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Original Research Article

Use of tele-health and telemedicine interventions for the prevention and management of COVID-19: providers' and users' perspective from Nepal

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ABSTRACT

Background: The COVID-19 pandemic disrupted routine healthcare services worldwide, including in Nepal. To ensure continuity of healthcare delivery during lockdowns and movement restrictions, telemedicine and telehealth services were widely adopted. This study explored the implementation, strengths, challenges, and perceived effectiveness of telemedicine and telehealth interventions for the prevention and management of COVID-19 in Nepal.
Methods: A cross-sectional mixed-methods study was conducted among 10 governmental and non-governmental organizations providing telemedicine services. Data were collected from 15 purposively selected healthcare providers and 20 randomly selected service users using semi-structured interviews, structured questionnaires, observation checklists, and record reviews. Quantitative data were analyzed descriptively, while qualitative data were analyzed using thematic analysis.
Results: Telemedicine ensured continuity of healthcare services through telephone calls, text messaging, video consultations, hotlines, and social media platforms. Participants reported improved access to healthcare, timely referrals, follow-up services, reliable health information, psychosocial support, and reduced travel-related costs. Service users expressed positive perceptions regarding the accessibility, affordability, and convenience of telemedicine services. Major challenges included inadequate patient recording and follow-up systems, shortages of trained personnel, poor internet connectivity, lack of standardized protocols, dependence on donor funding, and limited access in rural areas.
Conclusions: Telemedicine played a critical role in maintaining essential healthcare services during the COVID-19 pandemic in Nepal. Strengthening digital infrastructure, standardized guidelines, patient information systems, sustainable financing, and workforce capacity is essential for integrating telemedicine into routine healthcare and future public health emergency preparedness.

Keywords: COVID-19, Digital health, Health service delivery, Telehealth, Telemedicine

INTRODUCTION

The emergence of the coronavirus disease 2019 (COVID-19) pandemic resulted in an unprecedented global public health crisis, causing substantial morbidity, mortality, and socioeconomic disruption worldwide. Recognizing the severity and rapid international spread of the disease, the World Health Organization (WHO) declared the outbreak a Public Health Emergency of International Concern (PHEIC) on 30 January 2020 and subsequently characterized it as a pandemic on 11 March 2020.[1,2] In response, the Government of Nepal implemented a series of stringent public health measures, including nationwide lockdowns, international border closures, suspension of domestic and international flights, and restrictions on population movement. Although these interventions were essential for reducing viral transmission, they also caused

significant disruptions to the delivery and utilization of routine healthcare services throughout the country.[3,4]

To strengthen the national response to the pandemic, the Ministry of Health and Population (MoHP) introduced the Health Sector Emergency Response Plan, which included quarantine management, risk communication, contact tracing, disease surveillance, point-of-entry screening, laboratory capacity strengthening, hospital preparedness, referral mechanisms, and emergency response coordination.[3] Despite these comprehensive measures, the rapid increase in COVID-19 cases placed considerable pressure on Nepal's healthcare system and challenged its capacity to sustain both emergency and essential health services.[3]

Globally, the COVID-19 pandemic severely affected the provision of routine healthcare services, and Nepal was no exception.[5,6] Essential health services, particularly those targeting vulnerable populations such as pregnant women, newborns, and individuals with chronic health conditions, experienced substantial disruptions.[6] The continuity and quality of healthcare services were further compromised by fear of infection among patients, shortages of appropriate personal protective equipment (PPE), and increased occupational risks faced by healthcare workers.[5-7] Furthermore, limited healthcare resources and infrastructure meant that only a small number of designated hospitals were able to manage COVID-19 patients. Simultaneously, the Government of Nepal faced considerable challenges in maintaining essential health services while responding to the growing demands of the pandemic. Additional constraints included the management of quarantine and isolation centers, mobilization of healthcare professionals, including physicians and nurses, and ensuring the uninterrupted supply of laboratory consumables, medical equipment, and PPE.[3]

Fear of contracting COVID-19 discouraged many individuals from seeking healthcare services at hospitals and health facilities, resulting in reduced utilization of essential healthcare services. Under these circumstances, telemedicine emerged as an important strategy to support healthcare delivery by facilitating disease prevention, clinical consultation, and continuity of care while minimizing physical contact.[8] The provision of routine healthcare services is often challenging during public health emergencies, natural disasters, and epidemics due to disruptions in health systems and population mobility.[9] Therefore, innovative and technology-enabled healthcare approaches have become increasingly important in ensuring continuity of care and addressing the healthcare needs of affected populations during such crises.[10]

Telemedicine, involves the delivery of healthcare services through information and communication technologies (ICT), including telephone consultations, videoconferencing, email, and mobile health applications.[11,12] These technologies facilitate remote consultation, diagnosis, treatment, monitoring, storage and transmission of health information through audio, text, and images, as well as communication, education, and training among healthcare professionals.[11,12] During the COVID-19 pandemic, telemedicine played a crucial role in maintaining physical distancing while ensuring continuity of healthcare services, thereby reducing the risk of disease transmission associated with face-to-face consultations.[13]

In Nepal, telemedicine services were formally introduced nearly two decades ago.[14] However, the COVID-19 pandemic significantly accelerated their adoption and institutionalization. During the pandemic, the Ministry of Health and Population developed the Guideline on Telemedicine and Online Health Services and the Standard Operating Procedure for Telemedicine Services to promote the standardized implementation of telemedicine and e-health services across the country. Telemedicine reduced the burden on healthcare facilities, improved access to essential health services, and minimized the risk of person-to-person transmission of infectious diseases by limiting unnecessary physical interactions.[13,15] Consequently, telemedicine emerged as an effective, accessible, and cost-efficient approach for maintaining healthcare service delivery during the COVID-19 pandemic, particularly in settings where conventional healthcare access was severely constrained.[9,13,16]

METHODS

Study design and setting

A cross-sectional study employing a mixed-methods approach was conducted to explore the implementation of telemedicine and telehealth services during the COVID-19 pandemic in Nepal. The study was carried out among governmental and non-governmental organizations that were implementing telemedicine and telehealth services, particularly for the prevention, diagnosis, management, and follow-up of COVID-19 cases. Data were collected through field visits to the selected organizations where telemedicine services were being provided. The study was conducted from November, 2021 to February 2022.

Study population and sampling

The study population comprised healthcare providers involved in the management and implementation of telemedicine and telehealth services and service users who had utilized these services during the COVID-19 pandemic. Among approximately two dozen organizations providing telemedicine and telehealth services in Nepal, ten organizations were purposively selected based on their active involvement in COVID-19-related telemedicine service delivery. From these organizations, 15 key informants responsible for the management or coordination of telemedicine services were selected purposively. In addition, 20 service users were selected through simple random sampling from the service user records maintained by the respective organizations to

explore their experiences and perspectives regarding telemedicine services.

Inclusion criteria

Healthcare providers directly involved in the planning, coordination, implementation, or management of telemedicine and telehealth services during the COVID-19 pandemic were included in the study. Service users who had received telemedicine or telehealth services from the selected organizations during the study period were also included.

Exclusion criteria

Individuals who were unwilling to participate or unable to provide informed consent were excluded from the study.

Data collection tools and techniques

Data were collected using both qualitative and quantitative methods. Semi-structured interview guides were used to conduct face-to-face interviews with healthcare providers to explore their experiences, perceived strengths, challenges, and recommendations regarding telemedicine implementation during the COVID-19 pandemic. Service users were interviewed using a structured questionnaire to obtain information regarding their experiences and perceptions of telemedicine services.

In addition, an observation checklist was used to assess the availability and operational status of telemedicine facilities, while record review was conducted to examine service utilization trends and the characteristics of telemedicine users. The principal investigator personally visited each selected organization to conduct interviews, complete observations, and review relevant records. The interview guides, questionnaires, and observation checklist were developed following an extensive review of the literature and consultation with experts in telemedicine, digital health, and public health research. The tools were pretested before data collection, and necessary modifications were made to improve clarity, relevance, and consistency.

Validity and reliability

Content validity of the study instruments was established through expert review by specialists in public health, digital health, and research methodology. The data collection tools were pretested in a similar setting outside the study sites, and appropriate revisions were made based on the findings. Standardized interview guides and observation checklists were used throughout the study to ensure consistency in data collection. Interviews were conducted by the principal investigator using uniform procedures to enhance the reliability and credibility of the findings.

Data analysis

Quantitative data were checked for completeness, coded, entered, and analyzed using Statistical Package for the Social Sciences (SPSS) version 26. Descriptive statistics, including frequency, and percentage, were used to summarize the quantitative findings. Qualitative interviews were audio-recorded with participants' permission, transcribed verbatim, and reviewed for accuracy. The transcribed data were analyzed using a thematic analysis approach. The transcripts were read repeatedly to achieve familiarization with the data, followed by coding, categorization, identification of emerging themes, and interpretation of findings. Quantitative and qualitative findings were integrated during interpretation to provide a comprehensive understanding of telemedicine implementation during the COVID-19 pandemic.

Ethical consideration

Ethical approval for the study was obtained from the Ethical Review Board of Nepal Health Research Council. Formal permission was obtained from the respective governmental and non-governmental organizations included in the study. Informed consent was obtained from all study participants after explaining the objectives, procedures, potential benefits, and voluntary nature of participation. Participants were assured of confidentiality and anonymity, and personal identifiers were removed during data analysis and reporting. Participants were informed of their right to refuse participation or withdraw from the study at any stage without any consequences.

RESULTS

Purpose of initiating telemedicine and telehealth services and modes of service delivery

The study finding shows that telemedicine and telehealth services were introduced as an alternative approach to ensure continuity of healthcare delivery during the COVID-19 pandemic. Nationwide lockdowns, travel restrictions, and fear of infection substantially limited patients' ability to access healthcare facilities. In response, the Ministry of Health and Population (MoHP) prioritized telemedicine and telehealth as an essential strategy for maintaining access to healthcare services while minimizing the risk of disease transmission.

Participants explained that telemedicine facilitated clinical consultation, referral, follow-up, and continuity of treatment, particularly for individuals residing in remote and underserved areas where transportation barriers and geographical isolation limited access to specialist care. A medical doctor from Karnali Provincial Hospital highlighted the value of telemedicine for rural populations by describing the following experience:

"...the patient was seriously suffering from the skin infection and was unable to travel for treatment because of the lockdown and financial constraints. The local health worker connected the patient with the provincial hospital telemedicine center. A dermatologist examined the patient's condition through video consultation, prescribed appropriate medications, and after one month of treatment the patient recovered."

Telemedicine services were delivered through multiple communication platforms, including telephone calls, text messaging, and audio-visual consultations. Audio consultation was the most commonly used modality because it was simple, widely accessible, and required minimal technological resources. Telephone and mobile phone consultations were frequently used for medication, counseling, follow-up care, management of minor illnesses, and for providing COVID-19 related information.

From observation and review of the documents it shows that both government and private organizations have introduced several digital platforms during the pandemic to disseminate COVID-19-related information and provide remote consultation services. The Ministry of Health and Population utilized mobile applications, official social media platforms, push notifications, caller tunes, and regular national media briefings to communicate updated information on COVID-19 prevention, and management. Participants reported that these initiatives played an important role in reducing misinformation and improving public awareness.

A government official explained that dedicated telephone hotlines and Interactive Voice Response (IVR) systems were established to expand access to health information. Hotline "1145" primarily provided psychosocial counseling, whereas hotlines "1133" and "1115" delivered COVID-19-related information, referral support, and preventive guidance. The IVR system offered automated responses to frequently asked questions, enabling rapid dissemination of standardized health information. Private organizations also expanded telemedicine services through social media platforms and publicly shared healthcare providers' contact information to improve access to medical consultation. Several organizations established 24-hour psychosocial counseling helplines using telephone and video communication platforms, providing psychological support to both patients and healthcare workers. Participants further reported that telemedicine improved coordination between healthcare facilities and local organizations, facilitated referral services, and enabled patients to identify hospitals providing COVID-19-related care.

Teams involved in telemedicine service delivery

Telemedicine services during the COVID-19 pandemic were delivered through collaborative efforts of both government and private sectors. Private organizations largely relied on voluntary contributions from multidisciplinary teams comprising physicians, nurses, paramedics, psychologists, and other healthcare professionals, with most consultation services provided free of charge.

Government-led telemedicine services were primarily coordinated by the Ministry of Health and Population through national hotline services, particularly hotline numbers "1115", "1133", and "1145". These services supported health information dissemination, patient counseling, case management, contact tracing, referral coordination, and psychosocial support. Participants reported that approximately 500,000 individuals were contacted through hotline "1115" for case management, follow-up, and health counseling during the pandemic. Hotline "1145" mainly focused on providing psychosocial counseling and mental health support.

Service users' perspectives

Twenty service users participated in the study. Most participants were between 30 and 45 years of age and were residents of urban areas. Participants reported that they heard about the telemedicine and telehealth services through friends and relatives, healthcare workers, official social media platforms, particularly "Facebook", and other online information sources.

Service users consistently reported experiencing an "infodemic" during the pandemic, characterized by widespread misinformation and difficulty in identifying reliable health information. Consequently, many sought telemedicine services to obtain accurate information regarding COVID-19 symptoms, treatment, quarantine, isolation, and the availability of healthcare facilities.

Participants explained that telemedicine enabled them to consult healthcare providers while remaining in home, isolation or quarantine. They found it convenient to discuss their symptoms, receive medical advice, and obtain guidance without visiting healthcare facilities. Many participants emphasized that telemedicine became the only feasible means of communicating with doctors and with other healthcare professionals during periods of strict lockdown. One participant who received psychosocial counseling through a government hotline described its positive impact:

"...I was admitted to the isolation ward during COVID-19 infection. I had no one with whom I could share my feelings and the problems I was experiencing. Therefore, I called the hotline number. I was very happy because I received psychological support and all the information that I was looking for."

Participants appreciated that telemedicine consultations were provided free of charge, allowing them to receive healthcare services from their homes while avoiding unnecessary travel and potential exposure to COVID-19.

Overall, service users expressed positive perceptions regarding the accessibility, affordability, and usefulness of telemedicine during the pandemic.

Challenges faced by telemedicine service providers and users

Both healthcare providers and service users identified several challenges affecting the implementation and effectiveness of telemedicine services. A commonly reported concern was the absence of a comprehensive patient recording and follow-up system, which required patients to repeatedly describe their medical history during each consultation and limited continuity of care.

Participants also reported irregular service availability, delayed responses, and inadequate communication resulting from poor internet connectivity. Healthcare providers highlighted shortages of trained human resources, high staff turnover, and dependence on donor-funded projects as major barriers to long-term sustainability. The absence of standardized clinical guidelines and standard operating procedures resulted in inconsistencies in service delivery across organizations.

Technical challenges, including unstable internet connectivity and poor network coverage, reduced the quality of audio and video consultations, particularly in rural and geographically remote areas. Participants further reported that prank or unnecessary calls occasionally overloaded hotline services, reducing access for individuals with genuine healthcare needs. Moreover, telemedicine services were concentrated mainly in urban settings, limiting equitable access for populations living in remote communities.

Strengths of telemedicine services and recommendations for improvement

Participants identified several strengths of telemedicine and telehealth services during the COVID-19 pandemic. These services provided timely and reliable health information, maintained access to healthcare during lockdowns, reduced unnecessary hospital visits, and minimized travel-related expenses, including transportation, accommodation, and food costs. Telemedicine was particularly valuable for patients with COVID-19 by facilitating early consultation, strengthening referral and case management systems, reducing stigma associated with the disease, and improving access to psychosocial and mental health support. Participants also believed that telemedicine contributed substantially to increasing public awareness and confidence regarding COVID-19 prevention and management.

To strengthen telemedicine services in Nepal, participants recommended the development and implementation of standardized operating procedures and national clinical guidelines, establishment of comprehensive electronic patient recording and follow-up systems, allocation of regular government funding to ensure sustainability, recruitment of dedicated telemedicine personnel, and strengthening of digital infrastructure, particularly reliable internet connectivity. Additional recommendations included regular capacity-building and training for telemedicine providers and call center staff, expansion of telemedicine services to underserved rural areas, and implementation of advocacy and public awareness campaigns to improve community acceptance and utilization of telemedicine services.

DISCUSSION

This study explored the implementation, strengths, challenges, and perceived effectiveness of telemedicine and tele-health services introduced during the COVID-19 pandemic in Nepal. The findings demonstrate that telemedicine emerged as an important strategy to ensure continuity of essential healthcare services when lockdowns, travel restrictions, and fear of infection significantly limited access to health facilities. These findings are consistent with global evidence suggesting that telemedicine became an essential component of healthcare delivery during the COVID-19 pandemic by improving access to care while minimizing the risk of disease transmission.[8,13]

The primary purpose of introducing telemedicine and telehealth program during COVID-19 was to maintain healthcare service delivery during movement restrictions. Participants emphasized that telemedicine served as an alternative pathway for consultation, referral, follow-up, and dissemination of accurate health information. Similar findings also show that telemedicine service was rapidly adopted to reduce face-to-face consultations and ensuring continuity of essential healthcare services during the pandemic.[5,8,9] The case presented by a physician from provincial hospital further shows the practical value of telemedicine in geographically remote areas where transportation barriers and financial constraints traditionally limit the access to specialist care. This finding supports previous research conducted in Nepal, which identified telemedicine as an effective strategy for improving healthcare accessibility in rural and mountainous regions.[14]

The study found that audio-based communication, primarily through mobile phones and telephone calls, was the most frequently used modality of telemedicine during the pandemic. Although video consultation has become increasingly common in high-income countries, Nepal's reliance on telephone-based consultations reflects the country's digital infrastructure, internet limitations, and widespread ownership of mobile phones. Similar observations have been reported by the World Health Organization, which noted that low- and middle-income countries frequently utilize basic communication technologies because they are affordable, accessible, and easier to implement than sophisticated telemedicine

platforms.[12] Similarly, the extensive use of hotline services, Interactive Voice Response (IVR), mobile applications, and social media further demonstrates how existing communication technologies can be effectively integrated into national emergency health responses.

Another important finding of this study is the collaborative role played by both government and private sectors in delivering telemedicine services. Government-led services mainly focused on surveillance, case management, referral, and dissemination of COVID-19 information, whereas private organizations relied largely on voluntary participation of doctors, nurses, psychologists, and other healthcare professionals to provide consultation and psychosocial support at free of cost. Such public-private collaboration enabled rapid expansion of telemedicine services during the public health emergency. Similar collaborative approaches have been reported in other countries during the COVID-19 pandemic, where governments, professional organizations, academic institutions, and private healthcare providers jointly implemented telehealth services to ensure continuity of healthcare delivery.[5]

The experiences shared by service users shows that telemedicine was widely accepted and perceived as highly beneficial during the pandemic. Participants appreciated receiving healthcare services from their homes without incurring transportation or consultation costs, particularly during periods of lockdown. These findings are consistent with previous studies reporting high patient satisfaction with telemedicine because of its convenience, accessibility, and reduced travel-related expenses.[5,17] Furthermore, participants indicated that telemedicine and tele-health services helped to overcome the widespread "infodemic" experienced during COVID-19 by providing timely, accurate, and reliable information directly from healthcare professionals. During the pandemic, misinformation circulated rapidly through social media, generated confusion and fear among the general public. Consequently, telemedicine hotlines served not only as clinical consultation platforms but also as trusted sources of evidence-based public health information.

Mental health support emerged as another significant contribution of telemedicine during the pandemic. Dedicated psychosocial counseling hotlines enabled patients experiencing isolation, fear, anxiety, and psychological distress to receive timely counseling and emotional support. Similar study findings also show that telemedicine and telehealth effectively reduced the psychological burden associated with COVID-19 while expanding access to mental health services.[16] Given the shortage of mental health professionals in Nepal, integrating tele-mental health services into routine healthcare and emergency preparedness plans could substantially strengthen mental healthcare accessibility in the future.

Despite these strengths, several important challenges limited the effectiveness and sustainability of telemedicine and tele-health services. One of the most frequently reported challenges was the absence of standardized patient recording systems and follow-up mechanisms. Consequently, patients were often required to repeatedly explain their medical history during each consultation, reducing continuity and efficiency of care. Similar barriers have been reported internationally, where fragmented health information systems and lack of integration between telemedicine platforms and electronic health records hinder continuity of patient management.[12] Human resource constraints also affected service delivery. Many telemedicine initiatives depended on temporary staff, volunteers, or donor-funded projects, raising concerns regarding long-term sustainability. Participants highlighted the shortages of dedicated telemedicine personnel and limited training opportunities for healthcare providers. Other study also supports that the developing countries usually face the workforce-related challenges as well as the telemedicine programs have to rely on short-term external funding and lack institutional integration into routine health services.[11]

Technical limitations, including unstable internet connectivity, poor network coverage, interrupted communication, and inadequate digital infrastructure, further constrained service quality, particularly in rural and remote areas. Nepal's difficult topography continues to present significant barriers to equitable digital healthcare delivery. Similar study finding also shows that poor technological infrastructure as one of the principal barriers to successful telemedicine implementation during the COVID-19 pandemic.[13] Therefore, strengthening internet connectivity, expanding broadband infrastructure, and improving digital literacy should be prioritized to improve equitable access to telemedicine services nationwide.

The concentration of telemedicine services in urban areas also raises concerns regarding equity in healthcare access. Although telemedicine has considerable potential to reduce geographical barriers, unequal access to internet services, digital technologies, and smartphones may inadvertently widen health disparities between urban and rural populations. Future telemedicine policies should therefore prioritize underserved and remote communities by strengthening digital infrastructure, increasing public awareness, and integrating telemedicine into primary healthcare services. Participants recommended developing comprehensive national standard operating procedures, strengthening patient recording and follow-up systems, ensuring sustainable government financing, recruiting dedicated telemedicine personnel, improving technical infrastructure, and increasing public awareness regarding telemedicine services. These recommendations closely align with the World Health Organization's guidance, which emphasizes that successful and sustainable telemedicine implementation requires strong governance, appropriate regulatory frameworks, workforce development, standardized clinical protocols, sustainable

financing mechanisms, and integration with national health information systems.[12]

CONCLUSION

Overall, the findings indicate that telemedicine proved to be an effective and acceptable strategy for maintaining essential healthcare services during the COVID-19 pandemic in Nepal. Beyond the pandemic, telemedicine has significant potential to strengthen routine healthcare delivery, particularly for rural populations, chronic disease management, specialist consultations, mental healthcare, and emergency preparedness. However, realizing this potential will require sustained government commitment, investment in digital infrastructure, standardized operational guidelines, capacity building of healthcare professionals, and integration of telemedicine into Nepal's national healthcare system rather than continuing as isolated project-based initiatives. Such efforts would contribute to build a more resilient, equitable, and digitally enabled health system capable of responding effectively to future public health emergencies.

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