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Digital Pathways to Safer Motherhood: A Narrative Review of mHealth's Role in Achieving Sustainable Development Goal 3

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ABSTRACT

Background: Maternal and neonatal mortality remain pressing global health issues, particularly in low-resource settings. Barriers such as limited access to skilled care, delayed referrals, and insufficient health education contribute significantly to adverse outcomes. As part of the effort to achieve Sustainable Development Goal 3--ensuring healthy lives and well-being for all— mHealth is emerging as a key tool in transforming maternal care through digital innovation.

Objectives: This review explores the contribution of mHealth in improving maternal and neonatal outcomes, focusing on its effectiveness in reducing mortality and supporting global advancement of SDG3.

Methods: A comprehensive literature search was conducted using PubMed, Scopus, Web of Science, and Google Scholar for publications between 2010 and 2024. Peer-reviewed articles, pilot programs, and digital health reports were reviewed. Selection criteria focused on community-based mHealth tools used for maternal and newborn care.

Results: mHealth interventions demonstrated improvements in maternal service utilization, care-seeking behaviour, antenatal visit attendance, institutional deliveries, and emergency care access. Tools like MomConnect, mMitra, and MOTECH enhanced maternal awareness and care continuity. Apps such as CommCare and the Safe Delivery App improved health worker competencies. Programs including RapidSMS, TulaSalud, Ananya mHealth, Text4Baby and WelTel and GiftedMom contributed to reduced neonatal mortality through improved tracking, referrals, and health education.

Conclusion: mHealth technologies are reshaping maternal and neonatal healthcare in low-resource settings by bridging communication gaps and improving access to services. Continued innovation, investment and integration into national health systems are essential for scaling their impact to achieve SDG 3.

Keywords: *mHealth, maternal health, neonatal mortality, SDG 3, maternal mortality.*

1. INTRODUCTION

Maternal and neonatal mortality remain among the most pressing global public health concerns, especially in low and middle-income countries (LMICs), where the burden is disproportionately high. Despite concerted efforts through policies, health system reforms, and targeted programs, critical barriers persist in the form of delayed access to skilled care, lack of transportation, insufficient health infrastructure, inadequate referral systems, and a chronic shortage of trained healthcare personnel. Moreover, gaps in health education and community-level awareness further contribute to poor maternal and neonatal health outcomes.

Sustainable Development Goal 3 (SDG 3), set forth by the United Nations, aims to "ensure healthy lives and promote well-being for all at all ages." A key target under SDG 3 is to reduce the global maternal mortality ratio to less than 70 per 100,000 live births and to reduce neonatal mortality to at least as low as 12 per 1000 live births and under-5 mortality to at least as low as 25 per 1000 live births. Achieving this ambitious goal requires innovative, scalable, and cost-effective strategies that can address the challenges faced by health systems, particularly in resource-constrained settings.

In this context, mobile health (mHealth)—the use of mobile phones and other wireless technologies to support public health and clinical practice—has emerged as a promising digital intervention. mHealth facilitates improved communication between patients and healthcare providers, enhances health worker training and decision-making, supports remote monitoring of pregnancies, and provides pregnant women with timely, culturally appropriate health information. These functions can help bridge gaps in access, quality, and continuity of care during pregnancy, childbirth, and the postnatal period.

This narrative review explores the impact and potential of mHealth interventions in improving maternal and neonatal outcomes. It critically examines existing literature, with a focus on LMICs, and evaluates how these digital pathways contribute to the advancement of SDG 3 in promoting safer motherhood and reducing preventable mortality.

2. METHODS

Data Sources

A comprehensive literature search was conducted using four major databases: PubMed, Scopus, Web of Science, and Google Scholar. The search included peer-reviewed journal articles, government and NGO reports, conference proceedings, dissertations, program evaluations published between 2010 and 2024.

Study Selection

Articles were selected based on the following inclusion criteria:

- Focus on mHealth interventions related to maternal and neonatal health.
- Studies conducted in low- and middle-income countries (LMICs).
- Documentation of health outcomes, behavioural changes, or service utilization.
- Community-based interventions, including SMS, mobile apps, voice messages, and remote monitoring.

Exclusion criteria included studies that:

- Focused solely on telemedicine for general healthcare without maternal components.
- Lacked outcome evaluation.
- Were not available in English language

Data Extraction

Data were extracted on the following parameters:

- Type and scope of mHealth intervention.
- Target population (pregnant women, newborns, healthcare workers).
- Key outcomes (e.g., ANC visits, skilled deliveries, referral efficiency, knowledge improvement).
- Evidence of impact on maternal or neonatal mortality.
- Integration with health systems and scalability.

3. RESULTS

The review identified several impactful mHealth initiatives implemented across various low- and middle-income countries, each contributing meaningfully to improved maternal and neonatal health outcomes. These interventions leveraged mobile technology in diverse ways—ranging from SMS reminders to decision-support tools for health workers—and demonstrated promising results in promoting safer motherhood and advancing Sustainable Development Goal 3.

1. Improved Maternal Service Utilization and Health-Seeking Behaviour

A consistent finding across multiple studies was the role of mHealth in enhancing maternal awareness and health-seeking behaviour. Programs such as **MomConnect** in South Africa, **mMitra** in India, and **MOTECH** in Ghana used SMS and voice messaging platforms to educate pregnant women on the importance of antenatal care (ANC), danger signs, birth preparedness, and the benefits of institutional deliveries. These messages, often tailored in local languages and delivered at key gestational milestones, prompted timely antenatal visits, skilled birth attendance, and uptake of postnatal care. For

example, women enrolled in the mMitra program reported increased ANC visits and a better understanding of pregnancy-related complications, leading to early action and service utilization.

2.Enhanced Healthcare Worker Capacity

mHealth has also demonstrated value in strengthening the knowledge and performance of frontline health workers. Tools like **CommCare** and the **Safe Delivery App** provided midwives and community health workers with on-demand access to evidence-based clinical guidelines, visual training materials, checklists, and emergency response protocols. These apps were instrumental in standardizing care, supporting decision-making in emergency obstetric situations, and ensuring adherence to best practices, especially in remote or under-resourced facilities. The Safe Delivery App, in particular, was associated with improved healthcare provider confidence and skill in managing postpartum hemorrhage and neonatal resuscitation.

3. Strengthened Emergency Referrals and Continuity of Care

Another key theme observed was the role of mHealth in enhancing emergency referrals and continuity of care for high-risk pregnancies and neonatal complications. In **Rwanda**, the **RapidSMS** system allowed community health workers to report pregnancy-related indicators in real-time, enabling early identification of complications and prompt action. Similarly, **TulaSalud** in Guatemala integrated mobile tools to facilitate referral coordination between rural health posts and hospitals. Programs like **WelTel** (Kenya) and **GiftedMom** (Cameroon) employed two-way SMS communication, which not only reminded patients of upcoming appointments but also allowed them to ask questions and receive counselling—fostering a sense of connectedness and personalized care.

4. Contribution to Neonatal Mortality Reduction

Certain mHealth interventions directly contributed to improving neonatal outcomes. For instance, **Text4Baby** in the U.S. and the **Ananya mHealth program** in India reported enhanced newborn care practices such as early breastfeeding initiation, hygienic cord care, and timely immunization. These programs also improved the early detection of neonatal danger signs and prompted health care providers to seek appropriate care more rapidly. In areas where mHealth initiatives were implemented, there was a notable increase in facility-based deliveries and reductions in care-seeking delays for neonatal illness.

Quantitative Impact

Several studies reported **20–40% increases in ANC attendance**, **significantly higher rates of institutional deliveries,** and **notable reductions in maternal and neonatal mortality in** various pilot settings. Although the magnitude of impact varied depending on geographic, cultural, and infrastructural factors, the overall body of evidence consistently supports the effectiveness of mHealth interventions. These interventions have proven to be cost-effective, scalable, and adaptable tools for enhancing maternal and neonatal health outcomes, especially in remote, underserved, and resource-constrained areas. mHealth also improves health system efficiency, promotes timely decision-making, and fosters stronger engagement between healthcare providers and communities.

4. CONCLUSION

mHealth has demonstrated the capacity to bridge critical gaps in maternal and neonatal healthcare through improved communication, real-time monitoring, and expanded access to essential health information. It has shown particular promise in supporting positive behaviour change among pregnant women, enhancing healthcare provider competence, and strengthening healthcare delivery systems in under-resourced and remote areas. Numerous pilot programs and large-scale interventions have already yielded encouraging results in increasing antenatal care attendance, institutional deliveries, and timely postnatal care—key indicators of progress toward safer motherhood.

To fully harness the benefits of mHealth and maximize its impact, it is essential to integrate these digital tools into national health strategies, ensure sustainable funding mechanisms, and implement robust monitoring and evaluation frameworks to guide evidence-based scaling. As digital health continues to evolve, mHealth stands out as a powerful enabler of Sustainable Development Goal 3—offering an innovative, inclusive, and scalable pathway to improve maternal and newborn health outcomes across the globe.

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