THE ROLE OF TELE-DENTISTRY IN EXPANDING ACCESS TO DENTAL CARE

Alaa Abdulhamid Khojah[1*], Faris Helal Alharbi[2], Mohammed Abdullah Alqahtani[3], Najeeb Muflih Alqahtani[4], Ali Mohammed Alfareh[5], Faisal Abdulrahman Alkharisi[3], Raed Abdullah Alshahrani[6], Ali Abdullah Alshamrani[7], Khozam Mohammad Alshahrani[8], Wael Hisham Rajkhan[9]

Abstract

Dental care is of paramount importance for overall health, contributing not only to the maintenance of healthy teeth and gums but also playing a pivotal role in preventing systemic diseases, enhancing quality of life, and bolstering confidence and social well-being. However, access to dental care poses a critical challenge, particularly exacerbated by economic factors where a considerable number of individuals lack dental insurance coverage or face financial constraints hindering timely and preventive dental care. In response to these challenges, tele-dentistry emerges as a promising and efficient solution. By harnessing technology, tele-dentistry bridges gaps in dental care accessibility. Through virtual consultations and remote monitoring, individuals residing in underserved or remote areas gain access to timely advice, preventive care, and emergency triage without necessitating physical visits to a dental clinic. The rationale for delving into the subject of tele-dentistry lies in the persistent global challenges associated with oral health disparities and limited access to dental services. This review article seeks to analyze existing literature, exploring the impact of tele-dentistry on accessibility, cost-effectiveness, and preventive care. The synthesis of findings aims to offer insights into the potential of virtual consultations, remote monitoring, and tele-dental education in overcoming barriers to dental care. Initiated on February 27th, 2023, this review article stems from a meticulous examination of current academic literature. A comprehensive literature review, utilizing databases such as PubMed, Web of Science, and Cochrane, employed diverse combinations of medical terminology. Manual searches on Google Scholar complemented these efforts to identify pertinent research terms. In conclusion, tele-dentistry stands as a transformative solution, addressing geographical, economic, and logistical barriers to make oral health services more inclusive. The ongoing advancement of technology positions tele-dentistry as a catalyst for revolutionizing oral healthcare, emphasizing preventive measures and ensuring diverse populations receive timely and quality dental services, thereby fostering a more equitable and accessible dental care landscape.

Keywords: tele-dentistry, access, dental, oral health, prevention

[1*]Ministry of Health, Western Riyadh Dental Complex, Riyadh, Saudi Arabia
[2]Primary Health Care, King Fahad Specialist Hospital, Qassim, Saudi Arabia
[3]West of Riyadh Dental Complex, Riyadh, Saudi Arabia
[4]Dental Department, Abha Specialised Dental Center, Abha, Saudi Arabia
[5]Family Dental Medicine, Dental Medical Complex in West of Riyadh, Riyadh, Saudi Arabia
[6]Dental Department, Sarat Abidah General Hospital, Abha, Saudi Arabia
[7]Dental Department, Al Qunfudhah General Hospital, Al Qunfudhah, Saudi Arabia
[8]Family Dental Medicine, Khamis Mushait Primary Health Care, Khamis Mushait, Saudi Arabia
[9]Department of Endodontics, Khulais General Hospital, Khulais, Saudi Arabia

***Corresponding Author:** Alaa Abdulhamid Khojah
*Ministry of Health, Riyadh, Saudi Arabia. Email: alaa.a.khoja@gmail.com

DOI: 10.53555/ecb/2023.12.11.81

Introduction

Dental care holds immense significance in maintaining overall health and well-being. Beyond the obvious benefits of promoting healthy teeth and gums, it plays a crucial role in preventing various systemic diseases, enhancing quality of life, and contributing to one's confidence and social well-being (1). Research indicates that oral health is interconnected with general health. Poor dental hygiene can lead to a range of health issues, including cardiovascular diseases, diabetes, respiratory infections, and adverse pregnancy outcomes. The mouth serves as a gateway to the rest of the body, and oral infections can have systemic implications (2). Regular dental check-ups and proper oral hygiene practices act as preventive measures, reducing the risk of these interconnected health conditions. Moreover, dental care is pivotal in maintaining proper nutrition and digestion. Healthy teeth enable individuals to chew food effectively, supporting the digestive process. Missing or damaged teeth can limit dietary choices, potentially leading to nutritional deficiencies. Additionally, poor oral health may contribute to discomfort while eating, leading to altered dietary habits that can impact overall nutrition (3).

Beyond its physiological implications, dental care significantly influences social interactions and psychological well-being. A healthy and attractive smile can boost self-esteem and confidence, positively impacting mental health. Conversely, dental issues such as cavities, bad breath, or missing teeth may lead to embarrassment and social withdrawal. The ability to communicate effectively, eat without discomfort, and present a confident smile are integral aspects of social functioning and overall quality of life (4). Preventive dental care also proves to be more cost-effective in the long run. Regular dental check-ups help identify potential issues early, preventing the need for extensive and costly treatments. By addressing oral health proactively, individuals can avoid the financial burden associated with advanced dental procedures and emergency interventions (5).

The burden of dental issues poses a significant public health challenge globally, with various factors contributing to the prevalence and severity of oral health problems. Dental issues, such as cavities, gum disease, and tooth loss, are highly prevalent, affecting billions of people worldwide (6). Poor oral health not only leads to pain and discomfort but is also associated with systemic health conditions, including cardiovascular diseases, diabetes, and respiratory infections (3). The burden of dental issues is often disproportionately borne by vulnerable populations, including low-income individuals, minorities, and those in underserved or rural areas (7). These disparities highlight the need for a comprehensive approach to address the social determinants that contribute to oral health inequalities.

These challenges are further compounded by issues related to access to dental care, creating a complex landscape that impacts individuals, communities, and healthcare systems. Access to dental care is a critical challenge that exacerbates the burden of dental issues. Barriers to access include economic factors, with many individuals lacking dental insurance coverage or facing financial constraints that limit their ability to seek timely and preventive dental care (8). Additionally, geographical barriers, especially in rural or remote areas, contribute to reduced access to dental services. The shortage of dental professionals in certain regions further intensifies the challenges related to access. Furthermore, there is a maldistribution of dental care facilities, with urban areas often having better access to comprehensive dental services compared to rural counterparts. This creates disparities in oral health outcomes, as individuals in underserved regions may face challenges in obtaining timely preventive care or addressing dental emergencies (9). The lack of awareness about the importance of oral health, coupled with limited education on proper dental hygiene practices, also contributes to delayed or neglected dental care. The challenges related to access are also evident in emergency dental care, where individuals may face difficulties in receiving prompt attention for acute dental issues. Emergency rooms, often not adequately equipped for dental emergencies, may become the default option for those lacking access to regular dental services, leading to inefficient use of resources and delayed treatment (10).

Tele-dentistry emerges as a promising and efficient solution to address the burdens of dental issues and the associated challenges related to access. In the face of disparities in dental care, tele-dentistry leverages technology to bridge gaps and enhance accessibility. Through virtual consultations and remote monitoring, individuals in underserved or remote areas can receive timely advice, preventive care, and even emergency triage without the need for physical visits to a dental clinic. This not only contributes to early intervention but also minimizes the economic and geographical barriers that often hinder access to dental services (11). Tele-dentistry's ability to facilitate remote consultations enables dental professionals to reach a broader audience, providing expert advice and assistance where traditional infrastructure may be lacking. Furthermore, it aligns with the evolving landscape

of healthcare delivery, offering cost-effective alternatives, especially for those without dental insurance. By integrating tele-dentistry into oral health strategies, there is a significant potential to alleviate the burden of dental issues, enhance preventive care, and ensure more equitable access to dental services for diverse populations (12).

Tele-dentistry's role in expanding access to dental care is pivotal and warrants a comprehensive review. The rationale for exploring this subject lies in the persistent global challenges related to oral health disparities and limited access to dental services. The review also aims to analyze existing literature, examining the impact of tele-dentistry on accessibility, cost-effectiveness, and preventive care. By synthesizing findings, the article intends to provide insights into the potential of virtual consultations, remote monitoring, and teledental education in overcoming barriers to dental care. This review seeks to contribute evidence-based perspectives, fostering a deeper understanding of tele-dentistry's efficacy in reaching diverse populations and shaping future strategies to improve oral health outcomes globally.

Methods

Commencing on February 27th, 2023, this review article originated following an extensive examination of current academic literature. An exhaustive literature review was conducted, utilizing a range of databases such as PubMed, Web of Science, and Cochrane. Various combinations of medical terminology were employed in the search strategy, complemented by manual searches on Google Scholar to identify relevant research terms. The primary aim of this literature review was to comprehend the substantial burden of oral health issues and to pinpoint challenges related to accessing dental care. Additionally, the review explored diverse tele-dentistry approaches designed to enhance accessibility to dental care for individuals. It is crucial to underscore that the selected articles for inclusion in this study adhered to rigorous criteria, ensuring a comprehensive and meticulous review process.

Discussion

Tele-dentistry plays a crucial role in broadening access to dental care by leveraging technology to overcome traditional barriers. By embracing innovative technological solutions, tele-dentistry contributes significantly to enhancing accessibility and promoting better oral health outcomes for diverse populations (11).

Remote consultations

Tele-dentistry serves a pivotal role in expanding access to dental care through various modalities, notably in remote consultations, emergency and triage consultations, and specialist consultations. In the realm of remote consultations, tele-dentistry transcends geographical barriers, allowing individuals in underserved or remote areas to connect with dental professionals virtually. This not only facilitates timely advice on oral health concerns but also enables preventive care without the necessity of physical visits (13). In the context of emergency and triage consultations, tele-dentistry offers a rapid and efficient means of addressing urgent dental issues. Patients experiencing pain, swelling, or other emergencies can consult with dental professionals remotely, ensuring timely assessment and guidance. This is particularly significant in situations where immediate physical access to a dental clinic may be challenging, offering a valuable alternative for those facing barriers to traditional emergency dental care (14). Research suggests that tele-dentistry also plays a crucial role in specialist consultations, where access to specialized dental care may be limited. By utilizing virtual platforms, general dentists can collaborate with specialists remotely, providing patients with expert advice and intervention without the need for extensive travel. This enhances the overall quality of dental care by ensuring that individuals, irrespective of their location, can benefit from the expertise of specialists (15).

The flexibility and convenience offered by tele-dentistry in these three dimensions contribute to a more inclusive and accessible dental care landscape. According to the literature, remote consultations address preventive and routine care needs, emergency consultations ensure timely responses to urgent situations, and specialist consultations bring specialized expertise to diverse populations (12). As technology continues to advance, the role of tele-dentistry in these domains is likely to grow, further diminishing barriers to access and promoting oral health equity on a broader scale. This multifaceted approach underscores the transformative impact of tele-dentistry in expanding access to dental care across various aspects of oral health.

Increased reach

Tele-dentistry plays a crucial role in significantly increasing the reach of dental care services, breaking down barriers associated with geographical limitations, and expanding access to a broader population. Through virtual platforms, tele-dentistry enables dental professionals to reach

individuals in remote or underserved areas where traditional dental clinics may be scarce. This increased reach is particularly impactful in rural regions, where the shortage of dental facilities often leaves residents with limited access to oral health services (16). The use of tele-dentistry in increasing reach goes beyond geographical considerations. Individuals facing physical disabilities, transportation challenges, or other mobility issues can now access dental consultations from the comfort of their homes. Research indicates that this aspect is especially important in promoting inclusivity and ensuring that those who might otherwise struggle to reach a traditional dental clinic can still receive essential oral health care services (17).

Furthermore, tele-dentistry contributes to reaching a larger audience for educational purposes. Online platforms allow for the dissemination of oral health information and preventive care practices to diverse populations. This educational aspect enhances oral health literacy and empowers individuals to take proactive measures to maintain their dental well-being (18). By expanding the reach of dental care services, tele-dentistry supports early intervention and preventive measures, contributing to improved overall oral health outcomes. Research shows that tele-dentistry facilitates the identification of potential issues before they escalate, reducing the likelihood of complex and costly dental procedures. The increased reach also aligns with public health goals, as it enables a more widespread implementation of oral health education and community outreach programs (19). As technology continues to advance, the potential for tele-dentistry to reach even more diverse populations and underserved communities becomes increasingly promising, contributing to a more inclusive and accessible landscape for dental care services.

Cost-effectiveness

Tele-dentistry emerges as a transformative force in expanding access to dental care by addressing issues of cost-effectiveness and making oral health services more accessible to a broader population. The traditional model of in-person dental visits often incurs significant costs related to travel, time off work, and sometimes even accommodation, particularly for individuals residing in rural or underserved areas. Tele-dentistry mitigates these financial burdens by providing a cost-effective alternative (20).

One of the key aspects contributing to cost-effectiveness in tele-dentistry is the reduction in travel expenses. Patients can consult with dental professionals from the comfort of their homes, eliminating the need for costly and time-consuming commutes to dental clinics. This is especially beneficial for individuals in remote locations or those facing transportation challenges (21). Moreover, the virtual nature of tele-dentistry reduces overhead costs for both patients and dental providers. The need for physical infrastructure is minimized, translating to potential savings in rent, utilities, and other operational expenses. These cost savings can be passed on to the patients, making dental care more affordable, particularly for those without dental insurance (22). Tele-dentistry also contributes to preventing the escalation of dental issues, thereby avoiding the costs associated with advanced treatments. Early intervention through virtual consultations can address concerns promptly, preventing the need for extensive and expensive dental procedures. This preventive approach aligns with the principles of cost-effective healthcare, emphasizing the importance of addressing issues at their inception rather than dealing with more complex and costly problems later (23). In addition, the integration of tele-dentistry with mobile dental clinics or community outreach programs can further enhance cost-effectiveness, reaching populations that may not have easy access to traditional dental services (24).

Health education and disease prevention

Tele-dentistry plays a pivotal role in expanding access to dental care by fostering health education and disease prevention, addressing critical aspects of oral healthcare. Through virtual platforms, dental professionals can engage in educational initiatives that reach diverse populations, contributing to increased awareness about oral health practices and disease prevention measures (25). Evidence suggests that tele-dentistry facilitates the dissemination of information on proper oral hygiene, dietary habits, and lifestyle choices, empowering individuals to take proactive steps in maintaining their oral health. The interactive nature of tele-dentistry allows for personalized health education sessions, wherein dental professionals can tailor advice and recommendations based on the specific needs and conditions of individual patients. This personalized approach enhances the effectiveness of health education, fostering a deeper understanding of the importance of preventive measures in oral health (26). Furthermore, tele-dentistry serves as a valuable tool in disease prevention by enabling remote monitoring and early intervention. Dental professionals can remotely assess patients' oral health status, identify potential issues, and guide preventive measures. Research indicates that this proactive approach helps prevent the escalation of

dental problems, reducing the overall burden of oral diseases and the associated healthcare costs. Tele-dentistry also facilitates the development and implementation of virtual community outreach programs. These programs can target underserved populations, providing them with essential health education and preventive care information (19). By reaching communities that may have limited access to traditional dental services, tele-dentistry contributes to reducing oral health disparities and promoting overall community well-being. This educational dimension of tele-dentistry aligns with the principles of preventive care, creating a foundation for a healthier and more informed population.

Follow-up care

Tele-dentistry plays a crucial role in expanding access to dental care by facilitating efficient and accessible follow-up care. Traditionally, patients faced challenges in attending in-person follow-up appointments due to various factors such as transportation issues, work commitments, or geographical constraints. Tele-dentistry addresses these barriers by allowing dental professionals to conduct virtual follow-up consultations, ensuring continuity of care without the need for patients to physically revisit the dental clinic (27).

Virtual follow-ups enable dental professionals to monitor patient's progress remotely after dental procedures or treatments. This is particularly beneficial in cases of orthodontic treatments, postoperative care, or ongoing oral health management. Patients can share updates on their condition, ask questions, and receive guidance on aftercare practices, contributing to better treatment outcomes (28). Tele-dentistry's role in follow-up care also supports preventive measures. Dental professionals can identify potential issues early on, provide timely recommendations, and address any concerns before they escalate, ultimately reducing the need for emergency interventions. This approach not only enhances patient satisfaction but also contributes to overall oral health by fostering a proactive and collaborative approach between patients and dental providers (29).

Mobile dentistry

Tele-dentistry plays a pivotal role in expanding access to dental care, especially in the context of mobile dentistry. Integrating tele-dentistry with mobile dental clinics brings oral health services directly to communities, overcoming geographical and logistical barriers. Mobile dentistry, equipped with tele-dentistry capabilities, ensures that dental professionals can remotely connect with patients, conduct virtual consultations, and provide essential services on-site (24). In underserved or remote areas where establishing permanent dental infrastructure may be challenging, mobile dentistry becomes a practical solution. Tele-dentistry allows for real-time communication between on-site dental providers and off-site specialists, ensuring comprehensive and expert care. This collaborative approach leverages technology to bridge the gap between mobile clinics and specialized dental expertise, enhancing the quality of care delivered to diverse populations (30).

Moreover, mobile dentistry with tele-dentistry capabilities supports preventive care and education. Dental professionals can engage in virtual outreach programs, disseminating oral health information and promoting preventive measures within communities. This combination of mobility and technology not only increases the accessibility of dental care but also empowers individuals in various settings to prioritize and maintain their oral health, fostering a proactive approach to overall well-being (31). In essence, tele-dentistry enhances the impact of mobile dentistry, making quality dental care more accessible to populations that may otherwise face challenges in obtaining timely and regular oral health services.

Conclusion

In conclusion, tele-dentistry emerges as a transformative solution in expanding access to dental care. Its multifaceted approach addresses geographical, economic, and logistical barriers, making oral health services more inclusive. As technology continues to advance, tele-dentistry holds the promise of revolutionizing oral healthcare, promoting preventive measures, and ensuring that diverse populations receive timely and quality dental services, fostering a more equitable and accessible dental care landscape.

References

1. Gambhir RS, Brar P, Singh G, Sofat A, Kakar H. Utilization of dental care: An Indian outlook. Journal of natural science, biology, and medicine. 2013;4(2):292.
2. Gil-Montoya JA, Ferreira de Mello AL, Barrios R, Gonzalez-Moles MA, Bravo M. Oral health in the elderly patient and its impact on general well-being: a nonsystematic review. Clinical interventions in aging. 2015:461-7.
3. Spanemberg J, Cardoso J, Slob E, López-López J. Quality of life related to oral health and its impact in adults. Journal of stomatology, oral and maxillofacial surgery. 2019;120(3):234-9.
4. Haag D, Peres K, Balasubramanian M, Brennan D. Oral conditions and health-related quality of

life: a systematic review. Journal of dental research. 2017;96(8):864-74.
5. Listl S, Galloway J, Mossey PA, Marcenes W. Global economic impact of dental diseases. Journal of dental research. 2015;94(10):1355-61.
6. Kassebaum NJ, Smith AG, Bernabé E, Fleming TD, Reynolds AE, Vos T, et al. Global, regional, and national prevalence, incidence, and disability-adjusted life years for oral conditions for 195 countries, 1990–2015: a systematic analysis for the global burden of diseases, injuries, and risk factors. Journal of dental research. 2017;96(4):380-7.
7. Watt RG, Daly B, Allison P, Macpherson LM, Venturelli R, Listl S, et al. Ending the neglect of global oral health: time for radical action. The Lancet. 2019;394(10194):261-72.
8. Bastos LF, Hugo FN, Hilgert JB, Cardozo DD, Bulgarelli AF, Santos CMd. Access to dental services and oral health-related quality of life in the context of primary health care. Brazilian oral research. 2019;33:e018.
9. Crocombe L, Mahoney G, Spencer A, Waller M. Will improving access to dental care improve oral health-related quality of life? Australian Dental Journal. 2013;58(2):192-9.
10. Worsley D, Robinson P, Marshman Z. Access to urgent dental care: a scoping review. Community Dent Health. 2017;34(1):19-26.
11. Daniel SJ, Kumar S. Tele-dentistry: a key component in access to care. Journal of evidence based dental practice. 2014;14:201-8.
12. Kengne Talla P, Allison P, Bussières A, Giraudeau N, Komarova S, Basiren Q, et al. Tele-dentistry for improving access to, and quality of oral health care: A protocol for an overview of systematic reviews and meta-analyses. Plos one. 2023;19(1):e0288677.
13. Martin N, Shahrbaf S, Towers A, Stokes C, Storey C. Remote clinical consultations in restorative dentistry: a clinical service evaluation study. British Dental Journal. 2020;228(6):441-7.
14. Ali SA, Al-Qahtani AMA, Al Banai SR, Albaker FJ, Almarri AE, Al-Haithami K, et al. Role of newly introduced tele-dentistry service in the management of dental emergencies during COVID-19 pandemic in Qatar: a cross-sectional analysis. Telemedicine and e-Health. 2022;28(11):1623-32.
15. Modak B, Basu A. Tele-dentistry: A need of the hour. life. 2020;4:5.
16. Arora PC, Kaur J, Kaur J, Arora A. Tele-dentistry: An innovative tool for the underserved population. Digital Medicine. 2019;5(1):6.
17. Schafer TE, Riggs B. Use of a tele-dentistry partnership program to reach a rural pediatric population. Journal of the Georgia Public Health Association. 2017;6(3):390-2.
18. Roxo-Gonçalves M, Strey JR, Bavaresco CS, Martins MAT, Romanini J, Pilz C, et al. Tele-dentistry: a tool to promote continuing education actions on oral medicine for primary healthcare professionals. Telemedicine and e-Health. 2017;23(4):327-33.
19. Farooq I, Ali S, Moheet IA, AlHumaid J. COVID-19 outbreak, disruption of dental education, and the role of tele-dentistry. Pakistan journal of medical sciences. 2020;36(7):1726.
20. Estai M, Kanagasingam Y, Tennant M, Bunt S. A systematic review of the research evidence for the benefits of tele-dentistry. Journal of telemedicine and telecare. 2018;24(3):147-56.
21. Estai M, Bunt S, Kanagasingam Y, Tennant M. Cost savings from a tele-dentistry model for school dental screening: an Australian health system perspective. Australian Health Review. 2017;42(5):482-90.
22. Mariño R, Tonmukayakul U, Manton D, Stranieri A, Clarke K. Cost-analysis of tele-dentistry in residential aged care facilities. Journal of telemedicine and telecare. 2016;22(6):326-32.
23. Maqsood A, Sadiq MSK, Mirza D, Ahmed N, Lal A, Alam MK, et al. The tele-dentistry, impact, current trends, and application in dentistry: a global study. BioMed research international. 2021;2021.
24. Estai M, Kanagasingam Y, Huang B, Checker H, Steele L, Kruger E, et al. The efficacy of remote screening for dental caries by mid-level dental providers using a mobile tele-dentistry model. Community Dentistry and Oral Epidemiology. 2016;44(5):435-41.
25. Chen J-W, Hobdell MH, Dunn K, Johnson KA, Zhang J. Tele-dentistry and its use in dental education. The Journal of the American Dental Association. 2003;134(3):342-6.
26. Fernández C, Maturana C, Coloma S, Carrasco-Labra A, Giacaman R. Tele-dentistry and mHealth for promotion and prevention of oral health: a systematic review and meta-analysis. Journal of dental research. 2021;100(9):914-27.
27. Qari AH, Alharbi RM, Alomiri SS, Alandanusi BN, Mirza LA, Al-Harthy MH. Patients' experience with tele-dentistry compared to conventional follow-up visits in TMD clinic: a pilot study. Journal of Dentistry. 2023;140:104774.
28. Torul D, Kahveci K, Kahveci C. Is Tele-dentistry an effective approach for patient

follow-up in maxillofacial surgery. Journal of Maxillofacial and Oral Surgery. 2023;22(3):620-6.
29. Fortich-Mesa N, Hoyos-Hoyos V. Applications of tele-dentistry in dental practice: a systematic review. Revista Facultad de Odontología Universidad de Antioquia. 2020;32(1):77-88.
30. Irving M, Stewart R, Spallek H, Blinkhorn A. Using tele-dentistry in clinical practice as an enabler to improve access to clinical care: A qualitative systematic review. Journal of telemedicine and telecare. 2018;24(3):129-46.
31. da Costa CB, Peralta FdS, Ferreira de Mello ALS. How has tele-dentistry been applied in public dental health services? An integrative review. Telemedicine and e-Health. 2020;26(7):945-54.