

# Tele Health Transformation: A Review of Telemedicine Services in India

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## Abstract

Telemedicine is transforming healthcare delivery by enabling clinical services across distances through digital communication technologies. It enhances access to medical expertise, improves efficiency, and reduces costs related to travel and hospital visits. In India, unequal distribution of doctors, inadequate rural infrastructure, and financial barriers limit healthcare access, particularly for vulnerable populations. Telemedicine addresses these gaps by connecting patients in remote areas with qualified practitioners, supporting timely consultation, follow-up, and chronic disease monitoring. It strengthens continuity of care through digital records and reduces exposure to infectious diseases. By integrating technology into primary and community-level services, telemedicine promotes equitable, accessible, and coordinated healthcare delivery. This review is showing telemedicine progress and present status in India.

**Keywords:** Telemedicine, Digital, Health, Nurses

## 1. Introduction

The term “telemedicine” means “healing at a distance.” It broadly refers not only to remote clinical care but also to related activities such as medical education, research, disease surveillance, and the promotion of public health.<sup>1</sup> The American Telemedicine Association describes telemedicine as a natural progression of healthcare within an increasingly digital environment. By including communication technologies in clinical practice, telemedicine improves access to medical expertise while enhancing the efficiency and quality of care.<sup>2</sup> It also contributes to cost savings for both healthcare systems and patients by reducing travel, hospital visits, and related expenses. In addition, telemedicine supports clinical evaluation and follow-up through organized digital documentation and remote data exchange.

The increasing use of communication platforms and digital information systems has transformed the way medical information is collected, transmitted, and reviewed in teleconsultations. These advancements enable healthcare professionals to make timely and evidence-based decisions, ensure continuity of care, and provide coordinated services across different levels of the healthcare system. Through structured virtual interactions and secure data sharing, telemedicine strengthens clinical management while maintaining patient safety and accessibility.<sup>3</sup>

The roots of India’s telemedicine journey can be traced back to the Satellite Instructional Television Experiment conducted between 1976 and 1978. During this period, satellite-based communication technology was used to connect more than 2,000 villages, primarily for educational programs related to adult literacy, rural development, health, and hygiene.<sup>4</sup>

India, home to over a billion people, faces persistent challenges in ensuring fair access to healthcare, especially as most doctors and advanced facilities are concentrated in urban areas while a large share of the population resides in villages. To reduce this gap, the Indian Space Research Organisation launched an early telemedicine initiative in 2001, connecting Apollo Hospital, Chennai, with a rural hospital in Andhra Pradesh. Since then, multiple ministries and state governments have strengthened digital health networks, surveillance systems, and tele-education platforms. Public-private partnerships and national guidelines have further expanded services, linking remote islands and hilly regions with major specialty centers across the country.<sup>5</sup>

Mobile telemedicine units were also introduced to serve remote and difficult-to-reach areas. These services covered multiple specialties such as diabetology, ophthalmology, oncology, community medicine, and other clinical disciplines. The network facilitated hundreds of thousands of teleconsultations and played a supportive role during national emergencies, including natural disasters such as the 2004 tsunami and the floods in Bihar in 2008.<sup>6</sup>

## 2. Methodology

This study was designed as a narrative review of literature titled “Tele Health Transformation: A Review of Telemedicine Services in India.” The objective was to synthesize existing evidence on the development, implementation, impact, regulatory framework, and challenges of telemedicine services in India.

### 2.1 Search Strategy

A comprehensive literature search was conducted for studies published between January 2015 and January 2026. Electronic databases including PubMed, Medline, Scopus, and Google Scholar were systematically searched. In addition, grey literature was retrieved from official government websites, policy documents, and institutional reports.

The following keywords were used: “telemedicine AND India,” “telehealth services,” “digital health transformation,” “e-health,” “m-health,” “teleconsultation,” “Telemedicine Practice Guidelines 2020,” “rural healthcare access,” and “COVID-19 AND telemedicine.”

### 2.2 Study Selection Process

The review process followed a structured screening approach consistent with PRISMA guidelines.

- In the initial identification phase, relevant records were retrieved from databases and other sources.
- Duplicates were removed.
- Titles and abstracts were screened for relevance to telemedicine services in India.
- Full-text articles were assessed for eligibility based on predefined inclusion and exclusion criteria.
- Final studies meeting the criteria were included for qualitative synthesis.

### 2.3 Inclusion Criteria

- Studies focusing on telemedicine or telehealth services in India.
- Articles published in English between 2015 and 2026.
- Original research articles, systematic reviews, scoping reviews, and policy analyses.
- Government guidelines and official reports related to telemedicine implementation in India.

### 2.4 Exclusion Criteria

- Studies without clear methodology or defined data sources.
- Non-peer-reviewed or non-credible publications.
- Articles not specifically addressing telemedicine in the Indian healthcare context.
- Pure opinion pieces without empirical or policy relevance.

## 2.5 Data Extraction and Synthesis

Relevant data were extracted regarding study objectives, design, geographic focus, type of telemedicine intervention, reported outcomes, implementation challenges, and policy implications. The findings were synthesized thematically to identify patterns related to service expansion, accessibility, technological barriers, regulatory issues, and future opportunities in telehealth transformation.

## 2.6 Ethical Considerations

As this review utilized only previously published data and publicly available documents, no human participants were involved. Therefore, ethical approval was not required. All sources have been appropriately cited to ensure transparency and academic integrity.

### 1. Need of telemedicine in India

One of the persistent challenges facing India's healthcare system is the unequal distribution of doctors across the country. In India, the current doctor-to-population ratio is only 0.62:1,000, which should be 1:1,000 as per the World Health Organization (WHO). Although a good number of medical graduates pass every year, a significant proportion of them practice in urban and semi-urban regions, leaving rural and underserved areas with limited access to qualified physicians.<sup>7</sup> As a result, the doctor-patient population ratio remains below the level recommended by global health standards. This imbalance creates serious gaps in service delivery, particularly for vulnerable communities.

India's rapidly growing population has placed additional pressure on already exhausted healthcare infrastructure. The availability of hospital beds, trained professionals, and essential medical services has not expanded at the same pace as population growth.<sup>8</sup> India follows a three-tier healthcare system consisting of primary, secondary, and tertiary levels. The system often struggles to meet the needs of people living in remote and difficult regions. A large share of the population resides in rural areas, yet only a small proportion of doctors serve these communities, and many of them work in the private sector.<sup>9</sup> Around 69% of India's population resides in hilly areas, yet only nearly 26% of the country's doctors practice there, predominantly in the private sector. Jamil N, Vysak AS, Parihar A.<sup>10</sup> The Government of India is actively working to provide equitable and high-quality healthcare services to every citizen. Over the years, the country has achieved notable improvements in major health outcomes. Life expectancy has increased substantially, and access to essential services related to maternal, new born, and child health has expanded.<sup>11</sup> Moreover, many primary health centres lack staff and equipment, forcing patients to travel to tertiary health centres at cities for treatment, leading to financial strain, wage loss, and logistical challenges. Difficult terrain and limited transport facilities make access to healthcare services particularly challenging for residents.<sup>12</sup>

### 2. Telemedicine services in India

Telemedicine services in India currently operate under two primary models. Some states implement government-funded programs, while others follow a public-private partnership approach. In certain regions, both models function simultaneously. Most networks are structured using a hub-and-spoke framework. In this system, tertiary care institutions such as medical college hospitals act as hubs, providing specialist consultation and guidance. Peripheral facilities, including sub-centres, primary health centres, community health centres, and district hospitals, function as spokes. Depending on how clinical information is exchanged, telemedicine services may operate through real-time interactions or through store-and-forward methods.<sup>13</sup>

### 3. Telemedicine and its Horizon

Telemedicine offers multiple advantages for patients and healthcare systems alike.<sup>14</sup> One of its most sig-

nificant benefits is timely access to medical consultation and intervention, including services that may not be locally available. For rural populations, it eliminates the need for long-distance travel to urban hospitals, thereby reducing transportation costs, wage loss, and physical strain.<sup>15</sup> This also lessens the burden on family members who often accompany patients to distant facilities.

Digital consultations create documented records of medical advice and prescriptions, which can improve continuity of care and provide a measure of legal clarity for both patients and providers. Additionally, by reducing unnecessary hospital visits, telemedicine lowers the risk of exposure to infectious diseases, an important consideration in the context of communicable illnesses. <sup>16</sup>

Modern telemedicine platforms also support remote monitoring of health parameters such as blood pressure and blood glucose levels. This is particularly valuable for individuals with chronic conditions, as it facilitates regular follow-up, early identification of complications, and better adherence to prescribed treatment plans.

Not all medical concerns require physical examination. Routine follow-ups, medication adjustments, health education, and monitoring of stable chronic conditions can often be managed effectively through virtual consultations. By diverting such cases from overcrowded hospitals, telemedicine helps optimize healthcare resources and reduce patient load at higher-level facilities.

During emergencies, natural disasters, and pandemics, telemedicine becomes even more crucial. When mobility is restricted or healthcare facilities are overwhelmed, digital platforms allow patients to access medical guidance without unnecessary exposure to risk. In such situations, telemedicine ensures continuity of care while protecting both healthcare workers and the community.

Health care professionals may use an appropriate technological platform for delivering teleconsultation, provided it is suitable for clinical interaction. These tools may include video conferencing systems, devices connected through local or wide area networks, internet-based services, landline or mobile phones for audio consultations, and text-based communication platforms. Messaging applications, dedicated mobile health applications, and other digital platforms, such as email or similar communication tools, can also be utilized, depending on the clinical need and patient convenience.

## **4. Classification of Telemedicine Applications**

### **4.1 According to the Mode of Communication**

Telemedicine services may be grouped based on the type of communication technology used during the consultation. One common method is video-based interaction, where patients and healthcare providers communicate through video conferencing applications or similar digital platforms. Another method involves text-based communication, which may occur through dedicated telehealth applications and web portals or through widely used messaging services such as text messages and email. In addition, audio consultations conducted via telephone calls or app-based voice systems are also an important mode of telemedicine delivery.<sup>6</sup>

### **4.2 According to the Timing of Information Exchange**

Telemedicine can further be categorized depending on whether the communication occurs simultaneously or with a time gap. In synchronous consultations, the patient and the healthcare provider engage in live interaction through video, audio, or instant messaging. This allows real-time discussion for clinical assessment, prescribing treatment, providing counselling, and delivering health education. On the other hand, asynchronous communication involves sharing medical details for later review. <sup>17</sup> In such cases,

information such as patient history, clinical images, laboratory findings, or diagnostic reports is transmitted to the healthcare provider, who evaluates the material and responds at a later time.

#### **4.3 According to the Purpose of the Consultation**

Telemedicine consultations may also differ based on their intent. An initial consultation takes place when a patient seeks medical advice from a practitioner for the first time regarding diagnosis, treatment options, or counselling. A follow-up consultation refers to subsequent interactions with the same practitioner to monitor progress, adjust medications, or complete the course of therapy.

#### **4.4 According to the Participants Involved**

Telemedicine interactions can involve various combinations of individuals. These may include direct communication between a patient and a registered medical practitioner, consultations initiated by a caregiver representing the patient, professional exchanges between two healthcare practitioners for expert opinion, or interactions in which a community health worker connects with a practitioner for clinical guidance.

### **5. Discussion**

Recognizing the growing importance of digital health, the Ministry of Health and Family Welfare constituted a National Telemedicine Taskforce in 2005. This initiative supported several e-health projects and laid the groundwork for strengthening digital health infrastructure. Subsequently, a National Telemedicine Portal was developed to promote coordinated e-health activities across the country. One of its major objectives was to establish a National Medical College Network, aimed at interlinking medical colleges to facilitate tele-education and tele-health services, particularly benefiting rural regions.<sup>18</sup>

Several studies have evaluated the effectiveness and utilization of telemedicine in different parts of India. One study focusing on pediatric patients analyzed teleconsultations conducted at a tertiary care centre in North India over a three-year period. Children with a wide range of medical conditions including respiratory, gastrointestinal, neurological, infectious, cardiac, renal, oncological, dermatological, and neonatal disorders were managed through teleconsultation software platforms.<sup>19</sup>

Venkatesh et al. (2022) analyzed the implementation impact of India's Telemedicine Practice Guidelines in *World Medical & Health Policy*. Their work explained how formal regulatory endorsement during the COVID-19 crisis institutionalized remote medical consultations. The paper demonstrated that clearly defined operational standards strengthened provider trust, broadened service penetration in underserved regions, and reduced avoidable in-person visits. The authors positioned regulatory reform as a catalyst for organized and scalable telehealth expansion nationwide.<sup>1</sup>

Chellaiyan et al., 2019 in *Journal of Family Medicine and Primary Care*, Chellaiyan et al. (2019) evaluated structural preparedness for telemedicine in India before the pandemic surge. The study identified infrastructural inconsistencies, policy ambiguity, and digital skill limitations as critical constraints. Despite these challenges, the authors underscored telemedicine's promise in narrowing geographic inequities. They emphasized that long-term viability would depend on institutional investment, professional training, and stronger governance architecture.<sup>18</sup>

Monaghesh and Hajizadeh (2020), publishing in *BMC Public Health*, systematically synthesized global evidence on telehealth use amid COVID-19 disruptions. Their review illustrated how virtual platforms safeguarded continuity of essential services while lowering exposure risk. The findings particularly highlighted benefits in chronic illness follow-up and psychological care delivery. The authors advocated

embedding telehealth within routine systems to enhance resilience during future public health emergencies.<sup>16</sup>

Ummer et al. (2025), in the Journal of Medical Internet Research, depicted the trajectory of telemedicine programs in India from 2000 onward. Their scoping review traced evolution from space-supported pilot models to integrated digital ecosystems. The study reported improved subspecialty reach in remote areas and rising user acceptability. However, it stressed that interoperability, fiscal sustainability, and structured monitoring remain decisive for long-term system integration.<sup>13</sup>

Balarajan et al. (2011), in *The Lancet*, examined inequities embedded within India's health system. Although technology was not their sole focus, they detailed stark workforce imbalances and service accessibility gaps. The authors suggested that innovative delivery mechanisms, including digitally mediated care, are necessary to counter structural disparities. Their analysis offers a conceptual foundation for viewing telehealth as a strategy to advance distributive justice in healthcare. A proportion of patients sought advice regarding wound care and concerns related to postponed elective surgeries during the pandemic period. While patient satisfaction was generally high among respondents, traditional outpatient visits still exceeded telemedicine usage during that time.<sup>11</sup>

In 2020, another evaluation was carried out at a government medical college functioning as a hub within a hub-and-spoke telemedicine network. Online outpatient consultations were delivered through a nationally developed digital platform. Analysis of consultation records revealed balanced participation from rural and urban populations, with a slight predominance of male users. Musculoskeletal, dermatological, and gastrointestinal complaints were among the most frequently reported conditions. <sup>20</sup> The study highlighted the practical utility of teleconsultation services in routine outpatient care.

Telemedicine can be understood as the delivery of healthcare services when patients and healthcare providers are not physically present in the same location. By using digital communication technologies, medical advice, diagnosis, treatment planning, and follow-up care can be provided remotely. This approach supports healthcare systems by reducing unnecessary physical visits to primary care facilities while still maintaining access to qualified professionals. It was conceptualized as a means to bridge geographical gaps, particularly for populations living in remote or underserved regions, with the broader aim of improving overall health outcomes.<sup>3</sup>

Prior to the COVID-19 pandemic, telemedicine was gradually evolving but had not yet become mainstream. The sudden global health crisis created an urgent need for safe and alternative methods of healthcare delivery. Movement restrictions, infection risks, and overwhelmed hospitals accelerated the adoption of virtual consultations. Earlier hesitation among both patients and healthcare providers due to concerns about privacy, ethical standards, data security, technological limitations, and cost began to decline as digital systems improved.<sup>21</sup>

The introduction of formal telemedicine practice guidelines, stronger digital infrastructure, faster internet connectivity, secure data storage systems, standardized methods of information exchange, and encrypted communication channels enhanced trust in virtual care. The growing use of electronic medical records further streamlined documentation and continuity of care. Advances in digital imaging, communication devices, and information systems have also made remote consultations more practical and efficient. In today's environment, technological innovations are integrated into daily life much faster than in the past, contributing to the rapid expansion of telemedicine services.

Understanding how telemedicine is perceived and utilized by different population groups is crucial. Examining the relationship between socio-demographic factors and the acceptance of virtual healthcare can help identify existing gaps and guide improvements in service delivery.

## 6. Recommendations

Although digital health services have expanded considerably, several challenges remain that require attention. Further research is necessary to better understand how telemedicine usage varies across different socio-demographic groups. Such evidence can inform targeted strategies to ensure equitable access. Increasing public awareness through educational campaigns and outreach initiatives can also promote greater acceptance and utilization of telemedicine services.

Strengthening the quality and reliability of digital platforms particularly those operated by government institutions is essential to ensure timely, accessible, and user-friendly services. Training programs for healthcare providers and patients are equally important to build digital confidence and competence. A coordinated and well-balanced integration of virtual services into the existing healthcare framework is necessary to ensure that care is delivered effectively without disrupting established systems.

In a diverse and populous country like India, digital innovation in primary care must prioritize quality, equity, and patient rights. Virtual primary care services should be expanded responsibly, maintaining strong ethical standards and clinical accountability. Ongoing policy discussions and research are required to ensure sustainable integration of these services within the broader healthcare system.

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