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REVIEW ARTICLE

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# Utility of telemedicine in sub-Saharan Africa during the COVID-19 pandemic. A rapid review

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## Abstract

Telemedicine is the use of technology to achieve remote care. This review looks at the utility of telemedicine during the pandemic, period March 2020 to February 2021. Eleven articles met inclusion criteria. There was moderate use of telemedicine in sub-Sahara Africa during the pandemic, however, there were also some limitations. Benefits of telemedicine include continuing medical service provision, connecting relatives with loved ones in quarantine, education, and awareness of mental health issues, and toxicovigilance and infection control. Challenges to the implementation of telemedicine on the continent were lack of supporting telemedicine framework and policies, digital barriers, and patient and healthcare personnel biases. To address these challenges, this article proposes the development of policy frameworks that fosters telemedicine use by all stakeholders, including medical insurance organizations, the introduction of telemedicine training of medical workers, educational awareness programs for the public, and improvement of digital platforms access and affordability.

**KEYWORDS**
rapid review, telemedicine, utility

## 1 | INTRODUCTION

The emergence of coronavirus infection and the rapid spread of the disease in December 2019 in Wuhan, Hubei province of China stirred global public health concerns (Rothan & Byrareddy, 2020; Zhou et al., 2020). In early 2020, research indicated that the virus had a human-to-human spreading capacity (Shereen et al., 2020). The Chinese authorities responded to the epidemic in Hubei Province by instituting a raft of restrictive measures, such as isolation and quarantine of infected and affected individuals, lockdowns of cities to mitigate the spread of the virus. The success of these restrictive measures in breaking the transmission cycle of the virus in Hubei coupled with the continuous rise in global cases and lack of effective medical and pharmaceutical interventions during the initial phases of the pandemic forced other nations to adopt restrictive measures to mitigate the spread of the virus (Lai et al., 2020). Sub-Saharan Africa (SSA) recorded its first case of coronavirus infection on 28th February 2020 (Mbunge, 2020a) and by the 1st of April 2020, 43 countries had registered their first cases and since then all 46 nations have reported cases and deaths due to COVID-19. As of 26 March 2021 SSA, had recorded 74,635 deaths and a cumulative number of cases reaching 2,916,328. The continent model response to the rapid spread of the pandemic was based on the successful restrictive model of China plus the implementation of travel restrictions, large-scale social distancing including lockdowns (Chen et al., 2020; Lai et al., 2020). Despite bringing success in ameliorating the spread of coronavirus infections, these restrictive measures brought with them unintended consequences such as exacerbating the inequalities in health delivery (Chitungo, Mhango, Mbunge, et al., 2021) and disparities already existing in the sub-Saharan African region (Chitungo, Mhango, Chitungo and Dzinamarira, 2021).

The restrictive measures coupled with fear among citizens of acquiring the infection from medical centers which had become epic

  

centers for diagnosis and management of people infected by coronavirus limited access for other health conditions. Some countries on the continent adopted telehealth and other digital technologies to increase medical health access for their people (Chitungo, Mhango, Dzobo, et al., 2021; Mbunge, 2020b). Telehealth (or telemedicine) is defined as delivery of healthcare services, where distance is a critical factor, by all healthcare professionals using information technologies for the exchange of valid information for the diagnosis, treatment, and prevention of disease and injuries, research, and evaluation and the continuing education of healthcare providers, all in the interests of advancing the health of individuals and their communities (Garfan et al., 2021). The rapid technological advancements have revolutionized the medical landscape allowing its expansion out of the traditional healthcare facility, such as consultation rooms, clinics, and healthcare facilities by making use of information technology and overcoming barriers posed by geographical locations leading to the birth of telemedicine (Srinivasan et al., 2020). Employing telemedicine promotes accessibility through flexibility, convenience, and reduced financial constraints in utilizing general and specialized care (Scott Kruse et al., 2018). Thus, telemedicine is useful during disasters and the current pandemic to reduce health delivery inequalities, allowing for remote consultation, monitoring, and management of chronically ill patients (Romanick-Schmiedl & Raghu, 2020). Thus, telemedicine can be used for continuous management and as a safe and effective alternative to physical clinician-patient care (Portnoy et al., 2020).

## 2 | CONTRIBUTION OF THE STUDY

Several studies including Blandford et al. (2020), Mbunge et al. (2021), Dodoo et al. (2021), Galle et al. (2021) and Lam et al. (2021) noted that many countries adopted digital health technologies and some still piloting telemedicine to improve access and quality of healthcare services delivery during the pandemic to reduce transmission by observing COVID-19 social and physical distancing guidelines. However, despite the progress made toward the adoption and utilization of telemedicine technologies such as tele-education, teleconsultation (Bitar & Alismail, 2021), tele-pharmacy, tele-laboratory (Kamulegeya et al., 2020), teledermatology, teleradiology, telecardiology, tele-ophthalmology, tele-neurology, telerehabilitation, tele-oncology, and telepsychiatry, little is known pertaining the adoption, success, and impediments hindering the utilization of telemedicine in sub-Saharan Africa, especially during the pandemic. For instance, Bakibinga-Gaswaga et al. (2020) conducted a review of digital technologies that could be utilized to tackle COVID-19 in sub-Saharan Africa. In addition, Mars (2013) also conducted a review of barriers hindering the adoption of telemedicine in Africa. Blandford et al. (2020) highlighted opportunities for integrating telehealth in health systems during and beyond the pandemic. Also, Abdel-Wahab et al. (2020) highlight the general opportunities and challenges of the adoption of telehealth during the pandemic. Even though these studies reflect on the general application of telemedicine technologies in health systems, there is a need for a comprehensive review of the utilization of telemedicine to address healthcare disparities and inequalities exacerbated by the pandemic in sub-Saharan Africa. Therefore, this study aimed at analyzing current issues on leveraging telemedicine technologies in the management of chronic conditions during the COVID-19 pandemic, to improve care in SSA, while introspecting at their success and implementation challenges. Furthermore, the study outlines policy recommendations to tackle implementation challenges in defined communities in sub-Saharan Africa. Thus, the study sought to achieve the following objectives:

- Identify telemedicine technologies applied to improve care in different application domains in various sub-Saharan Africa during the pandemic.
- Analyze success and implementation challenges faced by sub-Saharan Africa countries to implement telemedicine technologies during the pandemic.
- Outline policy recommendations to address implementation barriers and challenges.

## 3 | METHODS

The study adopted rapid review to search, identify, select and critically synthesize published literature from various electronic databases guided by the research objectives. The search and selection of relevant literature were guided by the search terms, and screening process, as illustrated in the following subsections.

### 3.1 | Search terms and databases

A rapid review was conducted on 6–30 April 2021. We searched PubMed, Google Scholar, and EBSCOHost Web (Academic Search Complete, CINAHL Complete, MEDLINE with Full Text, CINAHL with Full Text, ScienceOpen), and WHO Global Database for eligible studies. We also searched for pre-prints on the medRxiv database. We searched for reports, reviews, and primary observational studies (case–control, case-cross-over, cross-sectional, and cohort). The search terms were: (“short message service (SMS)” OR “smartphone application” OR “telephone” OR “web-based systems” OR “telemedicine” OR “e-health” OR “telehealth” OR “electronic health) AND ( “use” OR “utilization “OR “adoption” OR “implementation” OR “adapt” OR “influence”) AND (“COVID-19” OR “coronavirus” OR “pandemic” OR “SARS-CoV-2”) AND (“Africa” OR “sub-Saharan Africa” OR “African countries” OR “Country name”). We employed Boolean terms, AND and OR were to separate the keywords. We identified relevant studies published within the period February 2020 to 31 March 2021.

### 3.2 | Screening process

Two researchers (IC and MM) screened the articles independently. Differences in screen results at the full-text stage were resolved by

discussion. The review focused on all studies that reported utilization of Telemedicine in SSA between the period from 1 February 2020 to 31 March 2021. The study excluded all articles that did not report utilization of telemedicine, reported utilization of telemedicine outside the SSA region and outside the period from February 2020 to March 2021.

### 3.3 | Data abstraction and analysis process

One researcher (MM) abstracted data from the included studies. The data abstraction form extracted information on the first author, title, discipline, mode of telemedicine delivery, reported successes, and challenges from the included studies. Thereafter, data were collated and summarized in a narrative format.

## 4 | RESULTS

Our initial keyword database search found 1748 potentially eligible articles. Results from each database search are presented in Table 1. Following title screening, 149 articles were eligible for inclusion in abstract screening. Of the 149 articles, nine duplicates were removed. Sixty-one articles were eligible for full-text screening after abstract screening. Fifty articles were excluded as not meeting the inclusion criteria and 11 articles were included in the final narrative review for data extraction.

### 4.1 | Characteristics of the included articles

The characteristics of articles included in the data extraction process are shown in Table 2. All the included articles reported utilizing telemedicine/telehealth in sub-Sahara Africa during the COVID-19 outbreak. Out of the 11 studies reported, three utilized telemedicine in South Africa, two in Nigeria, and the remaining were from Uganda, Zimbabwe, Mozambique, Cameroon, Tanzania, and Kenya. All these studies were reported in 2020 during the COVID-19 outbreak. Two articles were cross-sectional surveys (Armand et al., 2021; Feldman et al., 2021), one was a randomized controlled trial (Owolabi et al., 2020), one was a news article (Adebayo et al., 2020), one was a narrative review from Kenya (Jaguga & Kwobah, 2020), two were observational studies (Adebayo et al., 2021; Nlemadim et al., 2021), two were letters (Balme et al., 2020; Moolla et al., 2020), one was a commentary (Kamulegeya et al., 2020) and the other one was a retrospective and prospective analysis (Moyo & Madziyire, 2020).

### 4.2 | Study findings

Eleven articles were included in the data extraction and narrative summary. The study revealed that several telemedicine interventions have been deployed using different modes such as videos, telephones, smart wearable digital devices, messaging mobile applications, virtual programs, online health education modules, SMSes, live audio–visual communication, and other digital platforms. The review showed the utilization of telemedicine in Zimbabwe, Cameroon, Uganda, South Africa, Nigeria, Mozambique, Tanzania, and Kenya. The most utilized mode of engaging patients was the telephones (P. Adebayo et al., 2020; Armand et al., 2021; Balme et al., 2020; Kamulegeya et al., 2020) and (Feldman et al., 2021). Two studies made use of the social media platform Whatsapp (Armand et al., 2021; Moyo & Madziyire, 2020) while some employed virtual platforms and video calls such as Skype (Armand et al., 2021; Moolla et al., 2020). Telehealth in SSA was not limited to consultation but also extended to education with two studies making use of the virtual digital platform to increase awareness and engage patients (Feldman et al., 2021; Jaguga & Kwobah, 2020).

### 4.3 | Successes

The utilization of telemedicine in these eight sub-Saharan countries has been successful in various aspects. Nigeria adopted telepsychiatry

**TABLE 1** Results from keyword search

| Search engine | Date of search | Number of publications retrieved | Number eligible after title screening | Number of abstracts screened | Number full-text articles screened | Number included for data extraction |
|---|---|---|---|---|---|---|
| PubMed | 6 April 2021 | 220 | 34 | 34 | 11 | 1 |
| Google Scholar | 12 April 2021 | 1220 | 88 | 80 | 31 | 7 |
| EBSCOHost Web (Academic Search Complete, CINAHL Complete, MEDLINE with Full Text, CINAHL with Full Text, ScienceOpen | 17 April 2021 | 304 | 12 | 12 | 8 | 2 |
| WHO global database | 28 April 2021 | 7 | 4 | 3 | 0 | 0 |
| MedRxiv | 30 April 2021 | 308 | 11 | 11 | 11 | 1 |

**TABLE 2** Characteristics of includes studies

| Author name | Title | Country | Study design | Discipline | Mode of delivery | Successes | Challenges and opportunities for improvement |
|---|---|---|---|---|---|---|---|
| Adepoju (2020) | Africa turns to telemedicine to close the mental health gap | Nigeria | News article | Mental health, delivering information on testing centers | Mobile smartphones, | enabled access to mental healthcare despite lockdowns, clearing the mental health backlog, easier and quicker mental health services, maximizing scant mental health services | Enactment of telemedicine regulations. Accessibility of mobile online platforms |
| Jaguga and Kwobah (2020) | Mental health response to the COVID-19 pandemic in Kenya: a review | Kenya | Narrative review | Training of Mental health workers on psychological first aid, mental health teleconsultation | Virtual online programs, | Reaching scarce mental health workers remotely for training and mental patients for mental health. | Scarce mental health facilities and mental health workers |
| (P. Adebayo et al., 2020) | COVID-19: The Changing Trend of Tele-consultations in a Private Tertiary Level Health Facility in Tanzania | Tanzania | Retrospective Observational Study | Teleconsultation | Telephone, mobile phones | 118 patients were reached and followed up through teleconsultations. Managed to carry out 45 pediatric consultations. Successful 216 inquiries of health matters. | Lack of insurance coverage for teleconsultation.<br>Low awareness for telemedicine.<br>Unwillingness to explore other modalities of consultations.<br>Opportunities for Improvement include sensitization to improve awareness and willingness.<br>Establishment of frameworks that aid in reimbursement of health providers |
| Owolabi et al. (2020) | Impact of mobile phone text messaging intervention on adherence among patients with diabetes in a rural setting: A randomized controlled trial. | South Africa | Randomized controlled trial | Dietary adherence for diabetic patients | SMS | Moderate level of medication adherence. | Did not improve dietary adherence.<br>SMSs administered in a short period<br>SMS messaging can increase knowledge if continued for a longer period of time |
| Balme et al. (2020) | The economics of poisoning: The role of telemedicine and toxicovigilance | South Africa | Letter to the editor | Toxicovigilance, weekly clinical meetings, discussion of interesting toxicology cases | Telephone, virtual online platforms | Reduced hospital visits for patients ingesting poison by giving clear management instructions over the telephone, successfully monitored toxicology trends, | Lack of staffing |
| Moolla et al. (2020) | Implementing a video call visit system in a coronavirus disease 2019 unit | South Africa | | Used to video call to connect patients with their loved ones | Video call | Successfully reduced cross-infection of hospital visitors by patients.<br>Connected patients to their loved ones during quarantine<br>Improved lived experience for patients and families | Contamination of devices as they are shared.<br>Cross-infection of the hospital staff<br>Privacy lacks as conversations can be heard by inpatients and messages are stored and to be deleted after use.<br>Needs the training to use |

**TABLE 2** (Continued)

| Author name | Title | Country | Study design | Discipline | Mode of delivery | Successes | Challenges and opportunities for improvement |
|---|---|---|---|---|---|---|---|
| Feldman et al. (2021) | Community health worker knowledge, attitudes and practices toward COVID-19: Learnings from an online cross-sectional survey using a digital health platform, UpSCALE, in Mozambique | Mozambique | Cross-sectional survey | the training module, information dissemination via SMS, survey response | upSCALE digital health platform, SMS | Increased COVID-19 awareness.<br>Ease of access to training materials | Lack of mobile phones in other community healthcare workers,<br>Some have older phones, non-functioning phones and limited internet access |
| Kamulegeya et al. (2020) | Continuity of health service delivery during the COVID-19 pandemic: the role of digital health technologies in Uganda | Uganda | Commentary | Teleconsultation, | Telephone, SMS, | Continuity of health services during COVID-19 induced lockdown with minimal risk of COVID-19 transmission.<br>Health information dissemination, triaging and referral, mental health support, medical refills | Limited geographical access of on-demand medicines delivery and sample pick up.<br>Lack of electronic medical records system, lack linguistic variation limited referrals and linkages to service uptake<br>Health providers telehealth skills unknown |
| Nlemadim et al. (2021) | Telemedicine for Children with Sickle cell Anemia is a Resource-Poor Setting during COVID-19 Pandemic: An Observational Stud | Nigeria | Observational study | Management of children with sickle cell anemia | SMS, mobile phone | Managed to reach out to 271 children with Sickle cell anemia and got responses from 158<br>None of the participants' contract COVID-19<br>96 respondents agreed to continue with mobile telehealth for future interactions. | Limited airtime to make phone calls.<br>Some messages were not received |
| Moyo and Madziyire (2020) | Use of telemedicine in obstetrics and gynecology in Zimbabwe during a lockdown period | Zimbabwe | Retrospective and prospective study | Obstetrics and gynecology consultations and elective cases management | WhatsApp | 109 women used telemedicine, managed diagnosis during consultations<br>Urgent referral cases for 14 cases.<br>Continuous medical service provision to expecting mothers<br>Access to specialists for rural dwellers who have had no access without telemedicine | Lack of internet connectivity and data unaffordability by rural dwellers<br>Affected by literacy levels<br>Limited in case a physical examination and tests were needed. |
| Armand et al. (2021) | Telemedicine and COVID-19: Experience of Medical Doctors in Cameroon | Cameroon | Cross-sectional study | Consultations | Telephone, WhatsApp, SMS, Skype | Ability to consult while quarantined | Poor doctor-patient relationship.<br>Limited coverage of telemedicine |

to disseminate mental health information and improve access to mental health services despite the restrictive measures in place, which also aided in clearing the backlog of consultations by maximizing the scanty mental health services in Nigeria (Adepoju, 2020). Nigeria also utilized a combination of telephones and SMS to managed and care for children with sickle cell anemia (Nlemadim et al., 2021). In Kenya, a virtual online training program provided the scarce mental health professionals with the opportunity to receive psychological first aid training to successfully counsel those in need during lockdowns and beyond (Jaguga & Kwobah, 2020). Teleconsultations in Tanzania helped in successfully reaching 118 patients after 216 inquiries; and 45 pediatric consultations despite the distance barrier to the service provider (P. Adebayo et al., 2020). A randomized controlled trial in South Africa indicated moderate improved adherence levels to medication by diabetics (Owolabi et al., 2020). In the same country, the use of teleconsultation for poisoning cases and virtual meeting to discuss trends and interesting cases helped to improve toxicovigilance and reduce visits to the hospital (Balme et al., 2020). The use of video calls enabled relatives to communicate with their loved ones in hospital quarantine while minimizing the risk of transmission. The video call visits allowed for patients dignity while maintaining closeness with relatives (Moolla et al., 2020). Telemedicine aided in the ease of access to training and information while slowing down the transmission in Mozambique through the use of mobile phones (SMS) (Feldman et al., 2021). Uganda reported successful maintenance of mental health services, referrals, and refills by employing teleconsultations (Kamulegeya et al., 2020). Zimbabwe obstetrics and gynecology professionals made use of the social media platform Whatsapp to consult and process urgent referrals of expectant mothers (Moyo & Madziyire, 2020). However, the included studies did not only spell out successes in the utilization of Telemedicine but also reported challenges and identified gaps for improvements that are discussed in the following subsection.

## 4.4 | Challenges and identified gaps

From the included studies, we identified challenges and gaps involved in the utilization of telemedicine to improve health service delivery in SSA during the pandemic. This includes lack of regulatory framework for insurance reimbursement and creating awareness. Adepoju (2020) states that South Africa introduced the m-Health policy in 2015 with no guidance on the use of telemedicine for the delivery of mental healthcare. Also, a retrospective observational study by P. Adebayo et al. (2020) revealed that lack of insurance approval for teleconsultation was the reason for not booking a teleconsultation in private tertiary level health facilities in Tanzania. This is exacerbated by the lack of insurance coverage for teleconsultations and companies failing to reimburse physicians embarked in teleconsultations, as it becomes an indispensable and highly valuable tool during the pandemic. Also, Adepoju (2020) and P. Adebayo et al. (2020) revealed that low awareness for telemedicine and unwillingness to explore other modalities of consultations were major challenges and barriers to the effective utilization of telemedicine. However, there are opportunities for improvement and alleviating these barriers which include sensitization of the community and health workers to improve awareness and willingness to utilize telemedicine products during the pandemic. There is also a need for the establishment of regulatory frameworks that aid in the reimbursement of health providers who provide consultations through telemedicine.

This study also noted that health workers' concerns, such as the low number of health professionals, refusal to explore alternative consultation, limited physical examination, and limited doctor–patient relationship influence the utilization of telemedicine. Despite the unprecedented opportunities brought up with telemedicine, in Kenya, a narrative review by Jaguga and Kwobah (2020) revealed that utilization of telemedicine through virtual online programs is affected by the dearth of mental health facilities and mental health workers. However, a retrospective observational study conducted in Tanzania by P. B. Adebayo et al. (2021) noted that patients and health workers' unwillingness to explore other modalities of consultations affect the effective utilization of telemedicine. In Zimbabwe, telemedicine services were utilized for obstetrics and gynecology consultations and elective cases management during the pandemic. However, a retrospective and prospective study by Jephat Moyo and Madziyire (2020) revealed that effective utilization of telemedicine was hindered by the limited physical examination and tests, in some circumstances where they were needed especially in rural areas. Also, a cross-sectional study conducted in Cameroon by Armand et al. (2021) noted that the provision of consultation services through Telephone, WhatsApp, SMS, and Skype were hindered by the limited doctor–patient relationship.

Among other challenges, the study revealed that digital barriers, such as connectivity and data cost, inaccessibility of smartphones, lack of feedback on short messaging services especially nondelivery, and lack of digital skills. In Zimbabwe effective utilization of telemedicine is affected by lack of internet connectivity, data unaffordability and digital illiteracy, especially among rural areas dwellers (Moyo and Madziyire, 2020). In Nigeria, the management of children with sickle cell anemia through SMS and mobile phone was greatly affected with limited airtime to make phone calls and non-delivery of messages to patients which subsequently affected interactions between doctors and patients (Nlemadim et al., 2021). In addition, in Uganda, continuity of health service delivery during the COVID-19 pandemic was necessitated through teleconsultation; however, the lack of electronic medical records systems and health providers' telehealth skills affected the health service delivery (Kamulegeya et al., 2020). Also, lack of mobile phones in other community healthcare workers, incompatible phones, non-functioning phones, and limited internet access were noted as major challenges for effective utilization of telemedicine in a cross-sectional survey conducted by Feldman et al. (2021) in Mozambique.

## 4.5 | Implementation challenges

Despite the unprecedented opportunities brought by telemedicine to improve health service delivery, its adoption in SSA is still nascent. This is exacerbated by several impediments that retards the implementation and utilization of telemedicine, especially during the

pandemic. These impediments include insufficient technological infrastructure and medical equipment, poorly distributed health facilities and services, inadequate human resources, and training, lack of mobile health frameworks and policies, financial, digital illiteracy, and cultural aspects.

### 4.5.1 | Insufficient technological infrastructure and medical equipment

The study revealed that the utilization of telemedicine in sub-Saharan Africa is greatly affected by insufficient medical equipment, and a lack of technological infrastructure to host telemedicine projects (Babalola et al., 2021). To ensure effective provision of care while observing COVID-19 restrictions such as social distancing and physical distancing, there is a need for fast internet connection and the availability of computing devices for both healthcare professionals and patients. However, limited network coverage (Oyediran et al., 2020), lack of internet connectivity (Ibekwe & Fasunla, 2020), and unaffordability of internet data bundles (Dodoo et al., 2021) especially in rural communities remain significant barriers to the utilization of telemedicine. The cost of buying specialized medical equipment integrated with advanced digital technologies is generally high, which many countries in SSA might not be prepared to secure, considering the economic challenges posed by the pandemic. The findings of the study revealed that most sub-Saharan Africa countries do have electronic medical records systems, inadequate mobile phones among health workers, and patients (Babalola et al., 2021); however, those with access to mobile phones, most experience intermittent internet connection, and lack linguistic variation limited referrals and linkages to service uptake (Al-Samarraie et al., 2020). These challenges tremendously affect the utilization of telemedicine especially in rural communities of sub-Saharan Africa.

### 4.5.2 | Inadequate human resources and training

The effective utilization of telemedicine requires proper training of both healthcare professionals and patients. However, the following are constraints to the implementation and adoption of telemedicine in sub-Saharan Africa: high staff over, digital illiteracy, resistance to change, readiness (Sagaro et al., 2020), language problems, poor program design, and implementation of telemedicine in sub-Saharan Africa.

### 4.5.3 | Lack of active mobile health framework policy and ethical guidelines that support the utilization of telemedicine during pandemics such as COVID-19

Although telemedicine promises to offer transformative opportunities in sub-Saharan Africa to address the acute crisis posed by the pandemic, significant impediments to its optimal utilization remain. The major issue is the development of mobile health framework policy and ethical guidelines that support the utilization of telemedicine (Dodoo et al., 2021). Furthermore, implementation is affected by the limited application or lack of e-health policies and frameworks (Bakibinga-Gaswaga et al., 2020), lack of political support for telemedicine implementation (Babalola et al., 2021), due to limited funding among others. However, these challenges can be addressed through the development of robust and inclusive e-health policies, implementation models, and promulgation of guidelines by regulators and policymakers, in collaboration with local and international agencies.

### 4.5.4 | Lack of funding and financial barriers

Implementation and utilization of telemedicine technologies require a strong commitment from all stakeholders including regulators, international agencies, healthcare professionals, and patients. The study revealed that utilization of telemedicine is also hindered by financial barriers, such as the high cost of telemedicine infrastructure and system setup, high tariffs on telecommunication (Al-Samarraie et al., 2020), high internet data bundles, limited budget, and funding of telemedicine projects, multiple short-term telemedicine pilot projects running concurrently (Mars, 2013) and high cost of telemedicine services (Dodoo et al., 2021).

### 4.5.5 | Lack of awareness and sensitization of telemedicine products

The study revealed that despite having sufficient technological infrastructure that supports the utilization of telemedicine, a significant number of patients are unaware of telehealth products' existence and services in sub-Saharan Africa. For instance, a study conducted by Sagaro et al. (2020) in Ethiopia shows that patients were not aware of telemedicine technologies. Therefore, there is a need to sensitize and create awareness about the available telemedicine products in SSA.

### 4.5.6 | Digital illiteracy

Among other impediments, technological illiteracy among healthcare professionals and patients was also noted as a major setback for the utilization of telemedicine. The study revealed that the lack of technological skills to install, manage telemedicine software products, and digital devices are the major obstacles for both patients and healthcare professionals. For instance, Babalola et al. (2021) alluded that remote services delivery by video conferencing had been rarely implemented for reproductive healthcare in SSA.

### 4.5.7 | Cultural and language barriers

A study conducted by Dodoo et al. (2021) shows that resistance to change, religion, and cultural values as well as languages used to develop telemedicine technologies are major setbacks for effective

implementation and utilization of telemedicine. Sub-Saharan Africa is made up of people with different socio-cultural dynamics. For instance, a study by Sagaro et al. (2020) reflects that Ethiopia has diverse socio-demographic and cultural dynamics, and people staying in rural areas have minimal access to technological infrastructure and formal education which influences access to a cell phone and subsequently affect the adoption of telemedicine.

#### 4.5.8 | Digital divide and access gap

Despite the significant progress made toward the adoption of telemedicine in SSA, the existing digital divide threaten the massive rolling out of telemedicine products in some resource-constrained areas. This is exacerbated by the limited indices and actual statistics on mobile penetration of smartphones, types of communication lines, and digital access gap especially in rural areas of sub-Saharan Africa. A study conducted by Okereke et al. (2021) posits that the digital access gap and variations in smartphone penetration between urban and rural areas affect the effective adoption of telemedicine in Africa. In addition, David et al. (2020) also alluded that more smartphone users are highly concentrated in urban areas, especially with high- and medium-income earners as compared to rural counterparts, where feature phones are more prominent. Coupled with other challenges, the digital divide and inaccessibility, telemedical networks remain limited in some rural areas.

#### 4.5.9 | Social norms and healthcare inequalities

With the uneven distribution of health facilities, inaccessibility of medical care (Sarfo et al., 2017), low literacy level, especially in the rural areas, relatively high cost of internet and data bundles, inadequate power supply (Babalola et al., 2021), cultural misconceptions, and misinformation (David et al., 2020), most patients have tendencies of consulting and resorting to faith-based care, including churches, traditional healers, indigenous medicine among others. In such areas, in-person care and physical contact with healthcare professionals are still relevant because of limitations to providing care through telemedicine.

## 5 | DISCUSSION

The important question this review paper seeks to answer is, Did SSA leverage the use of telemedicine in increasing access to health services during the COVID-19 pandemic. For the included studies, telemedicine was critical in bridging the gap brought by social distancing to reach patients during the pandemic. Telemental health findings indicated that telemedicine was useful in some SSA countries in enabling access and clearing the backlog brought about by the tough COVID-19-induced lockdowns. Telemedicine enabled the training of mental health practitioners and allowed them the flexibility to consult patients in distant places without leaving their jobs (Adepoju, 2020; Jaguga & Kwobah, 2020). However, the lack of mobile health interventions impeded the spread of telemental health services to the general public in Kenya. Findings by P. Adebayo et al. (2020) and Moyo and Madziyire (2020) showed that teleconsultation was an appropriate intervention that resulted in the continuation of health services delivery in the middle of the pandemic. The successful implementation, however, faced challenges due to the general public's perception and knowledge of the benefits of telemedicine, lack of appropriate mobile devices, poor internet connectivity, and the reluctance by insurance companies to pay service providers. The problem of funding and clear policy guidelines and lack of awareness among the general public have been cited as reasons why SSA lags in the implementation of telemedicine (Babalola et al., 2021). A randomized control trial in South Africa by Owolabi et al. (2020) on dietary adherence for diabetic patients did not find significant improvement in medication, dietary, and physical activity adherence as a result of text messaging intervention. Contrasting findings have been reported elsewhere, Pandey et al. (2017) reported that text message intervention significantly increased adherence to medication and exercise among post-myocardial infarction patients receiving care in a structured cardiac rehabilitation program. Differences in impact may be due to existing structured telemedicine programs in Canada which is a high-income country compared to South Africa as an SSA nation.

Our findings suggest that the importance of telemedicine use during the COVID-19 pandemic; however, it has been hampered by challenges ranging from lack of financial support, internet infrastructure education, and awareness of the general public. This article has synthesized available evidence on the use of telemedicine in SSA to ensure continuity of service delivery during the COVID-19 pandemic. It further highlights the existing challenges and proffers solutions on ways telemedicine can be fully embraced and implemented to bridge the distance barrier between patients and service providers, particularly during the ongoing pandemic. A weakness of this review is that it does not look at gray literature. Social media played an important role in education and encouraging health-seeking behavior among patients with TB and HIV to continue accessing medical care during the pandemic. In addition, the heterogeneity of the studies in this review makes it difficult to draw conclusions that inform future telemedicine use in SSA. However, the barriers to implementation of telemedicine in SSA seem to be uniform across most of the studies and future efforts need to consider that to improve telemedicine coverage in SSA.

### Recommendations

There is urgent need for reform and promulgation of e-health policies, mobile health frameworks, and guidelines centred on ethical values, grounded in privacy and data confidentiality. Concurrently, wider communities support for integration, adoption and utilization of telemedicine during the pandemic and beyond to improve the quality of care. Digital education of both healthcare workers and the population

will help address and minimize socio-economic and technological inequalities in accessing healthcare services. The policy framework should also address insurance reimbursement for telemedicine services. South Africa quickly modified their policy and regulations at the inception of COVID-19 induced restrictive measures, enabling widespread adoption and utility of telemedicine.

The pandemic has undoubtedly played a paramount role in adopting telemedicine technologies as the best alternative solution for providing access to health care. However, to ensure effective utilization of telemedicine in sub-Saharan African, there is a great need to eliminate digital barriers through improving digital infrastructure, access, and affordability. Alternatively, we recommend regulators to zero-rate telemedicine platforms and also to create community networks subsidized by the regulators to reduce the digital divide to encourage universal access to digital care. Furthermore, an intentional approach to improving digital literacy and awareness is necessary for the effective adoption and utilization of telemedicine.

There is also a need to train more healthcare professionals to address the issue of the low number of health professionals. Health workers need to be capacitated and improve their technical skills and creating more awareness programs for effective utilization of available telemedicine services in SSA. However, this requires collective efforts from different stakeholders including regulators, health workers, patients, and companies to provide required support in the form of equipment and funding of training programs. Training programs should address issues such as refusal to explore alternative consultation, poor doctor-patient relationship, and digital illiteracy. This will tremendously assist to streamline telemedicine as a medical service delivery model and to prepare health workers to provide health care through telemedicine while preserving the privacy, security, and safety of patients. As countries in sub-Saharan Africa thrive to contain the pandemic and work toward the attainment of sustainable development goal-good and well-being for all, there is a need to support the utilization of telemedicine services during the pandemic and beyond.

## CONFLICT OF INTEREST

The authors declare no competing interests.

## PEER REVIEW

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## DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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