



## KNOWLEDGE AND ATTITUDE OF TELEMEDICINE AMONG CAREGIVERS OF PEDIATRIC EPILEPSY PATIENTS -A CROSS-SECTIONAL STUDY

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### ABSTRACT

**INTRODUCTION:** Telemedicine combines advanced telecommunications and electronic information technologies to provide healthcare services even at remote areas. It is an essential and beneficial technology that can ease preventive treatment and improve long-term health. In addition, it can make healthcare more efficient, organized, and available. We sought to understand the knowledge and attitude of telemedicine among the parent/ guardian of epilepsy patients.

**OBJECTIVE”:** To assess the knowledge and attitude regarding telemedicine among pediatric caregivers of epilepsy patients.

**MATERIALS AND METHODS:** A cross-sectional study was conducted in the Department of Pediatrics, Adichunchanagiri Hospital and Research centre between October 2024 and December 2024, utilizing self-administered questionnaires for data collection. In this study, the non-probability purposive sampling method was adopted. All caregivers (aged 18 years or older) of paediatric epilepsy patients visiting OPD or admitted patients who have been involved in the patient’s care for at least 6 months were included in the study and were provided with a questionnaire which comprised three main sections: demographics, knowledge and attitude Regarding caregivers’ knowledge. Statistical Package for Social Sciences (SPSS) version 22.0 was used for data analysis.

**RESULTS:** Among the 88 participants in the study, the majority (42%) were aged between 26 and 30 years, and 73.9% were female. In the study the level of awareness about telemedicine was low as only 28.4% had heard of telemedicine. Most participants were able to correctly identify its purposes and benefits. All aspects of the caregivers’ attitudes demonstrated positive agreement with the Likert scale of attitudes.

**CONCLUSION:** Our research uncovered a significant knowledge gap regarding telemedicine services, including their availability, purposes, and benefits. However, caregivers demonstrated positive attitudes toward telemedicine, with social media emerging as the most effective platform for awareness and education.

**KEYWORDS:** Telemedicine, Pediatric Epilepsy, Knowledge, Attitude.

## INTRODUCTION

Telemedicine is transforming healthcare by utilizing modern technology to facilitate remote medical services. Through tools such as telecommunication networks, video calls, and electronic medical records, it allows healthcare professionals to offer efficient, high-quality care to patients who may not have direct access to healthcare facilities. This digital approach will help to significantly improve patient management and treatment outcomes. The integration of telemedicine technologies has the potential to optimize healthcare delivery by streamlining clinical workflows, enhancing patient engagement, and facilitating more personalized and proactive approaches to preventive care and long-term disease management.<sup>[1,2]</sup> Epilepsy is one of the most common neurological diseases globally. It is a chronic and often refractory neurological disease characterized by recurrent seizures, which can have a profound impact on quality of life. According to WHO, around 50 million people worldwide have epilepsy, with 80% living in low- and middle-income countries. India has an estimated 12 million cases, with prevalence rates in children ranging from 4.07 to 6.99 per 1,000 population in India. As childhood is the onset period for over 60% of epilepsy cases, pediatricians are instrumental in identifying, treating, and managing this condition to ensure optimal outcomes for young patients.<sup>[3,4]</sup>

A recent review revealed that approximately four out of five individuals with epilepsy in India reside in rural areas, with a staggering 75% potentially lacking access to standard guideline-based treatment. The treatment gap in childhood epilepsy is primarily driven by two key barriers: financial constraints limiting access to care and restricted availability of specialized epilepsy treatment centers. Furthermore, research highlights that social and demographic factors, such as socioeconomic status, education, age, gender, social support, and proximity to healthcare facilities, also play a crucial role in shaping treatment choices for children with epilepsy.<sup>[5,6]</sup> The COVID-19 pandemic has accelerated the need for innovative healthcare solutions, particularly in underserved rural areas with limited access to specialized medical staff. Telemedicine has emerged as a vital tool, enabling healthcare providers to remotely care for patients, offer online consultations, and provide remote monitoring, nursing, and rehabilitation services. By leveraging telemedicine, healthcare systems can enhance decision-making, increase the quality and efficiency of emergency services, accelerate diagnosis, and alleviate financial burdens on patients by streamlining clinical processes and reducing travel costs.<sup>[7]</sup> The utilization of telemedicine, which facilitates remote medical consultations in real-time through audio-visual technology, presents a viable strategy for mitigating existing barriers to healthcare access. A comprehensive review of the literature reveals that telemedicine demonstrates comparable safety and efficacy profiles to traditional in-person care, with notable improvements in patient outcomes.<sup>[8]</sup> Recognizing the complex barriers that impede optimal epilepsy management, and acknowledging the advantages of telemedicine in bridging these gaps, it is clear that telemedicine has the potential to transform epilepsy care by enhancing accessibility, affordability, and overall quality of life for individuals with epilepsy. Prior to the COVID-19 pandemic, telemedicine was available but underutilized due to lack of familiarity with the technology and implementation processes among healthcare providers and patients. Despite its increasing global adoption, several challenges continue to hinder effective telemedicine implementation.<sup>[8-11]</sup> While numerous studies have explored healthcare workers' and medical students' knowledge and attitudes toward telemedicine, a significant knowledge gap exists regarding caregivers' perceptions and understanding of telemedicine in the context of epilepsy care.<sup>[12-13]</sup>

A well-designed telemedicine program can streamline outpatient services by decreasing the need for in-person clinic visits. This, in turn, offers a more economical and practical solution for caregivers of children with epilepsy, particularly those with comorbid conditions that necessitate specialized care and also to reduce logistical challenges related to transportation and accessibility.<sup>[14]</sup> Therefore this research study was undertaken to explore the knowledge and attitudes of caregivers of children with epilepsy regarding telemedicine at our institution. Gaining insight into caregivers' understanding and perceptions of telemedicine is essential for optimizing the telemedicine services, ultimately informing the development of a sustainable, patient-centered epilepsy telehealth clinic that delivers uninterrupted, high-quality epilepsy care.

## MATERIALS AND METHODS

This is a cross-sectional study, conducted at the Department of Paediatrics, Adichunchanagiri Hospital and Research centre, Bellur, Karnataka, India. Study population included the caregivers of paediatric epilepsy patients visiting OPD or admitted patients in Adichunchanagiri Hospital meeting the criteria. A convenience sampling method was utilized, and data collection took place from October 2024 to December 2024, during which time the questionnaire was administered to participants. The inclusion criteria for this study specified that caregivers of paediatric patients with epilepsy were required to meet two key criteria: they had to be at least 18 years old, and they had to have been actively involved in the patient's care for a minimum duration of 6 months. The study's exclusion criteria comprised two distinct categories. Firstly, caregivers who declined to provide informed consent, thereby withholding their participation, were excluded from the study. Secondly, caregivers who initiated the questionnaire but failed to complete it in its entirety, resulting in incomplete or unusable data, were also excluded from the analysis. This ensured that only caregivers who provided full consent and complete questionnaire data were included in the study. To determine the required sample size, we employed a statistical calculation based on the proportion of caregivers unfamiliar with telemedicine, as reported in a previous study by Grael M Dumally et al.,<sup>[14]</sup> (70.8%). We applied a 95% confidence level to ensure reliability and accounted for a potential 10% non-response rate to minimize bias and estimated that the sample size required for this study were 88 subjects. To gather relevant data, a structured questionnaire was designed, comprising three interconnected sections. The initial section focused on collecting caregivers' demographic data, encompassing essential information such as age, gender, place of residence, and educational background. The subsequent section was dedicated to assessing caregivers' knowledge, while the final section employed a 5-point Likert scale to evaluate their attitudes, with response options ranging from 'Strongly Disagree' (1) to 'Strongly Agree' (5), thereby facilitating a nuanced understanding of their perspectives. The questionnaire utilized in this study was developed based on a comprehensive literature review, with particular reference to the study conducted by Grael M. Dumallay et al.,<sup>[14]</sup> To ensure the validity and reliability of the questionnaire, a rigorous evaluation process was undertaken. Firstly, expert feedback was solicited from five specialists in medical and clinical informatics and health information, who assessed the questionnaire's format, clarity, and content validity. Secondly, the questionnaire's reliability was evaluated by administering it to a pilot group of 30 caregivers and calculating Cronbach's alpha, which yielded a satisfactory value of 0.85.

Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 (IBM SPSS Statistics, Somers NY, USA) version software. Categorical data was represented in the form of Frequencies and proportions. Chi-square test or Fischer's exact test (for 2x2 tables) was used as test of significance for qualitative data. The *p* value (Probability that the result is true) of <0.05 was considered as statistically significant after assuming all the rules of statistical tests.

The study was approved by the Institutional Ethics Committee of Adichunchanagiri Hospital and Research centre with the approval number AIMS / IEC / 197 / 2024. As part of the informed consent process, study participants were provided with a comprehensive overview of the research study prior to completing the questionnaire. This included a detailed explanation of the study's objectives, their role as participants, and the measures in place to ensure the confidentiality and anonymity of their responses. Additionally, participants were explicitly advised of their rights, including the right to refuse participation, withdraw from the study at any time, and decline to answer any questions that made them uncomfortable following which an informed consent was obtained from all participants.

## RESULTS

An analysis of the demographic characteristics of the 88 participants revealed a significant majority were female (N=65, 73.9%). The age distribution showed that 42% (N=37) of participants were between 26-30 years old, followed by 28.4% (N=25) in the 31-40 age bracket. Furthermore, the majority of participants (N=77, 87.5%) resided in rural areas, indicating a predominantly rural sample. In terms of educational attainment, the largest proportion of participants (N=33, 37.5%) held a higher

secondary education, while 25% (N=22) had secondary education, highlighting the varied educational backgrounds of the study participants. An examination of the sources from which participants obtained information about telemedicine revealed that social media platforms were the most frequently cited source (48%). Hospitals and healthcare institutions were the second most common source (23%), followed by television broadcasts (12%) and recommendations from friends (10%). The results of this study revealed a notable knowledge gap among caregivers regarding telemedicine, with 71.6% of respondents indicating that they had not previously heard of the terms 'telemedicine' or 'teleconsultation'. The analysis revealed a statistically significant correlation between caregivers' knowledge of telemedicine and two key demographic factors. Firstly, a significant difference in telemedicine knowledge was observed between rural and urban residents, with rural residents exhibiting lower levels of knowledge ( $p < 0.01$ ). Secondly, caregivers with lower educational attainment (less than higher secondary education) were more likely to report having no prior knowledge of telemedicine, highlighting a significant association between education level and telemedicine awareness ( $p = 0.04$ ). The attitude scores of the majority of questions exceeded 3.5, indicating a generally positive disposition towards telemedicine. Notably, attitudes towards telemedicine were not significantly influenced by gender, age, or residential location. However, a statistically significant correlation was observed between participants' attitudes towards telemedicine and their educational qualification ( $p \text{ value} < 0.05$ ).

Variables		N (%) (n=88)
Gender	Male	23 (26.1)
	Female	65 (73.9)
Age (Years)	18-25	8 (9.1)
	26-30	37 (42)
	31-40	25 (28.4)
	41-50	8 (9.1)
	51-60	5 (5.7)
	>61	5 (5.7)
Residence	Rural	77 (87.5)
	Urban	11 (12.5)
Education	Primary	16 (18.2)
	Secondary	22 (25)
	Higher Secondary	33 (37.5)
	Graduation	10 (11.4)
	Post-graduation	7 (8)

**Table 1: Demographic Characteristics of Caregivers of Children with Epilepsy**

Questionnaire		Response of Caregivers N (%)
Have you heard about telemedicine	Yes	25 (28.4)
	No	63 (71.6)
Have you ever used telemedicine	Yes	11 (12.5)
	No	77 (87.5)
From which sources did you get the information on telemedicine?	Friends	9 (10)
	TV	11 (12)
	Social media	48 (55)
	Hospital	20 (23)
Purpose of telemedicine	To overcome geographical barriers	10 (11.3)
	Consult a physician so that initial treatment options can be given	46 (52.3)
	To improve health outcomes	11 (12.5)

	All of the above	21 (23.9)
Benefits of telemedicine	Decreases travel time and expenses for patients	38 (43.2)
	Provides education for patients and their caregivers about epilepsy	7 (7.95)
	Improves access to expertise for remote or underserved area	29 (32.95)
	All of the above	14 (15.9)
<b>Table 2: Caregivers knowledge regarding telemedicine</b>		

	Strongly disagree N (%)	Disagree N (%)	Neutral N (%)	Agree N (%)	Strongly Agree N (%)	Mean $\pm$ SD
Cost Effective	5(5.7%)	16(18.8%)	21(23.8%)	11(12.5%)	35(39.7%)	3.6 $\pm$ 1.3
Opportunity to access health specialist services	6(6.8%)	7(7.9%)	11(12.5%)	41(46.6%)	23(26.1%)	3.7 $\pm$ 1.12
Lose that doctor/patient personal touch	9(10.2%)	21(23.8%)	13(14.7%)	8(9.1%)	37(42.1%)	3.48 $\pm$ 1.4
Security and confidentiality	7(7.9%)	21(23.8%)	39(44.3%)	14(15.9%)	7(7.9%)	2.95 $\pm$ 0.99
Comfortable	6(6.8%)	13(14.8%)	27(30.7%)	3(3.4%)	39(44.3%)	3.6 $\pm$ 1.3
Convenient	9(10.2%)	18(20.5%)	16(18.18%)	4(4.5%)	41(46.6%)	3.5 $\pm$ 1.4
Suitable for only young populations	3(3.4%)	10(11.3%)	23(26.1%)	31(35.2%)	21(23.8%)	3.64 $\pm$ 1.06
Not taken seriously	5(5.7%)	11(12.5%)	22(25%)	37(42%)	13(14.7%)	3.47 $\pm$ 1.06
Relieve overcrowding of health facilities	13(14.7%)	27(30.68%)	22(25%)	18(20.4%)	8(9%)	2.78 $\pm$ 1.19
<b>Table 3: Caregiver attitude regarding telemedicine</b>						

## DISCUSSION

Telemedicine applications have the potential to revolutionize healthcare delivery in developing nations, addressing the pressing need for increased access to basic medical services, reducing the burden of healthcare disparities, and fostering greater connectivity between rural communities and specialist healthcare institutions in urban centres.<sup>[15]</sup> The COVID-19 pandemic had a profound impact on healthcare facilities, resulting in a cascade of disruptions that compromised patient care. Follow-up appointments were delayed or cancelled, diagnostic tests were limited, and patients experienced unintentional non-adherence to treatment plans, leading to medication discontinuation and worsening health outcomes. Even after the pandemic these challenges are still pertinent for individuals residing in rural or remote areas, especially in developing countries, where access to healthcare is often limited and financial constraints are a significant barrier. The aforementioned challenges underscore the need for transformative solutions, and telemedicine rises to this occasion, providing an innovative framework for delivering healthcare services that prioritizes convenient, accessible, cost-effective, and efficient healthcare services.<sup>[16-18]</sup> The underutilization of telemedicine represents a missed opportunity to transform healthcare delivery. The ubiquitous availability of smartphones and high-speed internet connectivity presents an opportunity to bridge this gap, enabling patients and caregivers to engage in remote consultations, share vital information, and exchange files, such as electroencephalograms, magnetic resonance images, and videos of seizures.<sup>[13,16,19]</sup> The perceptual aspects of healthcare delivery, including nonverbal cues and emotional intelligence, as well as the physician-patient relationship facilitated through telemedicine, play a critical role in determining the success, failure, or unintended consequences of telemedicine interventions.<sup>[1]</sup>

Our research investigation, comprising 88 caregivers of children with epilepsy, uncovered a notable lack of knowledge about telemedicine services. The findings indicated that the majority (71.6%) of caregivers had not previously encountered the term 'telemedicine' prior to their participation in the study. The caregivers participating in our study reported learning about telemedicine services through a range of sources, including social media (55%), hospital and healthcare institutions (23%), television (12%), and friends (10%). A study conducted by Graef M. Dumallay et al. similarly revealed that social media was the primary source of information regarding telemedicine<sup>14</sup>. An assessment of caregivers' knowledge of telemedicine revealed significant gaps in their understanding of its primary purposes and benefits, contradicting the findings of a previous study by Dumallay et al. Our study's results also demonstrated that caregivers' knowledge of telemedicine is influenced by two factors, including residence and education level. The correlations observed in our study imply that rural residents and caregivers with lower educational attainment encounter significant challenges in accessing accurate and reliable information about telemedicine. This, in turn, results in limited knowledge and awareness of telemedicine services, which is consistent with the findings of previous research.<sup>[1,14]</sup> To address these disparities, targeted education and awareness, initiatives are necessary to empower caregivers and enhance their understanding of telemedicine's benefits and applications. A comprehensive analysis of the attitude scores revealed that the majority of respondents exhibited a positive attitude towards telemedicine, with mean scores for most questions surpassing 3.5. However, a notable proportion of respondents expressed reservations regarding telemedicine's potential consequences on the doctor-patient relationship, specifically citing concerns about disrupted personal connections and compromised patient confidentiality. These concerns are consistent with the findings of Ashfaq et al.<sup>[13]</sup> Consistent with our findings, studies by Singh et al. and Datta et al. reported that participants exhibited favourable attitudes towards telemedicine, despite possessing only average knowledge about the same.<sup>[20,21]</sup>

A comprehensive understanding of caregivers' knowledge and attitudes towards telemedicine for epilepsy care is critical for healthcare policy and decision-making. By examining these factors, policymakers can identify key areas for improvement and develop evidence-based strategies to enhance telemedicine services, ultimately expanding access to quality epilepsy care for children in remote and underserved regions.

The limitation of this study is it's a single-centre design, which may restrict the generalizability of the findings to more diverse populations. The use of a non-probability purposive sampling method may introduce selection bias and affect the representation of diverse caregiver populations. While the study assessed attitudes, it did not extensively explore practical challenges in adopting telemedicine, such as technological literacy, internet access, or financial constraints. The three-month study period may not have captured seasonal or temporal variations in caregivers' experiences and attitudes.

## CONCLUSION

Our study revealed a significant lack of awareness about telemedicine among caregivers of pediatric epilepsy patients, with only 28.4% having heard of the concept. However, despite the limited knowledge, caregivers demonstrated a positive attitude toward telemedicine, recognizing its potential benefits, such as reducing geographical barriers and improving healthcare accessibility. Social media was identified as the most common source of information about telemedicine, emphasizing the need for targeted awareness campaigns through digital platforms. Additionally, our findings highlight that rural residents and caregivers with lower educational attainment exhibit lower awareness, necessitating community-based interventions to bridge this knowledge gap.

Although concerns regarding the doctor-patient relationship and confidentiality were identified, the overall attitude was favorable, suggesting that structured telemedicine programs with appropriate security measures could gain acceptance among caregivers. Future studies should explore strategies to integrate telemedicine into routine pediatric epilepsy care, focusing on addressing concerns and improving user engagement.

## Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

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