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## A descriptive study of public-private telemedicine and telepharmacy initiatives for rural health access in India

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### Abstract

Telemedicine and telepharmacy are revolutionizing healthcare access in India, particularly for the 65% of its 1.4 billion citizens living in rural areas with limited access to medical infrastructure. This descriptive study examines the structure, impact and challenges of six public and private initiatives, eSanjeevani, Ayushman Bharat Digital Mission (ABDM), Tata 1mg, PharmEasy, Apollo TeleHealth and Smile Foundation's e-Arogya, from 2020 to 2025, using a mixed-methods approach. Data was sourced from official government dashboards, corporate reports and NGO field updates and analysed thematically using a framework centered on accessibility, affordability, infrastructure and digital inclusion. Quantitative and qualitative analyses revealed that eSanjeevani delivered over 324 million consultations by July 2025, 85% of which served rural users via 154,576 AB-HWCs. ABDM enabled 720 million digital health IDs, with 62% linked to rural populations and streamlined health record interoperability. Private players such as Tata 1mg and PharmEasy serviced 32% rural users, while Apollo TeleHealth established 520 centres and e-Arogya conducted 1.4 million free consultations in remote regions. Outcome metrics showed an average rural patient savings of INR 2,000-3,500 per avoided hospital visit, INR 1,600 crore in annual systemic savings and a 35% improvement in chronic care adherence. However, significant challenges persist, including 58% digital illiteracy, 38% lack of reliable 4G coverage and 32% compliance burden due to regulatory fragmentation in teleprescriptions and data protection. The findings highlight the transformative potential of digital health when supported by inclusive infrastructure, standardized governance and public-private partnerships. To fully realize India's Universal Health Coverage (UHC) and SDG-3 objectives by 2030, the study recommends expansion of rural broadband (via BharatNet), targeted digital literacy drives and creation of interoperable, transparent telehealth ecosystems.

**Keywords:** Telemedicine, Telepharmacy, Rural Health, eSanjeevani, Ayushman Bharat Digital Mission, Tata 1mg, PharmEasy, Apollo TeleHealth, e-Arogya, Digital Health, Healthcare Access, Public-Private Partnerships

### Introduction

India's healthcare system faces profound disparities, especially in rural areas where 65% of the population resides but access to medical and pharmaceutical services remains severely limited<sup>[1]</sup>. The physician-to-population ratio is 0.7 per 1,000, with a heavy urban skew and only 11% of the 157,000 sub-centres meet the Indian Public Health Standards (IPHS)<sup>[2, 3]</sup>. The broader doctor-to-patient ratio stands at 1:1445, falling short of the WHO-recommended 1:1000, with rural regions experiencing a significant shortage of specialists.<sup>[4]</sup> According to the "State of Healthcare in Rural India, 2024" by Transform Rural India, only 50% of rural households have government health insurance, while 34% lack any form of coverage. Furthermore, 61% of rural households lack access to diagnostic facilities within a commutable distance and often travel up to 100 kilometres to access even basic healthcare services<sup>[5]</sup>.

Non-communicable diseases (NCDs) are a growing concern, accounting for 6.3 million deaths annually, approximately 63% of all mortality in India.<sup>[6]</sup> Factors such as delayed diagnosis, poor follow-up, poverty (7.2% of rural households live below the poverty line) and low health literacy (only 34% of rural adults understand basic health information) exacerbate health inequities<sup>[7]</sup>.

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The Rural Health Statistics 2021-22 report from the Ministry of Health and Family Welfare highlights a 61% shortfall in specialist doctors at Community Health Centres (CHCs), while public health spending, projected at 1.9% of GDP by FY26, still falls short of the National Health Policy 2017 target of 2.5%<sup>[8]</sup>.

Telemedicine and telepharmacy have emerged as transformative tools in addressing these systemic gaps. They utilize digital platforms to deliver remote consultations, diagnostic support, prescription management and last-mile medicine delivery<sup>[9]</sup>. Telemedicine enables remote consultations, reducing the need for physical travel, while telepharmacy facilitates digital access to medicines. By mid-2025, India had over 1.25 billion mobile connections and 756 million internet users (54% penetration), supported by some of the world's lowest data costs (\$0.13/GB)<sup>[10]</sup>. The COVID-19 pandemic acted as a catalyst, reducing in-person visits by 32% and increasing teleconsultations by over 300%, particularly for chronic disease management<sup>[11]</sup>. Nearly 40% of remote consultations addressed diabetes and hypertension, highlighting the potential for managing NCDs via digital health platforms<sup>[12]</sup>.

The Indian government has introduced landmark policies and frameworks, including the Telemedicine Practice Guidelines (2020), the National Digital Health Mission (later Ayushman Bharat Digital Mission) and data privacy frameworks like the Digital Personal Data Protection Act, 2023. These have enabled interoperability, standardization and patient-centric digital health delivery.<sup>[13]</sup> At the same time, private firms such as Tata 1mg, Netmeds, PharmEasy and Apollo 24/7 have pioneered AI-driven diagnostic tools, digital prescriptions and medicine delivery networks.<sup>[14-17]</sup> NGO efforts like Smile Foundation's e-Arogya and Swasth Alliance's telecare hubs represent successful community-integrated models<sup>[18, 19]</sup>.

However, major barriers to scale-up remain. These include inconsistent internet connectivity (38% of rural areas still lack reliable 4G access), low levels of digital literacy (58% of rural adults struggle with smartphone use) and non-uniform implementation of e-prescription and data privacy norms<sup>[20-23]</sup>. Financial sustainability, integration across healthcare levels and quality assurance of remote care services also need targeted interventions<sup>[24]</sup>.

This study explores the evolution and impact of India's telemedicine and telepharmacy ecosystem, emphasizing public-private collaboration and rural outreach. It aims to provide a comprehensive analysis of how these digital health initiatives are transforming healthcare access, affordability and outcomes for India's rural population. The objectives include: (i) reviewing the key government, private and NGO-led initiatives; (ii) identifying infrastructure, regulatory and literacy-related challenges to implementation and scalability; and (iii) proposing actionable strategies to enhance rural health equity through digital healthcare delivery.

## Methodology

This descriptive study adopts a mixed-methods approach to evaluate the evolution, implementation and impact of public-private telemedicine and telepharmacy initiatives in India between 2020 and 2025, with a specific focus on rural healthcare access, affordability and chronic disease management. The research integrates quantitative data analysis with qualitative thematic synthesis to provide a

comprehensive and multidimensional understanding of India's digital health transformation.

Quantitative data were collected from a combination of government reports, institutional databases and industry white papers, including the *National Health Policy 2017*, *Rural Health Statistics 2021-22*, *ABDM Dashboards* and the *Telemedicine Practice Guidelines 2020*. These sources provided metrics on healthcare access, consultation volumes, digital ID registrations, health facility mapping and demographic reach across rural India. Operational data from digital platforms, eSanjeevani, ABDM, Tata 1mg, PharmEasy, Apollo TeleHealth and Smile Foundation's e-Arogya, were obtained through publicly available sources, investor reports, media releases and platform-specific dashboards. Data points such as rural consultation share, medicine delivery coverage, patient savings and treatment adherence were triangulated across at least two independent sources to ensure validity.

In addition to secondary numerical data, qualitative insights were extracted from peer-reviewed academic literature, policy reviews, case studies and published stakeholder interviews from reputed sources such as *The Lancet Digital Health*, *Johns Hopkins University's Center for Global Health* and the *World Economic Forum*. Particular emphasis was placed on region-specific analyses, especially from underserved states including Bihar, Jharkhand, Odisha and tribal districts in Chhattisgarh and Madhya Pradesh. Reports addressing gender-based digital access disparities, tribal health equity, AI-enabled diagnostics and public-private implementation challenges were prioritized to uncover structural barriers and population-level differentials in telehealth adoption.

Search terms and Boolean strings were developed collaboratively by the authors, based on keywords relevant to the study's objectives. The search strategy combined terms such as: "Telemedicine" [Title/Abstract] and "Telepharmacy" [Title/Abstract] and ("India" [MeSH Terms] or "Rural Health" [All Fields] or "Digital Health" [Title/Abstract]) and ("eSanjeevani" or "ABDM" or "Tata 1mg" or "PharmEasy" or "Apollo TeleHealth" or "e-Arogya" or "PPP") and ("Access to healthcare" or "Healthcare delivery" or "Health equity").

The inclusion criteria for this study encompassed government and private sector initiatives launched between 2020 and 2025 that specifically aimed to deliver telemedicine and telepharmacy services to rural populations in India. Eligible sources included peer-reviewed studies, official program reports, policy briefs and gray literature that provided verifiable impact metrics relevant to healthcare access, affordability or outcomes. Only articles published in English were considered to ensure consistency in data interpretation and analysis.

Conversely, the exclusion criteria ruled out review articles, editorials, opinion pieces or studies that did not directly pertain to healthcare delivery within the Indian context. Initiatives that were not explicitly linked to telemedicine or telepharmacy or those focused solely on urban populations, were excluded. Additionally, duplicate sources or inaccessible documents that could not be authenticated through institutional or public databases were also omitted from the final analysis.

A thematic analysis framework was applied to synthesize qualitative data around key domains: accessibility, affordability, digital infrastructure, health outcomes, policy

alignment and equity. This analysis helped capture nuanced enablers, such as successful public-private partnerships, mobile health van outreach and AI-assisted screening, as well as systemic constraints, including regulatory fragmentation, digital illiteracy and connectivity gaps.

The study did not involve any primary data collection involving human participants and therefore did not require ethical clearance. All data used were obtained from verified public sources and known biases related to institutional reporting or self-reported metrics were acknowledged and critically interpreted. While the data represent nationwide and sectoral trends, state-level variability, evolving policy landscapes and platform-specific inconsistencies are recognized as limitations that may affect generalizability. Nonetheless, the triangulated, evidence-driven methodology ensures a robust foundation for analysing the evolving impact of telemedicine and telepharmacy on rural healthcare in India.

## Results and Discussion

India's telemedicine and telepharmacy ecosystem has undergone a paradigm shift between 2020 and 2025, driven by a convergence of national digital health policies, private sector innovation and non-governmental interventions aimed at reducing rural healthcare disparities. This section examines the performance of six key public-private initiatives, eSanjeevani, ABDM, Tata 1mg, PharmEasy, Apollo TeleHealth and Smile Foundation's e-Arogya, alongside system-wide outcomes and persistent challenges. The government's flagship platform eSanjeevani has

emerged as the cornerstone of telemedicine delivery in India. By July 2025, the platform had enabled over 324 million consultations, with 85% of beneficiaries located in rural and semi-urban areas, indicating deep rural penetration [25]. This success was facilitated by the integration of 154,576 Ayushman Bharat Health and Wellness Centres (AB-HWCs) into the system, allowing primary care providers to connect patients with remote specialists via hub-and-spoke models [26].

Complementing eSanjeevani, the Ayushman Bharat Digital Mission (ABDM) catalysed infrastructure digitization. The issuance of over 720 million Ayushman Bharat Health Accounts (ABHA IDs), 62% of which are linked to rural individuals, illustrates the growing public uptake of digital health identity systems [27]. Additionally, the Health Facility Registry (HFR) and Health Professional Registry (HPR) standardized over 200,000 facilities and 1 million practitioners respectively, supporting data interoperability and care continuity across rural regions [28].

A comparative overview of these six initiatives, including their service models, reach and key strengths, is summarized in Table 1. Notably, while government-led platforms like eSanjeevani and ABDM demonstrate massive reach and policy backing, private initiatives such as Tata 1mg and PharmEasy are filling critical logistical and accessibility gaps, especially in Tier 2 and Tier 3 towns [29-31]. The Smile Foundation's e-Arogya initiative further extends this reach into tribal and remote geographies through mobile telemedicine vans, showcasing the potential of NGO-led outreach [18].

**Table 1:** Comparative overview of major public-private telemedicine and telepharmacy initiatives in rural India (2020-2025)

Initiative	Type	Coverage & Reach	Key Services	Rural Impact
eSanjeevani [32, 33]	Government	324 million consultations (85% rural)	Teleconsultation, OPD linkage via AB-HWCs	Largest digital OPD; improved specialist access in rural districts
ABDM [27, 34, 35]	Government	720 million ABHA IDs (62% rural)	Health IDs, HFR, HPR, interoperability	Enabled health record continuity; digital inclusion of rural patients
Tata 1mg [36-39]	Private	Operations in 1,200+ cities	Medicine delivery, AI triage, e-labs	Rural deliveries; drone pilots; cold-chain logistics in Northeast
PharmEasy [15, 40-42]	Private	PAN-India logistics with India Post partnership	Medicine delivery, teleconsultation	Rural orders; enhanced access in 600+ backward districts
Apollo TeleHealth [43-46]	Private	520 centers in Tier 2/3 towns	Remote diagnostics, chronic care, specialty consults	4.2/5 satisfaction score; 28% reduction in cardiac referral time (Jharkhand)
e-Arogya (Smile Foundation) [18, 47]	NGO	Bihar, Odisha, Chhattisgarh	Mobile health vans, maternal-child health	1.4 M free consultations; 41% increase in maternal check-up adherence

Private sector platforms have expanded their rural footprint through hybrid digital-logistics models. Tata 1mg and PharmEasy serve over 30% rural clientele, leveraging mobile apps and cold-chain logistics to deliver medicines and diagnostics in underserved districts [48]. Apollo TeleHealth operates over 520 centers in Tier 2 and Tier 3 towns, offering chronic disease management, virtual specialist care and tele-diagnostics, services critical for controlling non-communicable diseases (NCDs) in rural India [49].

On the non-profit front, Smile Foundation's e-Arogya initiative has delivered over 1.4 million free consultations via mobile medical vans across tribal regions of Bihar, Odisha and Jharkhand. These vans integrate portable diagnostic tools and real-time consultations with urban

specialists, enabling preventive screening and timely referral services in remote locations with no fixed health infrastructure [50].

Collectively, these efforts have contributed to significant system-level and patient-level benefits, as detailed in Table 2. Financially, patients have saved an average of INR 2,000-3,500 per teleconsultation by avoiding travel and hospital costs, while public healthcare systems reported estimated annual savings of INR 1,600 crore.[51] Clinical outcomes also improved, chronic disease adherence rose by 35% and teleconsultation reduced time-to-care from several days to under 24 hours. These improvements were especially relevant in managing diabetes, hypertension and maternal care follow-ups [52].

**Table 2:** Summary of outcomes and impact metrics from telemedicine and telepharmacy interventions (2020-2025)

Indicator	Value/Impact	Source/Notes
Average patient savings per rural visit	INR 2,000–3,500	Travel, consultation and diagnostic cost avoidance <sup>[53]</sup>
Annual health system savings	INR 1,600 crore	Based on reduced referrals, OPD loads, diagnostics <sup>[54]</sup>
Chronic disease treatment adherence	Improved by 35%	Noted across eSanjeevani and Apollo platforms <sup>[55]</sup>
Hospital readmission rate (NCDs)	Reduced by 19%	Compared to baseline OPD follow-up before telehealth integration <sup>[56]</sup>
Digital health ID issuance (ABHA)	720 million (62% rural)	ABDM dashboard, 2025 <sup>[57]</sup>
Mobile health van outreach (e-Arogya)	1.4 million consultations	Smile Foundation, PHFI 2024 <sup>[58]</sup>
Patient satisfaction (Apollo TeleHealth)	4.2/5 average rating	Apollo CSR and annual operational report, 2024 <sup>[59]</sup>
Rural women using digital health apps	22%	NITI Aayog Digital Literacy Survey, 2025 <sup>[60]</sup>
Villages without reliable 4G access	~80,000 (38% of rural India)	BharatNet Phase-II status, MoCIT 2025 <sup>[61]</sup>
Rural digital illiteracy rate	58% of adults	ASER and MeitY rural digital skills index, 2025 <sup>[62]</sup>
AI-based diagnostic accuracy improvement	24% in pilot settings (Tata 1mg triage tools)	Internal evaluation, Tata 1mg <sup>[63]</sup>

These gains are supported by anecdotal and case-based evidence highlighting improvements in maternal health monitoring, post-operative follow-up and mental health consultations, areas historically neglected in rural healthcare systems <sup>[64]</sup>. Importantly, these improvements support national goals toward Universal Health Coverage (UHC) and align with Sustainable Development Goal 3 (Good Health and Well-being) <sup>[65, 66]</sup>. Despite these achievements, barriers persist. Only 42% of rural regions have consistent 4G coverage, severely limiting access in the most backward districts <sup>[67]</sup>. Digital illiteracy remains high, affecting 58% of rural adults, particularly

older populations and women, restricting the use of health apps and e-prescription portals <sup>[68]</sup>. Regulatory concerns, ranging from data privacy compliance to interstate teleconsultation licensing, remain unresolved, inhibiting long-term trust in digital health solutions <sup>[69]</sup>. In this context, Table 3 synthesizes the study’s primary objectives, aligned findings and actionable policy recommendations. The analysis underscores the importance of scalable public-private models and suggests that sustained success will depend on integrating digital infrastructure expansion, user education, health workforce involvement and unified regulation.

**Table 3:** Connecting objectives, findings and recommendations

Study Objective	Key Findings	Recommendations
Review government, private and NGO-led telehealth initiatives	Six major initiatives (eSanjeevani, ABDM, Tata 1mg, PharmEasy, Apollo TeleHealth, e-Arogya) showed wide rural outreach and user engagement	Promote public-private partnerships (PPPs) and incentivize NGO participation for expanded rural digital outreach
Identify infrastructure and regulatory challenges	38% of rural areas lack 4G; 58% of adults digitally illiterate; e-prescription and data security inconsistencies create barriers	Expand BharatNet for rural connectivity; launch digital literacy campaigns; create universal telehealth standards
Propose actionable strategies to enhance rural healthcare via digital delivery	Telehealth saved INR 1,600 crore annually; 35% improvement in chronic disease adherence; significant cost and time savings for rural populations	Institutionalize hybrid care models; provide training for local health workers; strengthen telemedicine regulations

Together, these insights affirm that telemedicine and telepharmacy, when coordinated through robust public-private partnerships and contextualized digital strategies, can significantly improve healthcare access and outcomes in India’s rural landscape. The challenge now lies not in proving efficacy but in sustaining and scaling these gains through strategic policy alignment, infrastructure investment and user-centric design.

**Conclusion**

India’s telemedicine and telepharmacy landscape has made significant strides in improving rural health access, with public initiatives such as eSanjeevani and the Ayushman Bharat Digital Mission (ABDM) playing pivotal roles. These government-led programs, when complemented by private-sector platforms like Tata 1mg, PharmEasy and Apollo TeleHealth, along with NGO-driven models such as Smile Foundation’s e-Arogya, have collectively enabled millions of rural citizens to remotely access medical consultations, diagnostics and essential medicines. The study underscores the measurable benefits of these efforts, including significant cost savings, reduced travel burdens, improved adherence in chronic disease management and enhanced continuity of care, particularly in underserved geographies.

However, the digital health ecosystem continues to face systemic barriers that limit its equity and scalability. Persistent issues such as digital illiteracy affecting 58% of rural adults, insufficient 4G coverage in over one-third of rural areas and stark regional disparities hamper widespread adoption. Regulatory fragmentation in areas such as e-prescriptions, data security and cross-state teleconsultation practices further constrains progress. Unlocking the full transformative potential of telemedicine and telepharmacy in India will require a multipronged strategy. Priorities include expanding rural broadband infrastructure through initiatives like BharatNet, launching nationwide digital literacy campaigns tailored for low-literacy populations, ensuring interoperable digital health systems and establishing standardized regulatory frameworks for telehealth governance. Strengthening public-private partnerships and incentivizing grassroots innovation will also be critical to bridging existing gaps. By addressing these challenges through inclusive, scalable and policy-aligned interventions, India can consolidate its digital health gains and advance towards achieving Universal Health Coverage (UHC) and the Sustainable Development Goals (SDGs), particularly SDG 3: Good Health and Well-Being, by 2030. The convergence of technology, policy and community engagement thus offers a

powerful pathway to reimagine rural healthcare delivery in India.

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