

## Assessment of Telehealth Efficacy in Delivering Preventive Oral Healthcare: A Study Examining Patient and Caregiver Perspectives in Pakistan

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### Abstract

**Objective:** To explore the perspectives of patients and consultants regarding a telehealth-based preventive oral healthcare program at the pediatric dentistry department of a private tertiary care dental hospital in Pakistan

**Material and Methods:** An anonymous questionnaire was given to parents and guardians, and a focus group with clinicians was conducted to gather data. To summarize the data, descriptive statistics, chi-square tests, and theme analysis were utilized.

**Results:** Forty-five parents/guardians and six clinicians participated in the study. The kids mean age was 4 years (SD=3.1 years), and most of the parents were between 30- and 39-years age group (56.4%). The telehealth service demonstrated high satisfaction (78.1%) and acceptability (61.41%). Notably, native Urdu-speaking were much more likely to agree that telehealth was a good way to provide preventive. Parents who reported difficulty in accessing traditional dental visits were predominantly rated telehealth high in terms of usefulness, technical quality, and satisfaction. Key themes from the consultants focus group was that it was advantageous for patients with special needs or residing in rural areas, reduced burden on families, and an increased emphasis on prevention.

**Conclusions:** The study findings underscore the continued benefits of integrating telehealth into the provision of preventive oral health

**Keywords:** Telemedicine, Oral Health, Preventive Health Services, Patient Perspective, Caregiver Attitudes, Dental Care, Pakistan

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### Introduction

Telehealth, which involves using technology to deliver healthcare services remotely, has extended

beyond medicine to various fields, including dentistry.<sup>1,2</sup> Initially, telehealth dentistry primarily focused on providing remote diagnosis and consultations. The aim was to improve healthcare in rural areas, ensure timely access to care, reduce waiting times for appointments, and address social and geographical inequalities.<sup>3</sup> Telehealth has notably enhanced communication between general and specialist dental practitioners, playing a key role in large-scale dental screening programs. This has resulted in significant cost savings compared to traditional methods in remote and urban areas, ultimately enhancing access and care for underserved populations.<sup>4</sup>

The utilization of remote dental services, has emerged as a powerful tool in the field of dentistry. Tele dentistry enhances the training of professionals by providing

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access to continuous education and specialized consultations, which are particularly beneficial in underserved areas.<sup>3</sup> Additionally, it improves the effectiveness of primary healthcare by enabling early diagnosis and intervention, thus reducing the need for advanced treatments. Furthermore, tele dentistry has been shown to enhance the quality of oral healthcare services by facilitating regular monitoring and follow-up care, leading to better patient outcomes.<sup>4</sup> Successful integration of telehealth into oral healthcare requires training oral health professionals in digital media usage, modifying workflows, and bolstering management support. Resource management challenges identified in previous studies may hinder access to telehealth tools, thereby reducing their effectiveness in maintaining care quality and oral health indicators.<sup>5</sup>

A study found that patients and caregivers, especially those having trouble getting dental appointments, were highly satisfied and found the service acceptable.<sup>6</sup> Another study observed fewer referrals to specialized care and improvements in how oral health teams approach patient care. A study in 2021, pointed out that teledentistry has the potential to decrease plaque and gum inflammation levels, as well as the occurrence of white spot lesions.<sup>7</sup> A study conducted in 2012, highlighted the importance of telehealth in reaching at-risk and underserved communities, underscoring its potential for improving preventive oral healthcare.<sup>8</sup> Maintaining oral health is essential for overall well-being, and access to dental care plays a crucial role in promoting good oral hygiene.<sup>9</sup>

Despite its importance, numerous barriers hinder a significant portion of the population from accessing necessary dental care, contributing to a higher prevalence of oral diseases. These barriers include the limited availability of oral health services, geographic constraints, financial limitations, and transportation issues. Providing universal dental care is essential to reduce disparities in oral health.<sup>10</sup>

In recent years, telehealth has emerged as a promising solution to overcome these barriers and improve access to preventive oral healthcare. By leveraging technology, telehealth can reach underserved populations, bridging the gap in oral healthcare access. Patients can receive preventive oral healthcare without physical visits to dental practices, receiving virtual consultations, educational sessions, and even screenings and assessments. Moreover, telehealth enables early intervention and timely treatment of oral health issues, leading to im-

proved outcomes and reduced healthcare costs in the long term.<sup>11</sup>

Despite the growing recognition of telehealth's potential, there remains limited literature on the benefits and practicality of virtual or "online" tele dentistry in providing preventive dental care, such as dental screening and dietary counselling, particularly for paediatric populations.<sup>12</sup> This study aims to assess the experiences, satisfaction levels, and feasibility perspectives of patients/guardians and providers participating in a prevention-focused telehealth program at the pediatric dentistry department of a dental hospital.

### **Material and Methods:**

The study was conducted in the Department of Paediatric Dentistry at a dental college in Multan, Pakistan. The Zoom videoconferencing platform was used for synchronous telehealth. Parents and guardians got a WhatsApp message with information about the appointment and a link to join the virtual lesson. The one-click link lets anyone with an internet-connected gadget join the session. During sessions, families could use the video interface to discuss their main dental issues and share photos through the chatbox, which let clinicians assess them in real time. After a careful look at dietary habits and a caries risk assessment, consultants made and showed personalised care plans for each patient that were tailored to their specific needs. This included how to brush teeth, live demos using a typodont model, an evaluation of current brushing techniques, a prescription for a certain toothpaste, suggestions for oral hygiene aids, dietary advice, and ideas for tooth brushing games, videos, or resources. Resources and important messages were shown on the Zoom share screen and WhatsApp to everyone at the end of the meeting. Parents and guardians who were able to take the online poll had used Zoom before and did not need an interpreter.

The parent/guardian questionnaire was an online survey with 30 questions based on the Telehealth Satisfaction Questionnaire (TSQ). The questions looked at technical quality, communication impact, ease of use, comfort, accessibility, perceived usefulness, effectiveness, intention to use or reuse, and overall satisfaction with video or audio consultations in the home. A facilitator guide was used by the clinicians' focus group to talk about the telehealth process's satisfaction, ease of use, usefulness, and efficiency, as well as communication skills, parental views, problems, and possible solutions. The hour-long focus group was led by an external co-investigator, and

the session was recorded and transcribed.

The Institutional Review Board (IRB) at Bakhtawar Amin Medical & Dental College in Multan, Pakistan, granted approval for the study with IRB Num (236/23/COD). Informed consent was obtained online from participants, and written in person consent was obtained from doctors. An information sheet was provided beforehand to all participants, outlining the purpose, duration, and other details of the study. Participants were assured that their data would be kept confidential and only used for research purposes. To analyse questionnaire data, descriptive statistics were used to look at the distribution, and survey answers were used to create thematic groups. Chi-square tests and analyses of variance looked at how factors are related to each other. Coding was done manually. The Ritchie and Spenser framework was used for the analysis.

## Results

A total of 45 guardians participated in the study, which was conducted from June 2023 to October 2023. A significant portion of the parents (46.6%) were from the 30-39-year-old age group, and the majority had between 3 and 4 children (53.4%). A substantial majority (71.2%) reported speaking Urdu as their primary language at home, indicating a diverse cultural background among the participants. Travelling difficulty from appointments to their children's dental appointments was reported by a significant majority (64.5%) of the parents (Table 1). The children of the surveyed parents showed a mean age distribution, with a considerable number (60%) aged between 4 and 8 years. The data revealed that a vast majority of children (80%) did not report dental pain, and a notable 91.1% did not report dental swelling, indicating a prevalence of dental issues among the pediatric population surveyed. However, a large number of children (64.9%) had dental decay, emphasizing the importance of comprehensive dental care. A significant majority (64.5%) of respondents expressed that traveling to dental appointments posed challenges, highlighting the logistical barriers families face when accessing pediatric dental care. Some participants preferred traditional, face-to-face consultations for learning essential aspects of dental health, as indicated by a low score (2.6, SD = 1.01). With regard to parental demographics, a diverse range of languages spoken at home was noted, with Urdu being the predominant language (71.2%), followed by English (24.4%), Punjabi (2.2%), and Saraki (2.2%). This diversity underscores the impor-

tance of culturally sensitive healthcare provision.

In terms of travel difficulty, a clear majority (64.5%) agreed or strongly agreed that travelling to dental appointments was challenging, underscoring the logistical barriers faced by families in accessing paediatric dental care.

A low score (2.6, SD = 1.01) on the effectiveness of

Parent	n (%)	Child	n (%)
<b>Age (years)</b>		<b>Age (years)</b>	
20–29	6 (13.4)	0–3	8 (17.7)
30–39	21 (46.6)	4–8	27 (60)
40–49	18 (40)	9–12	10(22.3)
<b>Parents' language</b>		<b>Dental pain (Self-reported)</b>	
English	11 (24.4)	Yes	9 (20)
Urdu	32 (71.2)	No	36 (80)
Punjabi	1 (2.2)		
<b>Saraki</b>		<b>Swelling (Self-reported)</b>	
Pashto	0 (0)	Yes	4 (8.9)
Other	0 (0)	No	41 (91.1)
<b>Number of children</b>		<b>Dental decay (Self-reported)</b>	
1–2	16 (35.5)	Yes	19 (64.9)
3–4	24 (53.4)	No	26 (35.1)
>5	5 (11.1)		
<b>Travelling Difficulties</b>			
Strongly disagree/disagree	5 (11.1)		
Neither	11 (24.4)		
Strongly agree/agree	29 (64.5)		

learning oral hygiene skills or healthy diet habits via telehealth compared to in-person visits indicates a subset of participants might prefer traditional, face-to-face learning for these essential aspects of dental health. This points to an opportunity for enhancing how educational content is delivered and engaged with in a telehealth setting. The overall quality of the telehealth experience, as indicated by a score of 14.8 out of 25, suggests that technical aspects and the user experience need significant improvements. The feedback highlights the need for better audio/visual clarity (2.5/5) and a more user-friendly system (2.6/5), which are critical for a successful telehealth encounter.

Communication scores generally reflect a positive experience, with participants finding it relatively easy

to converse with their healthcare provider (4.1/5). However, the lower scores regarding the provider's understanding of the child's health condition (2.1/5) reveal a crucial area for enhancement in ensuring effective and empathetic communication within the telehealth platform. Satisfaction levels with telehealth services are indicative of their acceptance and perceived benefits, especially in gaining valuable skills for maintaining dental health (3.1/5), dietary improvements (3.6/5), and the confidence to apply these skills effectively

(3.1/5). Yet, the overall satisfaction score (21.7/35) signals a cautious optimism among participants, suggesting that while telehealth is valued for its accessibility and potential, there's a considerable scope for enriching the user experience to meet and exceed user expectations fully. The willingness to reuse telehealth services (3.1/5) and the comfort level with this mode of communication (3.1/5) show a general positivity towards telehealth as a healthcare delivery method.

Summary components	Survey question	Mean score (SD)
Usefulness (score = 16.4/25)	Telehealth saves me time traveling to the hospital or a specialist clinic	4.1 (0.66)
	I obtain better access to health-care services via telehealth	3.2 (0.71)
	I do not need assistance while using the system	3.1 (0.47)
	I think the health-care provided through telehealth is similar to what would be provided in the clinic	3.4 (1.03)
	I think that consulting in person would have been a better way to learn how to take care of my teeth or eat well.	2.6 (1.01)
Quality (score = 14.8/25)	The tele dental method is simple and easy to comprehend.	2.6 (0.47)
	I could see and hear my consultant as if we were face to face.	2.5 (0.51)
	I felt like I got enough attention during the tele dental program.	3.5 (0.78)
	I can easily talk to my health-care provider through telehealth	4.1 (0.69)
	The health-care provider is able to understand my child's health-care condition	2.1 (0.81)
Satisfaction (score = 21.7/35)	Overall, I am satisfied with the quality of service being provided via telehealth	2.1 (0.75)
	I find telehealth an acceptable way to receive health-care services	2.6 (1.08)
	I feel comfortable communicating with my health-care provider through telehealth	3.1 (0.62)
	I will use tele dentistry program in future too	3.1 (0.85)
	I have learnt essentials methods to help keep my kids' teeth healthy	3.1 (0.62)
	I now have useful skills to help me improve the food my child eats.	3.6 (0.51)
	I am sure that I can use these skills in real life.	3.1 (0.57)

The analysis of telehealth services based on the child's age and the number of children in a family showed that differences in satisfaction, usefulness, and quality of these services were small and statistically insignificant. For children under 4 years, the differences in satisfaction (0.67), usefulness (1.16), and quality (0.84) were not significant enough to suggest that the child's age impacts parents' perceptions of telehealth services. Similarly,

families with fewer than 3 children experienced only slightly higher satisfaction, usefulness, and quality compared to those with 3 or more children, but again, these differences were not statistically meaningful. Essentially, whether considering the age of the child or the number of children in a family, these factors do not significantly alter how parents view the effectiveness and quality of telehealth services.

Summary component factors (p-values)							
Independent t-test results		Satisfaction		Usefulness		Quality	
		Mean difference (SE)	p-Value	Mean difference (SE)	p-Value	Mean difference (SE)	p-Value
Child's age	<4 years	0.67 (1.27)	0.61	1.16 (1.65)	0.068	0.84 (1.23)	0.63
	≥4 years						
Number of children	<3	0.71 (1.06)	0.466	1.03 (1.62)	0.563	1.14 (1.09)	0.127
	≥3						

Telehealth sessions were highlighted for patients with transportation difficulties, emphasising their potential advantages. The analysis also highlighted benefits for paediatric patients with anxiety or unique needs like sensory difficulties, developmental delay, or autism disorder. Consultants were of the view that they could effectively involve anxious and introverted patients in oral hygiene education by conducting the sessions in the patients' familiar home environment. These sessions helped reduce sensitivity to the dental environment, preparing patients for future in-person treatment. Telemedicine improves dental care accessibility, especially in underserved rural areas with limited dental specialists. Patients expressed satisfaction with remote consultations, eliminating the need for travel and consulting with specialists. The telemedicine programme alleviated the burden on families associated with in-person visits. Overall, the relaxed environment facilitated the exchange of oral health preventive information.

As in surgery, during documentation, clinicians have to engage the child and give them instructions to sit still or limit movement. From the clinician's perspective, the primary advantages of a telehealth service are improved communication and connections, as well as a greater focus on prevention as compared to in-person appointments. Clinicians perceived that the method of communication resulted in increased parental involvement during the session. The consultations were frequently demonstrated to incorporate counselling for siblings as well, fostering bonds with all members of the family and offering comprehensive family-centred care.

“Guardians must be present with the child, holding the phone or device during telehealth consultations. It entails a dialogue between the parent, the child, and the health-care provider. Often, clinicians exhibit oral hygiene methods to the child while the parents are engrossed in their phones, hence improving the cooperative nature of telehealth consultations.”

“Parents often exhibited higher levels of involvement and openness in discussing personal matters, including social and stress-related concerns. This provided a fresh perspective to better understand the families' domestic circumstances, ultimately facilitating the establishment of strong connections and the customisation of patient-centred care.”

Technical obstacles encompassed inadequate internet connectivity among parents or the use of outdated devices, resulting in delays or interruptions in video transmission.

Considerable time and effort were often spent instructing parents on installing and using the app before appointments. Clinicians also observed that patients exhibited a lesser degree of seriousness towards the telehealth service compared to in-person appointments, resulting in higher rates of non-attendance compared to face-to-face appointments. Due to the lack of reliable internet connections and access to technology, not all patients, especially those in rural or low-income areas, were able to participate in these consultations.”

“Certain patients preferred in-person interactions because they felt disconnected from the care provided through teledental programmes.”

## Discussion

This study was conducted at the Pediatric Dentistry Department of a private dental hospital in Multan, Pakistan. The survey found that parents were generally satisfied with the telehealth services. Overall, parents were willing to utilize the service again, appreciating the convenience and ease of communication it provided. The benefits of telehealth were particularly significant for families facing transportation issues. Additionally, parents who spoke English or Urdu and were highly literate were more likely to accept the service. A 2021 systematic review found that tele dentistry procedures significantly reduce plaque, gingival indices, and white spot lesions.<sup>13</sup>

These constraints highlight the need to ensure equal access to tele dentistry services for all patients to improve its reach and efficacy in dental treatment. Barriers such as limited literacy, lack of technological knowledge, slow internet access, and a preference for in-person care can significantly impact the implementation of tele dentistry. Limited literacy and technological knowledge can prevent patients from effectively using telehealth platforms, while slow internet access can hinder the quality of virtual consultations. Additionally, a desire for in-person care may reduce the acceptance of tele dentistry among certain patient groups. Addressing these issues is crucial for boosting tele dentistry's efficacy and expanding its reach in dental care.<sup>14</sup>

There are strong reasons to continue implementing telehealth, especially in primary preventive dentistry, beyond the initial impact of the COVID-19 pandemic and related restrictions. Telehealth holds promise for addressing the oral health needs of rural and remote populations, where access to healthcare services is often limited, if provided with good internet and digital literacy skills,

especially in developing countries like Pakistan. Telehealth services can enhance access to dental care by connecting patients with providers in the comfort of their homes. A study in developing countries found that dentistry can enhance access to and delivery of oral health care at a lower cost. Several private digital platforms in Pakistan currently offer these services, improving access to dental care for individuals who lack easy access to traditional in-person services.<sup>15,16</sup>

The study highlighted the challenges families encountered when travelling long distances to access tertiary dental care services, underscoring the importance of telehealth in addressing these accessibility issues. Feedback from parents underscored the difficulties associated with attending multiple appointments. Consequently, the findings supported the permanent incorporation of tele dentistry program for initial screening, consultations, and paperwork with positive feedback already evident. This adjustment not only enhanced efficiency but also contributed to an improvement in overall patient satisfaction, reflecting the positive impact of integrating telehealth services. Additionally, it allowed for greater flexibility in scheduling and reduced wait times for patients.<sup>17,18</sup>

Interestingly, current research revealed a disparity in the satisfaction and feasibility ratings of the telehealth service between families speaking English or Urdu and those with high literacy rates. This highlights the importance of considering cultural and language barriers when implementing telehealth services to ensure equitable access and satisfaction among all patient populations. Language and cultural challenges can significantly impact the viability and patient satisfaction of telehealth services. To guarantee fair access for all patients, it is crucial to implement measures such as providing interpreters or translators for non-English and non-Urdu-speaking patients. Additionally, ensuring that telehealth platforms are user-friendly and accessible to individuals with varying levels of technological literacy is essential. Moreover, cultural competency training should be provided to all staff members. The findings indicate that children with impairments and/or unique needs, who frequently experience dental problem, can significantly benefit from continued tele dentistry utilisation, given the availability of suitable infrastructure and support.<sup>19,20</sup>

Furthermore, telehealth could help the dental system save money and time. According to previous study, low-cost cellphone preventive services can save a lot of money by lowering the caries rate in kids from low-income families.<sup>21,22</sup> While telehealth offers flexibility

and is well-received by patients, families, and clinicians, challenges such as appointment cancellations and non-attendance persist. To address this issue, the hospital should implement SMS reminders for telehealth appointments. However, the practicalities and cost-effectiveness of this option warrant further assessment.

Although personalised preventive advice via telehealth is beneficial, research suggests that face-to-face appointments are more effective in reducing plaque levels and cavities, especially in educating patients on proper oral hygiene practices and fluoride techniques. Therefore, It is important to carefully think about the role of telehealth as a useful addition to regular dental visits in addition to in traditional in person consultations for preventative care.

## Conclusion

Parents of paediatric patients and clinicians alike rated preventive dental telehealth visits satisfactory. The benefits of the programme were more pronounced for individuals having residence far away from hospital, those that have special needs related to healthcare, whose primary language was Urdu, and had a good internet connection. Clinicians reported improved communication with families, increased parental involvement, and enhanced comfort for children at home. Disadvantages included the excessive time and effort needed to fix technological problems, bad internet connections, and more missed appointments.

Even with these problems, the results show that preventive oral health services delivered through virtual platform are still useful as an addition to in-person care, especially for patients with specific needs. Future research should include larger and more diverse patient populations, incorporating interpreters as needed, to further explore how telehealth services can overall impact the healthcare quality. This knowledge can inform improvement and enhancement in telehealth services, consultant training, and the development of best practices.

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### Authors Contribution

**HJ:** Conceptualization of Project

**HP:** Data Collection

**IE:** Literature Search

**HA:** Statistical Analysis

**SUK:** Drafting, Revision

**WH:** Writing of Manuscript