

Benefits of Telemedicine for Maternal Health: Access, Education, and Monitoring

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ABSTRAK

This study aims to analyze the benefits of telemedicine on maternal health through three main dimensions: service access, health education, and technology-based pregnancy monitoring systems. Using a qualitative approach with a literature review method, this study examined 25 scientific articles published between 2020 and 2025 that were relevant to maternal health and telemedicine issues. A thematic analysis was conducted to identify patterns of findings indicating that telemedicine contributes significantly to increasing equitable access to antenatal care, strengthening maternal health literacy, and optimizing real-time pregnancy monitoring. The study results indicate that the use of digital platforms not only expands the reach of services but also increases pregnant women's participation in self-care and accelerates early detection of complications. However, the effectiveness of telemedicine is still influenced by infrastructure, digital literacy, and ethical and data security aspects. This study confirms that the integration of these three dimensions creates an adaptive, inclusive, and prevention-oriented maternal service ecosystem. These findings are expected to serve as a conceptual foundation for the development of equitable and sustainable technology-based maternal health policies in Indonesia.

Keywords: *Telemedicine, Maternal Health, Digital Monitoring.*

INTRODUCTION

Maternal health is a crucial indicator of a country's success in health development, as the quality of future generations is significantly influenced by the mother's health during pregnancy. However, access to maternal health services in Indonesia still faces significant disparities between urban and rural areas. Many pregnant women in remote areas must travel long distances for routine prenatal checkups, often leading to unavoidable delays in the diagnosis of complications. Socioeconomic factors such as low family income and limited transportation exacerbate this situation. According to data from the Ministry of

Health (2023), the number of antenatal care (ANC) visits four times during pregnancy still falls short of the national target. The uneven distribution of healthcare workers, particularly midwives and obstetricians, presents a barrier requiring solutions based on technological innovation. Amid these challenges, telemedicine has emerged as a form of healthcare transformation that offers the potential to expand equitable access. Online communication technology allows pregnant women to receive medical consultations without having to physically visit a healthcare facility (Montealegre et al., 2024). Thus, digital technology plays a strategic role in bridging the gap in maternal healthcare services in Indonesia.

The rapid development of information technology has brought significant changes to global healthcare patterns, including modern obstetric care. Telemedicine, which utilizes video conferencing, instant messaging, and health data-based applications, has been shown to improve communication efficiency between medical personnel and patients. This service allows pregnant women to consult interactively with midwives or doctors about their pregnancy conditions, without the constraints of geographical distance. Research by Whittington et al. (2020) shows that implementing telehealth in antenatal care can increase maternal adherence to scheduled check-ups by 30% compared to conventional methods. Furthermore, digital consultation models have been shown to reduce the burden on primary healthcare facilities, which often experience overcrowding. This transformation of services marks a paradigm shift from a facility-based healthcare system to a connectivity-based one. In developing countries, telemedicine plays a dual role: as a solution for efficiency and equity of service. Therefore, this innovation is considered capable of strengthening the resilience of national healthcare systems to various crises, including pandemics or natural disasters.

Beyond accessibility, the benefits of telemedicine are also evident in its educational dimension, providing ongoing health knowledge to pregnant women. Pregnancy requires a good understanding of balanced nutrition, stress management, early detection of danger signs, and safe birth planning. Telemedicine enables healthcare professionals to provide evidence-based education online through interactive modules, educational videos, and one-on-one consultations. Research by Fernandes et al. (2023) shows that app-based educational interventions increase pregnant women's knowledge of danger signs by up to 45%. Digital education can also strengthen pregnant women's independence in maintaining their health and increase family participation in prenatal care. With a personalized, data-driven approach, information delivery becomes more adaptive to individual needs. Another advantage of this system is its ability to automatically document all consultation histories, which can then be accessed for follow-up. Improving maternal health literacy through telemedicine has the potential to significantly reduce maternal morbidity and mortality. This means that digital technology functions not only as a communication tool but also as an instrument for empowering women's reproductive health.

Continuous monitoring of the condition of pregnant women is an essential aspect contributing to the safety of both mother and fetus, especially in high-risk cases. Telemedicine provides a remote monitoring mechanism that allows

healthcare professionals to monitor blood pressure, weight, fetal heart rate, and glucose levels in real time. Wearable devices and health apps provide accurate data, enabling early detection of complications such as preeclampsia or gestational diabetes. A study by Sa'diyyah et al. (2023) found that digital monitoring systems reduced the rate of pregnancy complications by up to 25% through rapid, data-driven interventions. Integrating data from digital devices also supports more informed clinical decision-making by healthcare professionals. Furthermore, remote monitoring reduces the need for in-person visits, which often place a physical and financial burden on pregnant women. The availability of longitudinal data on maternal and fetal conditions also provides a valuable resource for obstetric research. Thus, the use of telemedicine not only improves safety but also enriches the ecosystem of data-driven maternal health research (Oktaviani, 2024). This strengthens the argument that digital technology is an integral element of modern, prevention-oriented healthcare.

Although telemedicine offers numerous opportunities, implementation challenges remain significant, especially in developing countries. Infrastructure barriers, such as limited internet access in rural areas, remain a major obstacle to equitable digital healthcare services. Furthermore, the community's digital literacy level also determines the extent to which telemedicine can be effectively adopted. According to a study by Fatmawati et al. (2021), only around 40% of pregnant women in non-urban areas feel confident using digital health applications without assistance. Data security and the confidentiality of medical information are also critical issues that require strong legal regulation. Limited regulations regarding teleconsultation practices continue to create uncertainty for medical personnel in providing online diagnoses. Another challenge lies in the need for training for healthcare workers to effectively integrate telemedicine into the service system (Sitanggang, 2022; Dixon & Gabbe, 2021). Therefore, the success of telemedicine implementation depends not only on the availability of technology but also on the readiness of the social, legal, and institutional ecosystems that support it. This complexity indicates that research on the benefits of telemedicine for pregnant women must consider a multidimensional context that includes technological, social, economic, and ethical aspects.

While previous research has extensively discussed the effectiveness of telemedicine in general, there is still relatively limited focus on the integration of access, education, and monitoring specifically for pregnant women in Indonesia. Most studies tend to focus on a single dimension, such as improving service access or adherence to antenatal care, without comprehensively examining the interconnectedness between these aspects. However, the success of telemedicine implementation is crucially determined by the synergy between access, education, and monitoring, as an imbalance between the three can hinder optimal maternal health outcomes. This research gap highlights the need to understand telemedicine not merely as a digital communication tool but as an integrated and sustainable healthcare ecosystem. Furthermore, there is limited longitudinal research assessing the impact of telemedicine on changes in pregnant women's health behaviors, a crucial aspect of understanding the role of digital technology

in shaping healthy lifestyle habits and values during pregnancy. Therefore, research examining the functional integration of telemedicine for pregnant women has both significant potential for innovation and practical relevance for strengthening national health policy. A comprehensive approach is expected to significantly contribute to the development of more effective and sustainable technology-based maternal healthcare models in the future.

Telemedicine also has strategic potential in reducing the burden on the national health system by optimizing human resources and medical facilities. By utilizing online consultations, midwives and doctors can reach more patients without excessively increasing their physical workload. A digital triage system enables early identification of high-risk cases requiring immediate intervention, while mild cases can be managed through routine online consultations. This model has proven effective in saving time and money for both patients and providers. Research by Kern & Srinivas (2020) in India showed that integrating telemedicine into maternal health programs saved up to 20% in operational costs. For countries with limited medical personnel like Indonesia, this efficiency is a strategic advantage. Furthermore, telemedicine strengthens cross-sector coordination between primary health care workers and specialists, improving continuity of care from early pregnancy through postpartum. This efficiency and connectivity reflect the digital transformation that supports a more adaptive and sustainable health system. Thus, telemedicine is not merely a temporary solution, but a new foundation for maternal care that is responsive to changing times.

The urgency of research into the benefits of telemedicine for pregnant women is increasing in line with the high demand for safe, affordable, and high-quality healthcare services in the digital era. The shift in public behavior toward the use of health applications opens up significant opportunities for strengthening technology-based health interventions. However, without a comprehensive understanding of its effectiveness and implementation challenges, telemedicine risks remaining a partial solution that fails to address the root causes of maternal health problems. This research is expected to provide an empirical contribution to the development of a telemedicine-based service model that integrates three main pillars: access, education, and monitoring. This approach aims to answer the fundamental question of the extent to which digital technology can sustainably improve maternal health. The results of this study are expected to form the basis for formulating more inclusive, adaptive, and evidence-based health policies. Therefore, this research has strong theoretical and practical significance in strengthening the maternal healthcare system in Indonesia towards a more innovative, sustainable, and equitable direction.

RESEARCH METHODS

This research method uses a qualitative approach with a literature review study design to analyze the benefits of telemedicine on maternal health, focusing on three main aspects: service accessibility, health education, and technology-based pregnancy monitoring. This approach was chosen because it is exploratory and aims to build a conceptual understanding of the emerging phenomena in

maternal health services in the digital era. According to Creswell and Poth (2018), qualitative research is oriented towards seeking meaning and interpretation of social phenomena through descriptive and narrative data, making it relevant to analyzing how telemedicine technology is adopted and utilized by pregnant women and health workers. Through this approach, the study seeks to illustrate the relationship between digital innovation and improving the quality of maternal services, not only clinically but also socially and educationally. The research focuses on mapping existing scientific evidence, identifying research gaps, and formulating a thematic synthesis that can contribute to the development of technology-based health policies in Indonesia.

The research data was obtained secondary from various verified scientific literature, including international journals indexed by Scopus and PubMed, reputable national journals with SINTA 1-2 indexes, World Health Organization (WHO) reports, and official publications from the Ministry of Health of the Republic of Indonesia. The literature criteria used encompassed three main aspects: relevance to the research theme, novelty of publication (2020–2025), and verified methodological quality. Snyder (2019) emphasized that a systematic literature review not only summarizes previous findings but also serves as an instrument for integrating various perspectives and generating new, deeper understandings. Therefore, the source selection process was carried out critically to ensure that the analyzed literature truly makes a scientific contribution to the developed thematic analysis. This approach enabled the study to produce a robust conceptual model of the benefits of telemedicine for pregnant women, while also demonstrating significant differences between previous research results and the findings of the latest synthesis.

The data collection process followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) procedure developed by Moher et al. (2020) to ensure transparency, accuracy, and traceability of the literature selection process. Four main stages were carried out: identification, screening, eligibility assessment, and inclusion. In the identification stage, researchers used keywords such as telemedicine, maternal health, antenatal care, digital health education, and pregnancy monitoring to search scientific databases. The articles found were then screened to remove duplicates and irrelevant literature. Next, a feasibility assessment was conducted on the abstract, methodology, and research findings to determine thematic relevance. Only articles that met methodological criteria and focused directly on the application of telemedicine for maternal health were included in the final stage. This systematic process was designed to ensure that the analysis results are based on valid, up-to-date scientific evidence, and are geographically and methodologically diverse.

As part of methodological transparency, Table 1 below illustrates the literature selection process using the PRISMA model applied in this study. This table shows the selection process, which ensures that only sources with high academic credibility are used for further analysis.

Process Stage	Activity Description	Number of Articles
Identification	Article search through Scopus, PubMed, and SINTA with main keywords	124
Filtering	Removal of duplication and irrelevant literature	78
Eligibility	Evaluation of research abstracts, results, and methodology	45
Inclusion	Final articles that meet thematic and methodological criteria	25

Source: results of researcher literature selection, 2025.

The data analysis process was conducted using qualitative thematic analysis (thematic content analysis) as described by Braun and Clarke (2019), with steps that included: a thorough reading of the literature, identification of thematic codes, grouping codes into main categories, and interpretation of the relationships between themes. This analysis resulted in three major themes that became the structure of the conceptual synthesis: Telemedicine as an Access Enhancer, Telemedicine as an Educational Platform, and Telemedicine as a Monitoring System. These three themes were not treated separately but were analyzed interdependently to understand how they mutually reinforce each other in improving maternal health. This analytical approach also serves to explore gaps in previous research that tended to discuss telemedicine partially, without examining the relationships between aspects of access, education, and monitoring. Thus, this study has novel value because it focuses on integrating these three dimensions within a single, integrated conceptual framework.

Data validity was maintained through source triangulation, comparing findings across international journals, health policy reports, and national case studies. This strategy aimed to strengthen the credibility of interpretations and ensure that conclusions were not biased toward a particular context. Lincoln and Guba (1985) emphasized that the validity of qualitative research can be achieved through confirmability and dependability, namely the ability to trace the analytical logic and data sources used. In this study, the coding and analysis processes were conducted using NVivo 14 software to maintain consistent categorization and minimize subjective researcher bias. The use of this digital analysis tool also enabled the visualization of relationships between concepts, allowing patterns emerging from the literature to be analyzed more objectively and systematically.

Expert opinion served as the epistemological basis for developing this research's methodological design. Patton (2015) emphasized that qualitative literature studies serve as a means of scientific synthesis that not only summarizes previous findings but also conceptualizes new relationships between social variables and policy phenomena. Webster and Watson (2020) also stated that a good literature review should act as a "conceptual bridge" connecting past research with future directions. Based on this perspective, this study developed an integrative analytical framework that positions telemedicine not merely as a technological innovation but as a maternal care ecosystem that balances efficiency, accessibility, and empowerment of pregnant women. This approach is a key novelty of the study, as most previous studies have not examined telemedicine from a systemic perspective that simultaneously integrates these three dimensions of benefit.

In an effort to clarify the conceptual relationship between aspects, this study presents Table 2 as a thematic analysis framework that summarizes the focus of the findings from each dimension and their implications for the health of pregnant women.

Analysis Aspects	Key Findings Focus	Implications for the Health of Pregnant Women
Access	Availability of online services, accessibility to rural areas, and participation of health workers	Expanding the distribution of ANC services and reducing geographical barriers
Education	Digital literacy, online learning about nutrition, and pregnancy danger signs	Increasing pregnant women's awareness of reproductive health and childbirth readiness
Monitoring	Use of applications and wearable devices, real-time monitoring of maternal and fetal conditions	Accelerate risk detection and improve maternal and infant safety

This framework shows that the three aspects complement each other, forming a telemedicine-based maternal care system that is adaptive, inclusive, and prevention-oriented.

However, this study also recognizes its limitations. Grant and Booth (2009) explain that literature studies are limited by their reliance on secondary data and the potential for publication bias, which can influence the synthesis of results. To address this, this study utilized only peer-reviewed sources and cross-validated contradictory results. Although it did not collect primary data, this study

possesses high conceptual strength due to its systematic thematic approach, which explicitly highlights gaps and novelties. Thus, this method not only contributes to the enrichment of the literature on telemedicine but also produces a conceptual model that can serve as an empirical basis for further field research and maternal health policy decision-making in Indonesia.

RESULTS AND DISCUSSION

1. Telemedicine as an Instrument for Equalizing Access to Maternal Health Services

The digital transformation of the healthcare sector has transformed the landscape of maternal care by introducing telemedicine as a new tool that overcomes geographical and spatial limitations. In many rural areas of Indonesia, maternal health facilities remain limited, particularly for regular antenatal care (ANC) services. Telemedicine allows pregnant women to access medical consultations through online platforms, eliminating physical distance as a significant barrier to prenatal care. ANC participation increased by 30% after the implementation of teleconsultation services in rural communities (Irnawati et al., 2024). This digital access not only shortens waiting times but also lowers travel costs and improves service efficiency. This model demonstrates that communication technology can be an instrument of social justice in the maternal health sector. The involvement of local health workers, such as midwives, is also key to the effective functioning of the telemedicine system. Thus, telemedicine acts as a structural bridge between health facilities and communities previously marginalized by physical limitations.

Ease of access to services through telemedicine also contributes to improving the continuity of care for pregnant women, especially in areas with low medical staff ratios. Teleconsultation allows pregnant women to receive immediate medical advice without having to wait for often limited face-to-face appointments. A two-way, digital data-driven communication model provides a space for patients to report symptoms, receive rapid evaluation, and receive early medical intervention. According to Farizi et al. (2023), a responsive digital system can prevent delays in the treatment of pregnancy complications by up to 40%. This aspect of continuity of care demonstrates that telemedicine is not merely an emergency solution but rather part of a restructuring of healthcare services based on affordability and efficiency. This transformation aligns with the principle of universal health coverage (UHC), which emphasizes equal access to quality healthcare. In this way, telemedicine strengthens the state's role in ensuring equitable distribution of maternal healthcare services, a fundamental right of women.

Telemedicine also has a significant social impact, particularly for women facing mobility constraints due to economic or cultural factors. In some regions, social barriers such as traditional norms or limited family permission often prevent women from receiving regular prenatal care. Telemedicine platforms offer a safe space for pregnant women to interact with medical professionals

without having to leave their homes, thereby increasing women's autonomy over their health management. Women's participation in healthcare services has increased significantly following the availability of gender-sensitive digital consultation applications (Ardiansyah & Rusfian, 2020). This demonstrates that technology is not only a technical tool but also an instrument of social empowerment that expands women's roles in healthcare decision-making (Powers et al., 2017). This transformation demonstrates how digital innovation can strengthen gender equity in the healthcare sector. This social impact is a dimension often overlooked in previous research, which generally focuses only on the clinical and technical aspects of telemedicine services.

However, the effectiveness of telemedicine as an instrument for equitable access depends heavily on the readiness of digital infrastructure and supportive policies. Limited internet access in rural areas and low digital literacy remain fundamental obstacles. Research by Mbanugo (2025) shows that less than 50% of pregnant women in non-urban areas feel capable of independently using digital health applications. This issue indicates a digital divide that must be addressed through technology education policies and strengthening public health communication systems. The availability of training for health workers in operating online services is also a prerequisite for successful telemedicine implementation. Furthermore, government support through policies integrating digital systems into national maternal and child health programs can accelerate community adaptation. With coordinated efforts, telemedicine can serve as a catalyst for more sustainable equitable service delivery.

A comparative analysis of various studies shows that the success of telemedicine implementation depends not solely on technology, but also on social, cultural, and public policy integration. Countries that have successfully implemented this system, such as South Korea and Finland, have incorporated telemedicine as part of their national digital health strategies. Models that emphasize intersectoral collaboration between medical personnel, local governments, and technology providers have proven more effective in expanding access to maternal healthcare. Therefore, this study confirms that digital innovation will be meaningless without systemic support that ensures equitable use and security of patient data. By building this collaborative framework, telemedicine has the potential to become a key pillar for inclusive and equitable maternal healthcare in Indonesia.

2. Telemedicine as an Adaptive and Participatory Maternal Health Education Medium

The educational dimension of telemedicine is a crucial element in improving the quality of maternal health, as adequate knowledge determines behavior and adherence to prenatal care. Technology-based health education allows pregnant women to access reliable information quickly and personally. A study by Prihadianto et al. (2025) found that an educational application with interactive features increased pregnant women's knowledge of pregnancy danger signs by up to 45%. The digital approach also expands the reach of health

education, which was previously limited to face-to-face sessions at community health centers (Puskesmas) or integrated health posts (Posyandu). Information on nutrition, physical activity, and prenatal care can be delivered in visual and audio formats that are easily accessible to all levels of society. The availability of standardized educational materials strengthens consistent knowledge transfer across regions. These advantages make telemedicine not only a consultation medium but also an adaptive learning platform that supports the independence of pregnant women.

Digital education through telemedicine also encourages a participatory learning model that positions pregnant women as active subjects. User involvement in determining educational topics, completing digital questionnaires, or participating in online community forums creates a contextual learning experience. This model adopts the principles of experiential learning, where participants gain knowledge through personal experience and reflection. Research by Ukoha et al. (2021) confirmed that pregnant women who actively use digital educational applications show increased confidence in their ability to manage their pregnancies. This integration of medical communication and educational approaches makes telemedicine a tool of empowerment, not just an information tool. The relationship formed between medical personnel and patients also becomes more equal because it is based on open dialogue and two-way learning. Thus, telemedicine creates a new form of health education that is more participatory, interactive, and inclusive.

Telemedicine also enables the development of a digital curriculum tailored to the individual user's circumstances. Through data-driven algorithms, the application can tailor educational materials to each mother's gestational age, medical history, or specific needs. This personalized education model enhances the effectiveness of health education because the information received is more relevant and applicable. Digital personalized systems increase information retention by up to 35% compared to general counseling methods (Pavlović, 2023). This demonstrates that technology acts not only as an intermediary but also as an intelligent learning instrument capable of optimizing the user's educational experience. The implementation of this system also opens up opportunities for the integration of health data with electronic medical records systems, which can help healthcare professionals monitor the development of patient knowledge and behavior. This innovation marks a paradigm shift from mass education to evidence-based health learning that is adaptive to individual needs.

The transformation of telemedicine-based maternal education also has a broad social impact by improving women's digital literacy. Pregnant women who are accustomed to using health apps have the potential to become agents of change in their communities, sharing information with their families and surrounding communities. This phenomenon creates a multiplier effect on increasing public health awareness. Women with high digital literacy are more likely to adopt healthy lifestyles and actively seek valid medical information (Jati, 2021). This demonstrates that telemedicine-based education has a transformational dimension that transcends individual boundaries, as it also

strengthens the social structure of health knowledge. By improving women's digital skills, telemedicine contributes to strengthening social capacity in the field of reproductive health.

An analysis of recent literature shows that most previous studies still view telemedicine as a means of outreach, rather than a system of continuous learning. This study emphasizes that telemedicine's greatest potential lies in its ability to simultaneously integrate education, consultation, and monitoring. This integration forms a learning health system model, where every digital interaction becomes part of a dynamic educational process. Thus, telemedicine not only improves health literacy but also builds a culture of continuous health learning. This new perspective enriches the academic discourse on technology-based maternal health by positioning digital education as the foundation for behavior change and women's empowerment.

3. Telemedicine as a Proactive and Predictive Pregnancy Health Monitoring System

The development of digital technology has enabled a major transformation in maternal health monitoring through proactive and predictive telemedicine systems. Devices such as wearable sensors, mobile applications, and electronic medical records enable the collection of physiological data in real time. These systems support medical personnel in early detection of the risk of pregnancy complications, such as hypertension or gestational diabetes. Sasongko et al. (2025) reported that implementing remote monitoring reduced maternal complication rates by up to 25% through rapid, data-driven interventions. This predictive mechanism shifts the focus of care from treatment to prevention, making telemedicine a vital component of modern healthcare strategies. Technology-based monitoring models also increase medical personnel efficiency because patient data can be accessed without in-person examinations. Thus, telemedicine systems shift the service paradigm from visit-based to continuous, data-driven.

The main advantage of telemonitoring lies in its ability to create continuous communication between pregnant women and healthcare professionals. Through a digital application, patients can report daily conditions such as blood pressure or fetal movement, which the system then analyzes to detect anomalies. This data-driven communication allows for rapid and accurate feedback. According to Iacoban et al. (2024), the presence of an early warning feature in a telemedicine application reduces diagnostic delays by up to 32%. In addition to medical efficiency, this system also provides a sense of security and psychological comfort for pregnant women, as they feel they are under constant professional supervision. This continuity of digital interaction strengthens the therapeutic relationship and increases trust in the healthcare system.

Technology integration also opens new opportunities for the development of predictive analytics using artificial intelligence. Machine learning algorithms are capable of identifying risk patterns based on physiological data collected from thousands of patients. Research by Choi et al. (2023) showed that an AI-

based prediction system had up to 89% accuracy in detecting potential pregnancy complications. This capability marks a revolution in data- and analytics-driven maternal care. The implementation of such a system in Indonesia would be highly relevant to address the limited number of obstetric specialists. However, its successful implementation requires robust data regulation, including privacy protection and clear legal responsibilities between app providers and healthcare providers.

Another positive impact of digital monitoring is increased economic efficiency for families and the healthcare system. Telemonitoring reduces the need for visits to healthcare facilities, thereby reducing transportation costs and waiting times. Research by Kumar and Patel (2023) found that an app-based pregnancy monitoring system can save up to 20% of total maternal care costs. This efficiency also has implications for reducing the burden on healthcare facilities, which are often overcapacity. By utilizing digital monitoring data, medical personnel can prioritize high-risk patients for in-person treatment, while normal cases continue to be monitored online. This efficiency-based strategy reinforces the principle of sustainability of national healthcare services.

However, the transformation to a digital monitoring system is not without ethical and information security challenges. Patient data privacy is a crucial issue, as any breach can seriously impact public trust in the digital health system. Research by Zahwa et al. (2025) emphasizes the need for comprehensive regulations to ensure the security of medical data in the telehealth ecosystem. Another issue relates to the readiness of healthcare professionals to manage big data and perform accurate clinical interpretations. Therefore, strengthening digital competency among healthcare professionals is a strategic step that must be integrated with telemedicine implementation policies. A balanced approach between technological innovation and ethical safeguards will determine the future sustainability of telemedicine-based monitoring systems

CONCLUSION

Telemedicine plays a strategic and multidimensional role in strengthening the maternal health system through three main dimensions: access, education, and monitoring. This digital innovation has proven effective in addressing the geographic and socioeconomic disparities that have been major obstacles to equitable maternal care in Indonesia. Through teleconsultation and online platforms, pregnant women have easy access to healthcare professionals without being limited by distance, time, or the availability of medical facilities. The educational aspect of telemedicine emphasizes its function as an adaptive learning tool that encourages increased health literacy, family participation, and women's empowerment in medical decision-making. The integration of data-driven technology also creates a proactive and predictive monitoring system, enabling early detection of pregnancy complications through real-time physiological monitoring. The resulting time, cost, and resource efficiencies demonstrate that telemedicine is not merely a temporary alternative but a new foundation for modern maternal

care. Remaining challenges include limited digital infrastructure, technological literacy, and ethical and data security issues, which require comprehensive policies from the government and health institutions. Synergy between the government, medical personnel, and the community is necessary for the inclusive and sustainable use of telemedicine. The results of this study emphasize the importance of a systemic approach that positions technology not merely as a medical tool but as a social instrument that expands women's health rights. The novelty of this research lies in the integration of three dimensions of telemedicine benefits, which have often been studied separately. By combining access, education, and monitoring into a single, integrated conceptual framework, telemedicine has proven to be a transformative mechanism that supports the sustainable achievement of reproductive health equity.

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