**Title page**

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**Provision of rehabilitation and assistive technology services in a low resource setting during the COVID-19 pandemic and introduction of telehealth: service users’ and providers’ perspectives**

**Abstract**

The COVID-19 pandemic created a challenge for providing assistive technology (AT) and rehabilitation services, with many service providers implementing telehealth service provision for the first time. The objective of this study was to explore the experiences of people accessing and providing AT and rehabilitation services during the pandemic and to assess the implementation of telehealth service delivery at an assistive technology and rehabilitation centre in India. A mixed-methods design, combining analysis of clinical data and semi-structured interviews, was utilised. A descriptive analysis of demographics and clinical characteristics of service users accessing services through telehealth, or in-person mode was completed. In addition, service users were interviewed to explore their experiences of accessing services during the pandemic. Service providers were also interviewed to gather their opinions on telehealth service delivery during the pandemic. Findings showed that telehealth was an alternative tool in the pandemic for continuing to deliver services in a low resource setting. However, not all types of services could be successfully delivered via telehealth. There are barriers to the delivery of telehealth services that need to be considered and addressed to allow successful implementation, and it is important to consider that telehealth consultations are not suitable for all service users.

**Introduction**

With an approximate population of 1.4 billion, India is the second-most populous country and is classified as a lower-middle-income country (The World Bank, 2021). India includes a variety of socio-economic classes and cultures that reflects the heterogeneity of the population and therefore how they access and use various public services (Lutz & Kebede, 2018; Samir et al., 2018). Among these include healthcare, where resources and facilities are unevenly distributed across geographies with services concentrated more in urban areas (Barik & Thorat, 2015; Kasthuri, 2018).

Assistive Technology (AT) provision is a part of health care which is the application of organised knowledge and skills related to assistive products, including systems and services. Difficulties in accessing AT services and unmet AT needs for people are more prevalent in low and middle-income countries and may be higher in rural compared to urban areas, and between poor and non-poor populations (Pryor et al., 2018). The recently published WHO-UNICEF Global Report on Assistive Technology (World Health Organization & United Nations Children’s Fund (‎UNICEF)‎, 2022) identified that access to AT for those in need can range from as low as 3% of the population in need in low-income countries to 90% in high income countries.

The core activities of the facility where this work was conducted (Mobility India (MI), Bangalore, India), include the provision of rehabilitation services and AT devices such as prostheses, orthoses, wheelchairs, developmental and other appropriate mobility devices with therapeutic interventions. MI’s main aims are to integrate physical rehabilitation in community-based inclusive development (CBID) programs to ensure equality of access to rehabilitation services for the poorest in the community, to address the huge unmet need. The government of India issued orders for a nationwide lockdown due to the COVID-19 pandemic on 23rd March 2020. The lockdown continued till mid of June with phased unlocking and restoration of all the activities achieved by the end of October 2020. The healthcare systems, both private and public, were scrambling resources to cater for COVID-19 management. The general healthcare service delivery was disrupted due to the transfer of resources for COVID-19 care and the hesitance of patients to visit healthcare providers due to fear of contracting an infection (Amatya & Khan, 2020; Avellanet et al., 2020; Smith et al., 2020). Rehabilitation and AT service providers around the world, including MI, faced the challenge while providing the necessary care.

The recent COVID-19 pandemic created a much bigger challenge for providing AT and rehabilitation services in conventional settings. AT and rehabilitation clinics were abruptly closed, and personnel were not available to offer services at the household level. As a result, most existing AT users faced several challenges in acquiring products and therapy care, having products repaired in case of failure, following up on therapy interventions and developing secondary complications. To sustain these services, the use of telehealth technology was implemented by many service providers to keep service providers and users connected remotely and thus minimising the access barriers (Layton et al., 2021).

Many service providers shifted to telehealth service delivery for the first time (Christy & Keeffe, 2020; Kibirige, 2009; Kumar et al., 2012; Smith et al., 2020) Recent research has highlighted that telehealth has helped address some of the challenges faced by healthcare services due to the pandemic (Eddison et al., 2021). However, research has also identified barriers to use of telehealth which include: telehealth may not be appropriate for all service users, aspects of service such as physical examination and use of AT is difficult to replicate virtually, there can be difficulties associated with technology which may lead to an increased workload for service providers, and appropriate reimbursement systems may not currently exist for telehealth (Bezuidenhout et al., 2022; Eddison et al., 2021; Puli et al., 2021). The COVID-19 pandemic has increased the need to develop best-practice service delivery models that support development of telehealth for AT provision (Smith et al., 2021).

**Objective**

This paper presents information from a low resource setting on the adoption of telehealth services during a pandemic for rehabilitation and AT service delivery. The objective was to explore experiences of people accessing AT and rehabilitation services during the pandemic, and to assess the implementation, from the perspective of service users and providers, of telehealth service delivery.

**Methods**

A mixed-methods design combining analysis of clinical data and semi-structured interviews (see Supplementary file 1) was used. This design, and the subsequent richness that results from this type of analysis, is well suited to studies seeking to combine inductive and deductive methods (Kroll & Morris, 2009; Wisdom et al., 2012). The datasets used and analysed in the current study are available from MI. Ethical approval was granted by the management of MI, the rehabilitation and assistive technology service provider. Information about the study was given to all participants and written consent was taken from them before their interview. They were informed that they could choose to withdraw from the study at any time and that data would be handled confidentially.

A retrospective descriptive analysis of demographics and clinical characteristics of service users attending MI’s rehabilitation and AT services through telehealth or in-person mode for the period of May to October 2020 was completed. Services were grouped into five categories: 1) consultation, 2) therapy (predominantly physiotherapy assessment, reassessment, or intervention), 3) new AT, 4) AT repair and 5) follow-up. All service categories, except AT repair, were considered transferrable from in-person to telehealth mode. A comparison was undertaken between the number of appointments for these service categories before the COVID-19 pandemic, from October 2019 to February 2020.

Telehealth mode utilised WhatsApp, predominately, with a minority of services delivered using Skype. Service providers used smartphones, with accessories including Bluetooth headphones, a stand for holding the phone to enable product demonstration, dedicated space at the centre, and Wi-Fi connectivity to conduct telehealth mode. Prior to starting telehealth service delivery practice sessions were undertaken by all service providers. Through their experience they then prepared users and their family via phone in relation to technology and human support requirements for the telehealth session in advance. Usually for children with disabilities, two family members were needed to support the telehealth session. The process of new AT delivery was complex and challenging. Images and videos of AT products (example wheelchair, postural devices, prefabricated orthotics devices etc.) were prepared to share with users for the decision-making process, final prescription, and user training.

In addition, a random sample was drawn of five MI service users who availed of services through telehealth mode and four who availed of in-person services to complete an interview exploring their experiences of accessing MI services during the pandemic. If the selected service users were children, then the interview was conducted with their parent/guardian. The interview looked to gain information on understanding the ease, cost, and overall experience while using either mode of service delivery (i.e., telehealth or in-person), and willingness to continue using either of the modes as a standard option. Five MI service providers were also interviewed to gather their opinions on telehealth service delivery during the pandemic, and the challenges they faced while providing services to service users. The interview was conducted by the training associate of MI, and it was conducted via telephone with informed consent obtained from each participant before the start of the interview.

For the interview, a 5-point Likert scale was used for ascertaining satisfaction, ease of access to services; with one being lowest satisfaction or access, three being neutral, and five being highest satisfaction or access. A series of open-ended questions followed each Likert scale question to ascertain the reason for giving a particular rating. Keyword analysis was undertaken for open-ended questions. The interview was designed to capture responses that would help in understanding the difficulties faced while accessing services via telehealth mode or barriers to travel during lockdown to access in-person services. It also included questions to help understand the preferences for continuing to engage with telehealth services post lockdown or shifting from the telehealth mode to in-person mode post lockdown.

**Results**

*Service user demographics and modes of service delivery during the COVID-19 pandemic*

The comparative number of service users accessing services through either in-person or telehealth mode for May to October 2020 is presented in Table 1. The largest volume of telehealth services was in July and August 2020, at 17% and 11%, respectively, of monthly service users. For in-person services, there were more adult service users than children (59% v 41%), while most telehealth service users were children (≤ 18 years; 88%). For both modes of delivery, most service users lived in an urban area (81-97%), and most of the telehealth mode services were therapy services (90%). Detailed demographic characteristics of service users and the services they availed of, for in-person and offline mode MI rehabilitation and AT services, from May to October 2020 are provided in Supplementary file 2.

Table 1 near here

As the services began to resume after lockdown, the uptake was low in the initial month of May 2020 with numbers increasing in the following months. Telehealth services were launched in June 2020, to make services accessible to people in containment zones, and for people not able to travel due to travel restrictions. A detailed comparison of the number of appointments for MI rehabilitation and AT services before are during the pandemic are provided in Supplementary file 3.

For the telehealth mode of service delivery, 5 consultation sessions and 102 therapy sessions were held from May to October 2020. All 5 consultation sessions were for service users diagnosed with clubfoot, while for the therapy sessions the majority were undertaken for service users with cerebral palsy (68%). For the in-person mode of service delivery, 377 consultation sessions and 272 therapy sessions were held during this period. The majority of the consultation services were for people with cerebral palsy (15.38%), amputees (13.2%) and people with clubfoot (11.4%). A breakdown of the users’ medical conditions and the types of services availed of during this period, for both in-person and offline modes, is provided in Table 2 and 3, respectively.

Tables 2 and 3 near here

*Service users’ and providers’ experiences of service delivery during the pandemic*

Demographic information for the participants who completed the interviews is provided in Table 4. Three groups were examined: i) in-person service users, ii) telehealth service users, and iii) telehealth service providers.

Table 4 near here

*Experience with in-person/telehealth services*

*In-person service users*

All participants rated that they were very/extremely satisfied with their overall experience while using in-person services provided by MI. One service user stated that “*I was surprised to see arrangement made at clinic, with all doctors wearing PPE kits, only few patients were allowed in the clinic*”. All but one participant rated that it was extremely easy to attend the clinic, with all participants using their own vehicle to attend the clinic. The participant who rated ease of attending the clinic as “very difficult” stated, “*I was not able to find transport as the state boundaries were closed and they were not allowing people to come to Bangalore without pass*”. While one participant who rated ease of attending the clinic as extremely easy stated “*I took my son on bike and reached the clinic early morning, because of lockdown the roads were empty, we returned by afternoon as there was no traffic on road*”. Ease of understanding the information provided was rated by all participants as very/extremely easy. Three of the four service users stated that they would prefer to continue using in-person services. One service user stated, *“I don’t own a smartphone and I am not able to operate it, I have to use my son’s phone for using online platform and take his help to setup process, once my son goes back to his job I would not be using online service*”.

*Telehealth service users*

Four of the five service users were very/extremely satisfied with their overall experience of telehealth services, with one reporting that they were extremely dissatisfied due to network issues and difficulty in understanding. Four of the five participants reported that it was very/extremely easy to operate technology for the telehealth mode, with one service user rating that they were unsure and reported issues with placement of the device. Four of the five participants reported that it was very/extremely easy to understand the information provided, with one service user rating that it was extremely difficult to understand the instructions given by the service provider. When asked how likely they would be to use telehealth services again four stated that they would be very/extremely likely too; with one commenting on the positive aspect of telehealth services meaning no transportation costs to attend the clinic and no loss of pay due to not taking time off work to attend the clinic. One service user stated, “*I will not have to take leave from my work if I am using online mode. I will be using online mode even when lockdown is lifted*”. The service user who reported difficulties in understanding stated that due to this negative experience that they would not use telehealth services again.

*Telehealth service providers*

All interviewed service providers rated that they were very satisfied with their overall experience of service delivery via telehealth mode, with commonly reported barriers of poor internet network connectivity, issues with placement of camera by service users and background disturbance. All the service providers rated the use of telehealth service delivery platforms as easy/extremely easy. When asked how easy it was to explain information to service users, responses ranged from easy to extremely easy. Two service providers mentioned issues while explaining exercises via telehealth mode. One service provider stated, *“It is easy to demonstrate exercise using props, some difficulty is faced while explaining the exercises to caregivers of children… many times the camera placement is not appropriately placed…”.* When asked about preference to continue providing telehealth services, two expressed the preference to continue providing telehealth services, with three preferring to continue with in-person mode. They stated that they had learnt techniques to effectively deliver services through telehealth mode, but also that many patients had a preference for in-person services. One service provider stated, “*I learned from the internet how to deliver online services more effectively and thus can work on in-person mode or online mode without much difficulty*”. Another stated, *“Most patients have asked me when can they start visiting clinic back again, the network issues, and limited knowledge of patients to handle video calls makes online service delivery difficult, thus he prefers in-person mode”.* Two service providers reported that less time was required for telehealth mode compared to in-person mode, while the other three reported that telehealth mode made it difficult to complete all exercises in time.

*Financial costs*

Telehealth service users reported that they had to pay money for phone data credit exclusively for availing of telehealth services and that they saved money on fuel/transport costs. When asked about expenses incurred while accessing in-person services, all service users mentioned travel costs and one mentioned loss of pay. Reported costs incurred for travelling to attend their in-person mode service was less than ₹500 for three of the service users and more than ₹1000 for one service user.

**Discussion**

This study explored AT and rehabilitation service provision during the COVID-19 pandemic in a low resource setting, from the perspective of services users and providers, and assessed implementation of telehealth service delivery. It is the first study, to our knowledge, from a low resource setting to present the experience of AT and rehabilitation care providers and to capture the experiences of service users.

While MI remained open during the pandemic the volume of service users during the period of May to October 2020 was much lower than before the pandemic. MI’s approach to in-person consultations during the pandemic was in line with actions taken across the sector; for example, limiting in-person visits to prescheduled appointments, implementing social distancing norms across the clinic, all the staff was provided with personal protective equipment. With telehealth identified as a valuable option to enable continued AT and rehabilitation service provision (Wittmeier et al., 2016), MI implemented telehealth services in June 2020. The challenges presented to MI by the COVID-19 pandemic for providing AT and rehabilitation service accelerated the adoption of the telehealth mode of service delivery. Though the transfer of all the services provided by MI to telehealth mode delivery is not possible, transfer of therapy sessions and consultations was accepted by service users and the majority of the interviewed telehealth service users who reported wanting to continue telehealth mode delivery when restrictions were lifted. However, the interviewed service providers reported that many service users had indicated a preference for returning to in-person services. There was a low adoption amongst service users for the telehealth mode of delivery. While there are several factors that could have contributed to this, we postulate that it could be attributed to the novelty of this mode and therefore potential perceived need for technical expertise (Sanders et al., 2012). Another factor could be a lack of access to technology, as one service user stated not owning a smartphone.

Findings from this study were consistent with those reported in a recent survey assessing AT use and provision during the COVID-19 pandemic (Smith et al., 2020); specifically related to the requirement for training for telehealth consultations for service users and providers and barriers related to the internet access. From the service user interviews it is evident that a “one size fits all” approach to implementing AT and rehabilitation telehealth services is not appropriate; barriers like access to smartphones, lack of skills to operate smartphones, and issues with internet quality indicate the need for an individualised approach. In addition, it is important to consider that telehealth consultations are not appropriate for all patient groups (Eddison et al., 2021). It is also important to take into account that service providers will need time to develop their skills for the delivery of telehealth services (Smith et al., 2020). Although it might be considered intuitive that a telehealth consultation would reduce costs to services users, for example through removal of transportation costs, our study showed that the service users had an additional cost for data credit to avail of telehealth delivery mode. Prefabricated orthotics devices and basic wheelchair service provision was possible through telehealth mode, however, there were limitations to user training when there were being introduced with new AT. More in-depth studies are required to determine which users and what type of assistive devices should be considered for delivery through telehealth services. This potential barrier should be considered when planning the implementation of telehealth services in low resource settings.

It is reported that remote provision of rehabilitation services is not matured. There are challenges related to human, organisational and technological factors impacting the further development of telehealth services especially in low resource settings (Leochico et al., 2020). The findings from this study highlight the need for further exploration, addressing key stakeholder’s challenges especially in the context of low resource settings where Tele AT and telerehabilitation are underdeveloped. It should be considered to implement global health and development agendas like the World Health Organisations rehabilitation 2030 call to action and policy brief (World Health Organization, 2020) for advancing and strengthening health systems for rehabilitation and assistive technology services.

The limitations of this study include the small sample size of service users’ and providers who completed the interviews; additional larger scale research is needed to further understand experiences of people accessing and providing services via telehealth and to provide recommendations for best practice for telehealth service delivery. Information on socio-economic status of the service users who utilised telehealth mode was not collected; this is important as low socioeconomic status is known to be a barrier to telehealth (Kontos et al., 2014).

**Conclusion**

Findings from this study showed that certain types of AT and rehabilitation services can be successfully delivered via a telehealth consultation in a low resource setting. It is a viable alternative cost-effective method to improve access to AT and rehabilitation services. However, there are barriers to the delivery of telehealth services that need to be considered and addressed to allow successful implementation, and it is important to consider that telehealth consultations are not suitable for all patient groups.

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