



Original Article



Attitude Towards Tele-Medicine Among Caregivers of Pediatric Patients

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ABSTRACT

Telemedicine is a vital constituent of digital health-care, particularly stating the deliverance of medical facilities over remote areas by means of Information and Communication Technologies (ICT). The swift progress of mobile applications has improved support for health-care experts, rationalization responsibilities such as time organization, communication, and policymaking.

Objective: To assess attitudes of parents having children aged between one to twelve years towards telemedicine. **Methods:** The cross-sectional study employed an online survey with the sampling strategy as convenience method for recruitment of eligible parents. A self-administered questionnaire was employed to gather sociodemographic data, child-related information, and participants' technological profiles. Attitudes toward telemedicine were measured using a 5-point scale, evaluating the perceived usefulness of various telemedicine services and associated advantages. Data analysis included descriptive statistics to summarize sociodemographic variables and item prevalence, while excluding any missing values. **Results:** A total of 120 families participated in the study, with caregivers averaging 47.4 years in males, 43.1 in females and children 7.5 years old. The majority of caregivers were female (68.3%), and most children were male (53.3%). Technological profiles indicated high smartphone availability (93.3%) and moderate use of social media accounts. Attitudes toward telemedicine showed significant perceived usefulness, particularly for scheduling medical visits (54.1% rated it as moderate/much) and telemonitoring services (49.1%). Participants recognized advantages of telemedicine, highlighting time efficiency (44.1%) and financial savings (46.6%) as key benefits. **Conclusion:** Families of pediatric patients demonstrated a strong willingness to engage in telemedicine programs. They showed positive attitude towards usefulness of telemedicine.

INTRODUCTION

Telemedicine is a crucial component of digital healthcare, which encompasses the use of electronic devices and digital information across various health sectors [1]. It specifically refers to the delivery of medical services over distances, utilizing Information and Communication Technologies (ICT) [2]. Alongside these remote care methods, a wide array of mobile applications has emerged, providing essential support to Healthcare Professionals (HCPs) in their daily operations [3]. These applications enhance efficiency by streamlining tasks such as time management, information access and storage, health promotion, education, communication, monitoring, data organization, and decision-making [4]. The digital health

application landscape is rapidly evolving, with around 97,000 health-related apps available on platforms like Apple and Google. This quantity rises by almost 1,000 new apps per month, representing a predictable yearly rise of 25% [5]. The use of ICT and mobile technologies is cost-effective as well as improves operative competence, contributory to progressions in health-care amenities [6]. World Health Organization (WHO) highlights the transformative capacity of mobile machineries in cultivating community health facility delivery, depicting their user-friendliness and extensive reception among both workers and patients [7]. The development of ICT has led to the growth of various organizations intended for



healthcare settings, counting mobile appointment arrangement. Therefore, investors from various arenas like HCPs, IT experts, social researchers, public and private administrations, and representatives are vigorously discovering ways to influence portable Mobile Health (m-Health) technologies, generating novel prospects in healthcare delivery [8]. The noteworthy surge in mobile phone utilization over the past era, with worldwide payments outstanding at 5.11 billion and predictable to surpass 50 billion, accentuates this drift. According to WHO, this availability is not restricted to advanced countries but also spreads to underserved areas, marking an essential moment where technology is reforming healthcare structures [9]. The development of telemedicine has been considered by quick progressions, leading to cost-effective explanations and wider functionalities. Both developed and developing nations have accepted mobile health methods, though evidence on user information and practices remains limited [6]. For example, surveys conducted in Ghana indicate a significant awareness and potential integration of m-Health into standard healthcare systems [10]. In Korea, while the adoption of m-Health among older adults is increasing, some still face challenges due to limited expertise, even as their self-confidence in using these technologies grows [11]. From the perspective of HCPs, studies in Finland and Lithuania reveal that nurses are becoming increasingly familiar with mobile health technologies, emphasizing features like automated data recording and transmission [12]. In Ethiopia, a considerable number of healthcare professionals demonstrate good knowledge and awareness of telemedicine services, influenced by factors such as information sources, IT support, and training [13]. In underdeveloped countries, telemedicine applications could serve as a powerful means to deliver essential healthcare to large populations, effectively bridging the gap between rural areas and specialized medical institutions predominantly located in urban centers [14]. Since the COVID-19 pandemic began in Pakistan, there has been a notable rise in demand for telehealth services. Despite the potential of telemedicine to address many barriers to healthcare delivery in developing nations, Pakistan has not yet fully harnessed this opportunity [15]. The rapid population growth, combined with a fragmented healthcare system, has resulted in unequal access to services. Telemedicine holds the promise to enable Pakistan's healthcare system to adopt innovative and cost-effective strategies, thereby transforming healthcare delivery throughout the country. Notably, pediatric patients residing in isolated regions face considerable challenges in accessing specialized medical professionals, as their health outcomes can be significantly influenced by proximity to these specialized centers [16].

Although telemedicine has expanded globally as a cost-effective digital healthcare solution, evidence regarding caregivers' attitudes toward pediatric telemedicine in developing countries like Pakistan remains limited. Existing studies largely emphasize healthcare provider perspectives or adult populations, leaving a significant gap in understanding parental acceptance, technological readiness, and perceived usefulness of telemedicine for pediatric care. The objective of the current study was to assess attitudes of parents having children aged between one to twelve years towards telemedicine, focusing to understand their perceptions towards its utilization in the management of their children's healthcare needs.

METHODS

This study was a cross-sectional online survey, utilizing a convenience sampling method to recruit parents with children aged 1–12 years receiving care for acute or chronic conditions through a web-based survey platform. A total sample size of 120 participants was selected based on practical considerations, including time limitations, resource accessibility, and the exploratory nature of the study. Participants who met the eligibility criteria were contacted consecutively by research assistants, and inclusion criteria was as follows: having a child within the particular age range and giving informed consent. After the informed consent process and obtaining it from participants, research participants completed self-reported questionnaire intended at evaluating their attitudes toward telemedicine. The first section of the questionnaire constituted about sociodemographic characteristics. It also collected information about the child, such as gender, age, the number of hospital admissions in the past year, and the frequency of visits to the family pediatrician during the same period. Moreover, the questionnaire assessed technological aspects of research participants, measuring the accessibility of devices such as smartphones, personal computers, tabs, and smart TVs, along with the existence of blogs and social media accounts. It inquired about the use of messaging applications, video calls, smartphone apps, health-related apps, and online searches for health information. Attitudes toward telemedicine were measured on a 5-point scale, focusing on the perceived usefulness of various services, including communication apps for parents, health diaries, appointment scheduling, telemonitoring, emergency consultations, reminders for appointments, and health promotion newsletters. Participants also evaluated perceived benefits of telemedicine, such as time and cost savings, as well as empowerment for patients and families. Data analysis were performed using SPSS version 23.0. Analysis involved describing sociodemographic variables and the prevalence of each item using means, standard deviations, medians, ranges, or proportions with 95% confidence intervals, as appropriate, while excluding any

missing values. Participants' technological profiles were categorized based on device availability and usage of social media and messaging services. Descriptive statistics of attitudes towards telemedicine and perceived advantages were presented. These statistics were used to provide a detailed summary of categorical variables and response distributions.

RESULTS

A total of 120 families were enrolled. The mean age of caregivers was 45.2 ± 5.4 years and the mean age of children was 7.5 ± 3.8 years as shown in table 1.

Table 1: Characteristics of study Participants

Characteristics	Frequency (%) / Mean \pm SD
Caregivers Gender	
Male	38 (31.7%)
Female	82 (68.3%)
Caregivers Age	
Male	47.4 \pm 4.8
Female	43.1 \pm 5.2
Child's Gender	
Male	64 (53.3%)
Female	56 (46.6%)
Child's Age	7.5 \pm 3.8 Years
Pediatrician Visits During Last 6 Months	
Never	32 (26.6%)
1-4 Times	58 (48.3%)
5 or More Times	30 (25%)

Table 2 illustrated the technological characteristics of the study participants, highlighting their access to devices, ownership of technological tools, engagement with social media platforms, utilization of messaging services, and experience with video call applications. A significant proportion of participants (93.3%) reported owning a smartphone, followed by access to smart TVs (57.5%), laptops (35%), and desktop computers (20.8%). In terms of gadget ownership, half of the respondents (50%) possessed two gadgets, 35% reported minimal ownership (0-1 gadget), and 15% had extensive access (3-4 gadgets). Social media engagement was also examined, with Facebook being the most commonly used platform (70%), followed by Instagram (60%) and Google accounts (56.6%), while Twitter was used by a smaller group (18.3%). Overall, most participants (63.3%) exhibited moderate activity on social media (1-2 accounts), 20% demonstrated high activity (3-5 accounts), and 16.6% had no social media presence. Regarding messaging tools, WhatsApp emerged as the most widely used service (91.6%), followed by Facebook Messenger (42.5%) and Skype (35%). Participants' use of messaging platforms was categorized as moderate for the majority (51.6%), while 35.8% reported limited usage (0-1 facility), and 12.5% had extensive usage (3 facilities). Concerning video calling, 76.6% of respondents had used a smartphone application for video

communication, yet only 23.3% had employed it for healthcare purposes.

Table 2: Technological Profile

Variables		Frequency (%)
Type of Device Availability		
Smart Phone		112 (93.3%)
Laptop		42 (35%)
PC		25 (20.8%)
Smart TV		69 (57.5%)
Technological Gadgets		
Low	0-1 Gadget	42 (35.0%)
Moderate	2 Gadgets	60 (50.0%)
High	3-4 Gadgets	18 (15.0%)
Social Media Accounts		
Facebook Account		84 (70.0%)
Instagram Account		72 (60.0%)
Twitter Account		22 (18.3%)
Google Account		68 (56.6%)
Social Networking		
Low (No Account)		20 (16.6%)
Moderate (1-2 Accounts)		76 (63.3%)
High (3-5 Accounts)		24 (20.0%)
WhatsApp		110 (91.6%)
Skype		42 (35.0%)
Facebook Messenger		51 (42.5%)
Use of Messaging Facilities		
Low	0-1 Facility	43 (35.8%)
Moderate	2 Facilities	62 (51.6%)
High	3 Facilities	15 (12.5%)
Video Calls Facility		
Ever Utilized Smartphone App		92 (76.6%)
Ever Utilized Smartphone App for Health Purpose		28 (23.3%)

Table 3 outlined participants' attitudes toward telemedicine services, categorized by perceived usefulness across various features, including communication, health monitoring, scheduling, and emergency services. For communication features, 56.6% of participants found an app enabling communication with other parents sufficient, while 30% rated it as moderately or very useful. Regarding a diary for tracking a child's health status, 51.6% deemed it sufficient, and 41.6% found it moderately or very useful. Scheduling medical visits via an app was highly valued, with 54.1% rating it moderately or very useful, while 35.8% found it sufficient. Similarly, a service for teleconsultations was considered moderately or very useful by 43.3% of participants, and sufficient by 29.8%. In terms of telemonitoring services, 49.1% found these services moderately or very useful, and 41.6% considered them sufficient. Services for transmitting telemonitoring data to doctors were rated as sufficient by half of the participants (50.8%) and moderately or very useful by 40.8%. Emergency medical advice services were rated as

sufficient by 43.3% of respondents, while 35% rated them moderately or very useful. Notifications for medical appointments were highly rated, with 57.5% finding them sufficient and 35.8% considering them moderately or very useful. For transmitting health information from hospitals, 48.3% found the service sufficient, and 40.8% rated it

moderately or very useful. Alerts for therapy sessions were deemed sufficient by 55% of participants and moderately or very useful by 37.5%. Finally, health awareness newsletters were considered sufficient by 49.1% and moderately or very useful by 39.1%.

Table 3: Attitude Towards Telemedicine

Attitude Towards Telemedicine	None/A Bit Frequency (%)	Sufficient Frequency (%)	Moderate/Much/Frequency (%)
Perceived Usefulness			
An app allowing communication with other parents of children	16 (13.3%)	68 (56.6%)	36 (30.0%)
A diary for recording the child's health status	8 (6.6%)	62 (51.6%)	50 (41.6%)
An app for scheduling medical visits	12 (10%)	43 (35.8%)	65 (54.1%)
A service for televisits	20 (16.6%)	48 (29.8%)	52 (43.3%)
A telemonitoring service	11 (9.1%)	50 (41.6%)	59 (49.1%)
A service for transmitting telemonitoring data to the doctor	10 (8.3%)	61 (50.8%)	49 (40.8%)
A service for seeking medical advice in emergencies	26 (21.6%)	52 (43.3%)	42 (35.0%)
Notifications for medical appointments	8 (6.6%)	69 (57.5%)	43 (35.8%)
A service for transmitting health information from the hospital	13 (10.8%)	58 (48.3%)	49 (40.8%)
Alerts for therapy sessions	9 (7.5%)	66 (55%)	45 (37.5%)
A newsletter focused on health awareness	14 (11.6%)	59 (49.1%)	47 (39.1%)

Table 4 highlighted participants' perceptions of the advantages of telemedicine, categorized into levels of agreement: None/A Bit, Sufficient, and Moderate/Much. Regarding time efficiency, 44.1% of participants perceived it as moderately or very advantageous, while 38.3% considered it sufficient. Financial savings were recognized as a major benefit, with 46.6% rating it as moderately or very advantageous and 43.3% finding it sufficient. Increased patient autonomy was viewed positively, with 47.5% rating it as moderately or very advantageous and 40% finding it sufficient. Similarly, enhanced family empowerment was perceived as sufficient by the majority (50.8%), while 34.1% rated it as moderately or very advantageous.

Table 4: Perceived Advantages of Telemedicine

Advantages of Telemedicine	None/A Bit Frequency (%)	Sufficient Frequency (%)	Moderate/Much Frequency (%)
Time Efficiency	21 (17.5%)	46 (38.3%)	53 (44.1%)
Financial Savings	12 (10%)	52 (43.3%)	56 (46.6%)
Increased Patient Autonomy	15 (12.5%)	48 (40%)	57 (47.5%)
Enhanced Family Empowerment	18 (15.0%)	61 (50.8%)	41 (34.1%)

DISCUSSION

The decision to create and implement an innovation should be guided by three essential elements: feasibility, viability, and desirability [16]. The development of a telemedicine initiative stands to benefit from these principles. This study focuses on understanding the desires and expectations towards telemedicine among families with children. The findings reveal a strong interest in telemedicine, with many families enthusiastic about using a hospital-issued app, and over half willing to participate in televisits. This willingness was consistent across various demographics, indicating that a telemedicine service could cater to all patients without needing to target specific subgroups. Previous research has explored attitudes toward technology in health management, primarily among adult patients. Many studies have focused

on specific populations, yielding mixed results. Interest in telemedicine has been noted among cancer patients and those with chronic lung conditions, though some exhibited low enthusiasm for new technologies. A broad survey found that patients with depression and high cerebrovascular risk showed moderate interest in phone and internet services, while interest in social media was lower [17-19]. The pediatric context is particularly favorable for telemedicine, as both parents and children are generally younger and more comfortable with technology. Current study corroborates this, with participants demonstrating high technological proficiency and familiarity with video calls, messaging, and social networks. This demographic, combined with a higher educational level, creates an ideal environment for telemedicine services. Findings of present study align with existing literature, indicating a positive attitude toward telemedicine in pediatrics. High satisfaction was reported for telemedicine services in child and adolescent mental health [20]. Families undergoing genetic consultations and screenings for retinopathy of prematurity also showed a favorable perception of telemedicine, although preferences for in-person visits varied [21]. Preferred telemedicine functions primarily revolved around communication with the hospital, encompassing logistics (such as data transmission and appointment scheduling) and clinical interactions

(especially for emergencies). These functions can significantly enhance quality of life, positively influenced by telemedicine services. By reducing the need for in-person visits where time savings were highlighted as a key benefit telemedicine can streamline processes, empower patients, and bolster their sense of security [22]. Conversely, those less inclined to embrace telemedicine often expressed distrust in the technologies involved. Despite the generally high digital literacy within the target population, the introduction of a health app or televisit service necessitates a robust educational program aimed at patients, their families, and healthcare professionals to ensure proper usage and implementation. Interestingly, ownership of smartphones was linked to favorable study outcomes, indicating their considerable potential for delivering telemedicine services. Smartphones, due to their portability and good image quality, serve as ideal devices for remote communication and health-related applications. They have been widely adopted for telemedical purposes, benefiting both healthcare providers and patients [23]. The findings of the current study recommend that families of pediatric patients are not only willing but also technologically equipped to adopt telemedicine plans. This inclination emphasized an opportunity for healthcare providers to integrate telemedicine into routine pediatric care. For instance, video calls and app-based communication can enhance continuity of care for children with acute or chronic conditions, particularly in resource-constrained settings or where access to in-person care is challenging. The current study also has limitations. Firstly, it did not gather information on individuals who declined to complete the questionnaire, which may have resulted in a responding population that is more inclined toward telemedicine. Additionally, conducting qualitative studies would be beneficial for gaining a deeper understanding of the attitudes and experiences related to telemedicine. Future research should focus on evaluating the impact of telemedicine on clinical outcomes and patient satisfaction in pediatric care. Additionally, studies should explore barriers to adoption, such as digital literacy and access to technology, to ensure equitable implementation.

CONCLUSIONS

Families of pediatric patients demonstrated a strong willingness to engage in telemedicine programs. Features such as emergency medical advice and notifications for medical appointments are also widely perceived as useful. The technological capabilities of these families are generally adequate to support basic telemedicine services, such as video calls and dedicated applications.

Authors' Contribution

Conceptualization: SR

Methodology: SR, RR, AM

Formal analysis: SQ

Writing and Drafting: SR, SS, MI

Review and Editing: SR, SS, MI, AM, SQ, RR

All authors approved the final manuscript and take responsibility for the integrity of the work

Conflicts of Interest

All the authors declare no conflict of interest.

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