JOURNAL OF COMMUNITY SYSTEMS FOR HEALTH
2025, VOL. 2
https://doi.org/10.36368/jcsh.v2i1.1282

ORIGINAL RESEARCH

"Between promise and practice": Maternal, neonatal and child health professionals' experiences of digital service adaptations in Uganda during the COVID-19 pandemic

Ryan Alsaid[1], Tobias Herder[1], Gilbert Tumwine[1,2], Jack Palmieri[1*]

[1]Social Medicine and Global Health, Department of Clinical Sciences, Lund University, Malmö, Sweden
[2]St. Francis Hospital Nsambya, Kampala, Uganda

***Corresponding author:** jack.palmieri@med.lu.se

Received 24 September 2025 ; Accepted 23 November 2025 ; Published 20 December 2025

ABSTRACT

Introduction: The COVID-19 pandemic severely disrupted maternal, neonatal, and child health (MNCH) services in Uganda. In response, digital health tools were rapidly adopted as one of the strategies to restore service delivery. However, the experiences of MNCH professionals implementing these adaptations remain underexplored. This study aimed to explore how MNCH professionals in Uganda experienced the digital tools adaptations made to restore MNCH services during the pandemic.

Methods: This qualitative study involved seven in-depth interviews with MNCH professionals in Kampala, Uganda. Participants were purposively sampled based on their direct involvement in digital health adaptations during the pandemic. Data were analysed using qualitative content analysis to explore both manifest and latent meanings in participants' experiences.

Results: One overarching theme emerged: Experiencing digitalisation as a paradox between promise and practice. This was supported by two sub-themes: realising multi-dimensional gains of digitalisation and recognising digitalisation as only 'part of the puzzle', and six categories. The results explored how digital tools improved work-life balance, collaboration, and service continuity, they also exposed infrastructural and socioeconomic barriers, particularly in rural and low-income settings.

Conclusions: Digital health innovations offer valuable support for MNCH service delivery during public health emergencies. However, their effectiveness is limited by structural inequities and digital exclusion. This underscores the need for context-sensitive strategies that balance technological innovation with persistent structural and clinical realities.

Keywords: Digital health, maternal, neonatal, child, COVID-19, qualitative, Uganda.

Abstract in Español at the end of the article

INTRODUCTION

The novel coronavirus disease 2019 (COVID-19) was first reported in December 2019 and was declared a global pandemic by the World Health Organization (WHO) on March 11, 2020 [1]. The rapid global spread of the virus necessitated immediate public health interventions, prompting governments to implement measures such as quarantine, curfews, and lockdowns to curb transmission and protect populations [2]. This response also saw a rapid adoption of digital tools in healthcare and the digitalisation of society in general, in what has been termed the Great Acceleration [3, 4]. Although these measures were essential in controlling the pandemic, they also produced catastrophic impacts on multiple sectors, including the economy [5] and the health sector [6].

These disruptions were particularly acute in devel-

oping countries, where healthcare systems are often under-resourced and overburdened [7-11]. In these settings, access to essential health services was severely compromised. For example, maternal, neonatal, and child health (MNCH) services, critical components of global health initiatives and key to achieving the Sustainable Development Goals and Universal Health Coverage [12, 13], experienced significant interruptions.

Several systematic reviews have documented reduced antenatal and postnatal care visits, fewer family planning consultations, increased fear of hospital deliveries, and delayed referrals, all contributing to increased maternal and neonatal mortality [13-16].

The use of digital tools in healthcare has emerged as a global trend, offering promising solutions for overcoming barriers to healthcare access [17]. The WHO defines digital health as the use of information and communication technologies (ICT) in health and health-related fields, encompassing tools such as electronic health records, mobile health (mHealth) applications, and telemedicine/telehealth [18, 19]. With the onset of the COVID-19 pandemic, digital tools were rapidly adopted to enable both continued healthcare delivery, such as in telehealth, and to support MNCH personnel in continuing their work safely and effectively, including remote supervision, virtual meetings, and online training platforms [20-22] This study encompasses elements of both dimensions.

The adaptation of digital tools into healthcare has attracted substantial interest from the medical and public health communities. For instance, in Sub-Saharan Africa, well-developed mobile communication networks have played a key role in enabling access to digital health services, particularly in areas where broadband infrastructure is limited. These networks help overcome geographical barriers and facilitate broader access to MNCH services [23].

In Uganda, the COVID-19 pandemic severely disrupted maternal, newborn, and child health (MNCH) services, leading to interruptions in family planning services [24, 25], antenatal care attendance, and facility-based deliveries [26]. These disruptions were accompanied by reports of increased maternal and under-five mortality [27], indicating that almost all MNCH services were affected [28].

In response, innovative strategies were rapidly deployed to restore MNCH services [7]. These strategies included non-digital strategies including community outreach programs, disseminating safety protocols, reallocating staff for health education, community-based service delivery [29, 30]. While these strategies helped maintain some level of MNCH service continuity during the pandemic, they faced considerable limitations such as inconsistent implementation, limited supervision, and challenges in coordinating across the health system [31]. Digital interventions helped address these gaps by enabling remote consultations, virtual coordination among MNCH professionals, real-time data reporting, and online training platforms among others [20].

The acceleration of digital strategies in Uganda led to the adoption of a wide range of digital tools in the healthcare sector, each serving distinct purposes. These included telehealth; which enabled remote care provision and reduced the need for in-person visits, for instance, remote clinical consultations [21], digitalisation of the workflow, such as the use of electronic medical records and real-time dashboards to improve data management and monitor service delivery [32], and communication tools like Zoom and WhatsApp for coordination among health workers [33]. In addition, mobile health (mHealth) applications supported patient engagement through health education and reminders, digital supply chain systems improved the tracking and distribution of medical supplies, and eLearning platforms enabled continued training for healthcare providers during lockdowns [22].

While integrating digital innovations into health systems is essential for enhancing services delivery, especially during public health emergencies where the disruptions are frequent, their effectiveness varied across settings. This variation highlights the importance of how innovations are implemented and integrated into existing health structures [34]. For instance, studies from African contexts have shown that the successful uptake of health innovations is shaped by contextual factors such as community trust, alignment with local norms, and system-level support [35, 36]. Innovations are more likely to be adopted and sustained when they are compatible with local practices and supported by key actors.

Healthcare providers play a critical role in implementing digital services for health and are well-positioned to actively reflect on the potential risks and benefits of such initiatives [33]. Despite this, previous qualitative studies have predominantly focused on the challenges and barriers to accessing MNCH services during the pandemic [37], and to our knowledge, no studies have specifically examined the experiences and perceptions of MNCH professionals regarding the digital tool adaptations implemented to restore MNCH services in Uganda.

Unlike previous studies in Uganda [22, 24, 25, 31], this research uniquely captures the first-hand experiences of frontline MNCH professionals during the acute phase of the COVID-19 pandemic, showing how digital tools were implemented in practice under crisis conditions.

Capturing these experiences is essential for understanding both the opportunities and practical challenges involved in sustaining MNCH service delivery during public health crises.

Documenting these insights can inform tailored interventions aimed at strengthening the capacity of MNCH professionals, thereby guiding future health strategies in Uganda and comparable settings. Thus, this study aims to explore how MNCH professionals in Uganda

experienced the digital tools adaptations made to restore MNCH services during the pandemic.

METHODS

Study design and setting

The study was set in Kampala, Uganda's capital city, serves as the central location for health policy development, innovation, and coordination of maternal, newborn, and child health (MNCH) services, Kampala hosts a diverse mix of MNCH service providers and has been a focal point for piloting and scaling digital health interventions, especially during the pandemic [38]. In-depth interviews were conducted with maternal, newborn, and child health (MNCH) professionals to explore their experiences of the digital adaptations implemented to maintain MNCH services during the COVID-19 pandemic. A qualitative approach was chosen to capture the rich, subjective experiences of participants [39].

Sampling and recruitment

A purposive sampling strategy was used to ensure that participants had direct, firsthand experience with digital healthcare adaptations in MNCH services [39].

Participants were identified in collaboration with the Global Academy of Sexual and Reproductive Health and Rights, a platform for research, education, and innovation connecting actors working with Sexual and Reproductive Health and Rights from different sectors, organisations, and cadres across the globe, such as clinicians, policymakers, and NGO staff [40]. The Global Academy was selected as a recruitment platform to ensure trust with participants, access to a diverse and experienced group of MNCH professionals, and proficiency in the language required for participation. Potential participants were MNCH professionals with at least five years of experience in service delivery and who had been actively engaged in responding to the pandemic.

An invitation letter and study protocol were distributed via email to Global Academy members in Kampala (n= 14). Of these, 7 individuals responded positively and were, subsequently, sent formal invitations to participate in interviews. All 7 invited individuals agreed to participate and were interviewed. The remaining 7 did not respond to the initial invitation, and no formal refusals or reasons for non-participation were received.

Data collection

Data were collected using a semi-structured interview guide developed based on a review of the literature and refined following consultations with the co-authors. This flexible interview format enabled the exploration of the topic under investigation and allowed follow-up questions to be posed based on participants' responses. After one pilot interview, minor adjustments were made, primarily rephrasing several questions to enhance clarity and ensure a more natural flow for the subsequent interviews [41].

Prior to participation, all potential participants received an invitation letter and study protocol outlining the research objectives. Initial meetings to build rapport were also conducted to further explain the study's objectives and procedures.

All interviews were conducted by the first author (RA), who received formal training in qualitative research methods and worked as a research assistant under the supervision of an experienced qualitative researcher (JP), RA was familiar with the Global Academy network, which facilitated rapport-building with participants. Interviews were conducted in person between February and March 2024 at neutral, comfortable locations in Kampala that were chosen by the participants. The interviews, conducted in English, lasted between 33 and 90 minutes. Written informed consent was obtained from all participants before commencing the interviews. With participants' permission, each interview was audio-recorded, and detailed field notes were taken to supplement the recordings. All interviews were transcribed verbatim, and identifying details were removed to ensure confidentiality.

According to Malterud and colleagues, information power depends on the study aim, sample specificity, use of established theory, quality of dialogue, and analysis strategy. In this study, after seven interviews it was deemed that the data had sufficient information power for the intended analysis [42]. Given the focused study aim, the relatively specific sample, and the rich and relevant content of the interviews, additional data collection was considered unlikely to contribute substantially new insights.

Audio recordings and transcripts were stored on an encrypted drive accessible only to the research team, while the original written consent documents were securely stored in a locked safe.

Data analysis

Qualitative content analysis (QCA) as described by Graneheim and Lundman [43] was used to analyse the data. This allowed for examination at both the manifest (explicit content) and latent (underlying meaning) levels, as further elaborated by Lindgren et al. [44]. Each transcript was read multiple times to gain an in-depth understanding of the data, after which meaning units were identified and condensed. codes were developed from the meaning units to remain close to the data. These codes were then grouped into subcategories, which were further clustered into categories based on similarities. The categories were subsequently organised into subthemes and, finally, synthesised into a theme capturing the insights and perceptions of MNCH professionals about the digital adaptations implemented to restore MNCH services. Data coding and analysis were conducted by the first author (RA), with regular peer debriefings involving all co-authors. Excel software was used to organise codes and categories. The first author, a Sudanese public health practitioner with an MPH and

Meaning unit	Code	Sub-category	Category	Sub-theme	Theme
"It is suboptimal for me, I need to see their gestures, because sometimes what they are communicating verbally is different from their body language, we need to see them, otherwise we shall advise them wrongly and mislead them"	Experiencing online consultation as sub-optima	Experiencing online consultation as suboptimal and the need for physical presence	Acknowledging the limits of digital health care	Recognising digitalisation as only 'part of the puzzle'	Experiencing digitalisation as a paradox between promise and practice
	Needing to see patients in person for proper counselling				

Figure 1. Example of the analytical process moving from meaning unit to theme.

experience in maternal and child health programmes, led the analysis and interpretation. The co-author from Uganda (GT), a public health researcher familiar with the local health system and MNCH service delivery, contributed contextual insights and critical reflection throughout the analytic process. Other co-authors, experienced qualitative researchers from Sweden, provided reflexive discussion, and methodological guidance. All participants were informed about the study objectives and the researcher's role. The study was independently designed and implemented without external influence on data collection or analysis. An example of this process can be found in Figure 1.

Ethical considerations

The study protocol was approved by the Research Ethics Committee (REC) at St Francis Hospital Nsambya, Uganda (REC Approval No. 67/21.02.2024). The study adhered to the ethical principles outlined in the Helsinki Declaration (45). All participants received detailed information about the study and provided written informed consent. Confidentiality was ensured by pseudonymising transcripts and securely storing data in encrypted password-protected files accessible only to the research team.

RESULTS

The final sample included seven participants, after which recruitment ceased because sufficient information power was achieved [42]. All seven participants responded to the invitation and participated in interviews. This included two midwives, one doctor, one Ministry of Health official, one community health worker (village health team), and two employees of non-governmental organisations. Of the seven participants, two were female and five were male.

The analysis resulted in one overarching theme "experiencing digitalisation as a paradox between promise and practice" supported by two sub-themes, and six categories. Twenty-three sub-categories were also developed during the analysis, for example "building on covid-19 protocols to control and prepare for future threats", "experiencing improved collaboration and networking through digital tools" and "perceiving high illiteracy rate and training gaps as barriers to digitalisation", however these are not included in the results presented. The theme, sub-themes and categories are illustrated in Figure 2.

Subtheme 1: Experiencing multi-dimensional gains of digitalisation

Participants described how the rapid digitalisation during the pandemic introduced new ways of working across three interrelated domains: personal well-being, professional responsibilities, and future preparedness for MNCH service delivery. These digital adaptations were viewed as largely positive and beneficial, yielding improvements in their life, work, and services, which is captured in the sub theme: Experiencing multi-dimensional gains of digitalisation. This sub-theme is supported by 3 categories that capture the different domains of perceived gains of digitalisation.

In the first category, achieving work-life balance through digitalisation, participants emphasised significant improvements in work-life balance due to digitalisation. Remote consultations and virtual meetings reduced the need for travel, which was perceived as reducing stress for MNCH service providers while also shortening clinic waiting times for patients. The increased flexibility of working online allowed MNCH professionals to better balance personal and professional responsibilities. As one participant explained:

> *"Everybody can connect from wherever they are, and the limitations of time are a bit minimised... It saves time, and you can reach many people at the same time. This made my work much easier and improved work-life balance, I would say in one way or another, because you can work from home and be with your family as well"* (P2, M)

Theme	Experiencing digitalisation as a paradox between promise and practice					
Sub-themes	Realising multi-dimensional gains of digitalisation			Recognising digitalisation as only 'part of the puzzle'		
Categories	Achieving work-life balance through digitalisation	Valuing digitalisation as an enabler for work efficiency and collaboration	Seeing improved service outcomes and future preparedness through digitalisation	Acknowledging the limits of digital health care	Fearing negative consequences of digital supervision	Perceiving socioeconomic barriers to digital healthcare uptake

Figure 2. An overview of the results, outlining the theme, sub-themes, and categories that emerged from the analysis.

Other participants similarly noted that digital tools enabled them to be more productive in both their personal and professional lives, and found a sense of satisfaction in this greater freedom:

> "*I feel I am more productive. I started my master´s and at the same time, I got pregnant with my child...with digitalisation, I was able to do both, be home with my child and attend classes, unlike when it is physical where you must commute...but with digitalisation it is more flexible…*" (P3, F)

The second category, valuing digitalisation as an enabler for work efficiency and collaboration, describes how participants valued how digitalisation enabled more efficient communication and collaboration among diverse healthcare stakeholders, from national policymakers to community health workers. The use of enhanced digital communication was perceived by the participants to facilitate more inclusive and faster policy formulation and dissemination, improving local engagement in decision-making and ultimately increasing utilisation of MNCH services.

> "*We have seen the dissemination and the appreciation of policies from the national level to the lower levels faster than it was before...the policy guidance is taken up by people at different levels, across the country in a short time compared to before the pandemic and this improved utilisation of services by people, then me as an individual, this made my work much easier...*" (P1, M)

Another participant highlighted that digital tools have broadened participation in health sector planning to include a more diverse range of stakeholders.

> "*we have been able to involve all kinds of stakeholders in the policy-making process. Now, it´s not just about policies coming from higher authorities; now you gather data from regional hospitals, community workers, and even patients sometimes*" (P7, M)

Participants in this category also described how digitalisation allowed collaboration and coordination of different technical working groups within and across health sector.

> "*We have technical working groups in different sectors...different technical expertise and different service delivery areas, now they are coming together using online tools to complement each other*" (P7, M)

Moreover, participants described how digital tools made routine tasks such as sharing MNCH updates across different levels of the healthcare system, identifying service gaps, collaboratively planning interventions, and delivering capacity-building programs more efficiently. Instead of travelling long distances, they could now coordinate activities and deliver training remotely.

> "*Online tools were very important in my organisation, now we have a broader way on how to engage with people...we are able to engage without the need to travel to remote districts. For example, I could organise a virtual engagement with my team wherever they were, and we shared updates about where the service gaps, we planned together activities and supported the delivery of several capacity-building programs in some villages*" (P7, M)

Participants also noted that digital meetings were more cost-saving; instead of spending money on venues, transport, and meals, funds could be redirected to other priorities

> "*… we realised that it saves resources. Before we would organise physical engagements, we would need to rent conference rooms, rent chairs…you facilitate some members transportation, food… and lots of financial arrangements. So, with online, there are only a few things, just support*

> *them with internet fees, and then get together discussing. So online engagement is cheaper compared to the physical engagement. you save money, and you can utilise that money in a different way*" (P7, M)

Building on the perceived improvements in work-life balance and collaboration, participants shared their experiences of how digitalisation had improved MNCH service delivery and outcomes during the pandemic and even strengthened future health emergency preparedness in the category Seeing improved service outcomes and future preparedness through digitalisation, they noted increased service utilisation driven by widespread digital health messaging and education. For example, public health information about COVID-19 was disseminated via television, SMS, and social media (e.g. TikTok), which participants felt positively influenced community health behaviours

> "*During the COVID time, health messages were everywhere, on Tv, SMS, TikTok…it had a positive effect on people´s behaviour… they were really cautious*" (P3, F)

During the pandemic, digital platforms also enhanced knowledge-sharing among health professionals. Online training sessions and webinars enabled continuous learning despite lockdowns, helping providers stay updated:

> "*With all these online lectures and trainings, we are getting more information, sharing knowledge and we keep updated...*" (P2, F)

Furthermore, the use of digital tools such as real-time dashboards and mobile data collection apps allowed for quicker, data-driven decision-making. Participants gave examples of how these innovations enabled rapid responses to service disruptions during COVID-19 and other health crises.

> "*the dashboard is for epidemic-prone diseases...one of the functions was to develop guidelines for health workers and other players on how to support MNCH services…we also use it to monitor the continuity of the MNCH services and getting regular reports, on daily basis and for some other elements on weekly basis. so that if we find a block, we can go in quickly and rescue the situation....*" (P2, F)

Another noted how mobile phones were used for real-time data reporting, which improved responsiveness:

> "*Phones are used to collect data about any blockage in the MNCH services…these data were leading in making decisions, enabling more responsive and evidence-based management of MNCH services.*" (P4, F)

Participants felt that the reactivation of digital reporting and communication structures such as district-level dashboards for epidemic-prone diseases, that had existed prior to the pandemic, enabled faster data collection, improved coordination, and swifter responses to service disruptions. Originally designed for outbreak surveillance, these dashboards were adapted to monitor MNCH service continuity and later repurposed to manage other public health emergencies such as Ebola and cholera. Their reactivation contributed to enhanced preparedness for future health crises by facilitating timely decision-making and more responsive interventions.

> "*We had a big influx of refugees from South Sudan and from Sudan, and later we got another outbreak of cholera and Ebola. The reporting structures at district levels, that we used for COVID-19 control were revived and adopted .... and this was done swiftly, and the cholera was contained in one month, I think this has made the country more ready in terms of response for future epidemics and pandemics and outbreaks*" (P2, M)

Furthermore, Online platforms continued to be used post-covid for training and support – for example, national capacity-building sessions for health workers were held via Zoom, and maternal/perinatal death surveillance meetings were conducted virtually on a weekly basis.

> "*We now have a regular run as the maternal and prenatal surveillance and response platform, for national-level discussion and capacity building for health workers. That is held on Zoom, and across the country, we converge every Monday and every Thursday to discuss the issues relating to mothers and babies who have died.*" (P2, M)

Sub theme 2: Recognising digitalisation as "part of the puzzle" but not the only solution

Participants in this subtheme expressed concerns about the obstacles that hindered the broad and effective adoption of digital MNCH services. Their reflections highlighted both scepticism and practical barriers, underscoring that while digitalisation is a valuable tool, it cannot fully replace traditional service delivery. Instead, it should be viewed as one component within a broader strategy to sustain MNCH services, particularly in resource-constrained settings.

Many noted that not all aspects of care could be delivered or monitored effectively online, and several faced practical challenges in implementation. These included limitations inherent to digital care modalities, gaps in supervision and accountability when services went remote, and significant socioeconomic barriers among both providers and patients. Nonetheless, some participants maintained the positive tone, highlighting that the overall impact was still seen as positive despite the challenges where *"the benefits outweigh the risks"* (P5, M) of digitalisation.

The first category, acknowledging the limits of digital health care shows how Participants recognised fundamental limitations in digital healthcare, highlighting significant challenges in clinical care delivery. They expressed concern that telephone-based clinical consultations, lacking in-person interaction, often cannot replace the quality of physical examinations. For example, the absence of hands-on assessment and non-verbal cues such as body language and facial expressions made some providers worry about misdiagnoses or incomplete evaluations. As one clinician admitted, purely online consultations felt suboptimal and could never fully supplant face-to-face care:

> "*they are used to and believed in being touched by a health worker directly, speaking to health workers face to face. So, the culture of digitalisation has worked partially…it is suboptimal for me, I need to see their gestures, because sometimes what they are communicating verbally is different from their body language, we need to see them, otherwise we shall advise them wrongly and mislead them*" (P3, F)

A related concern was the difficulty of supervising staff and ensuring accountability when many activities moved online, captured in the category Fearing the consequences of digital supervision. Because direct oversight was reduced, documenting and following up on cases became harder. Participants expressed fear that these gaps in supervision could lead to reluctance or complacency among certain staff members.

> "*there´s reluctance, sometimes people don´t do the work because they know no one will come physically to supervise them*" (P1, M)

> "*Digitalisation can make people lazy because they know you cannot see them*" (P4, F)

Participants identified numerous practical barriers that limited the reach of digital MNCH initiatives, especially in resource-constrained settings. This is seen in the category Perceiving socioeconomic barriers to digital healthcare uptake. Poor internet connectivity and lack of electricity and literacy skills in some rural areas meant that online services were unreliable or inaccessible there. Many community members did not own smartphones or could not afford data bundles to join video calls or access online information. Even among health workers, not everyone was equally comfortable with the new technology. Older staff and those in remote clinics sometimes lacked the computer skills or equipment needed to fully participate.

> "*The Internet is very expensive…internet connectivity is a big issue here, a big challenge that we suffer with here. We have many geographical spaces where Internet is not fully available*" (P1, F)

> "*Digitalisation is very good, but it´s hard to be adopted in the whole country…works only for those who are educated and have access to internet …some people don´t have the skills for reading and interpreting, even the staffs need to be trained on how to use these gadgets*" (P3, F)

These socioeconomic and technological constraints meant that certain vulnerable groups such as the poorest families or those in very remote villages risked being left behind by the digital transformation.

Overarching theme

Build on the previous subthemes, the experiences of MNCH professionals in Uganda revealed a paradox, while digitalisation offered transformative opportunities, it also exposed fundamental limitations. Digital tools were described as both enabling and constraining, reflecting a tension between the promise of innovation and the realities of implementation in resource-constrained settings.

On the one hand, digitalisation was appreciated for its transformative potential in enhancing work-life balance and job satisfaction, improving work efficiency, enabling collaboration, improving service delivery, and strengthening preparedness for future health crises. On the other hand, participants recognised that digitalisation was only part of the solution to the broader challenges of restoring and maintaining MNCH service delivery during the pandemic.

In the interviews, participants expressed caution and concern about the practical limitations of digitalisation, including technological barriers, supervision challenges, and the irreplaceable value of in-person care. Concerns were also raised about the risk of excluding vulnerable groups due to pre-existing disparities in digital access and literacy.

This paradox reflects a tension between the enthusiasm for the promises of digital innovation in MNCH services and concerns about the practical challenges of implementing it in resource-constrained, culturally diverse settings such as Uganda which is reflected in the Theme: Experiencing Digitalisation as a Paradox: between promise and practice.

DISCUSSION

The pandemic catalysed an unprecedented expansion of digital tools in healthcare (including MNCH services) to maintain service delivery while minimising the risk of contracting the virus [46, 47]. In Uganda, the digitalisation of healthcare enhanced efficiency and continuity of care, overall health system resilience both during and after the pandemic [20]. This study adds a nuanced understanding of how MNCH professionals in Uganda experienced this shift, not merely as a technological advancement, but as a paradoxical process that simultaneously enabled service continuity and exposed systemic inequities as the results show. The insights

from this study contribute to a growing recognition that digital tools in healthcare, while promising, must be critically examined through the lens of user experience, cultural acceptability, and infrastructural readiness.

To understand the results of this study the Diffusion of Innovations (DOI) theory was applied. DOI is an interpretive framework that explains how innovations are adopted over time within an organisation or society (48). The framework identifies five key attributes that influence the adoption of an innovation over time, namely relative advantage, compatibility, complexity, trialability, and observability [48]. This framework aligns with this study study's aim of exploring MNCH professionals' experiences with digital health adaptations introduced rapidly during the COVID-19 pandemic in Uganda.

Relative advantage

Rogers defines relative advantage as the degree to which an innovation is perceived as better than the practice it replaces [49]. Participants in this study identified substantial advantages to digitalisation including improved work-life balance and increased productivity. These benefits are primarily attributed to the greater flexibility allowed by remote consultations and virtual meetings that reduce commuting demands and thus minimise stress among providers. The MNCH professionals reported being able to manage their time more effectively, spending more quality time with family whilst maintaining patient care. Improving work-life balance is crucial for workforce retention and reducing burnout rates, factors positively correlated with higher-quality patient care and fewer clinical errors [50]. Previous studies have shown that streamlining workflows and reducing commuting-related stress can be directly translated into greater efficiency to deliver MNCH services despite resource constraints and workforce shortages in Uganda [20].

Despite these advantages, participants also identified a number of challenges related to reduced supervision and accountability in remote settings. Some feared that the lack of physical oversight could lead to reluctance among staff. This tension illustrates that the relative advantage of digitalisation is not uniformly experienced. While digital tools can enhance productivity and work-life balance, these benefits may be offset if remote work leads to blurred boundaries between professional and personal life, increasing stress and the risk of burnout, which could negatively affect MNCH service delivery. A policy review examining national guidelines from Kenya, Uganda, Mozambique, and Zimbabwe during the COVID-19 pandemic highlighted that continuous connectivity often made it difficult for employees to focus and maintain motivation, despite the potential efficiency gains of digitalisation [48]. In the same policy review, the absence of a structured office environment made it difficult for some employees to stay focused and motivated.

These findings underscore that the perceived benefits of an innovation, such as flexibility and time management, depend on appropriate implementation, structured remote-work practices, and adequate support to sustain the relative advantage in MNCH service contexts [51].

Compatibility

Compatibility refers to the extent to which an innovation aligns with the existing social values, culture, and needs of potential adopters [49]. In this study, participants highlighted that while digitalisation offered practical benefits, it was not always culturally or socially compatible with established healthcare norms in Uganda.

The participants observed that both patients and providers initially struggled with the shift to digital tools. This was partially due to unfamiliarity with the technology, but also the limitations of virtual consultations that often failed to capture non-verbal cues, such as body language and facial expressions, which participants considered essential for accurate clinical assessments. These concerns were also reflected in an analysis of early-pandemic policy guidelines in four countries, including Uganda, where maintaining in-person services was particularly important especially in maternal and child health contexts, where trust and physical presence are highly valued [51]. In addition, these findings align with the results of a systematic literature review that examined how sociocultural factors shape mental health care and help-seeking behaviours in Uganda. The review emphasised strong cultural preferences for face-to-face consultations, highlighting the limitations of digital health interventions in contexts where interpersonal interaction is central to care [52]. The findings of the review conclude that digital platforms cannot fully replace traditional healthcare interactions without considerable societal and structural adaptations, suggesting that policies should therefore encourage a hybrid model combining digital and face-to-face care to ensure comprehensive and inclusive MNCH service delivery.

Beyond the patient-provider dynamics, participants also expressed concern about how digitalisation disrupted traditional norms of supervision and accountability. The shift to remote work reduced direct oversight, leading to fears that some staff might become complacent or disengaged. Similar results can be found in a qualitative study exploring the effective use of technology in clinical supervision within mental health and allied health settings in Australia [53]. In this context, while digital tools were seen as being able to enhance access to supervision, especially in rural or remote areas, there was also the risk of reduced accountability, and superficial engagement if not carefully structured.

Complexity

Complexity refers to how difficult an innovation is to understand and use [49]. While participants acknowledged the clear advantages of digital tools in healthcare amid the pandemic, they emphasised that its adoption was hindered by infrastructural barriers. These included poor internet connectivity, unstable electricity, and the

high cost of data in some Ugandan regions, particularly in remote or resource-poor regions. Such limitations frequently hampered the effectiveness of telemedicine, online training, and digital coordination efforts.

These limitations are also mentioned in a systematic review of qualitative research into Uganda's digital health response during COVID-19 [20]. The study similarly identified infrastructural challenges, such as limited internet access and unreliable electricity as critical barriers to the adoption of digital tools in healthcare in Uganda [48]. Both studies asserted that despite the recognised potential of digital tools, persistent structural limitations significantly constrain their reach and impact, especially in underserved communities.

Participants also noted that digital literacy varied widely among healthcare providers. Participants perceived that older staff and those working in rural clinics often lacked the skills or confidence to engage with digital platforms, findings that aligns with Ndejjo et al.'s findings in their systematic review about Uganda's digitalisation during the pandemic, which emphasised the need for digital capacity-building among health workers as a prerequisite for successful technology adoption [20].

Further, these findings are supported by results from a rapid review that examined how telemedicine was used across sub-Saharan Africa during the pandemic, which identified infrastructure and digital skills as major obstacles to equitable digital health implementation [54]. They also reflect the broader digital divide reported across the region, where low digital literacy and limited smartphone access continue to restrict the reach and impact of digital health innovations [48].

Overall, this duality created a tension between the promise of digitalisation and the reality on the ground. These perceptions were documented in a global mixed-methods study on maternal care during COVID-19, which highlighted telemedicine as a double-edged sword [55], it underscores that digital health's effectiveness in MNCH contexts is highly context dependent. Crucial prerequisites, such as reliable internet access, stable electricity, affordable digital devices, and sufficient digital literacy, are often unavailable in resource-limited rural settings. If digital health initiatives do not proactively ensure inclusivity, they risk excluding populations most in need, exacerbating existing healthcare disparities [20, 54]. Consequently, digital health strategies should aim explicitly address and mitigate barriers to equitable access, ensuring technology-driven healthcare solutions benefit all populations.

Observability

Observability refers to the extent to which the benefits of an innovation are visible and demonstrable to others [49]. In this study, MNCH professionals clearly observed the positive outcomes of digitalisation during the pandemic. Participants described how digital tools enhanced work efficiency and team collaboration by streamlining communication and reducing logistical burdens. Platforms such as Zoom enabled rapid, efficient information sharing and facilitated more inclusive decision-making across different levels of the health system. This shift toward bottom-up engagement of local health actors was seen as a significant improvement in responsiveness and adaptability in service delivery. These visible benefits align with findings from a qualitative case study in the Netherlands, examining online democratic participation and its implications for inclusivity in citizen engagement demonstrate digital tools' capability to decentralise decision-making processes and include diverse inputs, especially when traditional approaches were unsuitable during the pandemic [56]. In both contexts, the observable impact of digitalisation reinforced its perceived value and encouraged continued use.

Moreover, MNCH professionals perceived digitalisation as enhancing service quality and promoting proactive health-seeking behaviours among patients. This improvement was attributed to the use of diverse online channels (such as written content, infographics, and videos) that addressed various preferences and targeted different segments within the Ugandan community. thereby positively influencing health-seeking behaviours and overall health outcomes. This in turn lead to better adherence to recommended care practices, early identification of risks and timely intervention. Participants further expressed optimism about preparedness for future public health emergencies, aligning with findings from a mixed-methods study examining the role of digital technologies in Uganda's COVID-19 response [20], the study highlighted how digital tools supported essential health services in general amid the pandemic, including risk communication and public health messaging, which contributed to improved community awareness and service uptake highlighting technology adoption as pivotal for health system resilience in low-resource settings.

Trialability

Trialability refers to the degree to which an innovation can be tested on a limited basis before full-scale implementation [49]. In this study, MNCH professionals did not describe a phased or experimental rollout of digital tools in MNCH services. Instead, the COVID-19 pandemic created a context in which digitalisation was implemented rapidly and broadly, leaving little to no room for gradual testing.

Participants described how digital tools were introduced suddenly and with limited support. Many felt uncomfortable and unfamiliar with the new systems in the beginning, especially due to the lack of pre-training and infrastructural constraints, particularly in rural areas. This lack of trialability contributed to implementation challenges and uneven MNCH services uptake, especially in areas with limited digital literacy and infrastructure.

This mirrors the challenges identified in a WHO report, which found that health workers frequently faced pressure to adopt digital tools without adequate time, training, or resources to evaluate their usefulness, par-

ticularly during periods of rapid health system transformation [57].

The findings of this study highlight the importance of building trialability into future digital tools in healthcare strategies, ensuring that innovations can be tested, refined, and scaled in ways that are responsive to local contexts and capacities. By doing so, digital tools in healthcare will not only be effective but also equitable and sustainable across diverse healthcare settings.

The Diffusion of innovations theory was used in this study to interpret how MNCH professionals in Uganda experienced the Great Acceleration of digital tools in MNCH services during the COVID-19 pandemic. Diffusion of innovations provides a framework for understanding how new technologies are adopted, focusing on five key attributes: relative advantage, compatibility, complexity, trialability, and observability. This framework is especially relevant in crisis contexts, where innovations are introduced quickly and unevenly. By mapping participants' views onto these dimensions, we were able to interpret how digitalisation was experienced as both enabling and limiting, depending on contextual factors. The results show that while digital tools were widely appreciated for improving efficiency, flexibility, and preparedness, their adoption was constrained by infrastructural, cultural, and supervisory limitations. This highlights the need for context-sensitive implementation strategies to ensure equitable and sustainable digital health innovations in low-resource settings. Thus, DOI helped structure the analysis and offered insights into the conditions that may support successful integration of digital innovations into MNCH services in Uganda. Moreover, while these findings are grounded in the Ugandan context, the use of DOI may support transferability to similar low-resource settings where digital health innovations are being introduced under crisis conditions.

Methodological considerations

This study was conducted as part of the first author's master thesis work and was supervised by the last author. It used qualitative content analysis to explore the experiences and perceptions of MNCH professionals regarding digital health adaptations in MNCH service delivery during the COVID-19 pandemic in Uganda.

Having homogenous participant group was both advantageous for this qualitative study as it allowed for in-depth exploration of participants' experiences and facilitated achieving sufficient information power with less sample size. However, it was also disadvantageous, as a more diverse and larger sample might have provided additional varied experiences and enriched the findings.

All interviews were conducted in English, which was not the first language of either the interviewer or the interviewees. The decision to conduct interviews in English without interpreters was deliberate to avoid potential distortions or inaccuracies associated with interpretation [58]. However, while it is possible that some participants may have been more comfortable expressing certain experiences in their native language, we consider it unlikely that this substantially affected the data. All participants were proficient in English, having completed advanced qualifications in SRHR through English-language programmes, and they conduct their daily professional work in English.

The inclusion of MNCH professionals from different sectors allows this study to represent a range of experiences of digital tools during the Covid-19 response in Uganda. Although all interviews were conducted in Kampala, some participants were based in rural areas and were interviewed during their temporary stay in the capital. This added valuable perspectives from both urban and rural contexts. The use of face-to-face interviews strengthened rapport. Trustworthiness was enhanced through regular peer-debriefing, reflexive journaling, and meticulous documentation of the entire protocol and analytic process, supporting credibility, dependability and confirmability. Encouraging diverse MNCH professionals to provide rich, contextualised accounts further supported the transferability of the findings to other settings.

Future research would benefit from broader geographic sampling, multilingual data collection, and a larger, more varied cohort to capture a more comprehensive picture of digital health implementation across Uganda.

Opportunities and challenges

The findings highlight a paradoxical experience of digitalisation in MNCH service delivery in Uganda. While digital tools supported work–life balance, improved efficiency, and strengthened collaboration among health professionals, Oand facilitated faster data collection and preparedness for future health crises, persistent barriers limited their full potential. Poor connectivity, high data costs, and limited digital literacy constrained the effectiveness of digital solutions, and overreliance on digitalisation risked excluding vulnerable populations and undermining the quality of care.

CONCLUSIONS

This study highlights the dual nature of digitalisation in Uganda's MNCH services that occurred during the COVID-19 pandemic as experienced by MNCH professionals. the findings shows that digital services were seen as a catalyst for enhanced work–life balance, efficiency, collaboration and service continuity. These benefits suggest that, when thoughtfully integrated, digitalisation can strengthen provider well-being and enhance system responsiveness. at the same time, participants also highlighted barriers such as unreliable connectivity, high data costs, limited digital literacy, and the irreplaceable value of in-person clinical assessments.

These challenges imply that sole reliance on digitalisation can be a potential source of new inequities and practical challenges affect the care quality.

These findings recommend that future strategies could consider hybrid care models that integrate digital and face-to-face services, explore ways to improve affordable connectivity, and strengthen digital literacy among health workers and communities. Equity considerations must be embedded into the design of digital health interventions to ensure inclusive adoption and avoid reinforcing existing disparities.

DECLARATIONS

Ethics and consent

The study protocol was approved by the Research Ethics Committee (REC) at St Francis Hospital Nsambya, Uganda (REC Approval No. 67/21.02.2024). The study adhered to the ethical principles outlined in the Helsinki Declaration. Participants received detailed information about the study and provided written informed consent.

Competing interests

The authors report no conflicts of interest.

Funding

Not applicable.

Author contributions

RA and JP conceptualised the study design and methods. RA led data collection and GT facilitated project administration together with JP. All authors (RA, GT, TH, JP) contributed to the formal analysis of the data. RA led the writing and review, with support from all authors. All authors approved the final submission.

Data availability

Not applicable.

Acknowledgements

The authors would like to thank all individuals who contributed to this study, with special appreciation to the participants for sharing their time and experiences.

ORCIDs

Ryan Alsaid 0009-0000-1818-3958
Tobias Herder 0000-0002-8504-4031
Gilbert Tumwine 0000-0002-7900-2919
Jack Palmieri 0000-0002-7430-3157

ABSTRACT IN SPANISH

“Entre la promesa y la práctica”: Experiencias de los profesionales de salud materna, neonatal e infantil sobre las adaptaciones de los servicios digitales en Uganda durante la pandemia del COVID-19

Introducción: La pandemia del COVID-19 interrumpió de forma severa los servicios de salud materna, neonatal e infantil (SMNI) en Uganda. Como respuesta, las herramientas de salud digital se adoptaron rápidamente como una de las estrategias para restablecer la prestación de servicios. Sin embargo, las experiencias de los profesionales de SMNI que implementaron estas adaptaciones siguen poco exploradas. Este estudio tuvo como objetivo analizar cómo los profesionales de SMNI en Uganda vivieron las adaptaciones digitales implementadas para restablecer los servicios durante la pandemia.
Métodos: Este estudio cualitativo incluyó siete entrevistas en profundidad con profesionales de SMNI en Kampala, Uganda. Los participantes fueron seleccionados intencionalmente según su participación directa en las adaptaciones de salud digital durante la pandemia. Los datos se analizaron mediante análisis de contenido cualitativo para explorar tanto significados manifiestos como latentes en las experiencias de los participantes.
Resultados: Surgió un tema general: experimentar la digitalización como una paradoja entre la promesa y la práctica. Este tema estuvo respaldado por dos subtemas: reconocer los beneficios multidimensionales de la digitalización y entender la digitalización como solo “una parte del rompecabezas”, además de seis categorías. Los resultados muestran que, si bien las herramientas digitales mejoraron el equilibrio entre vida laboral y personal, la colaboración y la continuidad de los servicios, también evidenciaron barreras socioeconómicas y de infraestructura, especialmente en entornos rurales y de bajos ingresos.
Conclusiones: Las innovaciones en salud digital ofrecen un apoyo valioso para la prestación de servicios de SMNI durante emergencias de salud pública. No obstante, su efectividad está limitada por inequidades estructurales y exclusión digital. Esto resalta la necesidad de estrategias sensibles al contexto que equilibren la innovación tecnológica con las realidades estructurales y clínicas persistentes.

Palabras clave: Salud digital, materna, neonatal, infantil, COVID-19, cualitativo, Uganda.

REFERENCES

[1] Cucinotta D, Vanelli M. WHO declares COVID-19 a pandemic. Acta Biomed. 2020;91(1):157-60.

[2] Ayouni I, Maatoug J, Dhouib W, Zammit N, Fredj SB, Ghammam R, et al. Effective public health measures to mitigate the spread of COVID-19: a systematic review. BMC Public Health. 2021;21(1):1015.

[3] Gunasekeran DV, Tseng RMWW, Tham Y-C, Wong TY. Applications of digital health for public health responses to COVID-19: a systematic scoping review of artificial intelligence, telehealth and related technologies. NPJ Digit Med. 2021;4(1):40.

[4] Amankwah-Amoah J, Khan Z, Wood G, Knight G. COVID-19 and digitalization: The great acceleration. J Bus Res. 2021;136:602-11.

[5] Shang Y, Li H, Zhang R. Effects of Pandemic Outbreak on Economies: Evidence From Business History Context. Front Public Health. 2021;9:632043.

[6] Fejfar D, Andom AT, Msuya M, Jeune MA, Lambert W, Varney PF, et al. The impact of COVID-19 and national pandemic responses on health service utilisation in seven low- and middle-income countries. Glob Health Action. 2023;16(1):2178604.

[7] World Health Organization. Pulse survey on continuity of essential health services during the COVID-19 pandemic: Interim report. Geneva: WHO; 2020.

[8] Kc A, Gurung R, Kinney MV, Sunny AK, Moinuddin M, Basnet O, et al. Effect of the COVID-19 pandemic response on intrapartum care, stillbirth, and neonatal mortality outcomes in Nepal: a prospective observational study. Lancet Glob Health. 2020;8(10):e1273-e81.

[9] Shapira G, Ahmed T, Drouard SHP, Amor Fernandez P, Kandpal E, Nzelu C, et al. Disruptions in maternal and child health service utilization during COVID-19: analysis from eight sub-Saharan African countries. Health Policy Plan. 2021;36(7):1140-51.

[10] Sharma S, Aggarwal S, Kulkarni R, Kumar D, Mishra BK, Dwivedi GR, et al. Challenges in accessing and delivering maternal and child health services during the COVID-19 pandemic: A cross-sectional rapid survey from six states of India. Int J Environ Res Public Health. 2023;20(2).

[11] Haldane V, De Foo C, Abdalla SM, Jung AS, Tan M, Wu S, et al. Health systems resilience in managing the COVID-19 pandemic: lessons from 28 countries. Nat Med. 2021;27(6):964-80.

[12] World Health Organization. PMNCH 2020 annual report: protecting progress for women, children and adolescents in the COVID-19 era. Geneva: WHO; 2021.

[13] Kuandyk Sabitova A, Ortega MA, Ntegwa MJ, Sarria-Santamera A. Impact of the COVID-19 pandemic on access to and delivery of maternal and child healthcare services in low-and middle-income countries: a systematic review of the literature. Front Public Health. 2024;12:1346268.

[14] Townsend R, Chmielewska B, Barratt I, Kalafat E, van der Meulen J, Gurol-Urganci I, et al. Global changes in maternity care provision during the COVID-19 pandemic: A systematic review and meta-analysis. E Clin Med. 2021;37:100947.

[15] Mndala L, Chapuma C, Riches J, Gadama L, Kachale F, Bilesi R, et al. Effects of COVID-19 on maternal and neonatal outcomes and access to antenatal and postnatal care, Malawi. Emerg Infect Dis. 2023;29(10):1990.

[16] Hessami K, Homayoon N, Hashemi A, Vafaei H, Kasraeian M, Asadi N. COVID-19 and maternal, fetal and neonatal mortality: a systematic review. J Matern Fetal Neonatal Med. 2022;35(15):2936-41.

[17] Kozlakidis Z, Sargsyan K. Digitalization of healthcare in low-and middle-income countries (LMICs): An overview. Cham: Springer International Publishing; 2024. 1-4 p.

[18] Knop MR, Nagashima-Hayashi M, Lin R, Saing CH, Ung M, Oy S, et al. Impact of mHealth interventions on maternal, newborn, and child health from conception to 24 months postpartum in low- and middle-income countries: a systematic review. BMC Med. 2024;22(1):196.

[19] World Health Organization. Introduction. WHO guideline recommendations on digital interventions for health system strengthening. Geneva: WHO; 2019.

[20] Ndejjo R, Kabwama SN, Namale A, Tusubira AK, Wanyana I, Kizito S, et al. Harnessing digital technology for COVID-19 response in Uganda: lessons and implications for future public health emergencies. BMJ Glob Health. 2023;8(Suppl 6).

[21] World Health Organization. Telemedicine: opportunities and developments in Member States: report on the second global survey on eHealth. Geneve: WHO; 2010.

[22] Digital Square. Digital health systems to support pandemic response in Uganda: Mapping digital health tools and matching deployment opportunities in response to COVID-19. 2021.

[23] World Bank. The size and distribution of digital connectivity gaps in Sub-Saharan Africa. New York: World Bank; 2023.

[24] Kabagenyi A, Kyaddondo B, Nyachwo EB, Wasswa R, Bwanika JM, Kabajungu E, et al. Disruption in essential health service delivery: A qualitative study on access to family planning information and service utilization during the first wave of COVID-19 pandemic in Uganda. Open Access J Contracept. 2022;13:75-82.

[25] Burt JF, Ouma J, Lubyayi L, Amone A, Aol L, Sekikubo M, et al. Indirect effects of COVID-19 on maternal, neonatal, child, sexual and reproductive health services in Kampala, Uganda. BMJ Glob Health. 2021;6(8).

[26] Zeus A, Thierry B, Katherine T, Ananya T, Bill M, Daniel M, et al. Disruptions in maternal health service use during the COVID-19 pandemic in 2020: experiences from 37 health facilities in low-income and middle-income countries. BMJ Global Health. 2022;7(1):e007247.

[27] Roberton T, Carter ED, Chou VB, Stegmuller AR, Jackson BD, Tam Y, et al. Early estimates of the indirect effects of the COVID-19 pandemic on maternal and child mortality in low-income and middle-income countries: a modelling study. Lancet Glob Health. 2020;8(7):e901-e8.

[28] Rwengabo S. Covid-19 in Uganda: Toward a national strategy on complex public health emergencies. Kampala, Uganda: Konrad Adenauer Stiftung; 2020.

[29] Nangendo J, Semitala F, Kalyango J, Kabami J, Obeng-Amoako GO, Muwema M, et al. Village health team-delivered oral HIV self-testing increases linkage-to-care and antiretroviral-therapy initiation among men in Uganda. AIDS Care. 2024;36(4):482-90.

[30] Kabwama SN, Wanyenze RK, Kiwanuka SN, Namale A, Ndejjo R, Monje F, et al. Interventions for maintenance of essential health service delivery during the COVID-19 response in Uganda, between March 2020 and April 2021. Int J Environ Res Public Health. 2022;19(19).

[31] Kibira SPS, Evens E, Giibwa L, Tuhebwe D, Martinez A, Kagimu R, et al. Uptake of reproductive, maternal and child health services during the first year of the COVID-19 pandemic in Uganda: A mixed methods study. PLOS Glob Public Health. 2023;3(4):e0001619.

[32] Stofberg L, Strasheim A, Koekemoer E. Digitalisation in the Workplace: The Role of Technology on Employee Engagement and Creativity Teams. In: Ferreira N, Potgieter IL, Coetzee M, editors. Agile Coping in the Digital Workplace: Emerging Issues for Research and Practice. Cham: Springer International Publishing; 2021. p. 231-57.

[33] Cermak CA, Read H, Jeffs L. Health care professionals' experiences with using information and communication technologies in patient care during the COVID-19 pandemic: Qualitative study. JMIR Form Res. 2024;8:e53056.

[34] Sinha R. The role and impact of new technologies on healthcare systems. Discov Health Syst. 2024;3(1):96.

[35] Shaw B, Amouzou A, Miller NP, Tafesse M, Bryce J, Surkan PJ. Access to integrated community case management of childhood illnesses services in rural Ethiopia: a qualitative study of the perspectives and experiences of caregivers. Health Policy Plan. 2016;31(5):656 -666.

[36] Zulu JM, Hurtig AK, Kinsman J, Michelo C. Innovation in health service delivery: integrating community health assistants into the health system at district level in Zambia. BMC Health Serv Res. 2015;15:38.

[37] Kayiga H, Genevive DA, Amuge PM, Ssemata AS, Nanzira RS, Nakimuli A. Lived experiences of frontline healthcare providers offering maternal and newborn services amidst the novel corona virus disease 19 pandemic in Uganda: A qualitative study. PLoS One. 2021;16(12):e0259835.

[38] Centers for Disease Control and Prevention. CDC in Uganda 2024 [Available from: https://www.cdc.gov/global-health/countries/uganda.html.

[39] Dahlgren L, Emmelin M, Winkvist A. Qualitative methodology for international public health: Umeå universitet; 2007.

[40] The Global Academy of SRHR. about the Academy n.d. [Available from: https://www.globalsrhr.org/about-the-academy/.

[41] Kvale S. Interviews: Learning the craft of qualitative research interviewing. New York: Sage; 2009.

[42] Malterud K, Siersma VD, Guassora AD. Sample size in qualitative interview studies: guided by information power. Qual Health Res. 2016;26(13):1753-60.

[43] Graneheim UH, Lundman B. Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. Nurse Educ Today. 2004;24(2):105-12.

[44] Lindgren BM, Lundman B, Graneheim UH. Abstraction and interpretation during the qualitative content analysis process. Int J Nurs Stud. 2020;108:103632.

[45] World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. Jama. 2013;310(20):2191-4.

[46] Kamulegeya LH, Bwanika JM, Musinguzi D, Bakibinga P. Continuity of health service delivery during the COVID-19 pandemic: the role of digital health technologies in Uganda. Pan Afr Med J. 2020;35(Suppl 2):43.

[47] World Health Organization. Crucial changes needed to protect workers' health while teleworking Geneva, Switzerland: World Health Organization; 2022 [Available from: https://www.who.int/news/item/02-02-2022-crucial-changes-needed-to-protect-workers-health-while-teleworking.

[48] Rogers EM. Diffusion of Innovations. 5th ed. New York, NY: Free Press; 2003.

[49] Mbatha B. Diffusion of Innovations: How adoption of new technology spreads in society. In: Ocholla D, Onyancha OB, Adesina AO, editors. Information, Knowledge, and Technology for Teaching and Research in Africa: Human Machine Interaction and User Interfaces. Cham: Springer Nature Switzerland; 2024. p. 1-18.

[50] Kang J, Kwon S-S, Lee Y. Clinical nurses' work-life balance prediction due to patient safety incidents using classification and regression tree analysis: a secondary data analysis. BMC Nursing. 2024;23(1):70.

[51] Plotkin MK, Williams KM, Mbinda A, Oficiano VN, Nyauchi B, Walugembe P, et al. Keeping essential reproductive, maternal and child health services available during COVID-19 in Kenya, Mozambique, Uganda and Zimbabwe: analysis of early-pandemic policy guidelines. BMC Public Health. 2022;22(1):577.

[52] Asiimwe R, Nuwagaba-K RD, Dwanyen L, Kasujja R. Sociocultural considerations of mental health care and help-seeking in Uganda. SSM - Mental Health. 2023;4:100232.

[53] Martin P, Kumar S, Lizarondo L. Effective use of technology in clinical supervision. Internet Interv. 2017;8:35-9.

[54] Chitungo I, Mhango M, Mbunge E, Dzobo M, Musuka G, Dzinamarira T. Utility of telemedicine in sub-Saharan Africa during the COVID-19 pandemic. A rapid review. Hum Behav Emerg Technol. 2021;3(5):843-53.

[55] Galle A, Semaan A, Huysmans E, Audet C, Asefa A, Delvaux T, et al. A double-edged sword-telemedicine for maternal care during COVID-19: findings from a global mixed-methods study of healthcare providers. BMJ Glob Health. 2021;6(2).

[56] Hofstra R, Michels A, Meijer A. Online democratic participation during COVID-19:Assessing implications for inclusivity of citizen engagement. Information Polity. 2023;28(3):395-410.

[57] World Health Organization. Digital health literacy key to overcoming barriers for health workers. Geneve: WHO; 2023.

[58] van Nes F, Abma T, Jonsson H, Deeg D. Language differences in qualitative research: is meaning lost in translation? Eur J Ageing. 2010;7(4):313-6.