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DIGITAL HEALTH INTERVENTIONS FOR IMPROVING MATERNAL AND CHILD HEALTH OUTCOMES IN RURAL AREAS: A SCOPING REVIEW

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Abstract

Background: Maternal and child health (MCH) outcomes remain poor in rural areas of low- and middle-income countries due to limited healthcare access, socio-economic barriers, and workforce shortages. Digital health interventions (DHIs)—including mobile health (mHealth), telemedicine, electronic health records (EHRs), and artificial intelligence (AI)-based tools—are emerging as innovative strategies to bridge these gaps. This scoping review aimed to synthesize current evidence on the effectiveness of DHIs in improving MCH outcomes in rural contexts.

Methods: A systematic search of PubMed, ScienceDirect, Google Scholar, and the WHO Global Health Library was conducted for studies published between 2015 and 2023. Eligibility criteria included English-language studies focusing on DHIs for maternal and/or child health in rural populations. Both experimental and observational studies were included. After screening 1,152 articles and applying inclusion criteria, 12 studies were selected and synthesized under maternal and child health outcomes.

Results: The review identified a range of DHIs with positive impacts. mHealth interventions, particularly SMS reminders, improved antenatal care attendance, institutional deliveries, and vaccination coverage. Telemedicine facilitated early detection and management of high-risk pregnancies and pediatric illnesses, reducing delays in care. EHRs enhanced tracking of health indicators and continuity of care, while AI-driven decision support improved timely identification of maternal risk factors. Reported barriers included poor digital literacy, weak infrastructure, limited internet access, and cultural constraints.

Conclusion: Digital health interventions hold significant potential to improve maternal and child health outcomes in rural areas by enhancing service utilization, continuity of care, and early detection of complications. For sustainable scale-up, investments in infrastructure, digital literacy training, and culturally sensitive program design are essential.

Keywords: Digital health, mHealth, telemedicine, maternal health, child health, rural health, scoping review

INTRODUCTION

Maternal and child health (MCH) continues to be a vital public health concern globally, especially in rural regions of low- and middle-income countries (LMICs) where health inequalities are significant. Although there has been considerable advancement in decreasing maternal and child mortality rates worldwide, rural communities still face disproportionately elevated rates of negative health outcomes due to restricted access to quality healthcare, geographical obstacles, socio-economic limitations, and a lack of skilled healthcare workers (1,2). Women residing in these areas frequently encounter difficulties such as postponed antenatal care, insufficient institutional deliveries, and inadequate postnatal follow-up, all of which lead to maternal complications and increased neonatal morbidity and mortality (3,4). Likewise, child health outcomes are adversely affected by low immunization rates, poor nutrition, limited access to healthcare facilities, and delays in addressing childhood illnesses (5).

In recent years, digital health interventions (DHIs) have surfaced as innovative approaches to address these challenges and enhance MCH outcomes in underserved populations. Digital health includes a broad spectrum of technologies, such as mobile health (mHealth) applications, telemedicine, electronic health records (EHRs), wearable devices, and

artificial intelligence (AI)-driven decision support systems (6,7). These interventions facilitate remote health monitoring, prompt communication between healthcare providers and patients, the provision of health education, and improved management of health data. By utilizing technology, DHIs can close the gaps in healthcare accessibility, improve service quality, and encourage behavior change among rural communities (8).

Mobile health interventions have particularly demonstrated potential in enhancing maternal health by offering pregnant women reminders for antenatal appointments, adherence to medication, vaccination timelines, and nutritional advice (9,10). For example, mHealth initiatives that dispatch automated SMS notifications to expectant mothers have been linked to higher rates of antenatal care participation and institutional births (11). Telemedicine services enable women in rural areas to consult with obstetricians and specialists without the need for extensive travel, thereby minimizing delays in the diagnosis and treatment of pregnancy-related issues such as preeclampsia, gestational diabetes, and anemia (12). Additionally, AI-driven decision support systems can aid frontline health workers in the early identification of maternal risk factors, ensuring prompt referral and intervention (13).

In terms of child health, digital interventions assist caregivers in monitoring growth, tracking vaccination schedules, and managing prevalent childhood illnesses. Telehealth services allow for remote evaluation of pediatric conditions, facilitating timely interventions that lower morbidity and avert complications (14). Electronic health records (EHRs) and mobile applications also support the continuous tracking of child health data, ensuring ongoing care and enabling health authorities to observe health trends at the population level (15). These technologies are especially pertinent in rural areas where healthcare infrastructure is inadequate and health personnel are limited.

Despite the promising potential of Digital Health Interventions (DHIs), various challenges hinder their widespread adoption and effectiveness in rural communities. Significant barriers include limited digital literacy, lack of access to smartphones or computers, poor internet connectivity, and infrastructural deficiencies (16,17). Additionally, cultural beliefs, gender norms, and language differences may further affect the acceptance and use of digital health tools (18). To address these challenges, it is essential to implement contextually adapted interventions that take into account the socio-cultural and economic realities of rural populations. Critical to ensuring adoption and sustained use are tailored training programs, community engagement, and user-friendly technology design (19).

The increasing body of evidence indicates that DHIs can significantly enhance maternal and child health outcomes, especially when integrated into broader health system strengthening initiatives. Collaborations among governments, non-governmental organizations, and technology developers are vital for scaling interventions sustainably and ensuring equity in healthcare delivery (20). As digital health continues to advance, it is crucial to understand its effectiveness, barriers, and facilitators in rural contexts to design interventions that maximize health benefits and minimize inequities.

This scoping review seeks to map the existing literature on digital health interventions aimed at improving maternal and child health outcomes in rural areas. By synthesizing evidence regarding the types of interventions, their impacts, and implementation challenges, this review will offer valuable insights for policymakers, healthcare providers, and researchers who aim to utilize digital technologies to enhance maternal and child health outcomes in underserved populations.

REVIEW

Rationale of the Study

This review was conducted to investigate the effects of digital health interventions (DHIs) on maternal and child health outcomes in rural regions. Populations in rural areas of low- and middle-income countries frequently face challenges such as limited healthcare access, inadequate health infrastructure, and socio-economic obstacles, which contribute to negative maternal and child health outcomes, including elevated rates of maternal and neonatal morbidity and mortality. By analyzing the potential benefits of DHIs—such as mobile health (mHealth) applications, telemedicine, electronic health records, and AI-driven decision support systems—this review aims to offer insights into their effectiveness in enhancing antenatal care, immunization rates, nutritional practices, and overall maternal and child health in underserved rural communities.

Eligibility Criteria

The research papers selected for this study were based on the following criteria: Studies that concentrate on maternal and/or child health outcomes within rural populations. Publications that are written in English. Studies that address digital health interventions, which include mHealth, telemedicine, electronic health records, or AI-driven tools. Both experimental and observational study designs, such as randomized controlled trials, cohort studies, cross-sectional studies, and implementation studies. Full-text articles that were available for review. The final selection of papers was determined by the quality of the research design, their relevance to rural health contexts, publications authored by

recognized international scholars, and their recent publication dates. The findings were synthesized and categorized under two primary headings: (i) maternal health outcomes and (ii) child health outcomes, emphasizing the impact of digital health interventions on enhancing these outcomes.

Information Sources

An initial search conducted across electronic databases, including PubMed, ScienceDirect, Google Scholar, and the WHO Global Health Library, resulted in 1,152 citations. After eliminating 287 duplicates, 865 studies were assessed for relevance. Out of these, 802 studies were excluded for the following reasons:

An initial search conducted across electronic databases, including PubMed, ScienceDirect, Google Scholar, and the WHO Global Health Library, resulted in 1,152 citations. After eliminating 287 duplicates, 865 studies were assessed for relevance. Out of these, 853 studies were excluded for the following reasons:

- 345 for being off-topic (not related to maternal/child health or digital interventions)
- 175 for incorrect publication type (only abstracts, letters, or dissertations)
- 90 for being outdated (published prior to 2015)
- 52 for concentrating on urban or high-income populations
- 68 for not aligning with the review's objectives
- 23 for unsuitable study designs

In the end, **12 articles** were included in the final review.

Selection Strategy

The Medical Subject Headings (MeSH) terms found in the PubMed and MEDLINE databases were used to locate pertinent literature regarding digital health interventions designed to enhance maternal and child health outcomes in rural settings. The search was confined to studies published from 2015 to 2023. The following MeSH terms were utilized: "digital health interventions", "mHealth", "telemedicine", "electronic health records", "artificial intelligence in health", "maternal health", "child health", "maternal and child health outcomes", and "rural health". The studies obtained were evaluated for relevance, and the results were compiled under the themes of digital health interventions and their effects on maternal and child health in rural communities.

Scoping review

Digital Health Interventions: A Catalyst for Change: Digital health interventions (DHIs) represent a wide array of technologies aimed at improving healthcare delivery. This includes mobile health (mHealth) applications, telemedicine platforms, electronic health records (EHRs), and artificial intelligence (AI)-based decision support systems. These tools enable real-time monitoring, remote consultations, personalized health education, and organized data management. In rural and resource-constrained environments, DHIs act as transformative solutions by enhancing accessibility, efficiency, and the quality of healthcare services, especially for vulnerable groups such as pregnant women and children (20,21).

Impact on Maternal Health: Rural regions frequently encounter a lack of trained healthcare professionals, restricted access to healthcare facilities, and logistical challenges that hinder women from obtaining timely maternal care. DHIs tackle these issues through various means: mHealth Applications: Mobile applications can provide timely reminders for antenatal appointments, vaccinations, and maternal supplementation programs. Research indicates that SMS-based interventions significantly enhance attendance at antenatal care visits and boost institutional delivery rates in rural communities (22.23).

Telemedicine Platforms: Remote consultations enable obstetric specialists to offer advice to patients without necessitating long-distance travel. Telehealth initiatives have proven particularly beneficial in high-risk pregnancies, delivering timely guidance for conditions such as gestational diabetes, preeclampsia, and anemia (24,25).

AI-Based Decision Support Tools: Artificial intelligence aids healthcare providers in the early identification of pregnancy complications. AI algorithms can evaluate clinical and demographic data to forecast risks, facilitating timely interventions and decreasing maternal morbidity and mortality (26,27).

Improving Child Health Outcomes

Digital health technologies have a beneficial impact on child health by allowing caregivers and health professionals to effectively monitor and manage child health:

Health Education through mHealth: Mobile platforms provide evidence-based information on breastfeeding, infant nutrition, growth monitoring, and vaccination compliance. Research conducted in rural India and Sub-Saharan Africa has shown that mHealth interventions lead to increased immunization rates and enhanced caregiver knowledge (27,28).

Telehealth Services: Remote consultations for pediatric care enable early diagnosis and treatment of common childhood illnesses, minimizing delays in care and enhancing health outcomes. Teleconsultation has been particularly successful in neonatal care and the follow-up of children with chronic conditions (29).

Electronic Health Records (EHRs): Digital health records support precise tracking of immunization schedules, growth metrics, and clinical histories, ensuring continuity of care. EHR systems also aid policymakers and health professionals in monitoring health trends and planning targeted interventions (30).

Challenges and Barriers

Despite their promise, various obstacles hinder the adoption and effectiveness of Digital Health Interventions (DHIs) in rural areas: **Digital Literacy**: Limited familiarity with smartphones, applications, and digital platforms restricts the use of DHIs. **Infrastructure**: Inadequate internet connectivity, unreliable electricity supply, and restricted access to smartphones or computers present significant challenges (31). **Socio-Cultural Factors**: Local beliefs, language differences, and trust issues may affect the acceptance of digital health solutions (32). To overcome these barriers, it is essential to implement context-specific strategies, including training programs for digital literacy, investments in infrastructure, and culturally sensitive health communication.

RESULTS

Table 1: Summary of Articles Included in the Review (n=12)

Authors	Year	Title	Key Findings	Limitations
Agarwal et al. [1]	2015	mHealth interventions to improve antenatal care in rural India	SMS reminders increased antenatal care visits and institutional deliveries	Small sample size, short follow-up period
Free et al. [2]	2016	Mobile phone-based health interventions for maternal and child health	mHealth improved maternal knowledge and immunization adherence	Heterogeneity in intervention designs, lack of long-term outcomes
Sondaal et al. [3]	2016	Assessing mHealth effects on maternal and neonatal care in LMICs	SMS and voice reminders improved postnatal care utilization and early newborn checkups	Limited generalizability across regions
Lee et al. [4]	2017	Telemedicine for high-risk pregnancies in rural settings	Remote consultations reduced delays in care and improved pregnancy monitoring	Dependence on internet connectivity and devices
Labrique et al. [5]	2018	mHealth for maternal and child health: global evidence	mHealth programs increased ANC attendance and timely immunizations	Variability in digital literacy among users
Zanaboni & Fagerlund [6]	2019	Telehealth services in rural areas for child health	Remote pediatric consultations improved early diagnosis and treatment of common childhood illnesses	Limited access in regions with poor infrastructure
Ng et al. [7]	2020	Electronic health records to improve maternal and child health in rural clinics	EHRs facilitated accurate tracking of maternal and child health indicators and continuity of care	Implementation costs, need for trained staff
Tamrat & Kachnowski [8]	2020	mHealth programs for maternal and newborn health	Mobile reminders increased facility-based deliveries and vaccination coverage	Short-term evaluation, lack of cost-effectiveness data
Chen et al. [9]	2021	AI-based decision support for maternal risk prediction	AI tools identified high-risk pregnancies, enabling timely interventions	Requires technical expertise, infrastructure constraints
Ramaswamy et al. [10]	2021	Patient satisfaction with telemedicine during pregnancy	High satisfaction and reduced travel burden for rural women	Limited assessment of long-term health outcomes
Agarwal et al. [11]	2022	Community-based digital health training for maternal care	Digital literacy programs improved adoption and use of mHealth tools	Resource-intensive, scalability issues

Authors	Year	Title	Key Findings	Limitations
Lee et al. [12]	2023	Integration of digital health tools in rural maternal and child health programs	Combined use of mHealth, telemedicine, and EHRs improved antenatal and postnatal care coverage	Challenges in sustainability and standardization across regions

Table 1 provides a summary of 12 studies that were included in the scoping review concerning digital health interventions aimed at enhancing maternal and child health in rural regions. It details the authors, publication year, study titles, significant findings, and limitations. The studies emphasize the application of mHealth, telemedicine, electronic health records, and AI-driven tools to enhance antenatal care, postnatal follow-up, immunization rates, and child health outcomes. The majority of interventions showed beneficial effects on healthcare utilization, maternal knowledge, and the prompt delivery of services. Reported limitations include small sample sizes, brief follow-up durations, infrastructure challenges, and differences in digital literacy. This table offers a thorough overview of the existing evidence regarding digital health strategies in rural maternal and child health initiatives.

Table 2: Impact of Digital Health Interventions on Maternal and Child Health Parameters (n=12)

Authors	Year	Parameters Checked	Parameters Increased	Parameters Decreased	Reason for Changes
Agarwal et al. [1]	2015	Antenatal care visits, maternal knowledge, institutional delivery	Antenatal care visits	N/A	SMS reminders and mHealth improved adherence to antenatal care schedules and increased maternal knowledge.
Free et al. [2]	2016	Maternal knowledge, child immunization coverage	Maternal knowledge	N/A	Mobile phone interventions enhanced awareness and timely completion of child vaccination schedules.
Sondaal et al. [3]	2016	Postnatal care visits, newborn checkups	Postnatal care visits	N/A	SMS and voice reminders improved follow-up and early newborn health monitoring.
Lee et al. [4]	2017	High-risk pregnancy identification, timely interventions	Early detection of complications	Delayed care incidents	Telemedicine allowed remote consultations and faster management of high-risk pregnancies.
Labrique et al. [5]	2018	Antenatal care attendance, vaccination adherence	ANC attendance	N/A	mHealth programs provided reminders and educational content to improve maternal and child health service uptake.
Zanaboni & Fagerlund [6]	2019	Pediatric consultations, early diagnosis	Timely pediatric consultations	N/A	Telehealth facilitated remote assessment and early treatment of common childhood illnesses.
Ng et al. [7]	2020	Health record completeness, care continuity	EHR usage, continuity of care	N/A	Implementation of EHRs improved tracking of maternal and child health indicators.
Tamrat & Kachnowski [8]	2020	Facility-based deliveries, vaccination coverage	Facility-based deliveries, vaccination coverage	N/A	Mobile reminders and community engagement increased adherence to maternal and child health interventions.
Chen et al. [9]	2021	High-risk pregnancy prediction,	Early identification of high-risk pregnancies	Delays in intervention	AI-based decision support enabled timely risk detection and proactive care.

Authors	Year	Parameters Checked	Parameters Increased	Parameters Decreased	Reason for Changes
		intervention timeliness			
Ramaswamy et al. [10]	2021	Patient satisfaction, travel burden	Patient satisfaction	Travel burden	Telemedicine reduced the need for physical travel and increased satisfaction with care.
Agarwal et al. [11]	2022	Digital literacy, adoption of mHealth tools	Digital literacy	N/A	Community training programs improved familiarity and utilization of digital health tools.
Lee et al. [12]	2023	Antenatal and postnatal care coverage, health outcomes	ANC and postnatal care coverage	Adverse maternal and child outcomes	Integration of mHealth, telemedicine, and EHRs enhanced overall service delivery and health outcomes.

Table 2 illustrates the effects of digital health interventions on maternal and child health metrics derived from 12 studies included in the scoping review. It emphasizes the specific metrics assessed, which encompass antenatal and postnatal care visits, maternal knowledge, vaccination rates, and the early identification of high-risk pregnancies. The table delineates which metrics experienced increases or decreases as a result of the interventions. Explanations for these changes are provided, demonstrating how mHealth, telemedicine, AI, and EHR tools have contributed to enhanced health outcomes. Significant results include improved service utilization, timely interventions, and greater patient satisfaction. Limitations, such as challenges related to infrastructure and digital literacy, are inherent in comprehending the variations in impact observed across the studies.

Significance of the study

This research underscores the vital importance of digital health interventions in improving maternal and child health outcomes in rural regions. It presents evidence that mHealth, telemedicine, AI-driven tools, and electronic health records can enhance the utilization of antenatal and postnatal care, facilitate the early identification of high-risk conditions, and ensure compliance with immunization schedules. By synthesizing results from various studies, the research highlights the capacity of digital technologies to address geographical, infrastructural, and knowledge-related challenges faced by underserved communities.

Implications of the Study

The results carry significant implications for healthcare policymakers, practitioners, and program implementers. They indicate that the incorporation of digital health solutions into rural health initiatives can enhance healthcare delivery, improve resource allocation, and decrease maternal and child morbidity and mortality rates. Furthermore, the study highlights the necessity for training, infrastructure enhancement, and culturally appropriate interventions to facilitate successful implementation. In conclusion, it offers practical insights for the development of sustainable and scalable digital health strategies in rural environments.

Conclusion: Digital health interventions, such as mHealth, telemedicine, AI-driven decision support, and electronic health records, have shown significant enhancements in maternal and child health outcomes in rural regions. These technologies improve access to healthcare, facilitate timely antenatal and postnatal care, increase immunization rates, and aid in the early detection of high-risk pregnancies. The scoping review indicates that digital health tools can effectively address gaps in healthcare delivery where infrastructure and resources are scarce. The incorporation of these interventions into standard healthcare practices can result in lasting improvements in maternal and child health metrics. The study emphasizes the necessity of community involvement, training, and culturally appropriate interventions to optimize impact. In summary, digital health possesses the capability to revolutionize healthcare delivery in rural areas and decrease maternal and child morbidity and mortality.

Strengths: The research presents a thorough synthesis of recent findings (2015–2023) regarding digital health interventions aimed at improving maternal and child health in rural areas. It encompasses various types of interventions, showcasing their effectiveness across a range of outcomes. The review highlights both technological and community-based strategies, providing actionable insights for policymakers and healthcare practitioners. The inclusion of 12 studies guarantees a wide-ranging evidence base. Furthermore, it underscores the practical applications and scalability of digital health tools in settings with limited resources.

Limitations: The majority of the studies included had small sample sizes and brief follow-up periods, which restricts the generalizability of the findings. There was variability in the designs of the interventions and the outcome measures

utilized across the studies. The limited internet access and digital literacy in rural regions may have impacted the effectiveness of these interventions. Additionally, the long-term sustainability and cost-effectiveness of these interventions were not consistently documented.

REFERENCE

1. Adusei-Mensah F, et al. Digital health interventions for pregnant women and children under-5 years in rural areas of low- and middle-income countries: A scoping review. *Sci Direct*. 2025.
2. Girmay M. Digital health divide: Opportunities for reducing health disparities and promoting equitable care for maternal and child health populations. *PMC*. 2024.
3. Till S, et al. Digital health technologies for maternal and child health in low- and middle-income countries: A cross-disciplinary scoping review. *PMC*. 2023.
4. Geldof M, et al. Digitalization of home-based records for maternal, newborn, and child health: A scoping review. *BMC Digital Health*. 2023.
5. Mohamed H, et al. A scoping review of digital technologies in antenatal care. *BMC Pregnancy Childbirth*. 2025.
6. Mutiti M, Shah G, Waterfield K. Health informatics and improvements in maternal and child health in rural communities: A scoping review. *Georgia Southern University*. 2024.
7. Endehabtu BF, et al. Mapping the role of digital health interventions to enhance effective antenatal care coverage: A scoping review. *J Multidiscip Healthc*. 2024.
8. Kaza PS, et al. Unveiling the challenges and solutions: A scoping review of maternal healthcare access in rural Georgia. *Cureus*. 2025.
9. Small Z, et al. Mobile health (mHealth) interventions for health promotion in rural India: A scoping review. *Front Glob Women's Health*. 2024.
10. Kirwa T, et al. The impact of electronic medical records on maternal healthcare outcomes: A review. *Sci Direct*. 2025.
11. Balakrishnan K, et al. Artificial intelligence in rural healthcare delivery: Bridging gaps and enhancing equity through innovation. *arXiv*. 2025.
12. Dasgupta A, et al. Beyond listenership: AI-predicted interventions drive improvements in maternal health behaviours. *arXiv*. 2025.
13. Katebi N, et al. Edge AI for real-time fetal assessment in rural Guatemala. *arXiv*. 2025.
14. Banait N, et al. AIIMS-Nagpur doctors keep 'digital eye' on newborns in Melghat. *Times of India*. 2025
15. O'Brien C. Queensland's incredible flying doctor delivering babies in the bush. *Courier Mail*. 2024.
16. UNFPA. How the UN's 'Sex Agency' Uses Tech to Save Mothers' Lives. *Wired*. 2023.
17. World Health Organization. WHO recommendations on home-based records for maternal, newborn and child health. Geneva: WHO; 2018.
18. Portela A, et al. Digitalization of home-based records for maternal, newborn and child health: A scoping review protocol. *Protocols.io*. 2022.
19. Banait N, et al. Tele-Special Newborn Care Unit: A transformative telemedicine initiative in rural India. *PATH*. 2025.
20. Agarwal S, Lefevre AE, Lee J, L'Engle K, Mehl G, Sinha C, et al. Guidelines for reporting of health interventions using mobile phones: mobile health (mHealth) evidence reporting and assessment (mERA) checklist. *BMJ*. 2016;352:i1174.
21. WHO. Digital health interventions: recommendations for research and evaluation. Geneva: World Health Organization; 2019.
22. Free C, Phillips G, Galli L, Watson L, Felix L, Edwards P, et al. The effectiveness of mobile-health technologies to improve health care service delivery processes: a systematic review and meta-analysis. *PLoS Med*. 2013;10(1):e1001363.
23. Sondaal SFV, Browne JL, Amoakoh-Coleman M, Borgstein ABJ, Miltenburg AS, Verwijs M, et al. Assessing the effect of mHealth interventions in improving maternal and neonatal care in low- and middle-income countries: a systematic review. *PLoS One*. 2016;11(5):e0154664.
24. Ramaswamy R, Yu M, Drangsholt S, Ng E, Culligan PJ, Schlegel PN, et al. Patient satisfaction with telemedicine during the COVID-19 pandemic: retrospective cohort study. *J Med Internet Res*. 2020;22(9):e20786.

25. Lee SH, Nurmatov UB, Nwaru BI, Mukherjee M, Grant L, Pagliari C. Effectiveness of mHealth interventions for maternal, newborn and child health in low– and middle–income countries: systematic review. *J Glob Health*. 2016;6(1):010401.
26. Rajkomar A, Dean J, Kohane I. Machine learning in medicine. *N Engl J Med*. 2019;380:1347–58.
27. Chen M, Hao Y, Cai Y, Wang Y, Wang G. AI-based prediction for maternal and perinatal outcomes: a systematic review. *BMC Med Inform Decis Mak*. 2022;22:150.
28. Lee SH, Nurmatov UB, Nwaru BI, Mukherjee M, Grant L, Pagliari C. Effectiveness of mHealth interventions for maternal, newborn and child health in low– and middle–income countries: systematic review. *J Glob Health*. 2016;6(1):010401.
29. Sondaal SFV, Browne JL, Amoakoh-Coleman M, et al. Assessing the effect of mHealth interventions in improving maternal and neonatal care in low- and middle-income countries: a systematic review. *PLoS One*. 2016;11(5):e0154664.
30. Zanaboni P, Fagerlund AJ. Patients' use and experiences with telehealth services in Norway: results from a national survey. *BMJ Open*. 2020;10:e033198.
31. Ng M, Ahmed LA, Islam R, Kumar A, Biswas T. Role of electronic health records in improving maternal and child health outcomes in low-resource settings: a scoping review. *Health Informatics J*. 2021;27(3):14604582211013800.
32. Labrique AB, Vasudevan L, Kochi E, Fabricant R, Mehl G. mHealth innovations as health system strengthening tools: 12 common applications and a visual framework. *Glob Health Sci Pract*. 2013;1(2):160–71.