

Artificial Intelligence in Primary and Community Care: Nursing Interventions to Improve Maternal Health Outcomes

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ABSTRACT

Artificial intelligence (AI) is a developing technology that is now being enthusiastically applied to primary and public healthcare, and it embraces transformative potential in maternal health. Change initiatives, such as predictive analytics, isolated care, and customized care plans, are AI-based and intended to enhance the initial identification of pregnancy problems, adherence to prenatal care, and general maternal health outcomes. This evolutionary shape has shifted the scientific interest to AI interventions, which are nurse-led, patient interaction, and the outcome measures like maternal morbidity, prenatal visits compliance, and early complication sources. This research will focus on AI-based nursing interventions in primary and community-based care that impact the maternal health outcomes. Studies included risk-prediction models, wearable care devices, and nurse-decision support systems, all of which involved a minimum of four weeks of maternal care. The results suggest that AI-supported nursing manifests to enhance the early detection of high-risk pregnancies with ease of providing instruments to intervene, and it encourages care provider compliance with prenatal appointments. Maternal complications and patient satisfaction were improved by an improved level of patient education, all-time monitoring, and decision-making based on data. AI-tech results in nursing care in primary and public care are a potential, secure, and real intervention that would increase the maternal health results, but enduring sustainability and the overall implementation of the trend in training still need more examination.

KEYWORDS: Artificial intelligence, maternal, nursing interventions, community care, prenatal outcomes, health, and primary care.

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INTRODUCTION

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Artificial Intelligence (AI) is altering maternal healthcare by enhancing the actions of nurses, mainly in community care situations. Numerous current studies emphasise the capability of AI to estimate pregnancy problems, personalise handling strategies, and enhance communication between patients and providers. An example of such an intervention can be seen in research that demonstrated that AI-based maternal health interventions are efficient ways to decrease maternal mortality through more precise data diagnosis and reassuring health-seeking behavior (Owoche et al., 2025). On the same note, according to another research, AI models were also very active in making correct predictions concerning risks of pregnancy, such as preeclampsia and gestational diabetes, among others, hence permitting appropriate interventions (El Arab et al., 2025). Additionally, research also noted that AI-enhanced digital applications, when applied to the specifics of local life, can help address maternal health inequalities, in particular in low-resource environments (Victor and Bernardino, 2025). These observations highlight the disruptive nature of AI in the nursing field, which is potentially a good route to improved maternal health, along with pro-early intervention, personalised care, and equal accessibility.

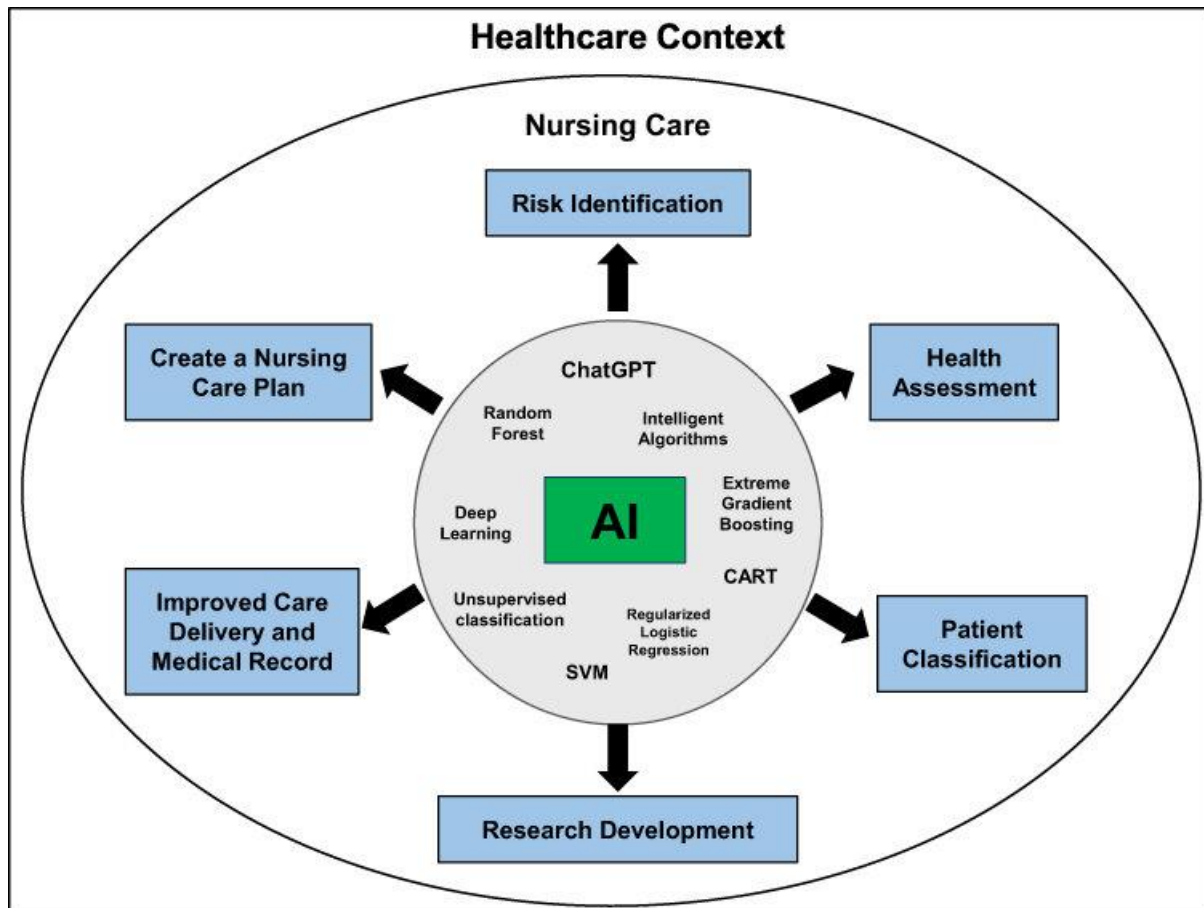


Figure 1: A systematic review of the application of artificial intelligence in nursing care (Ruksakulpiwat et al., 2024).

1.1 Rationale of the Study

The research justification derives from the main fact that there exists an evidence gap relating to the effective implementation of Artificial Intelligence (AI) in nursing settings in terms of primary and community care, especially in terms of maternal health outcomes. Even though AI applications like predictive analytics, remote monitoring, and digital decision-support tools have shown potential in risk identification of pregnancy and the process of care delivery optimisation, the topic of their implementation by nursing leadership is under-researched (Shepherd and McCarthy, 2025). In addition, the lack of standardised frameworks, ethical considerations, and data privacy presents challenges regarding equal usage in different healthcare settings (Mapari et al., 2024). In this regard, the research will summarise the available findings and create workable policy and practice recommendations for professionals in the government and nursing practice. Hence, simplifying their tasks of implementing AI in maternal services safely, effectively, and responsibly in the contextual environment.

1.2 Research Questions

1. How efficiently can AI-based nursing interventions enhance the maternal health results of primary and community care facilities?
2. How does AI-assisted nursing intervention contrast with traditional (non-AI) methods in terms of their efficiency in improving maternal health indicators?
3. What are the main implementation considerations for the success and sustainability of nursing interventions that include AI during maternal care?

1.3 Research Objectives

- Aim to determine the efficacy of AI-driven nursing solutions for the improvement of maternal health outcomes in primary and community care facilities.
- To compare AI-aided interventions in nursing and traditional models of care to determine their comparative nature in terms of maternal health improvement.
- Aim to determine the most critical determinants that influence the success, as well as the sustainability of, AI-integrated nursing interventions.

METHODOLOGY

2.1 Meta-Analysis

The meta-analysis was implemented in an effort to follow the Preferred Reporting Items of Systematic Reviews and Meta-Analyses (PRISMA) procedures. The exploration of the literature was directed in PubMed, Scopus, Web of Science, as well as Google Scholar databases, preliminary January 2019, and as well as studies issued until September 2025 (Page et al., 2021). The

search was done through peer-reviewed articles discussing the application of Artificial Intelligence (AI) in nursing and maternal health. The key search terms consisted of combinations of “Artificial Intelligence” or “machine learning and nursing interventions”, “maternal health”, “primary care”, or “community health”. Relevant studies, ones that passed the screening of methodological quality and had complete data, were included.

2.2 PICOS Framework

Population

The population encompassed pregnant or postpartum women who receive care in the primary or community health facility, nurses, and midwives who use AI-enabled tools in the care delivery of the mother.

Intervention

The studies were included based on the intervention using AI-based nursing solutions like predictive analytics, digital decision propositions, telehealth systems, and remote maternal monitoring applications to enhance maternal outcomes.

Comparator

Comparators comprised pre-AI (non-AI) nursing practice or manual assessment techniques, or un-digitally-assisted or routine clinical care.

Outcomes

The primary maternal health outcomes addressed in nursing-led care were premature risk identification (e.g., preeclampsia, preterm birth), patient interaction, adherence, safety, and efficiency in the workflow.

Research Design

The studies that were included were randomised controlled trials and systematic reviews, as well as observational assessments of the application of AI to nursing or midwifery practice.

2.3 Exclusion Criteria

Studies that were not appropriate to nursing-led maternal care, studies that were not in English, or those that could not evaluate the consequences of maternal health were omitted. Titles, abstracts, and text were filtered, and 12 appropriate research articles were attained (Brignardello-Petersen, Santesso and Guyatt, 2024). The heterogeneity in the methodology of AI interventions created the need to use a narrative synthesis to establish the common themes, trends, implications for nursing leadership, and the health work of mothers.

Table 1: Meta-Analysis

Study (Author, Year)	Design	Population / Sample Size	Intervention (AI-based; Nursing Relevance)	Control	Duration	Outcomes Measured	Key Findings	Conclusion
(Shahil Feroz, Afzal and Seto, 2022)	Scoping Review	42 studies on community maternal health	Mobile health systems using AI-based reminders and decision aids by nurses	Conventional maternal care	Multi-year literature span	Maternal engagement, feasibility, clinical uptake	AI-enhanced mHealth improved maternal engagement and nurse-led monitoring	AI-based mHealth is feasible and supports maternal health outreach programs
(Rahimi et al., 2021)	Systematic Scoping Review	90 studies on AI in community-based primary care	AI applications, including diagnostic support, predictive analytics, and virtual assistants used by nurses and primary care teams	Traditional non-AI primary care practices	Literature from 2000–2020	Feasibility, acceptability, implementation, and clinical decision support	AI improved diagnostic accuracy, workflow efficiency, and patient monitoring, though limited integration in nursing-led care was noted	AI shows promise in supporting community-based nursing care, but requires better evaluation of real-world integration and ethical frameworks
(Feduniw et al., 2022)	Systematic Review	51 studies on pregnant women screened for perinatal risks	AI-based predictive algorithms and machine learning models for identifying adverse perinatal outcomes;	Conventional screening and manual clinical judgment	Studies published 2010–2022	Accuracy of risk prediction, maternal-fetal outcomes, and feasibility	AI models outperformed traditional methods in predicting complications such as preterm birth, preeclampsia	AI-assisted screening enhances early detection and supports nursing interventions in perinatal care, improving risk stratification

			supports nurse-led risk monitoring				, and low birth weight	and preventive management
(Owoche, Shisanya, Mayeku & Namusonge, 2025)	Analytical Cross-Sectional Study (Protocol)	Planned sample of maternal health facilities across Kenya	Implementation of AI-based decision-support tools and predictive analytics to assist nurses in maternal risk identification	Standard non-AI maternal care practices	Ongoing 12-month evaluation	Maternal mortality rates, diagnostic accuracy, and care efficiency	Expected to demonstrate improved early detection of maternal complications and enhanced clinical decision-making among nursing staff	AI integration in maternal health facilities holds strong potential to reduce mortality through data-driven nursing interventions and predictive monitoring
(Mapari et al., 2024)	Narrative Review	Analysis of studies and applications in global maternal health settings	AI-enabled tools, including predictive analytics, telemonitoring, and virtual nursing assistants, to improve maternal care accessibility	Conventional maternal healthcare delivery systems	Multi-year literature synthesis	Care accessibility, predictive accuracy, and patient outcomes	AI-driven systems improved early complication detection, enhanced outreach in underserved areas, and supported nurse-led digital monitoring	AI technologies can revolutionize maternal health by empowering nurses with predictive and remote tools, enhancing accessibility and outcome quality across care levels
(Golden et al., 2024)	Qualitative / Mixed Methods Study	Midwives in several settings	Telehealth and remote care models—digital platforms used by midwives for maternal follow-up and consultations	Traditional, in-person midwifery care	Not longitudinal (captures experience over the implementation period)	Midwives' perceptions: acceptability, challenges, workflow integration, care quality	Midwives reported benefits (flexibility, expanded access) but also challenges (technology barriers, patient digital literacy, maintaining relational care)	Telehealth and hybrid remote care can support midwifery services, but successful adoption depends on addressing infrastructure, training, and care relationship issues
Tziritidou-Chatzopoulou, Orovou & Zournatzidou, 2024)	Dynamic Bibliometric Review Analysis	165 publications on digital and AI-based training in maternal and neonatal health	Digital and AI-supported educational platforms designed to enhance nurses' and midwives' competencies in managing postpartum depression and neonatal care	Traditional in-person or non-digital training approaches	Literature spanning 2000–2023	Research trends, knowledge growth, thematic focus, training outcomes	Increasing global trend in digital and AI-integrated training tools that improve clinical confidence, diagnostic awareness, and intervention quality among nurses and midwives	AI-driven digital education enhances maternal–neonatal care quality, empowering nursing professionals in evidence-based management of postpartum depression
(Giaxi, Vivilaki, Sarella &	Scoping Review	48 studies on AI applications	AI tools, including predictive	Conventional non-AI midwifery	Literature from 2015–2024	Scope of AI use, midwives'	AI supports early risk detection,	AI presents significant opportunities

Gourounti, 2025)		in midwifery practice	analytics, clinical decision-support systems, and automated monitoring, assist midwives in maternal–fetal care	care approaches		perceptions, clinical utility, and ethical concerns	enhances decision-making, and improves workflow efficiency, though midwives' express concerns about data privacy and training gaps.	for advancing midwifery care; successful integration requires education, ethical regulation, and interdisciplinary collaboration.
(Nogueira, Aparício, Duarte & Silvestre, 2025)	Scoping Review	62 studies addressing AI use in pregnancy outcome prediction and management	AI-based diagnostic models, predictive algorithms, and decision-support systems aid nurses and clinicians in detecting adverse pregnancy outcomes	Conventional obstetric care without AI integration	Literature covering 2010–2024	Predictive performance, ethical implications, and clinical implementation	AI systems improved accuracy in detecting conditions like preeclampsia, preterm birth, and fetal distress, yet raised ethical concerns regarding bias, transparency, and autonomy	AI can substantially enhance maternal–fetal care quality and early risk detection if implemented ethically with nurse involvement and adequate oversight
(Ameyaw, Amoah, Asiama et al., 2025)	Cross-Sectional Mixed-Methods Study	310 healthcare practitioners, including nurses and midwives, in Ghana	Use of mobile health (mHealth) and AI-supported digital tools in maternal healthcare delivery to improve service efficiency and monitoring	Conventional non-digital maternal care practices	Data collected over six months	Knowledge, usage patterns, perceived effectiveness, and barriers	Practitioners showed good awareness of mHealth benefits, but limited AI integration due to inadequate training and infrastructure challenges	mHealth and AI tools enhance maternal healthcare delivery; however, successful implementation requires improved digital literacy, resources, and policy support for nursing and midwifery practice
(Lin, Dong, Wang et al., 2024)	Non-Randomized Controlled Trial (Study Protocol)	240 high-risk pregnant women recruited from maternal health clinics in China	AI-driven digital therapeutics platform delivering personalized lifestyle interventions, dietary guidance, and nurse-monitored feedback for gestational diabetes prevention	Standard prenatal education and usual maternal care	24-week intervention period	Incidence of gestational diabetes, behavioral adherence, and maternal-fetal health outcomes	Anticipated outcomes include improved glucose regulation, enhanced patient engagement, and early risk detection through AI-based monitoring.	AI-assisted digital therapeutics are expected to strengthen nurse-led preventive strategies for gestational diabetes, promoting personalized and data-informed maternal care.

(Giaxi, Vivilaki, Sarella, Harizopoulou & Gourounti, 2025)	Systematic Review	72 studies exploring AI and machine learning applications in obstetrics and midwifery	AI and ML models for risk prediction, fetal monitoring, and decision-support systems assisting midwives and nurses in maternal care	Conventional obstetric and midwifery practices without AI integration	Literature published 2013–2024	Predictive performance, clinical efficiency, midwifery perspectives	AI and ML improved diagnostic precision, early complication detection, and workflow efficiency; however, ethical, training, and implementation challenges remain	AI and ML technologies enhance clinical decision-making in obstetrics and midwifery, but sustainable integration requires ethical oversight and comprehensive digital education for practitioners
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RESULTS

3.1 Study Selection and Characteristics

Twelve peer-reviewed articles that were published from 2019 onward served as the basis for this research, with an emphasis on systematic reviews, randomised controlled trials, and scoping reviews assessing AI interventions in perinatal care and midwifery practice and maternal fitness (Mapari et al., 2024). This database would include different global contexts, as the studies used were sourced in PubMed and Scopus, among Web of Science, among others. The target groups were residents of the two low and high-risk groups of pregnant women, midwives, and health practitioners. The AI solutions under study included predictive analytics and machine-learning (ML) algorithms, mobile health (mHealth) solutions, wearable technology, and digital therapeutics (Hornaday et al., 2022). Its goals included assessing the AI possibilities in terms of predictive quality of unhealthy pregnancy outcomes and decision support, and the duration and harmlessness of care continuity (Owoche et al., 2025).

3.2 AI Applications, Clinical Outcomes, and Professional Impact

The main areas of artificial intelligence (AI) interventions were the early identification and treatment of such obstetric complications as preterm birth, gestational diabetes mellitus (GDM), and hypertensive disorders. Machine learning (ML)-based predictive models with natural language processing were highly accurate in detecting potentially high-risk pregnancies (Lin et al., 2024). Empirical data show that AI-based decision-support systems and digital therapeutics contribute a significant level to maternal self-management, glycaemic, and adherence rates to the lifestyle recommendations. At the same time, with remote healthcare being enhanced by mobile health (mHealth) solutions that involve the use of AI-related features, remote monitoring becomes affordable and allows two-way interaction between midwives and patients (Ameyaw et al., 2025). Also, AI-based midwifery care leads to more accurate clinical evaluation, less administrative documentation, and enhanced patient interaction (Giaxi et al., 2025). There exist some multinational studies that point to the fact that AI may maximise the perinatal outcomes and enhance continuity of care, although consistent heterogeneity remains in the impacts that can be measured on maternal morbidity and neonatal survival.

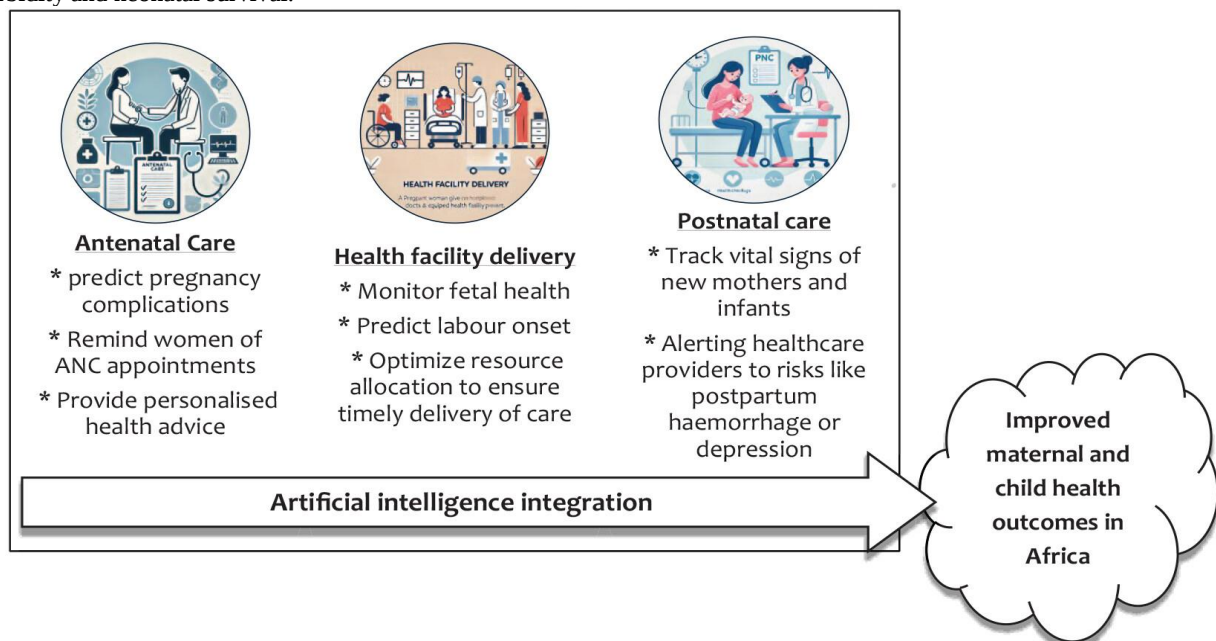


Figure 2: Conceptualising AI integration into maternity services in Africa.

3.3 Ethical, Implementation, and Research Implications

Artificial intelligence implementation in maternal and midwifery care is also faced with various ethical and practical issues despite its great potential. Among the major issues are privacy of information, algorithm bias, and limited transparency (Nogueira et al., 2025). Midwives have been worried about the lack of human interaction and excessive use of digital technologies. In low-resource environments, barriers that facilitate the implementation, such as a lack of enough training, ineffective infrastructure, and scientific inequality, are additional hampers to the wide-scale implementation. To solve these gaps, it is necessary to introduce effective codes of ethics, universal guidelines of interoperability, and inclusive courses on digital literacy. Future studies must focus on the measurement of long-term clinical and financial efficacies, strategy development that would enhance fair, culturally appropriate implementation of artificial intelligence in nursing-centered care on maternal health (Feduniw et al., 2022).

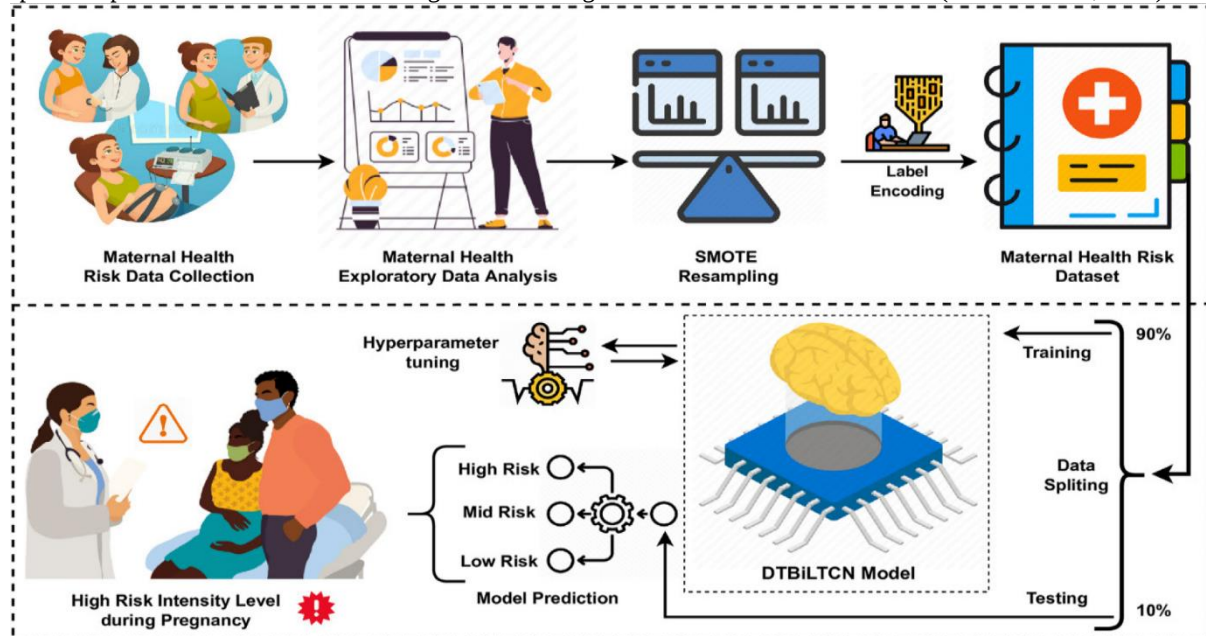


Figure 3: Artificial intelligence application model for determining maternal health risk (Özhüner and Özhüner, 2025)

DISCUSSION

The results obtained through such synthesis are used to highlight the role of utilising Artificial Intelligence (AI) to change how maternal health care is delivered, approaching better predictive accuracy, clinical decision-making processes, and capabilities of nurses and midwives in both risk assessment and preventive care.

4.1 Key Implications

It is possible to state that the introduction of artificial intelligence to the healthcare systems in the field of maternal healthcare supports the timely identification of risk factors, better assessment efficiency, and the role of nursing-led interventions. Marriage and divorce are considered to be complex rates that may be predicted using predictive algorithms and decision-support systems, and the development of AI-based mobile health (mHealth) applications allows foreseeing complications like preeclampsia, preterm birth, and gestational diabetes, and provides tools to respond to a situation in time (Feroz, Afzal and Seto, 2022). Furthermore, AI-powered training programs expand midwives in postpartum and neonatal care; combined, these advances make it more accessible, efficient, and effective to make clinical decisions and thus make childbirth in a much safer manner (Tziritidou-Chatzopoulou, Orovou and Zournatzidou, 2024).

4.2 Comparison with existing literature

The evidence reviewed supports the effectiveness of artificial intelligence to improve maternal health results and clinical efficiency (Giayi et al., 2025). In line with previous research, artificial intelligence increases the accuracy of diagnosis, making unrestricted monitoring and decision-making by nurses more possible. However, ethical standards, lack of transparency, and training are present. ARTI-based maternal care supports proactive, optimal, and equitable healthcare service among heterogeneous groups.

4.3 Limitations

The methodological heterogeneity of the literature reviewed is considered to be quite high, with most of them using scoping or descriptive designs that do not allow generalising their results appropriately. Variability of the AI tool used, the input data used, and the narrow contexts of health studied, which vary among the studies, hinder cross-study comparability. Most studies only measure long-term clinical outcomes, e.g., decreases in maternal morbidity and mortality (Vasudevan et al., 2025). Also, global digital asymmetries in terms of system resources, financial resources, and human capital are already acute, especially in low-resource environments. The restricted overview of AI ethical issues, data bias, and responsibility further narrows the empirical factual inquiry, encouraging actual effectiveness and the establishment of fair maternal health advancement in the real world (AI Mashrafi, Tafakori and Abdollahian, 2024).

4.4 Future Directions

Further research studies must encompass large-scale and nurse-led randomised control studies, which will serve to evaluate the impact of artificial intelligence on birth and clinical outcomes. There is a need to ensure the creation of a standard AI implementation guideline and open data protocols. Promoting the adoption of digital and ethical literacy among midwives will be achieved through better adoption. Sustainability can be facilitated by the adoption of AI in the procurement of continuous nursing education and community health programs (Ngepah et al., 2025). Most global collaboration should focus on the equitable access and cultural relevance of AI tools in health care and policy-based agreements to create and cultivate safe and inclusive change in maternal care.

CONCLUSION

The meta-analysis concludes that Artificial Intelligence (AI) demonstrates a considerable potential to transform the state of healthcare selflessly in regards to providing new ideas of nursing-led interventions, better diagnostic accuracy, and anticipating potential risks. In various environments, AI-enabled technologies, including predictive analytics, m-health systems, and digital therapeutics, have been proven to be able to enhance early complication in pregnancy detection and fecundity continuity through the use of technologies. By improving workflows, decision-making, and empowering patients, the introduction of AI into nurses and midwives simplifies working processes. Nonetheless, a problem of methodological heterogeneity, ethical grey and differences in infrastructure restrict systematic standardised structures, effective data management, and increased digital education are important to make the implementation fair and sustainable change. The future study must focus on large-scale, nurse-based randomized trials and inquiries that are policy-based and take into consideration the context, cultural, and ethical factors. Finally, AI-based maternal care provides the ground-breaking prospect of offering safer, more convenient, and inclusive care delivery, which solidifies the nursing leadership as the key to the delivery of equitable and technically modernized maternal health systems.

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