Physicians' experiences with telemedicine during the COVID-19 pandemic in India

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Author contributions

ARJ and VHN conceived the project; VHN and ARJ conceptualised the methodology with contributions from BGD; VHN designed and implemented the internet-based questionnaire with contributions from ARJ and BGD; BGD, VHN, and ARJ undertook survey dissemination; VHN collected and curated the data; VHN, BGD, SS, and ARJ contributed to formal analysis, investigation, visualisation, writing of final results, and preparation of the original draft manuscript; VHN and ARJ undertook supervision, project administration, and ensuring requisite infrastructure; all authors contributed to the subsequent draft review and editing; all authors have read and agreed to the final version of the manuscript.

Conflict of interest statement

The authors declare no potential conflicts of interest concerning this article's research, authorship, and/or publication. This research was unfunded. The authors have no relevant financial or non-financial interests to disclose.

Ethics approval

This is a service review. The Oxford Tropical Research Ethics Committee has confirmed that no ethical approval is required.

Abstract

Purpose: Digital health is an important factor in India's healthcare system. Inclusive policy measures, a fertile technological landscape, and relevant infrastructural development with unprecedented levels of telemedicine adoption catalysed by the recent COVID-19 pandemic have thrown open new possibilities and opportunities for clinicians, end-users, and other stakeholders. Nevertheless, there are still several challenges to properly integrating and scaling telemedicine use in India. This study's objective was to understand the views of practising physicians in India on the use of telemedicine and the challenges experienced during the accelerated rollout during the first wave of the COVID-19 pandemic.

Methods: We acquired data through an anonymous, cross-sectional, internet-based survey of physicians (n=444) across India on the COVID-19 frontline. These responses were subjected to qualitative data analysis (via inductive coding and thematic analyses) and descriptive statistics, as appropriate.

Results: Most responses (n=51) were categorised under a code indicating that telemedicine-led healthcare delivery compromised treatment quality. The second largest proportion of responses (n=22) suggested that 'Accessibility, quality and maturity of software and hardware infrastructure' was a considerable challenge.

Conclusions: Despite the considerable uptake, perceived benefits, and the foreseen positive role of telemedicine in India, several challenges of telemedicine use (viz., technical, user experience-based integration, and non-user-based integration challenges) have been identified. These must be addressed through suggested relevant opportunities to realise telemedicine's potential and help inform the future design of effective telemedicine policy and practice in India.

Keywords: COVID-19, Digital health, Healthcare delivery, Qualitative analysis, Healthcare policy, Telemedicine

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1. Introduction

Digital determinants of health (DDoH) are an essential component of 21st-century healthcare [1,2]. DDoH consist of digital infrastructure as well as telemedicine, mobile phones and apps, wearable devices, sensors and extended reality [3,4]. If used well, DDoH can transform care pathways to increase access and equity while improving health outcomes [3]. India, the world's most populous country, is amongst the fastest-digitising nations and is making important strides in addressing DDoH [5]. The National Digital India initiative was launched in 2015 with the stated aim "to transform India into a digitally empowered society and knowledge economy" [6]. As of 2021, *Aadhaar,* the world's largest digital identity program, has around 1.3 billion users [7], and the BharatNet programme aims to extend a fibre network to approximately 250,000 villages by 2025, driving the estimated number of smartphone users to one billion by 2026 [8].

In healthcare, the 2020 National Digital Health Mission (NDHM) Initiative was launched to support the goal of Universal Healthcare through technology [9]. NDHM proposed a national digital architecture of key components, including a national health identifier for all citizens (Ayushman Bharat Health Account [ABHA]), digitised patient health records, and a centralised patient-consent mechanism to allow sharing of health information [10]. The rollout of telehealth in India was boosted by the COVID-19 lockdowns. Besides releasing Telemedicine Practise Guidelines, the free Telemedicine Service, eSanjeevani, was rolled out nationally in 2019 and has since been used by over 148 million patients [11,12]. Despite the impressive progress in digitising healthcare, several challenges impede more rapid and widespread rollout. These challenges include the lack of adequate infrastructure, especially in rural areas; inequity of access; the continued commitment of the Indian Government and other institutional stakeholders; patient satisfaction; system usability; and buy-in of frontline clinicians [13-15].

In this manuscript, we present survey findings of physicians across India who were on the frontline during the first wave of the COVID-19 pandemic. Our aim was to better understand their views on telemedicine use and the challenges experienced during the accelerated rollout during the

pandemic. By understanding these perspectives, we hope the results of our study can inform the future design of effective telemedicine policy and practice in India with the ultimate goal of realising universal healthcare.

2. Materials and Methods

2.1 Study design

The methods and study findings adhere to the **Che**cklist for **R**eporting **R**esults of Internet **E-S**urveys (**CHERRIES**) [16] and recommended guidelines for conducting and reporting survey research [17]. Further details of the study design are as previously reported [18].

2.2 Ethical approval

This study surveyed physicians anonymously via an internet-based questionnaire to understand their experiences and perceptions of telemedicine. This study did not involve patient participation or material or seek identifiable, personal and/or confidential information from the survey respondents. Hence, according to the Declaration of Helsinki of the World Medical Association, no ethical approval was necessary for this study. In addition, in consultation with the local ethics committee at the University of Oxford, this study was deemed a 'service review' (confirmation available upon request).

2.3 Survey design

An open, online, self-administered survey [18] was used to collect quantitative and qualitative data anonymously from participants within India. Multiple-choice questions pertinent to the COVID-19 pandemic and open-ended questions on telemedicine use were included. Specifically, two free-text questions were included to cross-sectionally understand the perceived challenges with telemedicine use. All questions except those requiring free-text inputs were mandatory to proceed further. Response validation, adaptive questioning, and/or non-response options were used where appropriate.

2.4 Sampling strategies and target population

A non-probability sampling approach was used for survey dissemination across India. Participation was voluntary, and participants were informed that all data collected was non-identifiable and would be used solely for research purposes. Respondents were not reimbursed for their participation.

2.5 Data collection

The questionnaire-based survey was developed, hosted, and conducted online between 09/12/2020 and 28/02/2021 on the University of Oxford-approved survey tool, *JISC Online Surveys* (https://www.onlinesurveys.ac.uk/). The automated database for capturing responses was password-protected and stored on secure JISC Online Surveys and an institutionally issued personal computer of the study co-author (VHN). The responses corresponding to fully completed questionnaires were exported from the survey tool as a comma-separated values (.CSV) format for analysis.

2.6 Data analysis

All quantitative data analysis was conducted using Microsoft Excel 2016. The responses to the two optional open-ended questions (on perceived challenges with telemedicine and additional feedback) were aggregated, pre-processed, and analysed qualitatively in Google Sheets [19]. Only complete and relevant survey responses were considered.

Pre-processing steps included the following: (i) some open-ended entries had to be split into more than one response as they spanned multiple/unrelated codes, and (ii) some responses (that were incomplete, had a single-word entry, etc.) were removed leading to 116 eligible responses. Consensus on eligibility was achieved for all open-ended responses by the authors.

Coding and thematic analyses were used for qualitative data analysis [20-22]. A deductive coding approach was first used. This was based on the constructs per a relevant review article [23], with

the authors assigning the open-ended survey responses to these codes. After coding, it was found that the authors agreed 59 times and disagreed 57 times. The authors realised that the codes were not adequately suited to the survey responses because (i) the codes/constructs were not appropriate for our study, which was conducted in a low-resource setting; (ii) the considered study [23] is over six years old; and (iii) the recent COVID-19 pandemic has radically transformed and catalysed telemedicine adoption, rendering some of the codes and constructs from Langbecker et al. [23] obsolete.

The authors then adopted an inductive approach because its emergent nature was more appropriate for the unique situation of unprecedented levels of telemedicine use during the COVID-19 pandemic in India. Codes were identified by utilising (i) *In Vivo* coding, (ii) *Open* coding, and (iii) *Descriptive* coding. The authors read through the survey responses, applied codes independently, and then performed a second iteration of coding that added an interpretive lens. In total, three rounds were necessary, and 11 codes were agreed upon (Figure 1). Any conflict in coding was resolved by consensus [21].

After the first inductive coding round, the authors agreed 89 times and disagreed 27 times. After forming a consensus in the second coding round, all but one response saw agreement (i.e., 115 agreements).

3. Results

As reported previously [18], survey respondents generally represented the distribution of physicians across India, with 81% being from urban areas, 17% from semi-urban, and 2% from rural areas. 91.9 per cent of respondents were actively involved on the COVID-19 frontline. Participants were asked about their perceptions of the use and challenges linked to telemedicine in India.

3.1 Telemedicine use

When asked about the use of telemedicine after the start of the pandemic, 85.4% (n=379) of respondents felt that telemedicine use had increased; 11.7% (n=52) felt it decreased; 2.3% (n=10) felt it remained the same; and 0.7% (n=3) were unsure. Of the respondents who felt the use of telemedicine increased, the majority felt that it increased by up to 50% (Table 1).

<Insert Table 1 about here>

Respondents were also asked about their views on whether telemedicine would and should play a significant part in their practice after the pandemic. Most respondents felt that telemedicine would continue to be a considerable part of their practice (78.4% [n=348]), while 13.5% (n=60) felt that it would not, and 8.1% (n=36) were unsure. Finally, 95.3% of respondents believed telemedicine should play a substantial role in delivering healthcare in post-pandemic India.

3.2 Challenges with telemedicine use during the first wave of the COVID-19 pandemic

Survey responses (n=115) to two optional open-ended questions on the challenges of telemedicine use in India ("What are the main challenges with Telemedicine that you have faced so far?") and additional feedback were categorised into 11 codes agreed upon by the authors through an inductive process (Figure 1). The authors could not arrive at a consensus for one survey response, "Abuse of same prescription".

<Insert Figure 1 about here>

The majority of responses (n=51) were categorised under a code that indicated that telemedicine-led healthcare delivery compromised treatment quality. The second largest number of responses (n=22) indicated that 'Accessibility, quality and maturity of software and hardware infrastructure' was an important challenge. Table 2 provides a sample of representative verbatim responses under these two codes.

<Insert Table 2 about here>

The remaining 42 responses were categorised under a variety of challenges, including limitation in the type of condition that can be managed (n=8); governance issues (n=7); inability or unwillingness

of patients (n=7 and 6, respectively) or doctors to use the system (n=1 and 1, respectively); lack of

awareness (n=6); reimbursement issues (n=4); and potential for excess healthcare utilisation (n=2).

4. Discussion

Our survey was conducted between India's first two COVID-19 waves and reflects a unique situation

that resulted in a substantial push for nationwide use of telemedicine services, primarily to reduce

the risk of cross-contamination caused by close contact. This was reflected in our survey, with a

substantial portion of respondents stating that telemedicine usage had increased in their practice

and region/hospital. This finding is also consistent with studies done globally (e.g., [24]) that

compared healthcare workers' opinions on telemedicine before and during the COVID-19 pandemic.

The common theme across these studies was that despite the significant uptake, perceived benefits,

and anticipated future role of telemedicine, numerous challenges must be addressed to realise

telemedicine's full potential. Our study provides a unique perspective on the nuances around these

challenges, and they are also contextualised through the lens of the field experience of the study co-

author (BGD), who actively engaged in the National Telemedicine Service (eSanjeevani) and was on

the COVID-19 frontlines in India.

Reflecting on our survey responses and BGD's experiences, three broad themes were identified

regarding the challenges of telemedicine use in India: user experience-based integration, non-user-

based integration challenges and technical.

4.1 User experience-based integration challenges

Shifting to a completely non-physical consultation cannot be expected to be smooth because it

contradicts how medicine has been practised for centuries—in-person, face-to-face, and with a

clinician's 'healing' touch. A stark manifestation of this is an unwillingness on the part of both

patients and physicians to use telemedicine, though there were only seven responses that indicated

this. Some responses also suggested an inability to use telemedicine, although training can

overcome this challenge (see the section below on policy and practice).

A more significant set of challenges is linked to the doctor-patient relationship and the ability to do a physical examination, which were the most prevalent challenges identified in our survey. Besides having to unlearn how medicine has normally been practiced, it is important to recognise that physicians are more likely to uncover additional concerns during in-person consultations and examinations [25]. Furthermore, the lack of physical contact can also manifest as lost spaces in the consultation for patients to raise additional concerns (both clinical and non-clinical) [26]. These factors also negatively impact the ability to form and grow the doctor-patient relationship – as one of our respondents mentioned, "Patient-doctor relationship gonna like customer-call centre relationship, it is a lazy practice."

4.2 Non-user-based integration challenges

A challenge that several respondents highlighted was that telemedicine was not appropriate for the management of all conditions/situations and especially for emergencies – "Useful for mild health problems". The authors feel, however, that this is more a *limitation* of telemedicine rather than a challenge because it will never be appropriate for telemedicine to be used for these conditions/situations. Instead, it requires sound clinical judgement and better triage processes to ensure that telemedicine is *appropriately* used. Other non-user-based integration challenges are more significant.

For the use cases where telemedicine can be appropriate, its *inappropriate use* can be linked to defensive medicine, overdiagnosis, and overtreatment. One respondent implicated "playing safe" on the part of service providers in the absence of in-person physical examination and interaction as a key variable in compromising treatment quality. Another respondent referred to the problematic phenomenon of 'doctor shopping' – wherein patients fix multiple appointments with different doctors for the same complaint to get multiple opinions and/or prescriptions.

Seven respondents also felt that governance issues must be investigated, such as the legitimacy and inherent medicolegal risks of telemedicine practice, legality and overuse of prescriptions, and the

risk of unqualified/unlicensed or inadequately trained providers offering virtual services. Finally, it is essential to highlight that there is currently no provision in India for reimbursement from medical insurance in telemedicine practice [27].

4.3 Technical challenges

If users feel they cannot rely on telemedicine, they will not put their trust in the technology, and this will be reflected in less use. In our survey, 26% of responses were concerned about the lack of infrastructure to support telemedicine services, particularly in remote areas – "technology penetration in my country is still limited", "logistic issues in remote localities", and "network issues". Other responses indicated the quality of image transmission and prohibitive hardware and software infrastructure costs as important factors. Respondents also highlighted the current limitations of telemedicine – namely, the ability to perform and interpret laboratory or imaging-led investigations and the lack of availability of past medical history and records.

5. Implications for policy and practice

Telemedicine implementation is challenging in low-resource settings due to infrastructural costs linked to set-up, unreliable internet connection in rural regions, slow clinical acceptance, non-interoperable systems, lack of conformance to standards, and lack of clearly articulated regulatory frameworks, non-user-friendly technologies, and faulty implementation strategies [28]. Despite these challenges (also) highlighted in our study, over 95% of our survey respondents felt telemedicine should play a substantial role in delivering healthcare in post-pandemic India. The authors suspect that a reason for this could be the recognition that telemedicine could serve as a virtual bridge to universal and equitable healthcare access in India, where the majority of healthcare infrastructure is in urban centres despite most of the population living in rural areas [29]. Below, we highlight opportunities for integration of telemedicine in India using the same themes used to group the challenges. It is important to note that these opportunities are not mutually exclusive.

5.1 User experience-based integration opportunities

For telemedicine to become a standard component of care pathways, we will need to either see a change in norms of care delivery or telemedicine technology will have to evolve to better meet the requirements and expectations of patients and physicians – the reality will likely consist of both.

A starting point would be to explore telemedicine usage, adoption, and patient and clinician feedback (rural vs. urban-based) to better understand patient and clinician experiences and needs. There is, for example, evidence of the differential use of telemedicine among different groups according to various demographic attributes (e.g., rurality, region, literacy, etc.) [30,31]. Understanding care-seeking behaviour would be valuable in tailoring telemedicine services driven by a needs-led approach [23]. Further, it would be helpful to understand the shift in telemedicine adoption in different disciplines of medicine and healthcare and gauge their usage, efficacy, and impact.

Training and education of clinicians and patients will also help improve adoption and the ability of different users to easily adjust to care delivered through telemedicine. Furthermore, a hybrid telehealth model consisting of alternating in-person and telehealth visits could suit the Indian context well [32].

5.2 Non-user-based integration opportunities

One response that particularly resonated with the authors was that "there should be a national framework for referral" so that a patient is first seen by a general practitioner (GP) before referral to a specialist. General practitioners are significantly underrepresented in the current eSanjeevani referral pathway. This allows paramedics at the 'spoke' or individual patients to call specialist physicians at the state telemedicine 'hubs' directly – often for minor complaints, and they frequently use incomplete and vaguely typed messages to describe their complaints without any audio-visual input. The failure to account for these factors costs India's healthcare system unnecessary resources, prevents other patients with more urgent needs from availing of appropriate

appointment slots, and prevents the concerned specialist from providing informed and well-considered advice. As an example of this suboptimal use of resources, the study co-author, BGD, practices as an IVF specialist and has had several referrals coming to him of men with headaches. Implementing triage pathways, such as those used in the UK National Health Service (NHS), as well as linking every appointment to a patient's ABHA/Aadhaar identifier while retaining options for second or even third opinions, where genuinely warranted, could help to optimise the use of telemedicine in India. Additionally, establishing an online ABHA/Aadhaar-tagged record of the disbursement of prescription drugs would help to curb the abuse of the same or multiple prescriptions for repeated access to habit-forming medications – a concern identified by one of the respondents.

Another important factor highlighted in telemedicine integration is the need for further government involvement in funding and technical support, especially in rural settings [33]. Scaling up any promising innovations successfully across India necessitates a cautious approach; however, due to a lack of reliable data on quality and technical difficulties in measuring quality, any efforts to improve the quality of care are challenging [34]. There have also been several calls for specific legislation In India to tackle the various medicolegal issues associated with telemedicine and virtual care [27]. Healthcare professionals and policymakers must consider these intersectional issues for the appropriateness of telemedicine implementation in the Indian context and also recognise the important disparities between India's different states [35].

5.3 Technical opportunities

Scott Kruse et al. [36] highlight that the top barriers to telemedicine adoption are technology-specific (e.g., technology barriers and lack of computer literacy) and could be overcome through training, change-management techniques, and alternating delivery by telemedicine and personal patient-to-provider interaction. India has been and continues to make substantial investments to improve its technological infrastructure, including a shift to 5G, as well as support for internet and

smartphone growth in India in urban as well as rural areas. If designed, implemented and harnessed well, these initiatives could be essential to increasing, and ensuring more appropriate, use of telemedicine in India.

As healthcare in India progresses through a transformative period at an unprecedented scale, our study provides insights that can support effective telemedicine adoption. Supported by favourable and opportune policies by the Indian government, telemedicine played a crucial role in offering healthcare access during the COVID-19 pandemic. Overcoming the structural issues of the Indian healthcare system can position it to play a transformative role in ensuring universal access in India [18,29].

Supplementary materials

See our previous paper [18] for (i) a PDF version of the questionnaire and (ii) details on (social media posts/advertisements).

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Tables:

Table 1. Perceived changes in the use of telemedicine after the start of the COVID-19 pandemic in India. Numbers in parentheses indicate the number of respondents.

Perceived % increase or decrease from the start of the pandemic	Respondents (85.4% [n=379]) who felt telemedicine use increased in their:		Respondents (11.7% [n=52]) who felt telemedicine use decreased in their:	
	practice % (n)	*region/hospital % (n)*	*practice % (n)*	*region/hospital % (n)*
< 25%	50.4% (191)	46.4% (176)	21.2% (11)	28.8% (15)
25–50%	34.6% (131)	37.2% (141)	44.2% (23)	30.8% (16)
50–75%	12.4% (47)	14.2% (54)	23.8% (15)	36.5% (19)
> 75%	2.6% (10)	2.1% (8)	5.8% (3)	3.8% (2)
Total	*100% (379)*	*100% (379)*	*100% (52)*	*100% (52)*

Table 2. Representative responses for the two codes covering the greatest proportion of responses

Code	Representative responses
Compromise to treatment quality	"Being unable to physically/clinically examine patient to arrive at a comprehensive diagnosis." "The inability to examine a patient is a big drawback as it can hinder

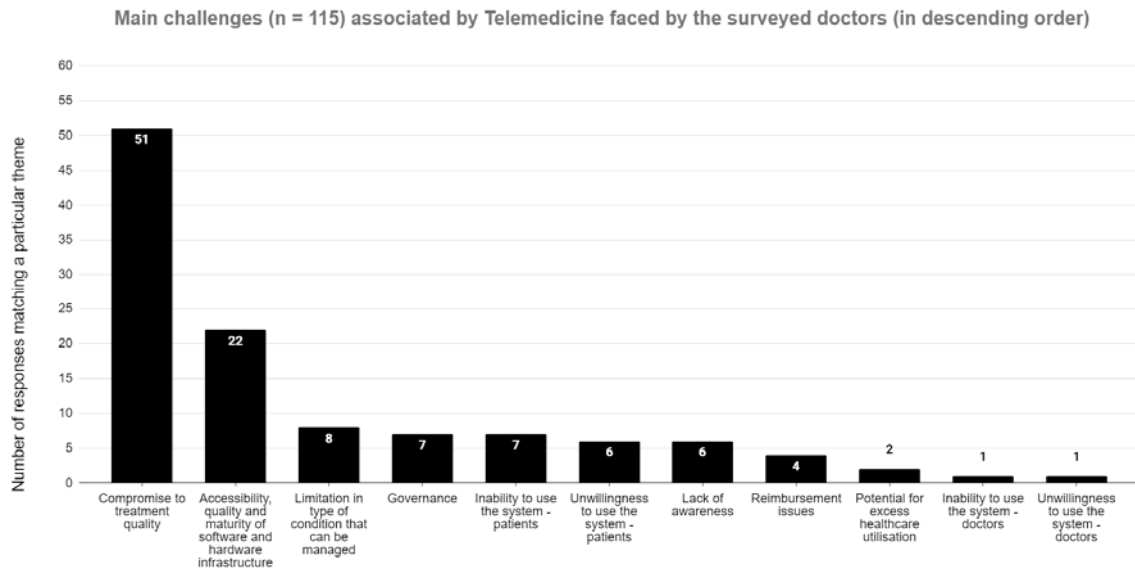|	our capability to diagnose a disease."
	"Many times we need to physically examine the patient. Many problems are picked up when we palpate or auscultate the patients and many things are missed by the patients in their complaints which are vital for diagnosis."
	"It's a blind opinion patient not examined"
	"We play safe as we do not know the pts due to which best treatment not possible."
	"Suboptimal clinical assessment!"
	"Patient to doctor relationship is almost materialistic…"
	"Change in patient-doctor relationship"
	"Patient-doctor relationship gonna like customer-call centre relationship, it is a lazy practice."
	"Misunderstandings and miscommunication can happen."
	"Follow up feedback with the patients."
	"Convincing people to get lab testing done."
Accessibility, quality and maturity of software and hardware infrastructure	"The technology penetration in my country is still limited , although people have smart phones , there usage is limited to surfing and social media"
	"Net connectivity"
	"Network issues"
	"Also logistic issues in remote localities"
	"Problems faced during video consultation"
	"Some time the transfer of the image is of poor quality and that can affect the diagnosis"
	"Sharing of past medical records"

Legends to Figures:

Fig. 1. Pareto histogram on the inductive coding summary challenges associated with telemedicine use faced by physicians in India during the first wave of the COVID-19 pandemic

Figures:

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