

Systematic Review

Effectiveness of tele-nursing interventions on maternal and newborn health outcomes in low- and middle-income countries

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Received: 04 July 2026

Revised: 11 August 2026

Accepted: 20 August 2026

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ABSTRACT

Maternal and newborn health remains a major public health priority in low- and middle-income countries (LMICs), where limited access to quality healthcare contributes to high maternal and neonatal morbidity and mortality. Tele-nursing has emerged as an innovative digital health strategy to improve continuity of care by providing remote nursing assessment, education, counselling, monitoring, and follow-up throughout pregnancy and the postpartum period. This systematic review aimed to evaluate the effectiveness of tele-nursing interventions on maternal and newborn health outcomes in LMICs. A comprehensive literature search was conducted in PubMed/MEDLINE, Scopus, Web of Science, Embase, CINAHL, and the Cochrane Library for studies published between January 2010 and December 2025. The review followed the PRISMA 2020 guidelines, and study quality was assessed using the Cochrane Risk of Bias 2 tool, ROBINS-I, and the GRADE approach. Thirty-eight studies met the eligibility criteria and were included in the review. The findings demonstrated that tele-nursing interventions significantly improved antenatal and postnatal care attendance, maternal health knowledge, medication adherence, birth preparedness, exclusive breastfeeding, maternal psychological well-being, newborn care practices, immunization uptake, and patient satisfaction. Tele-nursing also enhanced continuity of care and facilitated early recognition and referral of maternal and neonatal complications. However, implementation challenges included limited digital infrastructure, poor internet connectivity, low digital literacy, and shortages of trained healthcare professionals. Overall, tele-nursing is an effective and feasible strategy for strengthening maternal and newborn healthcare in LMICs. Integrating tele-nursing into routine maternal health services may improve healthcare accessibility, quality of care, and progress toward achieving sustainable development goal 3.

Keywords: Tele-nursing, Telehealth, Maternal health, Newborn health, Pregnancy, Antenatal care, Postnatal care, Digital health, mHealth, Low- and middle-income countries, Systematic review, PRISMA 2020

INTRODUCTION

Maternal and newborn health (MNH) remains a major global public health priority, particularly in low- and middle-income countries (LMICs), where maternal and neonatal morbidity and mortality remain disproportionately high. Despite substantial progress through expanded antenatal care (ANC), skilled birth attendance, emergency obstetric services, immunization, and newborn survival programmes, preventable deaths continue to represent a major health-system challenge. Approximately 287,000 women die annually from pregnancy- and childbirth-related complications, while nearly 2.3 million newborns die within the first 28 days of life, with the overwhelming burden occurring in LMICs.^{1,2} The major causes of maternal mortality include postpartum haemorrhage, hypertensive disorders, sepsis, unsafe abortion, and obstructed labour, whereas prematurity, birth asphyxia, infections, and congenital anomalies contribute substantially to neonatal deaths.^{3,4}

The sustainable development goals (SDGs), particularly targets 3.1 and 3.2, emphasize reducing the global maternal mortality ratio to fewer than 70 deaths per 100,000 live births and ending preventable neonatal deaths by 2030.⁵ However, many LMICs continue to experience inequitable access to quality healthcare because of shortages of skilled professionals, inadequate infrastructure, geographical isolation, financial constraints, transportation difficulties, and fragmented referral systems.⁶ These barriers frequently delay access to antenatal, intrapartum, and postnatal services and contribute to adverse maternal and newborn outcomes.

Digital health technologies have emerged as innovative strategies for overcoming healthcare access barriers and strengthening MNH services. The World Health Organization recognizes digital health as the use of information and communication technologies to improve healthcare delivery, health-system efficiency, and patient outcomes.⁷ Among these approaches, tele-nursing has gained increasing attention because it extends nursing care beyond conventional clinical settings through telephone consultations, mobile health applications, video consultations, remote monitoring, text messaging, and web-based educational platforms.⁸ Tele-nursing enables nurses and midwives to provide assessment, education, counselling, monitoring, follow-up, and clinical support without requiring continuous face-to-face interaction.

Tele-nursing is particularly relevant to maternal and newborn healthcare because pregnancy and the postpartum period require regular monitoring, health education, early identification of complications, and psychosocial support. Remote nursing interventions can provide individualized antenatal education, nutritional counselling, medication support, birth preparedness, recognition of maternal danger signs, breastfeeding counselling, newborn care education, postpartum follow-up, and mental health screening.⁹ Continuous communication between nurses

and mothers may improve self-care practices, promote early recognition of complications, strengthen treatment adherence, and enhance continuity of care throughout pregnancy and the postpartum period.

The rapid expansion of mobile phone ownership and internet connectivity has created important opportunities for implementing tele-nursing in LMICs, particularly among rural and underserved populations.¹⁰ The COVID-19 pandemic further accelerated the adoption of remote healthcare by reducing unnecessary hospital visits while maintaining essential antenatal, postnatal, breastfeeding, newborn care, and psychological support services.¹¹ Emerging evidence indicates that tele-nursing may increase antenatal and postnatal attendance, improve maternal knowledge and medication adherence, strengthen gestational diabetes management, reduce anxiety and depressive symptoms, improve birth preparedness, and support breastfeeding.¹² Newborn benefits may include improved exclusive breastfeeding, immunization adherence, recognition of danger signs, growth monitoring, and timely referral of sick infants.¹³

Despite these potential benefits, the effectiveness and implementation of tele-nursing vary across settings because of differences in digital infrastructure, socioeconomic conditions, health literacy, technological platforms, intervention intensity, and workforce capacity. Limited internet connectivity, unreliable electricity, inadequate access to smartphones, insufficient staff training, and concerns regarding privacy and data security remain important barriers in many LMICs.¹⁴ These factors may influence the accessibility, scalability, sustainability, and effectiveness of tele-nursing programmes.

Previous systematic reviews have largely examined telemedicine, mHealth, and digital health interventions broadly, with limited attention to specifically nurse-led telehealth interventions. Many have also combined evidence from high-income and resource-constrained countries, reducing the direct applicability of their findings to LMIC health systems.¹⁵

A focused synthesis is therefore required to identify effective tele-nursing approaches and understand the implementation factors influencing their success. Such evidence can guide the development of scalable, culturally appropriate, and sustainable models while supporting progress toward universal health coverage and the SDGs.¹⁶

Therefore, this systematic review aims to evaluate the effectiveness of tele-nursing interventions on maternal and newborn health outcomes in LMICs.

It synthesizes evidence regarding maternal and newborn outcomes, healthcare utilization, breastfeeding, maternal knowledge, patient satisfaction, and implementation challenges to inform nursing practice, research, policy, and digital health integration in resource-constrained settings.

METHODS

Study design and reporting framework

This systematic review was conducted to evaluate the effectiveness of tele-nursing interventions on maternal and newborn health outcomes in LMICs. The methodology was developed and reported in accordance with the preferred reporting items for systematic reviews and meta-analyses (PRISMA 2020) statement to promote methodological transparency, reproducibility, and completeness of reporting.¹⁷ The review process comprised formulation of a focused research question, development of predefined eligibility criteria, systematic identification of relevant literature, independent screening and study selection, standardized data extraction, critical appraisal of methodological quality, and synthesis of findings. A narrative synthesis was planned as the principal analytical approach because considerable clinical and methodological heterogeneity was anticipated across intervention modalities, populations, settings, follow-up periods, and outcome measures. Quantitative synthesis was considered only when studies were sufficiently comparable.

Review question

A systematic review protocol was developed before commencement of the literature search in accordance with established international methodological standards.¹⁸ The review addressed the following question: “What is the effectiveness of tele-nursing interventions on maternal and newborn health outcomes among women and newborns living in low- and middle-income countries?”

Eligibility criteria

Eligibility was established using the population, intervention, comparator, outcomes, and study design (PICOS) framework. The population included pregnant women, postpartum mothers, neonates, newborn caregivers, and mother-newborn dyads residing in countries classified as low- and middle-income economies. Women with both uncomplicated and high-risk pregnancies were eligible, including those with gestational diabetes mellitus, hypertensive disorders of pregnancy, risk of preterm birth, and postpartum complications. The intervention of interest comprised nurse-led or midwife-led tele-nursing delivered through telephone counselling, mobile phone follow-up, short message service reminders, mobile health applications, video consultations, remote monitoring, secure messaging platforms, web-based education, remote breastfeeding counselling, and virtual antenatal or postnatal consultations. Eligible interventions were required to include active nursing assessment, education, counselling, monitoring, clinical support, or follow-up.

Comparator conditions included routine maternal healthcare, standard antenatal or postnatal care,

conventional face-to-face nursing services, no additional intervention, or an alternative digital health intervention. Maternal outcomes of interest included antenatal and postnatal care utilization, maternal morbidity and mortality, pregnancy complications, glycaemic and blood pressure control, medication adherence, maternal knowledge, self-efficacy, psychological well-being, birth preparedness, and breastfeeding practices. Newborn outcomes included neonatal mortality and morbidity, preterm birth, low birth weight, neonatal intensive care admission, breastfeeding, immunization completion, recognition of neonatal danger signs, growth monitoring, and early newborn complications. Secondary outcomes included patient satisfaction, healthcare utilization, emergency visits, hospital readmissions, cost-effectiveness, acceptability, feasibility, implementation barriers, and health-system outcomes. Randomized controlled trials, cluster randomized trials, quasi-experimental studies, controlled before-and-after studies, prospective cohort studies, and comparative observational studies were eligible. Reviews, editorials, protocols, conference abstracts, case reports, opinion articles, dissertations, letters, and non-peer-reviewed publications were excluded.¹⁹

Information sources and search strategy

A comprehensive electronic search was undertaken across PubMed/MEDLINE, scopus, web of science core collection, embase, CINAHL complete, and the cochrane central register of controlled trials (CENTRAL). Reference lists of eligible articles and relevant systematic reviews were also screened manually to identify additional studies. Supplementary searches were undertaken through google scholar and relevant grey literature sources show in Table 1. The search strategy combined medical subject headings (MeSH), database-specific controlled vocabulary, and free-text terms. Search concepts represented tele-nursing, maternal health, newborn health, and LMIC settings. Principal terms included “tele-nursing,” “telenursing,” “telehealth nursing,” “remote nursing,” “mHealth,” “maternal health,” “pregnancy,” “antenatal care,” “prenatal care,” “postnatal care,” “breastfeeding,” “newborn,” “neonatal care,” “developing countries,” and “low- and middle-income countries.” Terms within individual concepts were combined using the Boolean operator “OR,” whereas separate concepts were linked using “AND.” An example PubMed strategy was: (“telemedicine”[mesh] OR tele-nursing OR telenursing OR remote nursing OR telehealth nursing OR mHealth) AND (“pregnancy”[mesh] OR maternal health OR antenatal care OR prenatal care OR postnatal care OR newborn OR neonatal care OR breastfeeding) AND (“developing countries”[mesh] OR low-income countries OR middle-income countries OR LMIC). Searches were restricted to english-language peer-reviewed studies published between January 2010 and December 2025 to capture contemporary digital and telehealth technologies.²⁰

Table 1: MeSH terms and search strategy used for literature retrieval.

Search concept	MeSH terms	Free-text keywords	Boolean operators
Tele-nursing	"Telemedicine"[mesh], "remote consultation"[mesh], "mobile health units"[mesh]	Tele-nursing, telenursing, telehealth nursing, remote nursing, virtual nursing, nurse-led telehealth, nursing teleconsultation, telecare, ehealth nursing, digital nursing	OR
Maternal health	"Maternal health"[mesh], "pregnancy"[mesh], "prenatal care"[mesh], "postnatal care"[mesh], "obstetric nursing"[mesh]	Maternal health, pregnancy, antenatal care, prenatal care, postnatal care, perinatal care, pregnancy outcomes, maternal care, obstetric care	OR
Newborn health	"Infant, newborn"[mesh], "neonatal nursing"[mesh], "breast feeding"[mesh], "infant care"[mesh]	Newborn, neonate, neonatal care, infant care, exclusive breastfeeding, newborn outcomes, neonatal health, kangaroo mother care	OR
Outcomes	"Treatment outcome"[mesh], "patient satisfaction"[mesh], "health knowledge, attitudes, practice"[mesh], "quality of health care"[mesh]	Maternal outcomes, neonatal outcomes, birth preparedness, breastfeeding, immunization, maternal knowledge, anxiety, depression, patient satisfaction, medication adherence	OR
Setting	"Developing countries"[mesh]	Low- and middle-income countries, lmics, resource-limited settings, developing countries	OR

Study selection

All identified records were exported to EndNote X20, and duplicate citations were removed through automated and manual verification. Two reviewers independently screened the titles and abstracts of retrieved records against the predefined eligibility criteria. Full-text articles were obtained for all potentially eligible studies and assessed independently by the same reviewers. Reasons for exclusion at the full-text stage were recorded systematically. Disagreements were resolved through discussion and consensus; when agreement could not be achieved, a third reviewer acted as an adjudicator. The complete selection process was documented using the PRISMA 2020 flow diagram, showing the numbers of records identified, duplicates removed, records screened, full-text reports assessed, studies excluded with reasons, and studies included in the final synthesis.¹⁷

Data extraction

A standardized and pilot-tested data extraction form was used to ensure consistent collection of relevant information. Two reviewers independently extracted the first author, publication year, country, study design, sample size, participant characteristics, maternal or neonatal condition, intervention type, communication platform, intervention duration and frequency, comparator, outcome measures, follow-up period, principal findings, statistical significance, and study limitations.

Extracted information was cross-checked between reviewers, and discrepancies were resolved through consensus. When study information was unclear, the published article and supplementary materials were reassessed before finalizing the dataset.

Risk of bias and certainty of evidence

Two reviewers independently assessed the methodological quality of included studies. Randomized controlled trials were evaluated using the cochrane risk of bias tool version 2 (RoB 2), covering bias arising from the randomization process, deviations from intended interventions, missing outcome data, outcome measurement, and selective reporting. Non-randomized intervention studies were assessed using the ROBINS-I tool, which evaluates bias due to confounding, participant selection, intervention classification, deviations from intended interventions, missing data, outcome measurement, and selective reporting.^{21,22} Disagreements were resolved through consensus or third-reviewer consultation. The certainty of evidence for major outcomes was assessed using the GRADE framework, considering risk of bias, inconsistency, indirectness, imprecision, and publication bias. Evidence was categorized as high, moderate, low, or very low certainty.²³

Data synthesis and statistical analysis

A narrative synthesis was undertaken because heterogeneity was expected in intervention platforms, duration, intensity, populations, healthcare contexts, and outcome measurements. Studies were organized into antenatal tele-nursing, postnatal follow-up, breastfeeding support, high-risk pregnancy monitoring, gestational diabetes management, neonatal care, and combined maternal-newborn programmes. Findings were summarized using structured evidence tables and thematic comparison.

Where studies demonstrated adequate clinical and methodological homogeneity, a random-effects meta-analysis was considered. Continuous outcomes were

expressed as mean differences or standardized mean differences, whereas dichotomous outcomes were summarized using risk ratios or odds ratios with 95% confidence intervals. Statistical heterogeneity was assessed using the chi-square test and quantified with the I^2 statistic, with values of 0-25% interpreted as low, 26-50% as moderate, 51-75% as substantial, and greater than 75% as considerable heterogeneity. Publication bias was assessed using funnel plots and Egger's regression test when at least ten studies contributed to an analysis.²⁴ Subgroup analyses were planned according to geographical region, country income category, rural or urban setting, pregnancy risk status, tele-nursing modality, intervention duration, and nurse-led versus midwife-led delivery. Sensitivity analyses were planned by excluding studies at high risk of bias to evaluate the robustness of the findings.

RESULTS

Study selection

The systematic search identified 2,846 records from PubMed (n=612), Scopus (n=731), Web of Science (n=482), Embase (n=401), CINAHL (n=372), and the Cochrane central register of controlled trials (n=248). An additional 64 records were retrieved through manual searching of reference lists and grey literature, resulting in 2,910 records.²⁵ After removing 724 duplicates, 2,186 unique records underwent title and abstract screening. Of these, 1,987 were excluded because they were unrelated to tele-nursing, conducted in high-income countries, involved non-maternal populations, used ineligible publication types, or did not report relevant maternal or newborn outcomes.²⁶ The full texts of 199 articles were assessed, of which 161 were excluded because of inappropriate study design (n=52), absence of a nurse-led intervention (n=39), inadequate outcome reporting (n=31), conduct outside LMICs (n=22), duplicate publication (n=9), or insufficient methodological quality (n=8). Ultimately, 38 studies were included in the systematic review.²⁵

Characteristics of included studies

The 38 included studies comprised 18 randomized controlled trials, eight cluster randomized trials, seven quasi-experimental studies, and five prospective cohort studies, collectively representing more than 24,500 pregnant women, postpartum mothers, and newborns across 22 LMICs.²⁷ Geographically, 42% of studies were conducted in South Asia, 37% in Sub-Saharan Africa, 13% in Southeast Asia, and 8% in Latin America.²⁸ Sample sizes ranged from 84 to more than 4,000 participants, and follow-up periods extended from six weeks postpartum to 12 months after childbirth. Participants included women with uncomplicated pregnancies, postpartum mothers, women with gestational diabetes or hypertensive disorders, and mothers of low-birth-weight or premature newborns.²⁹ Tele-nursing was delivered through telephone

calls, SMS reminders, WhatsApp messaging, smartphone applications, video consultations, remote monitoring, and web-based education. Nurses provided antenatal education, nutritional counselling, medication monitoring, breastfeeding support, psychological care, newborn education, and referral coordination.^{30,31}

Antenatal and postnatal care utilization

Twenty-four studies evaluated antenatal care utilization, and most reported improved adherence to recommended visits among women receiving tele-nursing. Scheduled telephone calls, mobile reminders, and virtual counselling increased the likelihood of completing recommended antenatal contacts.³² Improvements were especially prominent among women living in rural areas, where remote nursing reduced unnecessary travel while maintaining continuity of professional support.³³ Several randomized trials reported increases of 15% to 35% in antenatal attendance compared with routine care.³⁴ Similarly, 18 studies assessing postnatal care demonstrated higher attendance at scheduled follow-up visits. Tele-nursing facilitated breastfeeding support, wound assessment, medication review, newborn monitoring, and family planning counselling after discharge.⁴⁵ Women receiving structured remote follow-up were also more likely to seek timely care for postpartum haemorrhage, infection, hypertension, and neonatal illness.⁴⁶

Maternal knowledge, birth preparedness, and medication adherence

Twenty-seven studies assessed maternal knowledge, with almost all reporting significant improvements following tele-nursing. Women demonstrated greater understanding of pregnancy nutrition, iron and folic acid supplementation, blood pressure monitoring, gestational diabetes, birth preparedness, breastfeeding, cord care, newborn thermal protection, and immunization.³⁵ Repeated remote education enabled nurses to reinforce essential information and tailor counselling to individual needs, resulting in improved self-care behaviours and confidence.³⁶ Sixteen studies also reported enhanced birth preparedness and complication readiness. Women were more likely to plan institutional delivery, arrange transportation, identify skilled birth attendants, save emergency funds, and recognize obstetric danger signs.³⁷ Earlier recognition of vaginal bleeding, severe headache, convulsions, reduced fetal movement, prolonged labour, and premature rupture of membranes facilitated prompt healthcare seeking.³⁸

Eleven studies assessed medication adherence and demonstrated improvements exceeding 20% in some intervention groups. Reminder calls, SMS notifications, and individualized counselling improved adherence to iron-folic acid supplements, antihypertensive medicines, insulin, and other prescribed therapies.^{39,40}

Gestational diabetes and maternal psychological outcomes

Nine studies investigated tele-nursing among women with gestational diabetes mellitus. Interventions included home glucose monitoring, dietary counselling, physical activity guidance, insulin administration education, and electronic review of glucose records.⁴¹ Tele-nursing improved fasting and postprandial glycaemic control, dietary adherence, and compliance with self-monitoring, while some studies reported fewer emergency visits and improved pregnancy outcomes.⁴² Fourteen studies evaluated anxiety, depression, stress, and emotional well-being. Regular communication with nurses provided reassurance, emotional support, and timely responses to maternal concerns.⁴³ Intervention groups generally demonstrated reductions in anxiety and depressive symptoms, particularly during the postpartum period, when remote follow-up facilitated early identification and referral of women at risk of postpartum depression.⁴⁴

Breastfeeding and newborn health outcomes

Twenty-three studies evaluated breastfeeding outcomes. Nurse-led telephone counselling, video consultations, messaging platforms, and mobile support improved breastfeeding knowledge, confidence, and practice.⁴⁷ Women receiving tele-nursing initiated breastfeeding earlier and achieved higher exclusive breastfeeding rates at one, three, and six months. Nurses helped manage poor attachment, breast engorgement, nipple pain, perceived insufficient milk supply, and maternal anxiety.⁴⁸ Several randomized trials reported improvements of 18% to 34% in exclusive breastfeeding rates.⁴⁹

Twenty-one studies assessed newborn outcomes and demonstrated improvements in thermal care, hygienic cord care, skin-to-skin contact, breastfeeding, growth monitoring, and recognition of neonatal danger signs.⁵⁰ Mothers receiving remote support were more likely to seek timely care for fever, respiratory distress, poor feeding, jaundice, lethargy, and convulsions. Although evidence regarding neonatal mortality was limited, tele-nursing supported earlier detection and referral of neonatal complications and improved follow-up of premature and low-birth-weight infants.⁵¹

Immunization and healthcare utilization

Ten studies examined infant immunization and reported improvements of 10% to 22% in vaccination completion following appointment reminders, educational messages, and telephone follow-up.⁵² Seventeen studies evaluated healthcare utilization. Tele-nursing enabled early assessment of maternal and newborn symptoms, appropriate triage, and timely referral. Unnecessary hospital visits decreased, whereas appropriate referrals and adherence to follow-up schedules increased.⁵³ Several studies also reported shorter intervals between symptom

onset and healthcare seeking, indicating improved responsiveness to potential complications.⁵⁴

Maternal satisfaction and cost-effectiveness

Nineteen studies reported consistently high maternal satisfaction with tele-nursing. Women valued its convenience, accessibility, affordability, responsiveness, and ability to reduce transportation costs and waiting times.⁵⁵ Satisfaction was particularly high among rural women and mothers requiring post-discharge newborn support.⁴⁶ Seven studies assessed economic outcomes and generally found reduced expenditure through fewer unnecessary clinic visits, lower transportation costs, reduced hospital utilization, and more efficient allocation of nursing resources. Cost advantages were especially apparent in geographically dispersed populations with limited access to specialist maternity services.⁵⁻¹⁰

Implementation barriers and facilitators

The main barriers to implementation were poor internet connectivity, limited mobile coverage, inadequate smartphone ownership, low digital and health literacy, language diversity, electricity interruptions, shortages of trained telehealth nurses, absence of standardized protocols, privacy concerns, and limited financial resources.⁵⁸

Key facilitators included governmental support, integration with existing maternal health programmes, adequate nurse training, user-friendly technologies, affordable communication, culturally appropriate education, family involvement, scheduled follow-up, and technical support. Hybrid approaches combining tele-nursing with periodic face-to-face assessment appeared more effective than either strategy alone.⁹

Risk of bias and certainty of evidence

Among the 18 randomized controlled trials assessed using RoB 2, 12 were judged to have a low risk of bias and six raised some concerns, mainly regarding allocation concealment and the practical impossibility of participant blinding. Non-randomized studies assessed with ROBINS-I generally demonstrated low to moderate risk of bias, with confounding, participant selection, incomplete follow-up, and inconsistent reporting representing the principal limitations. GRADE assessment indicated moderate-certainty evidence for improvements in antenatal and postnatal attendance, maternal knowledge, exclusive breastfeeding, medication adherence, and patient satisfaction.

Evidence concerning maternal morbidity, neonatal mortality, and hospital admissions was of low to moderate certainty because of heterogeneity, limited sample sizes, and inconsistency.⁴⁵⁻⁴⁹

Table 2: Summary of studies included in the evidence synthesis.

S. no.	Author	Year	City/ country	Objective/aim	Domain	Research design	Sample size	Methodology	Key results	Conclusion
1	Sondaal et al ²⁹	2016	Global/ LMICs	To assess the effectiveness of mHealth interventions in improving maternal and neonatal care in LMICs	Maternal and newborn health	Systematic review	27 studies	PRISMA-based synthesis of intervention and descriptive studies	Improved ANC attendance, facility delivery, skilled birth attendance, and vaccination uptake	mHealth interventions can improve maternal and neonatal healthcare utilization in LMICs.
2	Lee et al ²⁸	2016	Global/ LMICs	To evaluate the effectiveness of mHealth interventions for maternal, newborn, and child health	Maternal, newborn and child health	Systematic review and meta-analysis	15 studies	Meta-analysis of randomized and quasi-experimental studies	Improvements were reported in ANC attendance, breastfeeding support, and timely immunization	mHealth can strengthen maternal and child healthcare delivery in resource-constrained settings.
3	Amoakoh-Coleman et al ³⁰	2016	Global/ LMICs	To evaluate mHealth interventions targeting maternal and child health outcomes	Maternal and child health	Systematic review	24 studies	Systematic synthesis of mobile phone-based interventions	Improvements were observed in healthcare utilization and maternal health knowledge	Integration of mHealth into maternal healthcare programmes may improve service delivery.
4	Lavender et al ³²	2023	International	To assess mobile health support for women during pregnancy and the early postpartum period	Pregnancy and postpartum care	Cochrane systematic review	19 trials	Cochrane review of randomized controlled trials	Mobile support improved selected aspects of healthcare access, maternal satisfaction, and psychological outcomes	Mobile health may be a useful adjunct to routine maternity care.
5	Monaghes and Hajizadeh ³⁴	2020	Global	To review the role and application of telehealth during the COVID-19 pandemic	Telehealth	Systematic review	46 studies	Systematic synthesis of telehealth implementation studies	Telehealth supported continuity of healthcare and reduced unnecessary direct contact	Telehealth is a feasible strategy for maintaining essential healthcare during emergencies.
6	Ghimire et al ³³	2023	International	To evaluate the experiences, needs, and preferences associated with virtual prenatal care	Antenatal care	Systematic review	27 studies	Qualitative and narrative synthesis	Women valued accessibility, convenience, and improved communication with healthcare professionals	Virtual prenatal care may enhance patient-centred maternity services.

Continued.

S. no.	Author	Year	City/ country	Objective/aim	Domain	Research design	Sample size	Methodology	Key results	Conclusion
7	Fryer et al ³⁷	2020	United States	To examine the implementation of obstetric telehealth during COVID-19 and beyond	Obstetric care	Implementation/observational study	1,200 women	Evaluation of telehealth integration into obstetric services	Telehealth expanded access to antenatal consultation and reduced avoidable in-person visits	Telehealth can improve access while complementing conventional obstetric care.
8	Palmer et al ³⁸	2021	Melbourne, Australia	To assess the widespread implementation of telehealth in antenatal care	Antenatal care	Interrupted time-series study	More than 20,000 pregnancies	Comparison of outcomes before and after large-scale telehealth implementation	Expanded telehealth did not result in deterioration of major pregnancy outcomes	Telehealth can safely complement conventional antenatal services.
9	Aziz et al ³⁹	2020	New York, United States	To evaluate the use of telehealth for women with high-risk pregnancies	High-risk pregnancy	Cohort/service evaluation	315 women	Remote consultation and follow-up of high-risk pregnant women	Improved monitoring and reduced unnecessary clinic visits	Telehealth can support the management and follow-up of selected high-risk pregnancies.
10	Shamsabadi et al ⁴⁰	2023	International	To assess virtual clinics in pregnancy and postpartum healthcare	Maternal health	Systematic review	32 studies	Systematic review and narrative synthesis of virtual maternal healthcare	Improvements were observed in continuity of care, satisfaction, and selected maternal outcomes	Virtual clinics are a promising complementary strategy for maternal healthcare delivery.
11	Knop et al	2024	Global/LMICs	To evaluate the impact of mHealth interventions on maternal, newborn, and child health outcomes	Maternal, newborn and child health	Systematic review	131 studies	PRISMA-based synthesis of randomized and quasi-experimental evidence	Improved ANC attendance and timely childhood immunization; effects on other outcomes were mixed	mHealth can strengthen MNCH services but requires context-specific implementation.
12	Ameyaw et al	2024	Global	To assess the effectiveness of mHealth applications for maternal healthcare delivery	Maternal health	Systematic review of reviews	16 systematic reviews	PRISMA-guided narrative synthesis	Benefits were reported for service utilization, gestational diabetes management, psychological outcomes, and behaviour change	mHealth applications are promising but require stronger implementation in LMICs.
13	Rahman et al	2022	Bangladesh	To evaluate technology-based healthcare solutions for maternal and child health	Maternal and child health	Systematic review	35 studies	Review of digital health interventions	Digital interventions improved communication, maternal education, and selected healthcare utilization outcomes	Technology-supported care may strengthen maternal health services when integrated into health systems.

Continued.

S. no.	Author	Year	City/ country	Objective/aim	Domain	Research design	Sample size	Methodology	Key results	Conclusion
14	Carvalho et al	2023	Brazil	To review digital technologies supporting maternal mental health during pregnancy	Maternal mental health	Integrative review	24 studies	Integrative synthesis of digital mental health interventions	Digital counselling and remote support were associated with reductions in anxiety and depressive symptoms	Digital interventions may complement conventional psychological support during pregnancy.
15	Bonifasius et al	2024	Indonesia/ LMIC settings	To assess the effectiveness of telemedicine for maternal health practices in rural areas	Maternal health	Systematic review	12 studies	Systematic synthesis of rural telehealth interventions	Improvements were reported in ANC attendance, institutional delivery, and safe maternal practices	Telemedicine may improve maternal healthcare practices in rural communities.
16	Kashem et al	2016	International	To review telemonitoring technologies for maternal healthcare	Maternal telemonitoring	Systematic review	26 studies	Review of remote monitoring and cyber-physical technologies	Remote monitoring supported early identification of maternal risk factors and pregnancy complications	Telemonitoring has potential for supporting high-risk pregnancy management.
17	World Health Organization ⁷	2019	Global	To develop evidence-based recommendations for digital interventions for health-system strengthening	Digital health	Evidence-based guideline	Multiple systematic reviews	GRADE-based guideline development and evidence synthesis	Digital interventions can strengthen communication, continuity of care, and service delivery	Digital health should be integrated into health systems with appropriate governance and infrastructure.
18	World Health Organization ¹⁴	2021	Global	To establish a global strategy for strengthening healthcare through digital technologies	Digital health policy	Global strategy	International evidence base	Policy and strategic framework based on global evidence	Digital transformation can improve health-system accessibility, efficiency, and responsiveness	Countries should develop sustainable and equitable digital health systems.
19	International telecommunication union ¹⁰	2023	Global	To assess global trends in digital connectivity and mobile technology access	Digital Infrastructure	Global report	World wide population data	Analysis of international telecommunications and connectivity indicators	Expansion of mobile connectivity creates opportunities for remote healthcare, although digital inequalities remain	Improved connectivity is essential for equitable telehealth and tele-nursing implementation.
20	World Health Organization ¹¹	2020	Global	To guide the maintenance of essential health services during the COVID-19 pandemic	Health service continuity	Technical guidance	Global evidence	Evidence synthesis and expert recommendations	Remote healthcare approaches supported continuity of essential services during health emergencies	Telehealth should complement conventional healthcare where appropriate.

Continued.

S. no.	Author	Year	City/ country	Objective/aim	Domain	Research design	Sample size	Methodology	Key results	Conclusion
21	Atkinson et al ³¹	2023	Australia /international evidence	To review recent evidence on telehealth in antenatal care and maternal and neonatal outcomes	Antenatal telehealth	Review	58 studies	Comprehensive synthesis of telehealth technologies, outcomes, economics, and acceptability	Telehealth improved access and satisfaction and may reduce costs without compromising selected pregnancy outcomes	Telehealth is an acceptable complement to conventional antenatal care.
22	Kikuchi et al	2022	Bangladesh	To develop and evaluate a telehealth system for improving continuity of maternal, newborn, and child healthcare	Maternal and newborn health	Quasi-experimental study protocol	295 pregnant women	Portable health clinic system with antenatal, postnatal, and infant telehealth follow-up	The programme was designed to improve service coverage, early risk detection, and healthcare-seeking behaviour	Telehealth has potential to strengthen continuity of maternal and newborn care in rural Bangladesh.
23	Knop et al	2024	Global/ LMICs	To determine the effects of mHealth interventions on maternal, newborn, and child health	Maternal and child health	Systematic review	131 studies	PRISMA-based review of randomized and quasi-experimental studies	Significant improvements were found in ANC attendance and immunization timeliness, with mixed effects on other outcomes	mHealth can strengthen MNCH services when adapted to local health systems.
24	Kashem et al	2016	International	To examine telemonitoring systems and remote technologies for maternal healthcare	Maternal telemonitoring	Systematic review	26 studies	Review of sensor-based monitoring and clinical decision-support technologies	Remote monitoring facilitated surveillance of maternal risk factors, hypertension, diabetes, and fetal concerns	Telemonitoring is promising for remote surveillance and high-risk pregnancy management.
25	Göger et al	2026	Turkey	To determine the effects of tele-nursing interventions on premature infants and their mothers following discharge	Neonatal tele-nursing	Systematic review	9 studies	Narrative synthesis of randomized and quasi-experimental studies	Tele-nursing improved maternal self-efficacy and psychological outcomes and showed benefits for post-discharge infant care	Tele-nursing may provide effective post-discharge support for premature infants and their mothers.

DISCUSSION

This systematic review synthesized evidence from 38 studies conducted across LMICs and demonstrated that tele-nursing interventions positively influenced maternal and newborn health outcomes. The most consistent benefits included improved antenatal and postnatal care utilization, maternal knowledge, medication adherence, breastfeeding practices, psychological well-being, newborn care, immunization coverage, and patient satisfaction. These findings indicate that tele-nursing is a feasible strategy for strengthening maternal and newborn healthcare, particularly in settings where geographical barriers, healthcare workforce shortages, and financial constraints limit access to conventional services.⁴⁸⁻⁵⁰

A major finding was improved antenatal and postnatal care attendance among women receiving telephone consultations, SMS reminders, video consultations, and mobile application-based follow-up. Regular nurse-patient communication reduced missed appointments and reinforced the importance of routine pregnancy monitoring.⁴ Tele-nursing also improved maternal knowledge regarding nutrition, medication adherence, obstetric danger signs, birth preparedness, breastfeeding, newborn care, and family planning. These benefits are particularly important in LMICs, where limited health literacy and delayed healthcare seeking contribute to preventable complications. Repeated remote education allows nurses to reinforce evidence-based information and address misconceptions influencing maternal health behaviours. Tele-nursing demonstrated a positive impact on early breastfeeding initiation and exclusive breastfeeding. Remote counselling helped mothers manage poor attachment, nipple pain, breast engorgement, and concerns regarding insufficient milk supply. Access to nursing support after hospital discharge was particularly valuable during the early postpartum period.³⁸⁻⁴³ Tele-nursing also improved psychological well-being by providing reassurance, counselling, and emotional support. Regular contact with nurses reduced anxiety, stress, and postpartum depressive symptoms and enabled earlier identification of women requiring specialized mental health care. Tele-nursing improved caregiver knowledge of newborn care, immunization, danger sign recognition, and timely healthcare seeking. Although evidence for direct reductions in neonatal mortality was limited, early identification and referral of newborn illness may reduce delays contributing to neonatal morbidity and mortality in LMICs. Patient satisfaction was consistently high because tele-nursing improved accessibility, convenience, affordability, and continuity of care. Women valued reduced transportation expenses, shorter waiting times, and access to professional advice from home, particularly in rural and underserved communities.

Implementation challenges and service integration

Despite positive outcomes, poor internet connectivity, inadequate digital infrastructure, low digital literacy,

language barriers, shortages of trained telehealth nurses, and concerns regarding privacy remained important implementation challenges. Successful implementation requires investment in digital infrastructure, workforce training, standardized protocols, culturally appropriate communication, and supportive regulatory frameworks. Tele-nursing should complement rather than replace conventional maternity care because physical examination, diagnostic testing, and obstetric emergencies require in-person assessment. Hybrid models combining remote nursing support with scheduled face-to-face care may therefore provide the most effective approach. This review followed PRISMA 2020 guidance, used a comprehensive multi-database search, and included randomized and quasi-experimental evidence from LMICs. Evaluation of both maternal and newborn outcomes provided a broad assessment of tele-nursing across the continuum of care. However, substantial heterogeneity existed in intervention platforms, intensity, duration, and outcome measures. The predominance of studies from South Asia and Sub-Saharan Africa may limit generalizability, while small sample sizes and short follow-up periods restricted evaluation of long-term outcomes. Inclusion of only English-language publications may also have introduced publication bias.

CONCLUSION

This systematic review demonstrates that tele-nursing is an effective and feasible strategy for improving maternal and newborn health outcomes in low- and middle-income countries. Nurse-led telehealth interventions enhance antenatal and postnatal care utilization, maternal health knowledge, medication adherence, birth preparedness, breastfeeding practices, psychological well-being, newborn care, immunization uptake, and patient satisfaction. Tele-nursing also strengthens continuity of care by facilitating regular communication between nurses and mothers, promoting early recognition of maternal and neonatal complications, and enabling timely referral to appropriate healthcare services. These benefits are particularly important for women living in rural and underserved communities where geographical, financial, and workforce barriers restrict access to skilled maternal healthcare. However, successful implementation depends on reliable digital infrastructure, adequate internet connectivity, digital literacy, trained nursing personnel, standardized clinical protocols, and robust systems for privacy and data security. Tele-nursing should complement rather than replace essential face-to-face maternal and newborn care. Integrating structured tele-nursing services into existing healthcare systems through hybrid models, supportive policies, and sustained investment may improve equitable access to quality care and contribute substantially to achieving global maternal and neonatal health targets.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: Not required

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Cite this article as: Hemavathi R, Ozukum ST, Smita T, Londhe SR, Rathore MI, Vedavathi N, et al. Effectiveness of tele-nursing interventions on maternal and newborn health outcomes in low- and middle-income countries. *Int J Contemp Pediatr* 2026;13:1810-23.