ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26feb903

Knowledge and Practice of Telemedicine Among Healthcare Professionals at a Tertiary Care Hospital in Western India: A Cross-Sectional Study

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Publication Date: 2026/02/28

Abstract: The rapid expansion of telemedicine has significantly transformed healthcare delivery in low- and middle-income countries like India, where access to specialist services remains uneven. This descriptive cross-sectional mixed-methods study, conducted over three months at a tertiary care hospital in central Gujarat, assessed knowledge and practices related to telemedicine among healthcare professionals using the national e-Sanjeevani platform. Quantitative data from 56 participants and qualitative insights from seven departmental nodal officers revealed that although all participants were aware of telemedicine, only 14.3% possessed comprehensive knowledge of all services and half correctly identified all beneficiary groups. While 83.9% were aware of various modes of teleconsultation, only one-third provided comprehensive services including diagnosis, treatment, and counselling, and emergency management was largely limited to referrals. Qualitative findings emphasized the pivotal coordinating role of nodal officers and highlighted operational challenges such as software glitches, connectivity issues, and inappropriate calls. Overall, despite high awareness, significant gaps in knowledge, confidence, and system readiness persist, underscoring the need for strengthened training, improved technical infrastructure, and enhanced administrative support to optimize telemedicine utilization in tertiary care settings.

Keywords: *Digital Health, Healthcare Professionals, Knowledge, Teleconsultation, Telemedicine Practice.*

How to Cite: Dr. Swati Rankja; Dr. Bharati Makwana; Dr. Kalpita Shringarpure; Dr. Dharmi Rankja, Dr. Dhruvi Rankja (2026) Knowledge and Practice of Telemedicine Among Healthcare Professionals at a Tertiary Care Hospital in Western India: A Cross-Sectional Study. *International Journal of Innovative Science and Research Technology*, 11(2), 2078-2084. https://doi.org/10.38124/ijisrt/26feb903

I. INTRODUCTION

Telemedicine is the defined as the delivery of healthcare services through technology for diagnosis, treatment, prevention, and education, aimed at improving individual and community health [1] Before the pandemic, Member States in the Western Pacific Region were using telemedicine applications, showing that telemedicine is not a new concept [2]. However in developing nations like India, telemedicine services remain indistinguishable [3]. Telemedicine gained momentum when it came to delivering healthcare during pandemics and disasters, allowing visits without exposing workers to viruses and reducing risks by limiting disease transmission [1]

Telemedicine in India began in 2001 with Indian Space Research Organisation supporting and has resulted in many initiatives in various states in collaboration with Ministry of

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26feb903

Electronics and Information Technology and Ministry of Health and Family Welfare [4]. In November 2019, the Indian government launched e Sanjeevani, the National Telemedicine Service of MoHFW, which digitally connects rural and remote communities to health services, overcoming geographical, accessibility, cost, and distance challenges, providing equitable care countrywide [5]. The use of mobile phones and internet is growing rapidly in the India [6]. There are 743.19 million smartphone users in India who have internet connectivity, according to telecom data India 2020 [7]. This increases the ease of using telemedicine.

Telemedicine has grown in popularity across the globe along with the advent of technology, especially as a result of improvements in healthcare and telecommunications. Even with the increased demand for telemedicine services, issues like service delivery and clinician availability still need to be resolved [8]. Studies show that health professionals' lack of understanding and awareness of telemedicine services is the leading reason of failure [9]. A study carried out in India found that 24% of the respondents had low level or below average level of knowledge and 41% had high or above average level of knowledge of telemedicine. With respect to the skill of telemedicine 56% do not have adequate skills of telemedicine and only 19% have adequate skills of telemedicine [10].

However, there are many possible reasons why the application of e-health system continues to be challenging despite the available literature. In the tertiary care setup, the telemedicine concept is relatively new; and much needs to be established for its smooth conduct. There have been hitherto no studies done in the Central Gujarat region to explore the teething issues with telemedicine. Knowledge regarding the issues faced may help smoothen this effort for providing online consultations to patients. Hence, this study was conducted to assess the knowledge and practices related to telemedicine among healthcare professionals and to explore the challenges faced while delivering telemedicine services at a tertiary care hospital in central Gujarat

II. MATERIAL AND METHODS

A descriptive cross-sectional study using a mixed-methods approach was conducted over a period of three months (August 2024 to October 2024) at a tertiary care teaching hospital in central Gujarat, Western India, after obtaining approval from the Institutional Ethics Committee for Human Research–PG Research (No. IECBHR/61-2024). The study included healthcare professionals of various cadres Heads of Departments, Professors, Associate Professors, Assistant Professors, Tutors, and Senior Residents—who were involved in teleconsultation services and actively using the e Sanjeevani portal in the Departments of General Medicine, Dermatology, Obstetrics and Gynaecology, Paediatrics, Ophthalmology, Dentistry, Otorhinolaryngology, General Surgery, and Respiratory Medicine at Sir Sayajirao General Hospital, Vadodara. For the quantitative component, all eligible healthcare professionals enrolled on the e Sanjeevani platform were invited to participate, and those who provided informed consent and completed a pre-tested, semi-structured questionnaire administered through Google Forms or printed copies were included in the analysis (N = 56), the questionnaire assessed sociodemographic characteristics, knowledge, and practices related to telemedicine. For the qualitative component, in-depth interviews were conducted with nodal officers of the respective departments using a predesigned semi-structured interview guide to explore their knowledge, perceived benefits, and challenges of telemedicine, with interviews lasting 30–40 minutes and continued until thematic saturation was achieved, resulting in seven interviews; interviews were audio-recorded after consent and supplemented with field notes. Quantitative data were analysed using Microsoft Excel 365 and expressed as frequencies and percentages, while qualitative data were transcribed verbatim, transliterated and back-translated to ensure preservation of meaning, and analysed manually using content analysis to derive codes, categories, and themes, with representative verbatim quotations used to support the findings.

III. RESULTS

A total of fifty-six medical professionals gave written consent, and they responded by completing all the questionnaires. The sociodemographic characteristics of healthcare professionals are the respondents, 31 (55.36%) were men and 25 (44.64%) were women. The participants' average age was 35.34±9.24 SD years, and most of the responders were within the 25-35 years age range and 24 (42.86%) participants designated as a senior resident.

Table 1: Socio-Demographic Characteristics of Healthcare Professionals(N=56)

Variables	Categories	N (%)
Gender	Male	31(55.36%)
	Female	25 (44.64%)
Age	25-35 years	28 (50.00%)
	36-45 years	19 (33.93%)
	>45 years	09 (16.07%)
Designation	Professor and head of the department	03 (5.36%)
	Professor	01(1.79%)
	Associate professor	10(17.86%)
	Assistant professor	12(21.43%)
	Tutor	06(10.71%)
	Senior resident	24(42.86%)

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26feb903

Table 1 shows the All the study participants were aware about the concept of telemedicine. However, only eight (14.29%) participants were aware of all the services provided by telemedicine. Half of them 28(50.00%) knew about the beneficiaries (patients, carers, and healthcare workers) of teleconsultation services. Only 21% of professionals were aware that it can be useful for research and evaluation of services. The majority of participants 47(83.92 %) are aware of all the teleconsultation service options, including text, video, and audio while 41(73.21%) were knowledgeable about medication prescriptions and their corresponding modes.

Table 2: Knowledge of Telemedicine Among Healthcare Professionals(N=56)

Variables	Response	N (%)
Definition of telemedicine	Correct answer	56 (100%)
Services of telemedicine	All of them are correct	08 (14.29%)
	Two of them	12 (21.42%)
	One of them	36 (64.28%)
Beneficiaries	All of them are correct	28 (50.00%)
	Two of them	12 (21.42%)
	One of them	16 (28.57%)
Modes of teleconsultation	All of them are correct	47 (83.92%)
	Two of them	04 (7.14%)
	One of them	05 (8.92%)
Prescription criteria	Correct prescription criteria	41 (73.21%)

On asking about the ease of using telemedicine Table 2, half of them participants 28(50.00%) replied in the affirmative. Approximately eighteen (32.14%) of the participants had joined telemedicine in the past six months. However, 24(42%) of the participants utilised teleconsultation in previous months. Almost half of the participants utilised different teleconsultation modes, although 34 (or 60.71%) of them most recently used text mode. Merely 19 out of 33.93% participants provide full services, including diagnosis, treatment, and counselling, through teleconsultation. When it came to emergency treatment, 48(85.71%) participants were not prepared to provide it via telemedicine; of those who were, the majority provided referrals service during emergency care required.32 (57.14%) participants provide beneficiaries with follow-up services

Table 3: Practice of Telemedicine Among Healthcare Professionals(N=56)

Variables	Categories	N (%)	CI
Total duration of registered in telemedicine	0-6 months	18 (32.14%)	20.28 to 45.96
	7-12 months	20 (35.71%)	23.35 to 49.64
	>12 months	14 (25.00%)	14.39 to 38.37
Mode of teleconsultation used	Audio	14 (25.00%)	14.39 to 38.37
	Video	08 (14.29%)	6.38 to 26.23
	Text	34 (60.71%)	46.75 to 73.50
Documentation of consultation	Telemedicine interaction logs or records	27 (48.21%)	34.65 to 61.96
	Patient records and reports	18 (32.14%)	20.28 to 45.96
	Prescription records	11 (19.64%)	10.23 to 32.43

- *Qualitative Findings*

Seven in-depth interviews with nodal officers were carried out so as to find out more about their duties and responsibilities, the advantages that telemedicine services offer to patients and doctors, and the challenges they encounter while conducting teleconsultations. From the perspective of the nodal officer show that the telemedicine is a system, utilizes distance in healthcare, aiding those lacking specialist care access, especially in remote areas. With information technology, it links patients to treatments, breaking geographical barriers, ensuring healthcare equity through technology transformation.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26feb903

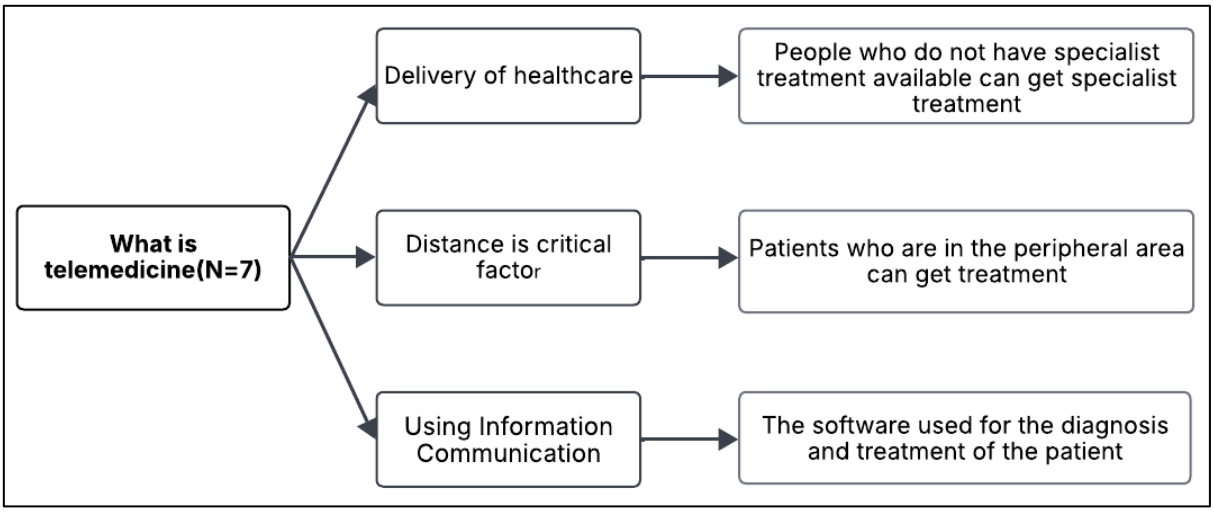

Fig 1: Concept of Telemedicine

The role of a Nodal Officer is crucial. Their responsibility to arranging the turn of telemedicine equal distribution among all staff members in the department. In addition to They are responsible for coordinating and communicating with the state officer, the commissioner of health, and the medical college. Furthermore, the Nodal Officer plays a key role in problem-solving. If a doctor encounters a problem, the Nodal Officer conveys this issue to the state and takes necessary steps to resolve it. Lastly, they are open to feedback and suggestions. If there are any problems or suggestions, the Nodal Officer coordinates with the department to address them.

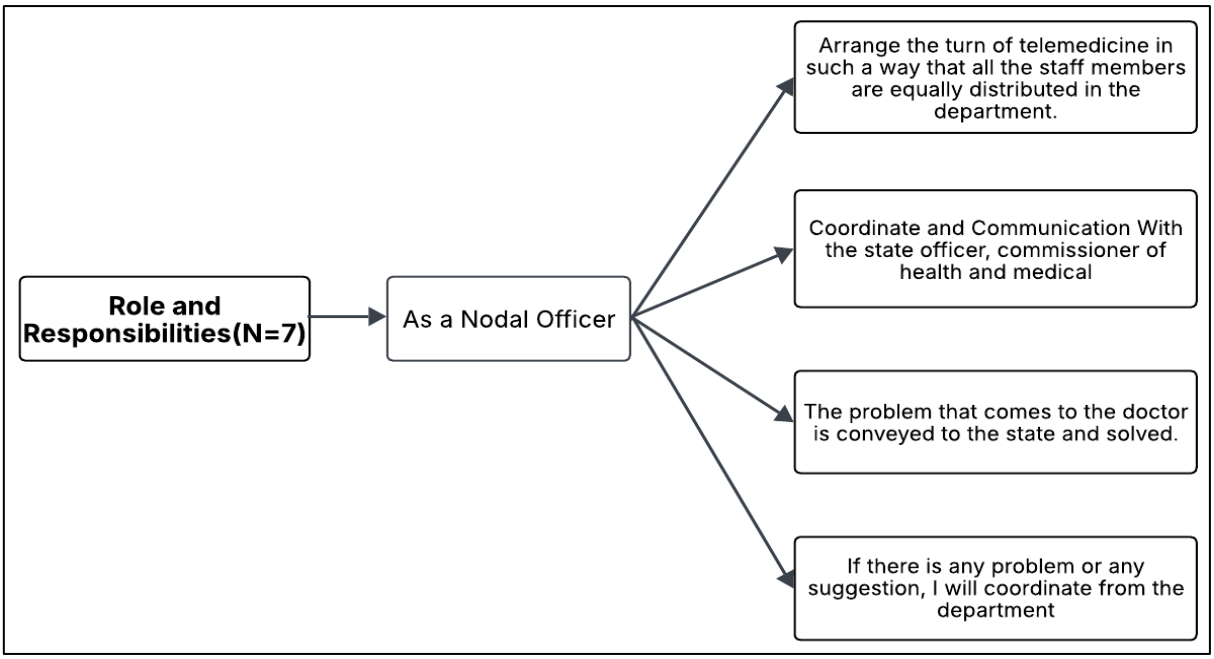

Fig 2: Role and Responsibilities of Nodal Officer

Telemedicine provides several benefits to both patients and physicians. For patients, it improves treatment accessibility, saves time and money on transportation, lowers infection risks, particularly during pandemics like as Covid-19, and allows for tertiary care for individuals who cannot be treated at primary or community health centres. For doctors, it minimises the need for health camps, makes it easier to serve patients in remote places, and allows them to treat several patients from the same spot. These advantages make telemedicine an important tool in modern healthcare

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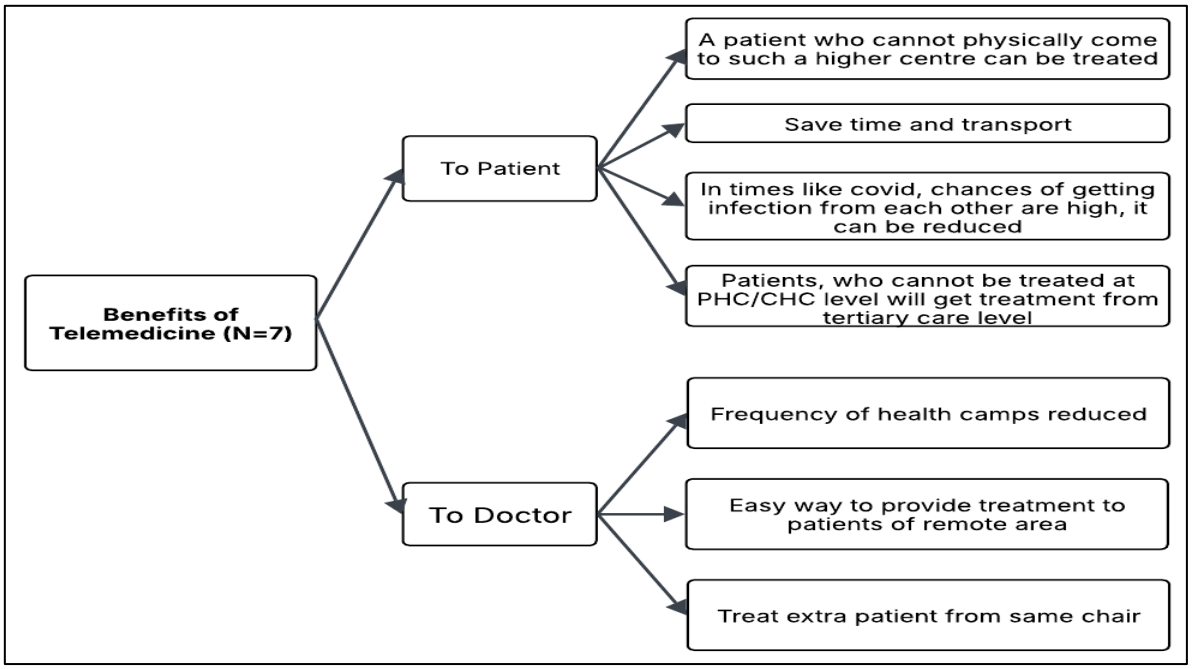

Fig 3: Benefits of Telemedicine

Teleconsultation, while beneficial, also presents several challenges for healthcare professionals. Software issues include calls coming from other than Baroda region, slow responses from patients, repeated calls, and reduced calls due to software updates. Internet-related problems involve difficulties in mobile login and connectivity issues. Other general concerns include time wastage due to missed calls, lack of knowledge and awareness among patients and healthcare workers, irrelevant calls, and instances of patients reporting fake symptoms or making dummy calls.

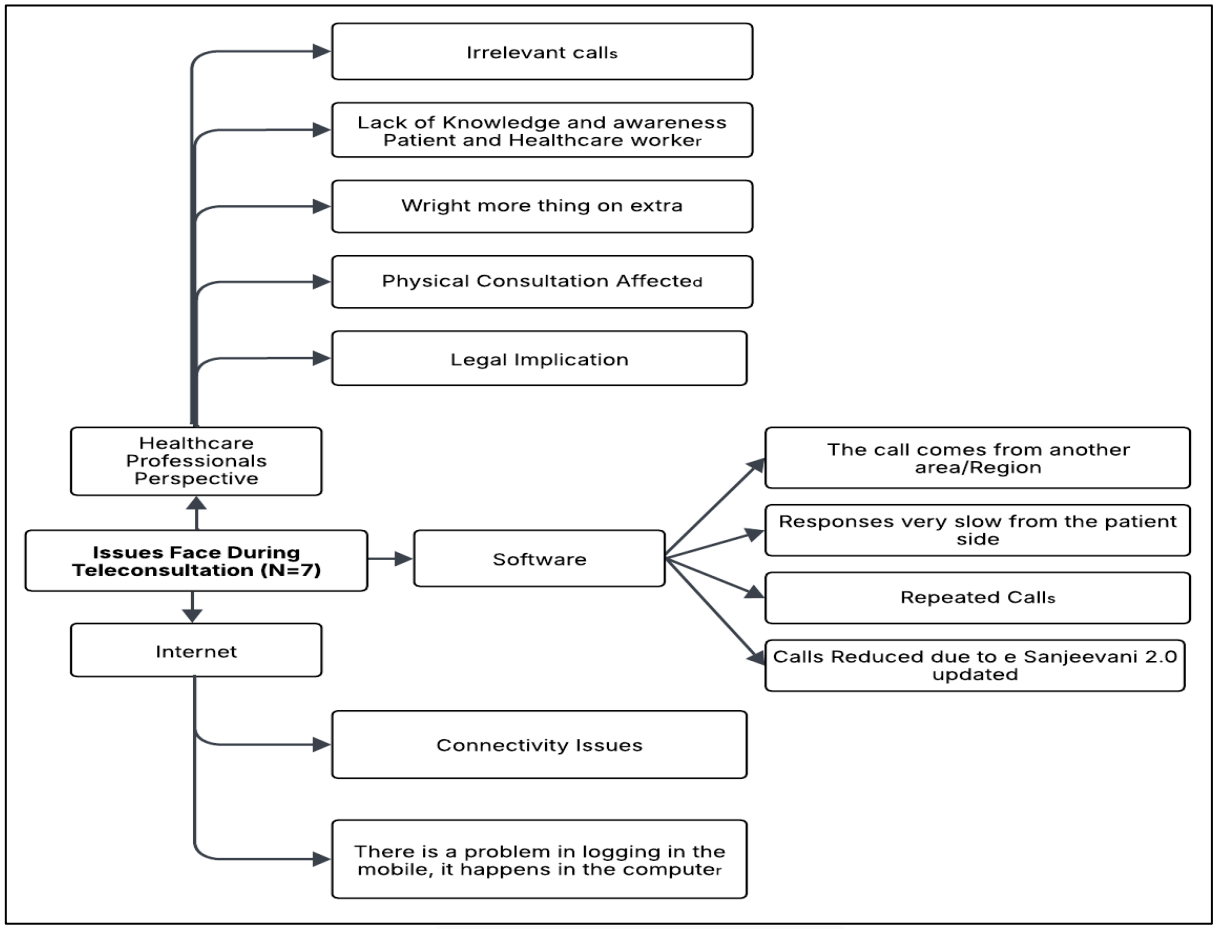

Fig 4: Issues Faced During Teleconsultation

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26feb903

IV. DISCUSSION

The present mixed-methods study assessed the knowledge, practices, and challenges related to telemedicine among healthcare professionals at a tertiary care teaching hospital in central Gujarat. Universal awareness of telemedicine observed among participants reflects the rapid expansion of digital health services following national initiatives and the COVID-19 pandemic. Similar findings of high awareness have been reported among healthcare professionals in India and other low- and middle-income countries after the pandemic [2] [3] [11]

Despite high awareness, comprehensive knowledge regarding the full scope of telemedicine services was limited, with only a minority of participants demonstrating complete understanding of available services and beneficiaries. Comparable gaps between awareness and detailed knowledge have been reported in studies from Karachi, Ethiopia, and other low-resource settings, where telemedicine is often perceived primarily as a tool for basic consultation rather than a comprehensive health system intervention [9] [12]

Most participants were aware of various teleconsultation modalities; however, text-based consultations were most frequently used. This contrasts with global recommendations that Favor video-based consultations for better clinical assessment and communication[2].The preference for text or audio consultations has been widely reported and is attributed to internet connectivity issues, platform usability, time constraints, and infrastructural limitations, particularly in resource-constrained settings[13] [14].

Although telemedicine utilization was reported by many participants, only one-third provided comprehensive services including diagnosis, treatment, and counselling. Emergency management through telemedicine was minimal, with most healthcare professionals preferring referral-based care. This cautious approach aligns with Indian Telemedicine Practice Guidelines and is supported by international evidence highlighting clinical, ethical, and medico-legal limitations of emergency telecare [15] [16].

Qualitative findings emphasized the crucial role of nodal officers in coordinating telemedicine services, managing workflows, and liaising with administrative authorities. However, multiple operational challenges such as software issues, connectivity problems, inappropriate or dummy calls, and limited patient awareness were identified. Similar barriers have been consistently documented in systematic reviews and implementation studies across low-resource and developing country contexts [13] [14] [17].

Overall, the findings indicate that while awareness of telemedicine is satisfactory, optimal utilization remains constrained by gaps in knowledge, limited confidence in clinical decision-making, infrastructural barriers, and system-level challenges. Evidence from implementation science suggests that structured training, clear standard operating procedures, improved digital infrastructure, and continuous administrative support are essential to bridge the gap between awareness and effective practice [8] [12].

V. CONCLUSIONS

This mixed-methods study, one of the first from central Gujarat, demonstrates that although telemedicine through the e Sanjeevani platform is well recognized among healthcare professionals at a tertiary care hospital, its optimal utilization remains limited. While most participants were familiar with teleconsultation modes, only a minority delivered comprehensive services, reflecting gaps in practical application rather than awareness alone. Qualitative insights from nodal officers highlighted the critical role of coordination in telemedicine delivery and revealed operational challenges such as software issues, connectivity problems, and inappropriate calls, which affected service efficiency. Despite these constraints, telemedicine was perceived as a valuable tool for extending tertiary care to peripheral populations and reducing patient burden. Strengthening training, technical systems, and administrative support can further enhance the effectiveness and scalability of telemedicine services in similar tertiary care settings.

ACKNOWLEDGEMENT

Authors sincerely thank all healthcare professionals and departmental nodal officers who participated in the study for their valuable time and cooperation. We also express our gratitude to the hospital administration for permitting and supporting the conduct of this research.

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