft patients in rural area.	In comparison to face-to-face consultation, teledentistry is a prospective cost-effective alternative.
Carrard et al. ⁽⁷⁾ 2018 BRAZIL	Exploratory study	Tele-diagnosis of oral lesions via web-based platform to specialized oral medicine teleconsultants.	Tele-diagnosis is an efficient and feasible pathway in detecting lesions of oral cavity, thereby improving standard of primary health care services.
Estai et al. ⁽⁸⁾ 2018 AUSTRALIA	Cost minimization analysis	Cost comparison between tele-screening and traditional screening approach in school children from different regions.	In a context of limited resources, tele-screening assists in diminishing the inequities by shifting available resources towards high risk children.
Tynan et al. ⁽⁹⁾ 2018 AUSTRALIA	Mixed method comparative study	Integrated platform combining teledentistry and oral health therapists for residents of aged care facilities.	This integrated setting was beneficial to high care residents with pre-conditions such as dementia and other cognitive or physical disabilities. Added advantage of increased support and training opportunities for staff members.
Pacheco et al. ⁽¹⁰⁾ 2018 BRAZIL	Action research	Information and communication technologies for professional training in dentistry.	Teledentistry services can endorse, through its specific tools, information, exchange of knowledge and experiences to develop and improve its services.
McLaren et al. ⁽¹¹⁾ 2017 UNITED STATES	Retrospective study	Teledentistry in predicting accuracy of actual treatment modality in a rural paediatric set up.	Live video teledentistry in paediatric consultations are reasonably accurate as well as effective intervention for extensive dental needs with complex treatment modalities.
Giraudeau et al. ⁽¹²⁾ 2017 FRANCE	Accuracy study	Oral telehealth communication performed by a dentist and a nurse, to find their disparity in diagnoses.	Although oral teleconsultation is not as accurate as conventional oral screening, it is adequate for providing an appropriate diagnosis. However, 63% of the recorded diagnoses turned out to be wrong.
McFarland et al. ⁽¹³⁾ 2017 UNITED STATES	Quantitative descriptive study	Formative evaluation and effectiveness of teledentistry program in a rural location.	Statistical data evaluation offered critical feedback to program administrators. Tele dentistry has the potential to improve oral health outcomes, especially for rural and underprivileged populations.
Estai et al. ⁽¹⁴⁾ 2017 AUSTRALIA	Cost minimization analysis	Cost savings from a teledentistry model.	Annual reduction in cost of teledentistry program was considerably lesser than conventional face to face dental screening, in rural areas as well as urban areas. This marked reduction of expense was reflected due to the low remunerations for dental therapists, and the cost savings of travel and accommodation.
Kruger et al. ⁽¹⁵⁾ 2016 AUSTRALIA	Descriptive cross-sectional study	Australian dental practitioners.	General dental practitioners had optimistic view and have supported the model of teledentistry and its integration into modern dental practices.
Roxo-Gonçalves et al. ⁽¹⁶⁾ 2016 BRAZIL	Assessment study	Teledentistry for diagnosis of oral lesions by dentists and non-dentists.	Good capability in distinguishing the nature of oral lesions. E-learning may develop the knowledge essential for detection of oral cancer.
Blomstrand et al. ⁽¹⁷⁾ 2012 SWEDEN	Cross-sectional study	Tele consultations against simple referrals.	Highly effectual oral health care and correct diagnosis provided at the correct place as part of the health service is an economical and effective way to organize health services.

Reference	Study Design	Context	Key Findings
Skelton-Macedo et al. ⁽¹⁸⁾ 2012 BRAZIL	Descriptive study	Teleassistance applications for adding to professional actions refining the quality of oral care.	Introducing information and communication technology in day to day dental practice is advantageous. However, protecting the confidentiality of information relating to patients is a matter of concern.
Bradley et al. ⁽¹⁹⁾ 2010 NORTHERN IRELAND	Descriptive study	Application of teledentistry in oral medicine in a community dental service.	Use of teledentistry for triage referrals, could be a substitute to the management of referrals of elderly patients having oral diseases.
Berndt et al. ⁽²⁰⁾ 2008 UNITED STATES	Case control series study	Teledentistry to provide interceptive orthodontic services to disadvantaged children.	Real time supervision by an orthodontist is a feasible approach to reduce the severity of malocclusion in disadvantaged children when referral is not possible.
Chen et al. ⁽²¹⁾ 2007 UNITED STATES	Case report	Specialized dental care from a distance.	The assessments, diagnoses, and advocated treatment plans were comprehensive and similar to routine dental clinic visit. However, 61% of visits were of similar time duration as a regular in-office appointment.
Mandall et al. ⁽²²⁾ 2005 UNITED KINGDOM	Randomized controlled trial	Screening new patient for orthodontic referrals using teledentistry.	An effective scheme for positively identifying appropriate new patient for specialist orthodontic treatment. Thus, eliminating inappropriate referrals and saving time.
Stephens et al. ⁽²³⁾ 2002 UNITED KINGDOM	Questionnaire study	Attitude of orthodontists of United Kingdom in offering advice to general dental practitioners.	A majority of orthodontists encourage the teledentistry model to make their opinion more accessible to general dentists and subsequently to the patients.

Indian Scenario

A considerable improvement in oral health has been noticed over the years. However, an unequal development in the prevalence and severity of oral diseases in the urban civilization compared to their rural counterpart is a matter of concern. World Health Organization [WHO], ideally proposes a dentist to population ratio of 1:7500. According to World Health Statistics- 2014, the ratio was 1:10000. In 2004, dentist-population ratio in India was 1:30000⁽²⁴⁾. But in 2004, India had one dentist for 10000 individuals in urban areas whereas one dentist for approximately 250000 individuals in rural areas. This indicates, three-quarters of the total dentists are

clustered in the urban areas where only one-quarter of the country's population reside⁽²⁵⁾.

Periodontal diseases are the most prevalent oral health care issue in India. In age groups 12, 15, 35-44 and 65-74 years, the prevalence of periodontal diseases reported were 57%, 67.7%, 89.6% and 79.9%, respectively⁽²⁶⁾.

Introduction to teledentistry in India shall propel the health care system as it will serve as an effective adjunct and a potential cost-effective tool in a low-resource setting. A few studies have been conducted in India and there is a vast scope for future research in this field.

Table 2: Studies related to Teledentistry in India.

Reference	Study Design	Context	Key Findings
Avula et al. ⁽²⁷⁾ 2015 INDIA	Descriptive study	Potential of tele-periodontics.	Better patient supervision over geographic limitations. Prospects of oral health education.

Reference	Study Design	Context	Key Findings
Boringi et al. ⁽²⁸⁾ 2015 INDIA	Cross-sectional study	Awareness of teledentistry programs.	Most of the dental professionals lacked enough knowledge and understanding.
Purohit et al. ⁽³⁰⁾ 2017 INDIA	Cross-sectional study	Teledentistry as a tool to screen for dental caries among 12 years old school children.	Teledentistry and clinical examination findings were equivalent. This study set up provides evidence that teledentistry can be used as a feasible tool for consultation and treatment planning.
Vinayagamoorthy et al. ⁽²⁹⁾ 2019 INDIA	Cross-sectional study	Efficacy of a remote screening model for oral potentially malignant disorders.	Based on direct clinical examination and WhatsApp image examination, both examiners concluded similarly on distinguishing a lesion as normal or abnormal. But there was a substantial disagreement in exact diagnosis.

Conclusion

The demand for oral health care is mounting, with the cost rising simultaneously⁽¹⁾. Even though teledentistry has not been an integral part of dental care services, it is definitely a tool which is worth developing to encourage access to care for the isolated populations. World Health Organization suggests that telemedicine should be amalgamated to the day to day practice of dental surgeons across the globe as a public health equity tool.

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