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Article

Digital Health Inequities: Analysing Barriers to Access Across Demographic Groups in India

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Abstract

The pandemic has led to a rapid adoption of technology and mobile apps in healthcare systems worldwide. From diagnostic to measures of tracking and containing pandemic infections, digital technologies rapidly became a part of the healthcare sector. This has globally given an impetus to digital healthcare systems involving the use of artificial intelligence to come to the fore. Given the impact technology has had on access to healthcare services during the outbreak of COVID-19, the article attempts to understand barriers faced by communities in accessing digital health services. The article maps digital health services from the lens of inclusivity, to assess whether technology has been able to bridge the health divide or whether the digital divide has pushed those at the margins of healthcare further away from it. The primary survey conducted as part of the study tries to understand the exclusions faced by the vulnerable groups.

Keywords

Technology, healthcare, telemedicine, pandemic, inclusion

Introduction

The pandemic has led to a rapid adoption of technology and technology apps in healthcare systems across the world. From diagnostic to measures of tracking and containing pandemic infections, digital technologies rapidly became a part of the healthcare sector. This has globally given an impetus to digital healthcare systems involving the use of artificial intelligence (AI) to come to the fore. Much of the time, AI itself has been projected as a missing link that will usher in quality healthcare assurance for all and will help meet the Sustainable Development Goals (SDGs). For example, the WHO considers the use of AI and technology in

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the health sector as a highly promising tool, and similarly, several technologically advanced nations have increasingly developed AI in healthcare programmes to enhance digital health literacy, investing in training inclusive AI techniques and allowing the development and deployment of AI from personal health management to public health management. India is the most populous country in the world, and how well these technologies are adopted in the healthcare sector in India is relevant to developing and monitoring global plans on digital health, especially those aimed at achieving the SDGs on health and well-being for all. Through this baseline study, we seek to map and understand the impact of technology on the healthcare sector in India.

Objectives

- To develop an understanding of the state of access to healthcare services with a focus on the growth of the digital health sector.
- To assess the access to healthcare services for those who are not a part of healthcare systems—impact of exclusion.
- To understand how popular digital health apps are used in India.

Background and Context

The government launched the Digital India Mission in 2015 to build a digitally empowered society by strengthening access, maximising inclusion and minimising the digital divide. Under this, several initiatives have been deployed, which, in turn, have been a robust foundation for the penetration of digital health services in the country. For instance, Common Service Centres (CSCs) offer e-government and e-business services in rural regions through designated Village Level Entrepreneurs (VLEs). The CSCs are spread across 0.5 million rural and urban towns. CSCs are being used by telemedicine services, doorstep delivery of medicines and related health services. Similarly, e-hospital is the Hospital Management Information System for internal workflows and processes of hospitals and is being used across the country, allowing for online booking of appointments (PIB Delhi, 2023).

The National Health Policy (NHP) 2017 recognises the role of technology in the delivery of healthcare services and promotes the extensive use of digital tools in providing efficient healthcare outcomes. The NHP 2017 also puts forward the creation of an integrated health information system (Ministry of Health and Family Welfare, 2017). The National Health Stack vision outlines the development of an electronic national health registry as a resource for national health data (NITI Aayog, 2018). The National Digital Health Blueprint (NHDB), a follow-up to the NHP 2017, envisages the creation of a digital health ecosystem in India. The NHDB incorporates aspects, such as a unique health identifier, portability, standards for electronic health records (EHR), privacy and empowerment of citizens (Ministry of Health and Family Welfare, 2019).

The Ayushman Bharat Digital Mission (ABDM), launched by the Government of India in 2021, aimed to create a digital health ecosystem. The key aspects of this ecosystem included a unique health ID (Ayushman Bharat Health Account ID

(ABHA ID)) comprising a 14-digit number for every citizen, interlinking medical records across hospitals, clinics and labs. Moreover, the programme attempts to build a database of health facilities and professionals in the country. ABDM gave impetus to the roll-out of e-Sanjeevani, a nationwide telemedicine platform (Dastidar et al., 2024). As per the numbers quoted by the Press Information Bureau, about 500 million Indian citizens have an ABHA as their unique health ID. Around 15 million patients have used the account for instant OPD registration services. Moreover, 330 million health records have been linked with ABHA (Press Trust of India, 2023).

The COVID-19 pandemic allowed digital health services to be adopted in a fast-paced manner. The period saw demand for healthcare that was quick and safe in the wake of traditional healthcare delivery systems remaining heavily burdened. For healthcare providers, digital services provided the flexibility of addressing concerns of patients amidst challenging situations of lockdowns and social distancing. Hospitals and related personnel were quick to adopt digital solutions that minimised human contact, reduced case load and enabled better patient outcomes. On the other hand, the patients, given the situation, were also less resistant to the idea of digital consultations than they would have been in the absence of a pandemic. The convenience and ease of using digital healthcare services gave it more acceptance among patients, as opposed to a physical service in the midst of rising infections.

While the policy framework was developing in the background, the impetus to implement and hasten the adoption of digital practices came only with the COVID-19 pandemic. Moreover, public apps to book vaccinations, appointments and surveillance and tracking of cases could have created consensus among the public on the usage of technology to obtain healthcare services. The COVID-19 Vaccine Intelligence Network (Co-WIN) system enabled citizens to book vaccination appointments and supported India's COVID-19 vaccination drive extensively. Another government app, Aarogya Setu, used for contact tracing, had 218 million people enrolled in it as of 11 October 2023. Furthermore, another aspect that resulted in quicker adoption was the relaxation of regulations around privacy, approvals on digital health services and telehealth.

India allocates approximately 2% of its GDP to public healthcare. While the share of out-of-pocket spending has been declining, nearly half the population pays out of their own pocket. Nearly 55 million people fall back into poverty owing to exorbitant health expenses. As per WHO, India will need a minimum of 1.8 million doctors, nurses and midwives to achieve the lower threshold of 44.5 health workers per 10,000 population in 2030 (WHO, 2020). About 65% of India's population lives in the villages, but only 25% of India's healthcare facilities serve rural areas, leading to regional disparities in health access. Digital health services can play a major role in mitigating the inadequacies in the existing healthcare divide, provided the digital divide does not hamper the proliferation of these services.

The underserved populations of health services include senior citizens, migrants, the chronically ill, the unemployed and those affected by mental illnesses. In the case of digital health services, the vulnerabilities will be exacerbated due to the inability to use technology, poor motivation, financial constraints and a lack of technical guidance to access digital services. Patients with chronic

illness are associated with lesser interaction with digital health services and hence may face exclusion. Moreover, digital health services may not serve to solve complex health needs. Those with cognitive impairments may also face exclusion from digital health services stemming from an inability to use these services. Both of these sections felt that they were able to access limited health services, but faced challenges in accessing others. Migrants are another group that often face exclusion from traditional health systems, but even with digital health systems, they could face constraints with the local language (Kaihlanen et al., 2022).

The proliferation of digital health services may only further exclude women from accessing health services. Women in India have exhibited a lesser inclination towards health services and often neglect their health or limit themselves to treatment in their homes. While digital health services could be a potential solution to the issues of access, the wide digital disparity will continue to dampen efforts at digitisation. According to the National Family Health Survey (NFHS-5), only 33% of women, as opposed to 57% of men in India, have ever used the internet. In rural India, only 25% women have ever used the internet. A scant 14% of women report having smartphones. This differential access to the internet and devices was a major reason why participation of women in telehealth services remained lower when compared to men during the pandemic years (2019–2021). Maternal and Child Health programmes, such as Kilkari, Arogya Sakhi and mMitra, that have been implemented in certain regions have reported improved health access, digital literacy and better maternal and child health outcomes. Rural populations, with their limited access to health services, also face challenges in using digital health platforms due to a lack of devices and data connections. Local NGOs in remote regions have successfully provided support by offering devices, data and instructions on operation services, such as Aarogya Setu, Co-WIN and e-Sanjeevani.

Inequity in existing healthcare systems stems from socio-economic disparities and geographical barriers to access. When healthcare services are digitised, aspects that include digital divide, technological constraints and privacy concerns compound the existing challenges of poverty, illiteracy, infrastructure and insurance coverage.

Methodology

Scope

The study has restricted digital health services to Co-WIN app, Aarogya Setu, e-Sanjeevani (telemedicine), mobile health applications, e-pharmacy services, diagnostic services, patient tracking apps and e-health records. The sample size is composed of 5,028 individuals spread across different age groups, religious groups and social groups. The survey is spread across 6 states (Andhra Pradesh, Haryana, Karnataka, Telangana, Rajasthan and Uttar Pradesh) and 15 districts in India.

Sampling Strategy

A non-probability, purposive sampling technique was employed by the Digital Empowerment Foundation (DEF), targeting villages that have developed familiarity with DEF interventions over the years. While the sample was largely rural-centric (96%), it included small proportions of urban and suburban respondents.

Data Collection Instruments

Data were collected using structured questionnaires. The questionnaires were designed to capture the familiarity of the respondents with digital health services and included:

- Demographic information: Age, gender, education level, region and others,
- Access to health apps,
- Access to primary health,
- Adoption of digital health services and
- Quality and patient care received through digital health services.

The questionnaire was pre-tested in a pilot study involving 10 individuals to ensure clarity and reliability.

Data Collection Procedure

Respondents were approached through designated DEF centres for face-to-face interviews. Written informed consent was obtained from all participants prior to data collection.

Data Analysis

Descriptive statistics were used to summarise demographic characteristics and adoption patterns. Barriers to digital health services were analysed across gender, education, caste, religion and region. Where appropriate, percentages and ratios were used to illustrate disparities.

Ethical Considerations

Informed consent was obtained from all participants, and anonymity and confidentiality were maintained throughout the research process.

Limitations

The non-probability sampling approach and rural-centric sample limit generalisability. Small sample sizes in certain districts may reduce reliability for localised inferences. Nevertheless, the study provides valuable insights into digital health inequities across multiple demographic dimensions in India.

Methodological Limitation

The study did not reveal any gender-based disparities, which is particularly noteworthy given the narratives and reports of gender divide in access to technology as well as health. A plausible explanation could be attributed to the survey being conducted in villages where DEF has an established presence. Given DEF's long-standing commitments towards digital empowerment, focused on women, the findings may reflect the outcomes of such interventions rather than widespread rural realities. The study acknowledges the selection bias present in the survey and also the limited external validity of the study. To enhance generalisability, future research could employ probability-based sampling in areas without DEF's direct engagement, thereby offering a more representative account of gender-based digital disparities.

Results

Demographic Analysis of Digital Health Access

Gender-based Disparities

A high number of respondents (74%) use digital health services, suggesting a good acceptance and utilisation of digital health technologies among the population surveyed. The usage rates between genders are relatively close, indicating that digital health services are being embraced by both genders almost equally. The data, however, reveal gender differences in barriers to using digital health services. Internet connectivity is a common issue for both genders (2/5th of the respondents for both male and female).

Women face greater challenges with unfamiliar language and access, with 1/5th of respondents reporting language issues and 1/3rd encountering problems with smartphone availability, compared to 1/7th and 2/9th of male respondents, respectively. Males, on the other hand, express higher concerns about the effectiveness of services (1/3rd vs. 2/9th of respondents) and accuracy and training of personnel (1/4th vs. 1/6th of respondents). These differences highlight that challenges vary by gender, reflecting diverse needs and concerns in accessing digital health services.

In spite of the shift towards digital platforms, especially since 2020, reports show that 25,067 villages (4%) still lack mobile and internet connectivity. Further, out of the 2,50,000-village panchayats targeted by the BharatNet rural broadband, fewer than half have Wi-Fi hotspots, and only 65,000 provide actual services. Also, even though internet subscribers are growing, the quality and the speed of the connections are problematic (India Inequality Report, 2022).

Caste and Social Group Disparities

The General Category has a usage rate of 81%, indicating a higher acceptance of digital health services when compared to the OBCs at 74% and SCs at 76%. However, STs have the lowest adoption rate at 56%, with nearly half of individuals in this group not utilising these services. This disparity may stem from factors such as limited access to technology, lower levels of digital literacy or

socio-economic barriers, suggesting a need for targeted interventions and educational initiatives that address these challenges and promote digital health service adoption among the STs and other lower-engagement caste groups.

The data highlight several barriers preventing individuals from utilising digital health services, with variations among different social groups. Internet connectivity is a major barrier among the General (1/2 of the respondents), OBC (3/8th of the respondents) and SC (1/2th of the respondents) groups. Unfamiliarity with the language or inability to read is a minor challenge among all groups. The lack of smartphone availability or service provider access is the major concern among 5/9th ST respondents. Concerns about the accuracy of information and personnel training are higher among OBC respondents (1/4th). Effectiveness concerns are most prevalent among the General population (2/7th of respondents) and OBCs (1/3rd of respondents). Lastly, the complexity of the app appears to be a challenge for 2/7th of the General population, but it is less of a concern for OBC and SC respondents.

Religious Group Disparities

The data indicate differences in the usage of digital health services among various religious groups. Followers of Christianity (92%), Buddhism (95% usage) and Sikhism (88% usage) reflect high engagement. In contrast, Hinduism and Islam both exhibit relatively lower usage rates of 74% and 70%, respectively.

Education-level Disparities

In the group with no education, more than half (54%) use digital health services, but this is the highest percentage of non-users (46%) among all groups. Lack of education may limit familiarity with technology or the perceived relevance of digital health services. The secondary education group (68%) shows slightly lower usage when compared to the primary education group (76%), but still reflects strong engagement. Individuals with a Bachelor's degree show a very high level of engagement (93%) with digital health services, indicating that higher education likely leads to increased familiarity and comfort with technology. The group with a Master's degree has the highest percentage of users (95%), indicating that advanced education correlates strongly with the usage of digital health services.

The data show how different levels of education influence barriers to using digital health services. Internet connectivity issues are a significant concern across all educational levels, particularly for those with secondary education (1/2 of the respondents) and no education (2/7th of the respondents).

Unfamiliarity with language and reading abilities is a major barrier for 1/3rd individuals with no education. At the same time, it drastically decreases among those with higher education, suggesting that educational background significantly impacts comfort with digital interfaces. The lack of smartphone availability or service providers is highest among individuals with no education (3/8th of respondents). The complexity of the app is especially problematic for individuals, for 5/9th of respondents with Bachelor's degrees. Overall, addressing these specific concerns could enhance accessibility and encourage the use of digital health services.

Regional Disparities

The data reveal significant regional disparities in the adoption of digital health services, with Andhra Pradesh leading in adoption and Haryana lagging significantly. Andhra Pradesh has the highest usage at 99%, while Haryana shows a stark contrast with only 13% adoption. Andhra Pradesh has been a forerunner in adopting digital technology in the public health sector.

The analysis of barriers to using digital health services across various states reveals regional disparities. Rajasthan and Uttar Pradesh face major challenges with internet connectivity, affecting 4/9th and 1/2 of respondents within each state, respectively, while states like Haryana and Karnataka report much lower concerns. Language barriers are a major issue in Telangana (1/2 of Telangana respondents) and a comparatively lesser challenge in Andhra Pradesh and Rajasthan, contrasting with the lower responses in Haryana and Karnataka. For Karnataka and Andhra Pradesh, the major challenge is related to smartphone availability or service providers, with 7/8th and 5/9th respondents within each state, respectively. Security and privacy concerns are generally lower across the states. Concerns about the accuracy and training of personnel and concerns about effectiveness are highest in Haryana, both at 2/3rd of respondents. The complexity of the app is an issue only in Uttar Pradesh (1/3rd of the respondents from the state). These variations highlight how regional factors, such as infrastructure, language and device access, shape the challenges faced by users of digital health services, reflecting the diverse needs and conditions across states.

Use of Digital Health Platforms

Co-WIN

The data indicate a high uptake of COVID-19 vaccinations among users of the Co-WIN app, with 69% fully vaccinated (having received 2 or 3 doses) and 27% partially vaccinated (having received 1 dose). Only 5% of respondents report not being vaccinated at all. This suggests that the Co-WIN app has played a role in facilitating vaccine access and administration, contributing to widespread vaccination within the population. Approximately 68% of female respondents and 67% of male respondents received the COVID-19 vaccine using the Co-WIN app. Overall, the Co-WIN app has played a crucial role in facilitating vaccine access.

The data on difficulties faced while booking vaccination slots using the Co-WIN app reveal several key challenges encountered by users. A significant concern for many users is internet connectivity, with 3/8th of fully vaccinated individuals reporting it as a challenge. This highlights a critical barrier that can hinder access to online services. This issue is less prominent among partially vaccinated individuals, where only 1/8th of the respondents reported facing connectivity issues.

The complexity of the app is also a concern, particularly for those who are partially vaccinated, suggesting that usability issues may discourage some individuals from successfully booking their slots. Security and privacy concerns affect a smaller percentage of users, with 1/8th of fully vaccinated and 1/7th of partially vaccinated individuals citing this as a difficulty.

Interestingly, no difficulties faced were reported by 2/9th of fully vaccinated users when compared to just 1/9th of partially vaccinated users. Challenges, such as no smartphone availability (1/8th of fully vaccinated and partially vaccinated) and inability to read (1/9th for fully vaccinated and 1/6th for partially vaccinated), suggest accessibility issues.

Overall, the data highlight that while many users successfully navigate the Co-WIN app, significant challenges remain, especially regarding internet connectivity and app usability. These findings suggest a need for improvements in the app's design and increased support for users facing connectivity issues or literacy challenges to ensure equitable access to vaccination services.

Aarogya Setu

The data on the use of the Aarogya Setu app show that about 51% of the respondents use it. The data on the purposes for which users engaged with the Aarogya Setu app reveal important insights into public needs. A majority of users utilised the app for checking COVID-19 updates and statistics (5/8th of the respondents) and for self-assessment of COVID-19 risk (5/8th of the respondents). Accessing teleconsultation services (3/8th of the respondents) shows that a portion of users valued remote medical advice, reflecting a shift towards digital healthcare solutions.

Overall, the data suggest that while users found the app useful for personal health management and information, there is an opportunity to enhance awareness and utilisation of features like teleconsulting services.

Gender-based Disparities

The data on the use of the Aarogya Setu app show that about 51% of the respondents use it. The gender-wise break-up reveals 56% of females and 49% of males have utilised the app.

Region-based Disparities

The data present a clear variation in the usage of the Aarogya Setu app across different states in India, highlighting disparities. Andhra Pradesh stands out, with an impressive 97% of respondents reporting they have used the app, indicating a strong acceptance. In contrast, Haryana and Rajasthan show a different trend, with only 8% and 14%, respectively, of respondents utilising the app, suggesting a reluctance or lack of awareness among their populations regarding this digital health tool. Other states, such as Karnataka (65%), Telangana (73%) and Uttar Pradesh (57%), demonstrate moderate usage rates. The differences in usage rates across these states may reflect variations in factors, such as digital literacy, access to technology and the need for the app.

Religion-based Disparities

The data reveal significant differences in the usage of the Aarogya Setu app across various religious groups in India. Among Buddhists, a striking 72% reported not using the app; in contrast, Christians show a much higher engagement, with 75% indicating they have utilised the app.

Hindus also demonstrate a moderate level of usage, with 66% having accessed the app, which may be attributed to greater awareness or digital literacy within this demographic. On the other hand, Muslims exhibit a high non-usage rate of 78%, indicating significant challenges in app adoption that could stem from socio-economic factors or concerns regarding technology. Sikhs present the highest non-usage rate at 86%.

Caste-based Disparities

The data reveal disparities in the usage of the Aarogya Setu app across different caste categories. Among the General Category, 74% of respondents reported using the app. In contrast, the OBC category shows a different trend, with 54% of respondents not using the app. This suggests barriers to usage that may stem from factors that include access, awareness or digital literacy.

SCs and STs also show significant non-usage rates, with 44% of SC and 53% of ST respondents indicating they have not utilised the app. The relatively higher usage rates among the General Category as compared to SC and ST groups may reflect broader socio-economic factors and disparities in access to technology.

Education-based Disparities

Among individuals with no formal education, 73% individuals have not used the app, with only 27% engaging with it. This highlights potential barriers to owning a smartphone, digital literacy and access to technology in this demographic. Among those with primary education, 56% report not using the app, while 44% do, indicating a modest increase in engagement. This trend continues with secondary education, where 58% have not used the app and 42% have. Meanwhile, individuals with vocational or technical education show a remarkable shift, with only 29% not using the app and 71% actively utilising it. This pattern continues among higher education levels, with high usage rates of 87% with a Bachelor's degree and 89% with a Master's degree. This indicates that as educational attainment increases, so does the likelihood of using digital health tools.

Telemedicine

The major challenge faced by the respondents in using the telemedicine service has been the absence of a physical exam, with two out of five respondents reporting it. The next two major challenges are internet connectivity and the absence of emergency care. A fourth of the respondents blamed a lack of technical know-how, while another fourth expressed concerns about privacy and security in trying to use telemedicine. One in eight respondents expressed concern about the lack of provider–patient relations when using telemedicine. A third of the respondents felt that the non-availability of emergency care was a challenge.

Regional Disparities

The data on telemedicine usage across different states in India reveal disparities. Andhra Pradesh stands out with a high usage rate of 89%. Conversely, Haryana

shows a strikingly low usage rate, with 94% of respondents reporting they have not utilised telemedicine services. This suggests potential barriers to access or a lack of awareness in this state. Karnataka and Telangana show moderate levels of usage at 63% and 62%, respectively. Rajasthan also exhibits a relatively high usage rate of 74%, indicating a growing acceptance of telemedicine in that region.

Religion-based Disparities

Among Buddhists, 79% reported using telemedicine, indicating a strong acceptance of this healthcare service. Similarly, Sikhs also demonstrate high utilisation, with 86% indicating they have accessed telemedicine services. In contrast, Hindu respondents show a lower usage rate, with only 58% having utilised telemedicine. Muslim respondents had a slightly higher usage rate of 62%, while Christian respondents had a 67% usage rate, indicating a relatively better usage compared to Hindus, but still lower than Buddhists and Sikhs.

Education-based Disparities

The data on the usage of telemedicine services across different levels of education reveal a trend between the level of education and the usage of telemedicine services. Among individuals with no formal education, 54% have not used telemedicine services. This indicates that nearly half of this demographic is utilising available digital healthcare options despite potential barriers related to literacy and technology access. This can be due to the availability of third-party operators (such as DEF centres in this case) providing access to and awareness about telemedicine in the survey areas. As we move up the educational ladder, the percentage of individuals who have not used telemedicine decreases. For those with primary education, only 35% have not accessed these services, with 65% actively using them. This trend continues with secondary education, where 52% report having used telemedicine services, showcasing an increasing acceptance of remote healthcare options. The most significant shifts occur among individuals with vocational or technical education, where only 32% report not using telemedicine, and this figure drops further for those with a Bachelor's degree (24%) and a Master's degree (14%). Overall, the data highlight the positive impact of education on the utilisation of telemedicine services. While a significant portion of individuals across all education levels is using these services, targeted educational initiatives could further enhance adoption among lower-education groups, ensuring that all populations have equitable access to vital healthcare resources.

Caste-based Disparities

Among the General Category and OBCs, 67% and 62% of respondents, respectively, reported using telemedicine services, indicating a relatively high acceptance of digital healthcare solutions. SCs and STs reported comparatively lower usage rates, with 55% and 44%, respectively, indicating they have used telemedicine services.

Discussion

Digital health services have grown rapidly and have supplanted the existing health infrastructure, especially during the pandemic. The survey indicates that while digital health services grew exponentially during COVID-19, their implementation and penetration still have a long road to cover. The services have managed to make inroads into rural hinterlands; however, the distribution is largely governed by demographic factors, much like conventional healthcare access.

Gender

Though this survey did not report a gender-wise disparity in access to digital health services, women did report more barriers, such as non-availability of smartphones, language and complexity of the apps. As per the Comprehensive Modular Survey: Telecom, 2025 (CMS: T) released by the National Statistics Office (NSO), about 51.6% of women belonging to the '15 years and above age group' in rural areas do not own a mobile phone, while 80.7% of men own one (Rajora, 2025). The survey, thus, highlights the systemic inequities that result in a lack of access to healthcare, even if technology is leveraged. The 78th round of the National Sample Survey indicated that digital literacy is low for both men and women. Only 22% of all men and 21% of all women above the age of 15 possess some form of digital literacy. The gender gap in digital literacy is lower for basic digital literacy skills but widens for advanced skills, such as transferring files between a computer and other devices. The gap between the rural and urban cohorts is also considerably large, with basic information and communication technology (ICT) skills reporting a gap of 21%. The disparity in digital literacy translates into exclusion in the access and adoption of health services. Much like healthcare access, which is dependent on geographic proximity and income, digital healthcare access also stands to become restricted by the same factors. For instance, the survey highlighted that the southern states had better access and higher adoption rates, while the northern states exhibited a lag, which could be a mix of factors, such as literacy (Fernandez & Puri, n.d.).

Caste

In the primary survey, among the social groups, the Scheduled Tribes showed one of the lowest proportions in access and adoption of digital health services. At the same time, device unavailability was cited as a major cause for their lower participation. Other factors, like geographic location with poor internet penetration, could also perhaps be a major obstacle to access, coupled with poverty and illiteracy, leading to a lack of awareness of the availability of such services. The Comprehensive Modular Survey on Telecom, 80th Round, NSS, 2025 shows that 95% of the upper-caste households in urban areas and 86% in rural areas have access to the internet at home. Whereas only 87% of ST homes in urban areas and 78% of ST homes in rural areas have internet access, clearly reflecting a caste-based digital divide, when compared to other social groups (National Statistics

Office, 2025). Moreover, the optical fibre coverage in urban India is about 20% for upper-caste groups and about 12% for ST and 7% for SC households. Furthermore, the share for ST households with optical fibre network in rural areas falls to a meagre 2%. The survey also indicates that these groups are more likely to suffer from infrastructure deficits as well as the lack of adequate digital skills when compared to the more privileged groups (Thomas, 2025).

Education

The study has clearly brought out the positive correlation between education and access to health services. Higher education leads to fewer barriers in access, thus leading to higher adoption and usage. Moreover, the more educated users also raised concerns regarding privacy and security while using services such as telemedicine. Such users also reported fewer language-related issues. The Comprehensive Modular Survey on Telecom, 80th Round, NSS, 2025, indicates that low digital readiness is a major roadblock in the uptake of digital services. Nearly 49% of rural households either do not know how to use the internet or are not aware of it. A total of 43% of urban households also reported the same (National Statistics Office, 2025).

App Design

Apps like Co-WIN and Aarogya Setu reported a high uptake, but several users also faced issues with connectivity and the complexity of the app. Telemedicine by way of e-Sanjeevani received a huge fillip, especially among educated users; however, the lack of physical exams and emergency care has hindered its growth to some extent. The older age population experienced difficulties in operating apps owing to a lack of technical know-how. The younger age group, though more favourable towards virtual consultations, did express concerns with regard to reimbursement and insurance claims. While the overarching framework of digital health is defined by robust policies and institutions, implementation remains a major challenge, especially in terms of infrastructure, digital literacy and inclusive design.

Infrastructure

Internet access is a major impediment to the adoption of digital health services across all major groups. Although 95% of rural households had internet access through 3G/4G mobile connections. Even though mobile internet penetration is universal, high-speed internet connections in rural households still remain marginal. Only 3.8% of rural households have access to the internet via optical fibre connections, and 9.1% rural households have access to Wi-Fi connections. The same services in urban households have a penetration of 15% and 24%, respectively (National Statistics Office, 2025; Thomas, 2025). Optical fibre connections and Wi-Fi connections remain critical pieces to ensure reliable and continued access to these services. Moreover, the distribution of internet penetration is quite lop-sided, for instance, the number of subscribers is 100% across the urban areas

in the following, in states that include Kerala, Karnataka, Rajasthan, Punjab, Gujarat, Assam, North-East and Himachal Pradesh while the lowest number of internet users is found in Bihar, UP and Madhya Pradesh (Moinuddin, 2021).

Conclusion

The survey highlights that the barriers faced in accessing digital health services are a mix of infrastructure and sociodemographic inequalities, coupled with concerns of trust and privacy. Digital health services hold tremendous potential to support and complement traditional healthcare, especially at the grassroots level. The interventions must be specifically targeted to overcome the digital divide.

The distribution of internet infrastructure suffers from regional imbalances, thus making the distribution of digital health services as skewed as conventional healthcare. Hence, to ensure a uniform uptake of digital health services, greater priority must be allocated to scaling the existing infrastructure and expanding outreach.

In order to overcome demographic barriers, digital health platforms must make allowance for users' constraints. For instance, designing systems that allow for bandwidth constraints and multilingual features can go a long way in ensuring inclusivity in services. Targeted literacy programmes for the vulnerable groups, such as women and STs, can help in minimising the digital gender gap. Digitalisation in health is here to stay, but a lot more needs to be addressed with regard to making these services sustainable and universal in coverage.

The access may not always lead to large-scale adoption; concerns on safety, usability and quality are likely to follow. Apps need to be designed with greater sensitivity and safeguards, else they may just end up alienating potential users.

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