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# Telehealth and COVID-19: Using technology to accelerate the curve on access and quality healthcare for citizens in India

Ridhi Bhatia

Faculty of Management Studies, Manav Rachna International Institute of Research and Studies, India

## ABSTRACT

The current COVID-19 pandemic has reinstated the importance of telehealth as a business model for accelerating the accessibility of healthcare and improving the quality of healthcare for citizens of a country. Telehealth service has a tremendous potential in a developing country like India where the healthcare facilities in India are heavily concentrated in urban cities while their majority (67%) of the population resides in rural areas. At the same time, a high teledensity of almost 90% supports telehealth overall reach. However, the growth of telehealth in India till now has been sluggish but the corona virus (COVID-19) crisis has redefined the telehealth ecosystem by reducing the risk of infection through person-to-person contact. In this study, we explore the perception of healthcare users towards telehealth services and analyze the key enablers for the telehealth services in the current scenario. We collected data from 1170 participants through personal interview. The results of the study shows a considerable segment of the population is having high healthcare need, have aspirations for accessing better healthcare for themselves and their family members and use ICT to a significant extent. At the same time, they have positive attitude towards telehealth and socio-demographic factors like age, geographical location, educational qualification, family size affects the attitude towards telehealth services. The results of the study shows there is a significant market for telehealth services in India to be explored by the technology firms, hospitals and other healthcare stakeholders and going forward it has an enormous capability to transform the complete healthcare ecosystem, especially in developing countries like India post the COVID-19 crisis.

## 1. Introduction

The Covid-19 Crisis has led to tremendous disruption across industries [1]. Digital transformation has taken a new shape during this global pandemic, and also set groundwork for the future [2]. Business models backed by technology has emerged, and gaining popularity due to their utility in the times of social distancing and restrictions on movement [3]. These business models are coming in the major sectors that touch the life of citizens on a daily basis which includes the financial service, education, and the healthcare sector [4,5].

The use of technology to reach out to healthcare consumers through different telehealth platforms has been prevailing from a long time but in developing country like India, the growth of these services has been very slow and is unable to reach its true potential due to low adoption by the healthcare consumers [6,7]. There always has been preference towards physical visit to the healthcare provider for different healthcare needs rather than using technology based platforms like telehealth to reach to the healthcare providers and to manage their healthcare needs [8–10].

The recent Covid-19 pandemic has changed the complete scenario for the healthcare users [11]. Since the corona-virus outbreak, doctors across the globe have been flooded by enquiries from patients who want to discuss about symptoms and other aspects related to COVID-19 [12].

At the same time, people suffering from other medical ailments are finding it difficult and scary to visit a hospital to get medical care [13].

It is said that there is an opportunity in every crisis that organizations can explore to develop new business models [4]. In this case, Telehealth or telemedicine is emerging as a popular medium to connect with healthcare provider to meet the healthcare need for the people [12–14]. Under telehealth, patients sit at a comfort of their home and connect with a doctor through video conferencing facility [8,15]. Thus, telehealth enables home delivery of healthcare services remotely using IT infrastructure [16]. The demand for telehealth consultations have surged across the globe since the pandemic struck [12,17]. Using this platform, people who are suffering from any medical ailments are able to receive care from their homes, without entering the medical facilities, thus minimizing their risk of contracting the virus [17]. Also, these platforms are enabling patients suffering from chronic diseases to schedule follow up tele-consultations with their health care provider [18].

To understand the utility of Telehealth in India, a deeper understanding of the healthcare dynamics in India becomes essential. As per the Healthcare Access and Quality (HAQ) index 2016, India was ranked 145th among the 195 countries on the parameters of quality and accessibility of healthcare. In this ranking, India's rank was even below the neighboring countries Bangladesh, Bhutan and Sri Lanka as well as

E-mail address: [ridhi.fms@mriu.edu.in](mailto:ridhi.fms@mriu.edu.in).

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the poorer countries in Sub-Saharan Africa like Namibia, Sudan and Botswana [19]. As per the Global Multidimensional Poverty Index (MPI), released by the United Nations Development Programme (UNDP) in 2019, more than 7.7 persons per 1000 people in India live in areas which are vulnerable to malaria which is much higher than the statistics of its neighbours Bangladesh (1.9 per 1000), Nepal (0.5 per 1000) and Myanmar (3.7 persons per 1000 people) [20]. There is the limited government support concerning funding of health care which have lead to a shortage of healthcare infrastructure. According to the World Health Organization (WHO) [21]; India has a population ratio of 0.77 doctors per 1000 which is much lower than countries like Germany (4.12:1), Australia (3.37: 1000), United States of America (2.55: 1000) and China (1.49: 1000) [21]. India will require an additional 600,000 doctors and two million nurses to achieve the global benchmark and to serve its 1.33 billion populations [21]. Moreover, major share of healthcare cost needs to be borne at the individual's level. As per the latest data released in 2018, government spend on healthcare is only 1.02% of the country's GDP which is much below of the global average of 9.20% [22]. Thus, more than 70% of the health care expenditure is out-of-pocket.

Thus, the key issue in the healthcare sector in India that emerges from the literature is regarding accessibility, affordability, and financial viability of healthcare services. Healthcare providers are looking for solutions that can help them to reach out to people to whom healthcare facilities are still not accessible at a cost that is affordable to them and at the same time financially viable and sustainable for the providers [23]. Telehealth services have a huge scope in India considering the demographics of the country. India has a teledensity of almost 90% with over 1.16 billion mobile users and 636.73 million Internet users (as on May 2019) with Internet penetration of almost 49% [24].

Telehealth includes the use of information and communication technologies (ICT) to establish communication between two remote parties that can be healthcare providers or provider and patient [25]. It is as an effective vehicle that enables the delivery of high-quality and cost-effective health care to patients from a remote location [26]. Telehealth enables remotely caring for people suffering from chronic diseases and acute illness and facilitate the initial evaluation, diagnosis, prevention, and treatment of patient by the doctor situated at a remote location [25,27].

The objective of this study is to empirically study the prospects of telehealth in India in terms of understanding the key enablers for telehealth initiatives from the perspective of healthcare consumers during and post Covid 19 crisis. Our study also explores the healthcare consumers' perception towards telehealth services and their willingness to use and pay for these services. For this study, the data was collected from people in Delhi and the neighboring cities of Noida, Faridabad, Gurgaon, and Ghaziabad. Delhi was further geographically divided into different parts based on the categorization done by the government. Delhi consists of five regions which are North Delhi, South Delhi, East Delhi, West Delhi, and Central Delhi. Within the National Capital Region, the four nearby cities are Noida, Faridabad, Gurgaon, and Ghaziabad. Quota sampling technique was used to ensure that sample distribution in terms of geographical location is in similar proportions to that of overall population (as per Census 2011). While collecting data it was ensured that the sample was diverse in terms of gender, age, educational qualification, family size, and income.

Data was collected from 1500 respondents but only 1292 responses were complete in all aspects as some of them did not answer to all the questions. The final responses considered for the study were 1170 after excluding outliers. Data was collected through structured personal interviews with the respondents. In a structured interview, predetermined questions are asked from the respondents in the same sequence. The questions for the structured interview consisted of both open-ended and close-ended questions. The questions were divided into different sections that included basic demographics of the respondents and relevant healthcare-related information, accessibility of healthcare, information seeking need, use of Information and Communication Technologies

(ICT) and attitude towards telehealth services.

## 2. Data analysis

The first set of questions asked from the respondents was to understand and measure their healthcare need. First one was about the frequency of their visit to the doctor, in terms of how often they or their family member visited a doctor in the past. Almost 80% of them visited at least once in three months, and out of them 50% visited at least once a month to the doctor for their healthcare needs. The second question was in the context of chronic disease suffered by them or their family members as then they would have a higher need of healthcare. The respondents were specifically asked whether any of their family members were suffering from any chronic diseases like diabetes, asthma, arthritis, heart disease, etc. or any disease requiring extended care like cancer, etc. To this question, 35% of respondents (409 respondents) mentioned that either they or their family member are suffering from the chronic disease and the most common chronic diseases specified by them were diabetes (31%), heart disease (23%), high blood pressure (22%) and arthritis (17%). The results suggest that a significant proportion of sample respondents have high healthcare need evident from people suffering from chronic diseases, and frequency of visit to healthcare providers. Considering that India was in lockdown for more than two months and the continuous spike in the number of covid cases, telehealth is an attractive alternative for these healthcare consumers who have high need for healthcare services.

The second set of questions was to understand and measure their accessibility to quality healthcare. The respondents were asked whether they or their family member visited a doctor/hospital outside their village or district in last one year; 38% of the sample agreed to have visited due to lack of proper healthcare in their village or district, and for specialized health services which were not available in their hometown. Several health services stated by the respondents (for which they went to other town) were ayurvedic services, skincare, cancer treatment and dialysis and for taking advice from specialist on the disease suffered by them or their family members. The respondents were also asked questions on their satisfaction level with the current state of healthcare that they have access to. Around 38% of the respondents were not satisfied with the current healthcare accessible to them in terms of distance, infrastructure, availability of doctors and their competency. Thus, for these people telehealth is a convenient way of connecting with the healthcare providers and specialists in different geographical location. This will help them to have an access to quality healthcare services which they were not able to get due to geographical constraints.

The third set of questions aimed at understanding and measuring the extent of technology usage among the respondents as that would have a bearing on the ability to use telehealth services. The respondents were asked the different purposes for which they use mobile phones. 72% of the respondents could download and use mobile applications for different purposes, 67% of them read online documents on phone and 58% of them used video conferencing facility like WhatsApp video call, Skype, etc., to talk to a person sitting at some other place. Thus, the technology use is considerable amongst the respondents which become an enabler for telehealth services for healthcare consumers in India.

The next set of questions aimed at exploring the existing use of the internet among the respondents for gathering health-related information. 45% of the respondents search the Internet for more information on medicines prescribed by their doctor, 51% search the Internet for more information on the disease that them or their family, 43% search the Internet for more information on the surgery or procedure advised by the doctor, and 56% to take a second opinion of another doctor online. The results show that a significant proportion of the sample is using internet for gathering health-related information and thus can move towards using telehealth to communicate with their healthcare providers in future.

The respondents were asked certain questions to understand and

measure their attitude towards telehealth. 68% of the respondents have shown a positive attitude towards telehealth; 62% of respondents believed that the facility to connect with a doctor at some other location through video conferencing and other technology can improve the quality of healthcare for them by connecting them to more competent doctors and will enhance the quality of medical treatment that they receive. 60% of the respondents believed that it will be easy for them to learn, and use telehealth platforms to interact with a doctor situated at some other location. The multiple set of questions asked in the context of respondents' perceived usefulness, ease of use and behavioral intention to use telehealth services indicated a positive attitude towards telehealth platforms that need to be leveraged by the telehealth companies and healthcare providers.

The last set of questions was regarding willingness to pay for telehealth services. 71% were willing pay a premium for video conferencing facility and other technology to connect with doctor situated at some other location (excluding doctor's fees). The respondents were also asked as to how much premium they were willing to pay for the telehealth services. 70% were willing to pay more than Rs 50 per month for this service and 34% of respondents showed willingness to pay more than Rs 100 per month for availing this service.

### 3. Factors influencing attitude towards telehealth and willingness to pay for telehealth

#### 3.1. Age

In this study, people in the age group of "less than 25 years" and "25–34 years" have reported the most positive attitude towards telehealth services that have decreased with age and people in the age group of "more than 55 years" reported the least score. To analyze the significance of difference in the attitude towards telehealth services of the different age groups, analysis of variance (ANOVA) technique was used. To further understand these differences, a detailed post-hoc comparison was done using the Least Significant Difference (LSD) method. The comparison showed attitude towards telehealth of respondents in the age group "less than 25 years" differ significantly from age groups "35–44 years" and "55 years and above". People in the age group of "25–34 years" differ significantly with age groups "35–44 years" and "55 years and above" in regard to their attitude towards telehealth. Thus, the study supports the argument that consumers' attitude towards technology oriented service like telehealth varies with age and the younger generation has more positive attitude towards them (de Veer et al., 2015; [28,29,54,55]). The same is also reflected in the Willingness to Pay for the telehealth services. People in the lower age bracket showed a higher inclination to pay and it decreased with age, with people in the age group of "more than 55 years" being the most hesitant to pay for these services. Respondents in the age group of "55 years and above" had significant mean difference in respect to their intention to pay for mobile applications on healthcare with people in the age group of "less than 25 years" and "25–34 years".

#### 3.2. Gender

In this study, both males and females have shown similar interest in using telehealth services, but when it comes to willingness to pay for telehealth services, females have shown a higher interest as compared to males.

#### 3.3. Educational qualification

In this study, people with primary educational qualification has shown the least interest to use telehealth services and it improved as the qualification increased and people with a professional degree reported the highest interest. At the same time, there was insignificant difference in attitude towards different telehealth services among people with

educational qualification of graduation, post-graduation and professional degrees. Thus, the study supports the argument that acceptance improves with education (de Veer et al., 2015; [28]; Morton, 2011) In the case of Willingness to Pay, it was significantly lower among people with educational qualification up to matriculation as compared to people with higher qualifications.

#### 3.4. Geographical location

In this study, people residing in South Delhi showed the highest interest in using telehealth services while it was lowest among people residing in West and Central Delhi. Other parts of Delhi (North Delhi, East Delhi) and NCR regions (Faridabad, Ghaziabad, Gurgaon and Noida) were similar in their attitude towards telehealth services. Similar results were reported for Willingness to Pay for these services. Thus, location of consumers' affects their attitude and willingness to pay for telehealth services.

#### 3.5. Healthcare need

The respondents who have a higher need for healthcare services due to a large family size, infants or elders in family, prevailing chronic disease among any family member or ones who had to frequently visit a doctor due to any of the above reasons have shown the highest interest to use telehealth services and were willing to pay higher premium to use these services.

#### 3.6. Accessibility of healthcare facilities

One of the key benefits of telehealth that has been highlighted in different forums is towards improving the accessibility of healthcare for people [30,31]. In this study, people who do not have access to quality healthcare or are dissatisfied with the existing medical facilities available to them have shown a higher inclination to use and pay for telehealth services.

#### 3.7. Technology use

In this study, Technology Use had a positive relationship with attitude but a negative one with WTP which means those people who are more technology savvy are were more inclined to use telehealth services but are less likely to pay for these services. The previous studies on the influence of Technology Use on Intention to Use showed a positive result ([32,54]; Wangpipatwong et al., 2008).

#### 3.8. Accessing internet for healthcare information

The respondents who already access internet to gather information about different aspects regarding health have shown higher interest in using the telehealth services but their willingness to pay was similar to the other respondents who currently do not use the internet for gaining knowledge or taking second opinion on health matters.

## 4. Discussion

World Health Organization declared the corona virus disease (COVID-19) as global pandemic on 11th March, 2020. This newly identified corona virus was first seen in Wuhan, the capital of Hubei province in central China, on December 31, 2019. By May end, the virus has infected over 6.5 million people, and led to more than 388,200 deaths. More importantly, more than 210 countries are now reporting positive cases of COVID-19 as the virus spreads across the globe and impacting communities at large. The widespread virus has put tremendous pressure on the healthcare system of countries across the globe and the governments are putting efforts towards strengthening the healthcare system to manage the pandemic. Telehealth has emerged as an ideal

tool to meet healthcare needs of people in the current phase of social distancing. For people infected with COVID-19, or those who symptoms that might be a sign of infection, telehealth can help with remote assessment (triage) and the provision of care. For people not infected with the COVID-19 virus, especially those at higher risk of being affected (e.g. older adults with pre-existing medical conditions), telehealth can offer convenient access to routine care without the risk of exposure in a congested hospital or in medical practice waiting rooms [13]. In the past also there were instances where telehealth services were used during the time of crisis. In the year 2000, a Multinational Telemedicine System was deployed by North Atlantic Treaty Alliance (NATO) for their military forces [33]. Using portable telemedicine kits and satellite linkage, healthcare support was provided to people in need from medical experts located in other countries (Doarn, Latifi, & Hostiu, 2016). Similarly, in 2003, during the Severe Acute Respiratory Syndrome (SARS) pandemic, China explored telehealth to provide care to the patients from remote location [34]. The health department in Australia used telehealth to provide mental health services to clinicians and affected people during the severe drought and the recent bushfires [13]. But the real challenge for telehealth is the acceptance and use of these initiatives by the public. For example, as per government data, during the first three months of initiating the telehealth services for affected people in bushfires in Australia only four telehealth visits happened [35]. This low acceptance and adoption have restricted the growth of telehealth and due of which telehealth is yet to reach its true potential [36,37]. During the current Covid-19 crisis, telehealth has become crucial for countries like India that have greater population density [38]. In India, the number of patients visiting hospitals for chronic diseases like diabetes, hypertension, tuberculosis, HIV, and those needing regular dialysis is enormous [39]. According to World Health Statistics 2018, about 8.7% of the population in India is diabetic and diabetes is a growing challenge for India considering the lifestyle changes due to urbanization. As per the projections of the International Diabetes Federation the number of Indians with diabetes will reach 123 million by 2040 and telehealth services are an effective tool to provide healthcare support to people suffering from chronic diseases. The necessity for using telehealth to deliver healthcare was also highlighted by the Prime Minister of India in his recent address wherein he stressed upon the need to come out with new strategies to make telehealth popular amongst the people [40]. Thus, it becomes pivotal in the current scenario to understand the public perception about telehealth and key enablers for its growth in India. The results of the personal interview with 1170 respondents in India convey that the people have a high healthcare need as a considerable proportion of the sample population were suffering from chronic diseases and the visits to healthcare providers is quite frequent. Telehealth is considered as an effective model to provide regular and cost-effective support to such people [41, 42]. The results of our study reiterate that access to quality healthcare in close vicinity of their homes is another challenge that is faced by people and telehealth is a hope for them to access the quality healthcare which is currently not available to them [43]. The mobile phone and internet usage is also significantly high across age groups and the geographical locations in our sample due to high mobile penetration in India in the last few years. Previous studies suggest that access to Internet broadband has a positive influence on the acceptance towards eHealth services [44]. In our study technology use had a positive effect on the attitude towards telehealth. Thus, the socio-demographic factors are supporting the growth of telehealth in India. At the same time, when the respondents were asked questions to understand their attitude towards telehealth, most of them gave a positive response. The perceived ease of use and perceived usefulness of telehealth had a significant influence on the attitude and thus were key determinants of the acceptance of telehealth. This is in line with some of the previous studies on the determinants of telehealth. Zhou [43] found ease of use as a critical factor that influences elderly population's acceptance of telehealth in China. Su et al. [45] concluded that perceived usefulness and perceived ease of use positively affect the intention to use telehealth for chronic disease

management [45]. One of the barriers in the growth of the telehealth services has been their revenue model. The perceived value for telehealth services and accordingly the willingness of consumers to pay for these services has been a concern for the eHealth industry [46–48]. In this scenario, it becomes critical to know whether consumers are willing to not only use these services but also to pay for them [43,49,50]. This study makes a significant contribution to the existing literature by analyzing the willingness to pay for telehealth services along with the attitude to use them. In the era of electronic services, it becomes critical to understand and test the WTP of consumers towards them. The respondents were willing to pay a premium over and above the doctor fees to use telehealth platform but the premium amount was not very high. The study also found that age, educational qualification, family size and location are important demographic factors that determine the acceptance of telehealth services. The youth and educated people of this country need to be encouraged to use telehealth services to avail better healthcare facilities for themselves as well as their family members. Telehealth companies and healthcare providers should also identify and target those geographic areas which have higher potential for telehealth services.

## 5. Conclusion

According to the report in 2012 by United Nations Population Fund (UNFPA), the number of elderly people (60 years or above) in India are around 100 million and this number is expected to increase to 323 million by 2050 and elderly people will constitute 20% of the total population and this segment of the population would have greater need for healthcare services. With the aging population and ever-increasing prevalence of chronic, lifestyle, and long-term illnesses, telehealth solutions are the need of the hour to deal with the growing demand for healthcare. In this study we first analyzed the macro-economic, technological, social and other demographic factors in India in order to understand the scope of telehealth services in terms of the drivers and inhibitors in its growth. An empirical study was then carried out to explore the perceptions of consumers telehealth services and identify the key factors that determine the consumers' intention to use and pay for them. From the study we concluded that the key determinants and enablers are healthcare need of individuals, accessibility of healthcare facilities, technology use and information seeking behavior, perceived usefulness, and perceived ease of use of telehealth. In the current times of Covid19, where the governments worldwide are recommending people to stay at home and have restricted movements, healthcare delivery system is undergoing a dramatic change [51]. Telehealth has become an integral part of the evolving system as a measure to mitigate the risk of transmission of virus during the healthcare delivery [52]. Telehealth is closing the gap in current times in terms of healthcare for people suffering from any disease especially the ones with chronic diseases [53]. Thus, this empirical study is an effort in the direction towards analyzing how using technology platforms like telehealth, India can accelerate the curve of accessibility and provide quality healthcare to its citizens.

## Author statement

The entire work right from Conceptualization; Data curation; Formal analysis; Funding acquisition; Investigation; Methodology; Project administration; Resources; Software; Supervision; Validation; Visualization; Roles/Writing – original draft; Writing – review & editing has been done by the single author of the paper.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.techsoc.2020.101465>.

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