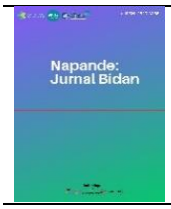

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Original Article

Digital Transformation in Midwifery Services: A Global Review of Telemedicine

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ABSTRACT

Background: Telemedicine has emerged as a key innovation in transforming global healthcare services, including midwifery practice. Advances in digital technology facilitate pregnancy monitoring, remote consultations, and maternal health education in a more efficient, timely, and cost-effective manner, thereby supporting Sustainable Development Goal (SDG) 3.1 to reduce maternal mortality. This article reviews the implementation of telemedicine in eight countries—Indonesia, India, Nigeria, Australia, the United Kingdom, Japan, Singapore, and the United States with an emphasis on its contribution to maternal health.
Method: A literature review was conducted by analyzing scientific articles and books published between 2021 and 2025 that addressed midwifery, antenatal care, and maternal health outcomes.
Result: In developing countries such as Indonesia, India, and Nigeria, telemedicine expands access to antenatal care, accelerates referrals, reduces geographic barriers, and enhances maternal health literacy through community-based digital platforms. In developed countries such as Australia, the United Kingdom, Japan, Singapore, and the United States, telemedicine focuses on health system integration, early detection of pregnancy complications, and optimizing service efficiency using advanced technologies, including artificial intelligence, big data analytics, telemonitoring, and wearable devices. Midwives play a pivotal role as direct care providers, clinical decision-makers, and intermediaries between digital platforms and patients.
Conclusion: Telemedicine is not merely a temporary response to healthcare limitations in developing countries but also a catalyst for innovation, quality improvement, and equity in global midwifery services.

INTRODUCTION

Maternal and child health is *a key indicator of national health development*. Although significant progress has been achieved in recent decades, maternal mortality rates remain high, particularly in developing countries (World Health Organization 2023). In 2020, approximately 287,000 maternal deaths were reported worldwide, with 95% occurring in low- and middle-income countries. The leading causes of maternal mortality include obstetric complications, hemorrhage, hypertensive

disorders in pregnancy, and delays in accessing healthcare services (Syairaji et al, 2024; United Nations Population Fund, 2025; World Health Organization, 2023).

In this context, telemedicine has emerged as an important innovation. It is defined as the delivery of healthcare services using information and communication technology across distances (Stoltzfus et al, 2023; World Health Organization, 2021). In midwifery practice, telemedicine enables midwives to conduct pregnancy monitoring, provide prenatal and postnatal consultations, and deliver lactation education without geographical constraints (Golden et al, 2024).

The COVID-19 pandemic acted as a catalyst for the accelerated adoption of telemedicine worldwide. Many healthcare services transitioned to digital platforms, including midwifery care, to ensure continuity of maternal services (Berg et al, 2021; Bonifasius et al, 2024; Smith et al, 2024). Developed countries such as the United Kingdom, Japan, Singapore, and the United States have successfully integrated telemedicine into their national health systems, while developing countries such as India and Nigeria have begun implementing it to address workforce and infrastructure limitations (Chua et al, 2024; Choudhury, 2022; Mbachu at al, 2021).

Indonesia faces unique challenges, including its archipelagic geography, disparities in internet access, and uneven distribution of healthcare workers. Nevertheless, several cities—such as Purwakarta, Surabaya, and Makassar—have developed midwifery-based telemedicine services as pilot projects (Ministry of Health of the Republic of Indonesia, 2021; Stellata et al, 2022; Susanti et al, 2022). Therefore, it is important to review and compare the implementation of telemedicine in Indonesia, other developing countries, and developed countries to obtain a global perspective and formulate policy recommendations.

Therefore, it is important to review and compare the implementation of telemedicine across Indonesia, other developing countries, and developed countries. Unlike previous studies that primarily describe national initiatives, this review emphasizes global comparisons to highlight both shared and context-specific challenges. By identifying these gaps, the study aims to provide evidence-based recommendations for strengthening maternal health strategies. This literature review is expected to illustrate the potential, challenges, and future directions of telemedicine in midwifery as part of accelerating progress toward the Sustainable Development Goals (SDG 3.1), particularly the reduction of maternal and child mortality.

METHODS

Types of Research

This study employed a literature review design aimed at identifying the use of telemedicine in midwifery services in Indonesia, developing countries, and developed countries. The literature search was conducted systematically in four electronic databases (PubMed, Scopus, ScienceDirect, and Google Scholar) between January and March 2025. Inclusion and exclusion criteria were applied to ensure relevance to midwifery, antenatal care, and maternal health outcomes.

The screening process followed the PRISMA guidelines and is presented in a flowchart to illustrate the identification, screening, eligibility, and inclusion stages. To minimize bias, two reviewers independently screened the articles and resolved disagreements through discussion. The methodological quality of included studies was assessed using standardized appraisal tools appropriate to each study design, with particular attention to potential sources of bias.

Data from the selected studies were analyzed using a manual thematic analysis approach. This involved systematically coding key findings, grouping them into themes, and synthesizing patterns across studies to generate comprehensive insights. Thematic analysis was conducted iteratively to ensure rigor and reliability.

Table 1. Inclusion and Exclusion Criteria

Criteria	Inclusion	Exclusion
Publication period	Articles published between 2021–2025	Articles published before 2021
Language	English and Indonesian	Other languages
Study type	Peer-reviewed research journals, systematic reviews, and academic textbooks	Non–peer-reviewed articles (e.g., editorials, commentaries, opinion pieces)
Topic relevance	Studies related to maternal health, antenatal care, and midwifery services	Studies not related to maternal health or antenatal care

Resources

A comprehensive literature search was conducted using the PubMed, Scopus, Google Scholar, and ScienceDirect databases. Keywords used included: Telemedicine, Midwifery, Maternal Health, Digital Health, and Global. From the search results, 65 relevant articles were obtained, then selected based on quality and relevance to the research into 25 main sources.

Data analysis

Data obtained from articles that met the inclusion criteria were analyzed manually using a thematic approach. The analysis followed several steps: (1) each article was read in full to extract relevant information; (2) initial codes were generated based on recurring concepts related to telemedicine, midwifery interventions, and maternal health outcomes; (3) codes were grouped into broader categories; and (4) overarching themes were developed through iterative comparison across studies.

No specialized software was used, as the analysis was conducted manually to ensure depth and contextual understanding. To enhance reliability, two reviewers independently coded the articles and then discussed discrepancies until consensus was reached. The results of the thematic synthesis are presented in comparative tables to facilitate clarity and readability.

Data Analysis. Data were analyzed using a manual thematic approach. This involved: (1) repeated reading of full-text articles, (2) coding relevant data on telemedicine interventions, midwifery roles, challenges, and outcomes, (3) grouping codes into broader themes, and (4) synthesizing findings across countries. Although no software was used, inter-coder reliability was ensured through cross-checking and consensus discussions. Results were then organized into comparative tables to facilitate synthesis.

RESULTS

The literature review shows that telemedicine in the field of midwifery has developed with different patterns between developing and developed countries. In Indonesia, telemedicine has emerged as response to limitations access service directly, especially in cities big start adopt online

consultation for Mother pregnant (Ministry of Health of the Republic of Indonesia, 2021; Stellata et al, 2022; Susanti et al, 2022). Meanwhile in India and Nigeria, telemedicine is used in a way strategic for bridge gap between power health limited and needs public wide (Gilano et al, 2024; Kachimanga et al, 2024; Knop et al, 2024). Different with that, developed countries such as Australia, England, Japan, Singapore, and the United States positioning telemedicine as part from system more modern health, focusing on integration technology, efficiency, and improvement quality service (Atkinson et al, 2023; Ishikawa et al, 2023; Marshall et al, 2022; Neo et al, 2024; Poon & Tan, 2022)

For give a clearer picture systematic, summary The use of telemedicine in various countries is presented in Table 1.

Table 2. Use of Telemedicine in Midwifery in Various Countries

Aspect	Developing Countries (e.g., Indonesia, India, Nigeria)	Developed Countries (e.g., Australia, UK, Japan, Singapore, USA)
Primary Focus	Expanding access to antenatal care, referrals, and health literacy	Service integration, efficiency, early complication detection, advanced monitoring
Main Technologies	Mobile platforms, hotlines, community-based applications	AI, big data, telemonitoring, wearable devices, integrated health records
Role of Midwives	Frontline providers for ANC, education, and bridging digital literacy	Clinical decision support, specialized care, liaison with digital platforms
Key Challenges	Limited infrastructure, internet access gaps, cultural barriers	Data privacy, regulatory frameworks, workload management
Outcomes	Increased ANC compliance, improved referrals, better maternal literacy	Higher service efficiency, patient satisfaction, improved maternal outcomes

DISCUSSION

This review demonstrates that telemedicine in midwifery improves access, quality, and efficiency of maternal care worldwide. However, its implementation differs substantially between developing and developed countries. Developing countries such as Indonesia, India, and Nigeria primarily rely on community-based, low-cost digital platforms to overcome geographic barriers, workforce shortages, and limited health literacy. By contrast, developed countries including Australia, the United Kingdom, Japan, Singapore, and the United States focus on system integration, advanced technologies (e.g., artificfial intelligence and wearable devices), and robust governance frameworks (Atkinson et al, 2023; Drummond et al, 2024; Evans et al, 2024; Gilano et al, 2024; ishikawa et al, 2023; Chua et al, 2024; NHS England, 2025; Susanti et al, 2022).

Table 3. Comparative Synthesis of Telemedicine in Midwifery

Context	Focus of Telemedicine	Main Challenges	Outcomes	Policy Implications
Developing countries (Indonesia, India, Nigeria)	Antenatal care, maternal health education, community-based teleconsultation	Infrastructure gaps, cost barriers, low digital literacy	Increased ANC compliance, improved maternal knowledge, more timely referrals	Invest in infrastructure, strengthen midwife training, expand community engagement
Developed countries (Australia, UK, Japan,	Integrated telehealth, AI-based monitoring, postpartum and mental health support	Data privacy, reimbursement sustainability, digital	Greater efficiency, higher patient satisfaction, earlier	Establish clear reimbursement policies, strengthen digital health regulations,

Context	Focus of Telemedicine	Main Challenges	Outcomes	Policy Implications
Singapore, USA)		divide among vulnerable groups	detection of complications	promote equity in digital access

From this synthesis, a clear contrast emerges: developing countries demonstrate high potential but fragmented implementation, whereas developed countries achieve stronger outcomes through systemic integration and supportive policies. These findings are consistent with the WHO *Global Strategy on Digital Health 2020–2025*, which highlights governance, financing, and workforce readiness as critical enablers of digital health (World Health Organization 2021).

Midwives remain central across both contexts. In resource-constrained settings, they serve a dual role as clinical providers and digital facilitators, often bridging technology gaps for mothers. In high-income countries, their role focuses more on embedding telehealth within clinical pathways and ensuring continuity of care. This underscores the need for policy frameworks that not only expand infrastructure but also enhance midwifery education and digital competencies (Golden et al, 2024; Sangy et al, 2023).

Ultimately, telemedicine has the potential to act as a catalyst for achieving SDG 3.1 by reducing maternal mortality (Hirko et al, 2024). To maximize its global impact, governments should prioritize (World Health Organization 2021):

1. Investment in digital infrastructure and maternal digital literacy;
2. Development of clear regulatory and reimbursement systems;
3. Integration of telemedicine into midwifery education and professional practice.

CONCLUSION

Telemedicine plays a pivotal role in transforming midwifery services globally. In developing countries such as Indonesia, India, and Nigeria, it primarily improves access and referral systems, while in developed countries like Australia, the United Kingdom, Japan, Singapore, and the United States, it enhances service quality, efficiency, and early complication detection. For policymakers in developing contexts, scaling pilot projects with government investment in rural internet infrastructure and integrating telemedicine into national health policies are essential. For educators, structured digital health and telemedicine training should be incorporated into midwifery curricula. For healthcare providers, continuous professional development and mandatory digital literacy programs for midwives are recommended. Collectively, these measures can maximize telemedicine's contribution to reducing maternal and neonatal morbidity and mortality.

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