Virtual Medicine and Teledentistry during covid 19:systematic Reviews

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Abstract

Background

Covid19 pandemic has changed the vision on how to deal in emergency situations. Advanced technology and spreading growth of internet connection encourage people to use it to obtain helpful advice in critical climate of covid 19 crisis. The aim of this study to through the light on importance of teledentistry in critical emergency situations.

Methods/Design

A systematic literature review depends on collecting data from an evidence-based studies.Searches were made of eight electronic databases: the Cochrane Oral Health Group's Trials Register, The Cochrane Central Register of Controlled Trials (CENTRAL), , EMBASE, PsycINFO, CINAHL, Scopus and Web of science ,MEDLINE(PubMed).

Results

Systematic reviews have demonstrated the successful use of teledentistry in diagnosis of gingivitis/periodontitis, plaque and calculus, and presence of teeth exhibiting gingival recession, furcation involvement, erosion, tooth wear, and non-carious cervical lesion, as well as presence of carious, filled, and crowned teeth and implants. In a second opnion assessments and in the periapical radiograph's interpretation and in education purpose also used.

Conclusion

Teledentistry improve oral healthcare follow up in critical situation.

Keywords: Teledentistry, telemedicine, telehealth, Oral healthcare, smartphone, internet, Dentistry, Covid19.

Introduction

Dentistry is the most profession affected by the globally COVID-19 pandemic. Future workplaces will be forced to follow a clinical protocol to avoid the emergence of new illnesses and spreading of the viruses. The patient's oral secretions, contaminated materials, and dental unit surfaces may serve as possible sources of infection for the dentist, the assistant, and the patient during routine clinical practise. Saliva and blood droplets generated on surfaces, as well as aerosol inhalation from spinning machinery and ultrasound handpieces, offer a considerable danger to current and future occupants. To prevent infections, dental practitioners must use disinfectants and personal protective equipment (PPE). The rapid spread of Covid 19 has forced adjustments to preventative and restorative dental practises. In dentistry, COVID-19 preventive measures include telephone and clinical triage supported by a questionnaire on recent symptoms and movements, body temperature measure-

ment, oral rinses with 1 percent hydrogen peroxide, and the use of appropriate PPEs [1].

Dental Association of United States plan emergency recommendations incorporated in urgent dental care, which focuses on the management of conditions needing immediate attention to alleviate severe pain and/or infection risk. Urgent dental care focuses on disorders requiring minimally invasive treatment, including severe tooth pain due to pulpal inflammation, pericoronitis or third-molar discomfort, surgical post-operative osteitis, and dry socket dressing changes. Abscess or localized bacterial infection resulting in localized pain and edoema. Tooth fracture producing localized pain or soft tissue damage. Trauma to the teeth with avulsion/luxation [2].

Telemedicine encourage delivery of health care services by using

the communication technologies. The term of telemedicine is to improve health of patients in unaccessible areas. Teledentistry is a sub-group of telemedicine and is successfully used within the dental practice for teleconsultation, telediagnosis and delivery of oral care services. In Covid- 19 pandemic, teledentistry used an alternative method to deliver the continuation of dental health services. A systematic review concluded that teledentistry was a valuable tool for oral screening similar to face-to-face consultations. Variable electronic devices were used to capture the intraoral soft and hard tissues such as smartphones, digital extraoral cameras, or intraoral cameras [3,4].

Smartphones is a noval attractive way in telehealth services due to mobile connectivity, advancing digital photography technniques, storage and transfer data as well as low-cost, secure storage. A smartphone camera could be used in dental photography which are useful for recording a baseline of oral health status preoperatively, to assess the diagnosis and preparing an appropriate treatment plan. Follow up evaluation by a speciality dentist from a distancen [5].

Mobile-health technology could use as adjunctive tool for emprovement careness of oral hygiene, followup and increase awareness of health education. In covid 19 pandemic, people are interested to have facilities of their health information in their smartphones. These apps have easy, simple performance and also provide simple information so further investigation are required in next steps [6,7].

In oral health field, Dental caries is a common chronic disease of the childhood. some smartphones apps have used games to teach children many topics including carious tooth, healthy and carcinogenic diet. Dental caries in childhood can be associated with severe pain and psychological problems, and may impose a high burden on the parents [8].

Dental associations worldwide recommend the first dental visit and initiation of toothbrushing at 1 year of age. However, parents often neglect this visit. Dental health education via mobile apps can be a potential solution to enhance oral health knowledge of parents, particularly mothers, considering the popularity of mobile apps and their widespread use [9].

Using social media (SM) is one of the most common people today's activities. Websites which allow social interaction are considered SM platforms, allowing users to communicate, develop their creativity, increase their knowledge and getting health information. Health information through online may make the users feel more secure in expressing their primary concerns because their identities are masked and their privacy is guaranteed [10].

Applications and services for telemedicine include email, two-way video, wireless tools, smart phones, and further communication technologies. Telemedicine involves group treatment, nurse contacts, teaching and training, tele visits with community health experts, and medical image transfer. Telehealth, provides a larger range of distant healthcare services that are not often limited to the clinical context. These services, known as remote nonclinical services, consist of training, medical education, and administrative meetings. The two primary types of telemedicine are store-and-forward telemedicine and real-time telemedicine. Store-and-forward telemedicine does not need communication partners to concurrently transfer data. It is possible to gather, organize, and store data. Data are sent as often as possible to the desired destination for diagnosis or analysis. In addition to the patient's information and medical history, images of skin lesions or electrocardiograms are sent to a physician in the linked area. Real-time telemedicine, like videoconferencing, needs simultaneous communication between the healthcare provider and the patient [11].

Tele dentistry's limitations and constraints must be understood. The most prevalent technical concerns were Internet access and sound quality. All telemedicine mistakes may be categorized as technical, organizational, or severe. Universities and colleges must include telemedicine into their curricula and offer training for doctors. Telemedicine allows physicians to participate in continuing education programmed without leaving their existing roles. Tele dentistry may thus be used to optimize and lower the cost of dental treatment. Additionally, tele dentistry is often used during the anamnesis phase of patient evaluation [12].

A significant barrier is the high cost of tele dentistry for both governments and individuals. Tele dentistry is a rapidly growing field with immense potential, but it is still in its infancy, and more emphasis must be placed on the distribution of funds and grants to conduct additional clinical research to provide more data and establish tele dentistry's role in the delivery of oral healthcare [13].

Internet is the basis of modern tele dentistry systems since it is current, rapid, and capable of delivering vast amounts of data. Recent tele dentistry technology and remote consultation methods exist only on the Internet. Today, almost every dentist clinic is outfitted with intra-oral cameras, digital cameras, and Internet-connected computers, allowing for the rapid examination of tele dental possibilities. Tele dentistry is a novel part of patient care that is rapidly rising in popularity and significance. Practitioners who want to include tele dentistry into their practices must educate themselves on the legal, technological, and ethical obstacles posed by this burgeoning field. Dentists are required to take initiative and adapt to the digital world. They must understand not only how the digital transformation of healthcare will affect their practices, but also how they and their patients may benefit from the expansion of tele dentistry. Implementing tele dentistry in professional dental education is a realistic and effective strategy for fostering tele dental skills [14].

Tele dentistry is a rapidly growing field with immense potential, but it is still in its infancy, and more emphasis must be placed on the distribution of funds and grants to conduct additional clinical research to provide more data and establish tele dentistry's role in the delivery of oral healthcare. Inspite of benefit from tele dentistry and the variety of applications, there are still restrictions on the use of information technology. Digital photographs may be useful for recognizing obvious issues, but they have their limitations. Tele dentistry requires the use of high-quality pictures, which are unavailable at all remote clinics and facilities. A significant barrier is the high cost of tele dentistry for both governments and individuals [15].

Clinical photograph showing aphthous ulcer / early childhood caries /furcation involvement.

Discussion

The results of the present study showed that a positive role of using tele dentistry in enhancement dental health services. The dentist can make a time-efficient, costlessness and appropriate tele screening of the oral soft and hard tissues based only on true color, shape of intraoral scans taken by means of mobile technology or IOS. The continuous development of hard- and software made it possible to electronically capture and transmit clinical pictures of patients. The accuracy of tele dentistry, depends on the selected field of view. Two-dimensional intraoral images have their drawbacks, as they represent a limited two-dimensional view of three-dimensional soft and hard tissue structures the quality of the images may influence the outcome of tele evaluations.

This clinical study showed the advantage and positive role of this new technology.

Table 1: Participant demographic data (n = 70). *assumed they knew what teledentistry is, and 65.7% could identify that teledentistry Q26 is the use of the internet and technology to diagnose dental issues via a remote consultation. The chi-square and Fisher's exact tests found no significant differences on these questions between the SG and the CG*

Variables		n	%
Group	Study	35	50.0
	Control	35	50.0
Sex	Male	22	31.4
	Female	48	68.6
Education	Less than high school	6	8.60
	High school	27	38.6
	Bachelor's	31	44.3
	Higher education	6	8.60
Occupation	Student	16	22.9
	Employee	23	32.9
	Without a job or retired	31	44.3
Nationality	Saudi	44	62.9
	Non-Saudi	26	37.1

Do you have a smart-phone?	Yes	68	97.1
	No	2	2.90
Do you have internet access?	Yes	69	98.6
	No	1	1.40

Table 2: Participants who answered 'yes' to knowledge items about teledentistry (_n_ = 70).

Statement	Total	Study	Control	_p_-value
	n (%)	n (%)	n (%)	
Teledentistry could reduce in-person dental visits.	52 (74.3)	27 (77.1)	25 (71.4)	0.584
Teledentistry helps monitor the patient's oral health.	45 (64.3)	23 (65.7)	22 (62.9)	0.803
Teledentistry is useful for early and easy consultations with a specialist in oral diseases.	44 (62.9)	20 (57.1)	24 (68.6)	0.322
Teledentistry helps by providing a consultation with an expert on the patient's problem.	43 (61.4)	22 (62.9)	21 (60.0)	0.806
Teledentistry is useful for improving access to oral health care.	35 (50.0)	16 (45.7)	19 (54.3)	0.473
Teledentistry is useful in the diagnosis and management of oral diseases.	28 (40.0)	16 (45.7)	12 (34.3)	0.329
Teledentistry is a good tool for oral hygiene training.	26 (37.1)	13 (37.1)	13 (37.1)	1

Table 3: Participants' attitudes about teledentistry (n = 70).

Statement	Total	Study	Control	_P_-value
	Mean ± SD	Mean ± SD	Mean ± SD	
Would teledentistry help avoid unnecessary travel to hospitals?	4.16 ± 0.75	4.11 ± 0.83	4.20 ± 0.68	0.602
Would teledentistry be helpful with patient education?	4.13 ± 0.70	4.17 ± 0.71	4.09 ± 0.70	0.903
I think the use of teledentistry during COVID-19 is safer than visiting a dentist.	4.03 ± 0.80	4.06 ± 0.76	4.00 ± 0.84	0.330
Teledentistry would improve communication between patients and practitioners.	3.86 ± 0.80	3.80 ± 0.87	3.91 ± 0.74	0.889
Teledentistry would help shorten waiting times for me to receive dental services.	3.81 ± 0.82	3.77 ± 0.84	3.86 ± 0.81	0.651
I think teledentistry can replace in-person visits to a dental practitioner for treatment.	2.79 ± 1.06	2.83 ± 1.12	2.74 ± 1.01	0.480
Would teledentistry be as accurate as a clinical diagnosis?	2.77 ± 1.07	2.91 ± 1.09	2.63 ± 1.03	0.767
I think teledentistry can reduce the costs of dental services.	3.76 ± 0.69	3.71 ± 0.75	3.80 ± 0.63	0.809
Would teledentistry reduce costs for dental practitioners?	3.74 ± 0.83	3.69 ± 0.90	3.80 ± 0.76	0.738
In the future, I think I will use teledentistry for dental purposes for members of my family (children or parents).	3.60 ± 0.91	3.66 ± 0.87	3.54 ± 0.95	0.607
In the future, I think I will use teledentistry for myself.	3.53 ± 0.97	3.51 ± 0.85	3.54 ± 1.09	0.023
I think teledentistry is very useful in general.	3.47 ± 0.85	3.46 ± 0.89	3.49 ± 0.82	1.000
I think dental examinations through teledentistry are as accurate as face-to-face consultations.	2.91 ± 1.06	3.20 ± 0.93	2.63 ± 1.11	0.806
I think teledentistry can replace visiting a dental practitioner for diagnosis.	3.26 ± 1.05	3.20 ± 0.99	3.31 ± 1.11	0.336

Table 4: Participants' experiences using teledentistry (n = 35).

Statement	Answered Yes *n*	%
The dentist understood me properly.	34	97.1
I benefitted from using teledentistry.	33	94.3
I felt secure sending my information and photograph though a mobile application (WhatsApp).	33	94.3
I got a good diagnosis.	33	94.3
It was easy to communicate through teledentistry.	32	91.4
Now I trust teledentistry to provide me with appropriate dental service.	31	88.6
I will use teledentistry again in the future.	31	88.6
I was more comfortable having a teledental consultation than an in-person visit.	28	80.0
I had problems taking the dental photographs.	19	54.3
I had problems with my internet/mobile connection during the teledentistry session.	17	48.6

Table 5: Participants' barriers to teledentistry (n = 70).

Barrier	Total	Study	Control
	n (%)	*n (%)*	*n (%)*
Internet connection problems.	34 (48.6)	14 (40.0)	20 (57.1)
Personal accent is a barrier for communication between patient and dental practitioner in teledentistry.	23 (32.9)	11 (31.4)	12 (34.3)
I do not have someone to assist me with taking a photograph for teledentistry.	26 (37.1)	10 (28.6)	16 (45.7)
I am afraid of sending my pictures and information using digital media.	20 (28.6)	9 (25.7)	11 (31.4)
Taking a good photograph on my own for teledentistry is a problem.	19 (27.1)	12 (34.3)	7 (20.0)
Communication in teledentistry is a problem and it is less effective than face-to-face communication with the dentist.	18 (25.7)	9 (25.7)	9 (25.7)
My phone does not have the ability to be used in teledentistry.	13 (18.6)	8 (22.9)	5 (14.3)
I do not have the skills with a smartphone necessary to use for teledentistry.	11 (15.7)	7 (20.0)	4 (11.4)
Teledentistry may threaten my confidentiality.	10 (14.3)	4 (11.4)	6 (17.1)
Teledentistry can violate the patient's privacy.	6 (8.60)	3 (8.60)	3 (8.60)

Table 6: Comparison of teledentistry results with clinical diagnosis results.

Item		*n*	%
Chief complaint	Similar	26	74.3
	Different	9	25.7
Health items	Underestimated	10	28.6
	Accurate	18	51.4
	Overestimated	7	20.0
Decayed	Underestimated	5	14.3
	Accurate	14	40.0
	Overestimated	16	45.7
Missing	Underestimated	3	8.60
	Accurate	26	74.3
	Overestimated	6	17.1

Filled	Underestimated	3	8.60
	Accurate	25	71.4
	Overestimated	7	20.0
DMF score	Underestimated	4	11.4
	Accurate	9	25.7
	Overestimated	22	62.9
Oral hygiene	Underestimated	9	25.7
	Accurate	23	65.7
	Overestimated	3	8.60

Table 7: Paired t-test results of teledentistry compared with clinical diagnosis results.

Statement	Mean ± SD	*p*-value
Total health record, by clinical examination	1.77 ± 1.52	0.692
Total health record, by teledentistry	1.69 ± 1.51	
Decay level, by clinical examination	5.26 ± 2.92	0.021a
Decay level, by teledentistry	6.57 ± 4.51	
Filled teeth, by clinical examination	3.00 ± 3.55	0.447
Filled teeth, by teledentistry	3.09 ± 3.55	
Missing teeth, by clinical examination	2.43 ± 1.97	0.314
Missing teeth, by teledentistry	2.63 ± 2.37	
DMFT score, from clinical examination	10.7 ± 4.65	0.007a
DMFT score, from teledentistry	12.4 ± 5.82	

Conclusion
Tele dentistry is a promising tool which still under-utilized in dentistry. Tele dentistry allow remote assessment with time-efficient screening and triage of patients. The expected benefits from this intervention are improvement in the oral health status.

Recommendations
Improve advertising and marketing of the worthy using the healthcare system on smartphones to obtain the maximum efficient, rapid way to improve oral health state.

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