

Changes in Knowledge and Attitudes Toward Pregnancy Complication Prevention Following a Health Promotion Intervention: A One-Group Pretest–Posttest Study

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Abstract:

Pregnancy complications remain an important contributor to maternal morbidity and mortality, highlighting the need for preventive strategies that strengthen pregnant women's knowledge and attitudes toward early recognition and appropriate management of pregnancy-related risks. This study aimed to evaluate changes in pregnant women's knowledge and attitudes regarding the prevention of pregnancy complications following a health promotion intervention. A quantitative pre-experimental study with a one-group pretest-posttest design was conducted among 15 pregnant women attending antenatal care at an Independent Midwife Practice in April 2026. Participants were recruited using total sampling. The intervention consisted of structured health promotion delivered through counseling, presentations, and educational leaflets. Knowledge and attitudes were assessed using a structured questionnaire that had undergone validity and reliability testing. Pretest and posttest outcomes were analyzed using paired statistical procedures based on the data distribution. The mean knowledge score increased from 56.2 before the intervention to 82.5 after the intervention, with a mean difference of 26.3 points. The mean attitude score increased from 60.1 to 85.7, representing a mean difference of 25.6 points. Both changes were statistically significant ($p < 0.001$). These findings indicate that structured health promotion was associated with substantial improvements in pregnant women's knowledge and attitudes regarding the prevention of pregnancy complications. Integrating systematic and accessible health education into routine antenatal care may strengthen maternal preparedness and support preventive practices. However, larger controlled studies are required to confirm the effectiveness and generalizability of the intervention.

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INTRODUCTION

Pregnancy complications remain a major challenge to maternal health because preventable conditions can rapidly progress into severe morbidity and mortality when recognition and management are delayed (Cresswell et al., 2025). Pregnancy is generally a normal physiological process, yet physiological adaptations during gestation can develop into pathological conditions that threaten maternal and fetal well-being. Hemorrhage, hypertensive disorders of pregnancy, including preeclampsia and eclampsia, infection, anemia, and other obstetric complications remain important causes or contributors to adverse maternal outcomes (Akaishi et al., 2024). Postpartum hemorrhage continues to represent a major preventable cause of maternal mortality, especially in low-resource settings (Candidori et al., 2024). Early recognition of these conditions is particularly important because the progression from initial symptoms to severe complications may occur within a relatively

short period. Effective maternal healthcare consequently requires not only clinical surveillance but also adequate preparedness among pregnant women to identify potential danger signs and respond appropriately.

Maternal complications in Indonesia continue to be associated with hemorrhage, hypertensive disorders of pregnancy, infection, and other pregnancy-related conditions that require timely prevention and early detection (Syairaji et al., 2024). The occurrence of severe maternal complications cannot be explained solely by underlying medical conditions because access to information, recognition of warning signs, and decisions regarding healthcare utilization also influence maternal outcomes (Damayanti et al., 2023). Delays or deficiencies across care-seeking pathways may reduce opportunities for timely management and contribute to preventable pregnancy-related deaths (Anggondowati et al., 2022). Preventive strategies within antenatal care need to address both clinical risk and the ability of pregnant women to understand and respond to pregnancy-related health threats.

Pregnant women's knowledge and attitudes are important determinants of their ability to recognize danger signs, seek appropriate care, and participate in preventive maternal health practices (Gesese et al., 2023). Knowledge provides a cognitive foundation for understanding potential complications, the importance of regular antenatal care, and the actions required when warning signs occur. Greater exposure to antenatal care has also been associated with improved knowledge of obstetric danger signs, underscoring the educational role of maternal healthcare encounters (Uwiringiyimana et al., 2022). Attitudes reflect how individuals evaluate health recommendations and may influence their willingness to adopt preventive practices or seek professional assistance; recent evidence has demonstrated that knowledge, attitudes, and care-seeking practices concerning obstetric danger signs remain interrelated concerns among antenatal populations (Al-Matarnah et al., 2023). Inadequate knowledge may contribute to failure to recognize potentially serious symptoms, while unfavorable attitudes may discourage timely utilization of maternal healthcare even when services are available. Strengthening both domains is therefore essential, as increased knowledge without a supportive attitude may not necessarily lead to appropriate health-related decision-making.

Health promotion has become an important strategy in antenatal care because structured education can strengthen maternal knowledge, risk awareness, and readiness to adopt preventive behaviors (Ariyani et al., 2022). Educational interventions enable healthcare professionals to communicate information on pregnancy danger signs, antenatal examinations, prevention of complications, and appropriate responses to obstetric emergencies. Counseling provides opportunities for direct communication and clarification, while presentations and printed or visual educational materials can reinforce key messages and facilitate comprehension (Essam et al., 2022). Health promotion also extends beyond the transfer of information by encouraging pregnant women to develop greater awareness of their health status and responsibility for preventive practices. Midwives occupy a particularly important position in this process because regular contact during antenatal care provides opportunities to integrate structured and individualized education into routine maternal health services (Merriel et al., 2024). Evidence from these studies supports both structured antenatal education and communication approaches adapted to pregnant women's informational needs.

Evidence remains limited on the extent to which health promotion delivered in independent midwifery practice can simultaneously improve knowledge and attitudes toward preventing pregnancy complications. Health education is widely incorporated into maternal healthcare, yet pregnant women may continue to demonstrate heterogeneous informational needs, levels of understanding, and responses to antenatal educational programs (Shorey et al., 2022). Variations

in educational background, socioeconomic circumstances, pregnancy-related experience, interaction with healthcare professionals, and access to health information may influence maternal health literacy and responsiveness to health promotion (Meldgaard et al., 2022). Maternal health literacy itself represents a multidimensional capacity involving access to, comprehension of, evaluation of, and application of pregnancy-related health information, supporting the need for context-sensitive evaluation rather than if exposure to information alone produces favorable outcomes (Putri & Lu, 2024).

The present study provides context-specific evidence by evaluating changes in cognitive and attitudinal outcomes following a structured health promotion intervention that included counseling, presentations, and leaflets. Assessment of knowledge and attitudes before and after the intervention allows examination of changes in these two complementary dimensions within the same group of pregnant women (Mulyani et al., 2023). The simultaneous evaluation of cognitive understanding and attitudinal responses provides a broader perspective on the potential contribution of health promotion than assessment of knowledge alone (Abdisa et al., 2023). The independent midwifery practice setting also offers practical relevance, as these services serve as an important point of contact for incorporating maternal health education directly into antenatal care. Recent intervention research supports the use of pre-intervention and post-intervention assessments to evaluate changes in knowledge and attitudes among pregnant women following structured educational interventions.

This study aimed to determine changes in pregnant women's knowledge and attitudes regarding the prevention of pregnancy complications following a health promotion intervention at an Independent Midwife Practice. The urgency of this investigation lies in the need to strengthen preventive maternal healthcare through educational strategies that are feasible, accessible, and applicable within routine antenatal services (Mwiliwe et al., 2024). Evidence on changes in knowledge and attitudes may help midwives assess the value of structured health promotion and refine educational approaches to meet pregnant women's information needs (Radu et al., 2024). The findings are expected to provide an empirical basis for strengthening maternal health education as part of efforts to improve preparedness for pregnancy complications and support the quality of antenatal care. Recent evidence highlights both the value of improving access to midwife-led antenatal services and the importance of tailoring maternal health education to women's perceptions and informational needs.

METHOD

Study Design

This study employed a quantitative, pre-experimental design using a one-group pretest-posttest approach. The design was selected to assess changes in pregnant women's knowledge and attitudes regarding the prevention of pregnancy complications following a health promotion intervention. Each participant completed a baseline assessment (pretest), received the health promotion intervention, and subsequently completed a follow-up assessment (posttest) using the same measurement instrument. The primary outcomes were changes in knowledge and attitude scores from pre- to post-intervention. Health promotion constituted the independent variable, whereas knowledge and attitudes regarding the prevention of pregnancy complications constituted the dependent variables.

Setting and Time

The study was conducted at an Independent Midwife Practice in April 2026. The study setting provided antenatal care (ANC) services to pregnant women. It served as the location for participant

recruitment, baseline assessment, delivery of the health promotion intervention, and post-intervention assessment.

Population, Sample, and Sampling

The target population consisted of pregnant women attending antenatal care services at the Independent Midwife Practice during the study period. Participants were recruited using a total sampling technique, in which all eligible pregnant women available during the data collection period and meeting the predetermined inclusion criteria were invited to participate. A total of 15 pregnant women were included in the final study sample. The inclusion criteria comprised pregnant women who were willing to participate in the study, were able to communicate effectively, and were available throughout the study procedures. Participation was voluntary and required written informed consent.

Intervention

The intervention consisted of a structured health promotion session focused on preventing pregnancy complications. The educational content covered information on pregnancy complications and their prevention. Health promotion was delivered through counseling using lectures, presentation materials, and printed leaflets. The intervention was intended to improve participants' understanding of pregnancy complications and promote more favorable attitudes toward preventive practices. Educational materials were provided in formats designed to facilitate the delivery and comprehension of health information.

Instrument and Measurement Properties

Data were collected using a structured questionnaire developed to assess pregnant women's knowledge and attitudes regarding the prevention of pregnancy complications. The same instrument was administered during the pretest and posttest assessments to ensure consistency in measuring within-participant changes following the health promotion intervention. The questionnaire had undergone validity and reliability testing prior to its use in the study. Knowledge was operationally defined as the participant's level of understanding of information related to preventing pregnancy complications and was measured using the corresponding questionnaire items. Attitude was operationally defined as the participant's evaluative response or behavioral tendency toward preventive measures for pregnancy complications and was assessed using the attitude-related questionnaire items. Pretest and posttest scores were compared to determine changes in both knowledge and attitude outcomes after the intervention.

Data Collection Procedure

Potential participants were screened according to the eligibility criteria. Eligible pregnant women received information about the study and were invited to participate. Written informed consent was obtained before any study-related measurements were conducted. Baseline data were collected using the structured questionnaire to assess participants' knowledge and attitudes regarding the prevention of pregnancy complications. The health promotion intervention was subsequently delivered through counseling supported by presentation materials and leaflets. The same questionnaire was administered after completion of the intervention to obtain posttest measurements. Collected data were subsequently checked, edited, coded, scored, entered into the study database, and tabulated before statistical analysis.

Data Analysis

Data were analyzed using univariate and bivariate statistical procedures. Univariate analysis was performed to describe participant characteristics and the distributions of knowledge and attitude outcomes. Categorical variables were summarized using frequencies and percentages. Bivariate analysis was conducted to compare knowledge and attitude measurements before and after the health promotion intervention. The paired-samples t-test was selected for paired outcome data that satisfied the assumption of normality.

Ethical Declaration

The study was conducted in accordance with established ethical principles for research involving human participants. All eligible participants received information regarding the study procedures before enrollment and provided written informed consent. Participation was voluntary, and participants were informed of their right to withdraw from the study at any time without penalty or adverse consequences. Participant confidentiality was maintained throughout the research process, and participation was free from coercion. The manuscript states that ethical approval was obtained from the Institute of Science and Health Technology, Dr. Soepraoen Hospital.

RESULT

A total of 15 pregnant women participated in the study. Table 1 presents the sociodemographic and obstetric characteristics of the respondents, including age, education, employment status, and parity.

Table 1. Characteristics of the Pregnant Women (N = 15)

Characteristic	Category	n	%
Age	20–35 years	14	93.4
	>35 years	1	6.6
Education level	Primary	5	33.4
	Secondary	9	60.0
	Higher	1	6.6
Employment status	Housewife	13	86.6
	Employed	2	13.4
Parity	Primigravida	4	26.6
	Multigravida	11	73.4

Based on Table 1, the majority of respondents were aged 20–35 years (14 people (93.4%)), had secondary education (9 people (60%)), worked as housewives (13 people (86.6%)), and were multigravida (11 people (73.4%)). These data indicate that most respondents were of healthy reproductive age, had a fairly good level of education, and had previous pregnancy experience that could influence their knowledge and attitudes in preventing pregnancy complications.

Table 2. Knowledge and Attitudes of Pregnant Women Before and After Health Promotion (N = 15)

Variable	Category	Pretest, n (%)	Posttest, n (%)
Knowledge	Not enough	6 (40.0)	1 (6.6)
	Enough	7 (46.6)	3 (20.0)
	Good	2 (13.4)	11 (73.4)
Attitude	Negative	9 (60.0)	3 (20.0)
	Positive	6 (40.0)	12 (80.0)

The findings in Table 2 demonstrate an overall shift toward better knowledge and more positive attitudes following health promotion. The proportion of pregnant women with good knowledge increased from 13.4% at pretest to 73.4% at posttest, while the proportion with insufficient knowledge decreased from 40.0% to 6.6%. A similar improvement was observed in attitudes, with positive attitudes increasing from 40.0% to 80.0% and negative attitudes decreasing from 60.0% to 20.0%. These findings suggest that the health promotion intervention was accompanied by improvements in both the cognitive and affective domains.

Table 3. Differences in Knowledge and Attitude Scores Before and After the Intervention

Variable	Mean Pretest	Mean Posttest	Mean Difference	p
Knowledge	56.2	82.5	26.3	< 0.001
Attitude	60.1	85.7	25.6	< 0.001

The analysis presented in Table 3 demonstrated significant improvements in both knowledge and attitude following the intervention. The mean knowledge score increased from 56.2 to 82.5, representing a mean improvement of 26.3 points ($p < 0.001$). Similarly, the mean attitude score increased from 60.1 to 85.7, with a mean difference of 25.6 points ($p < 0.001$). These findings indicate that the intervention was associated with significant improvements in both pregnant women's knowledge and attitudes.

DISCUSSION

The present study demonstrated that health promotion was associated with significant improvements in pregnant women's knowledge and attitudes regarding the prevention of pregnancy complications. The mean knowledge score increased from 56.2 before the intervention to 82.5 after the intervention, representing a 26.3-point improvement. In contrast, the mean attitude score increased from 60.1 to 85.7, representing an improvement of 25.6 points. Statistical analysis showed significant differences between pretest and posttest measurements for both outcomes, with p-values below 0.05. These findings suggest that a structured health promotion intervention delivered through counseling, presentations, and leaflets can strengthen cognitive understanding and promote more favorable attitudes toward preventive maternal health practices (Lee et al., 2025). A recent quasi-experimental study similarly demonstrated substantial improvements in maternal health knowledge and attitudes among pregnant women following a contextually tailored educational intervention. The simultaneous improvement in knowledge and attitudes is particularly relevant because recognizing pregnancy-related risks requires not only access to appropriate information but also a willingness to interpret it as personally relevant and to respond with appropriate preventive actions (Velasco-Velázquez et al., 2024). Educational exposure among pregnant women has also been shown to improve knowledge and preventive practices, reinforcing the potential relationship between information acquisition and health-related action.

The substantial improvement in knowledge observed after health promotion can be explained by the structured delivery of information on pregnancy complications, danger signs, antenatal care, and preventive measures. Health education provides an opportunity to transform unfamiliar or fragmented information into knowledge that pregnant women can understand and apply in everyday decision-making. Previous studies of maternal health education have similarly reported that counseling and educational interventions can improve women's understanding of pregnancy danger signs, antenatal care requirements, and appropriate responses to obstetric complications (Halake et al., 2024). A quasi-experimental intervention among pregnant women in northern Kenya led to

significant improvements in recognition of obstetric danger signs during pregnancy, childbirth, the postpartum period, and the neonatal period. Such findings are consistent with educational and cognitive learning principles, which indicate that knowledge can be strengthened through exposure to relevant information, repetition, clarification, and the use of materials that facilitate comprehension. The combination of verbal explanation and visual or printed information in the present intervention may therefore have increased the likelihood that participants understood and retained key messages related to preventing pregnancy complications (Shannon et al., 2024). Recent evidence has similarly emphasized provider-delivered and audiovisual educational approaches as promising strategies for improving pregnant women's awareness of obstetric danger signs.

The use of multiple educational media contributed to the magnitude of the improvement in knowledge, as different modes of information delivery can reinforce learning. Counseling permits direct communication between health professionals and pregnant women, allowing information to be explained in an accessible language and providing opportunities to clarify misunderstandings. Presentation materials can organize complex health information into a structured sequence, while leaflets provide participants with information to review after the counseling session. Previous health education research suggests that interactive and technology-assisted modes of antenatal education can strengthen health literacy and engagement with health information (Yang et al., 2025). A randomized controlled trial comparing robot-assisted digital education with conventional video-based education demonstrated improvements in health literacy, educational satisfaction, and technology acceptance among pregnant women. Visual educational materials may also facilitate the acquisition of complex pregnancy-related information, as an educational video intervention significantly increased good knowledge and informed decision-making among pregnant women (Lim et al., 2023). The respondents in the present study differed in educational level and prior pregnancy experience, making the use of multiple communication formats potentially valuable for accommodating differences in health literacy and information-processing abilities.

The improvement in attitudes following the intervention indicates that health promotion may influence affective and evaluative responses in addition to increasing factual knowledge. Attitudes toward pregnancy complication prevention are important because awareness of danger signs does not automatically lead to acceptance of preventive recommendations or to timely care-seeking behavior. Maternal health research indicates that knowledge and favorable attitudes are closely related to the adoption of recommended health practices during pregnancy (Yimer et al., 2024). Evidence among antenatal populations has demonstrated meaningful relationships among maternal knowledge, attitudes, and engagement in pregnancy-related health behaviors. The increase in the mean attitude score from 60.1 to 85.7 in the present study suggests that participants may have developed a stronger acceptance of preventive actions after receiving information about the potential consequences of pregnancy complications. Educational exposure may have altered participants' perceptions of susceptibility, seriousness, and the potential benefits of prevention, thereby contributing to more supportive attitudes toward maternal health recommendations (Hatamzadeh et al., 2024). Health Belief Model research among pregnant women supports the importance of perceived risk and related cognitive constructs in explaining preventive health behaviors.

The concurrent improvement in knowledge and attitudes is consistent with theoretical models of health behavior in which cognitive understanding contributes to the formation of beliefs, evaluations, and behavioral intentions (Jeihooni et al., 2024). Health Belief Model-based educational interventions among pregnant women have demonstrated improvements in knowledge and key cognitive constructs, including perceived susceptibility, perceived severity, perceived benefits, self-efficacy, and cues to action, as well as improvements in health-related behaviors. Increased

knowledge can help individuals recognize why a health recommendation is important, while favorable attitudes can increase their readiness to translate that understanding into action. Pregnancy complication prevention requires women to identify warning signs, attend antenatal care, communicate concerns to health professionals, and seek assistance when potentially serious symptoms occur. Limited knowledge can hinder recognition of risk, while unfavorable attitudes can delay responses even when relevant information is available. The pattern observed in this study supports the proposition that educational interventions may operate through interconnected cognitive and affective pathways rather than influencing a single dimension of health behavior (Bayrami et al., 2024). Evidence among pregnant women has likewise identified knowledge, self-efficacy, perceived barriers, and other health-belief constructs as important correlates or predictors of preventive behavior.

The findings also emphasize the clinical importance of integrating structured health promotion into routine antenatal care services. Antenatal visits provide repeated opportunities for midwives and other health professionals to assess pregnant women's information needs and deliver education tailored to gestational stage, previous pregnancy experience, educational background, and perceived risks (Tsiamparlis-Wildeboer et al., 2023). Health promotion delivered during routine care may strengthen women's ability to recognize warning signs such as bleeding, symptoms associated with hypertensive disorders, infection-related symptoms, and other indications requiring professional assessment. Midwives are particularly well-positioned to provide this education because they maintain direct contact with pregnant women and can combine preventive counseling with clinical assessment (Somji et al., 2022). Standardized educational materials could further support consistency in messages across antenatal encounters and reduce variation in the information pregnant women receive.

The results have additional implications for the design of maternal health promotion programs because educational effectiveness may depend on the accessibility and individual relevance of the information provided. A small proportion of participants remained in less favorable knowledge or attitude categories after the intervention, indicating that a uniform educational approach may not produce equivalent outcomes for all pregnant women. Differences in educational attainment, previous pregnancy experiences, baseline knowledge, communication ability, health literacy, social support, and access to health information may affect the extent to which educational content is understood and accepted (Ningrum et al., 2024). Tailored communication strategies may therefore be necessary for women who require additional explanation or repeated exposure to key messages (Şenol et al., 2024). Interactive counseling, simplified educational materials, visual illustrations, teach-back techniques, and reinforcement during subsequent antenatal visits represent potential strategies for addressing variations in learning needs.

The observed changes should also be interpreted in relation to the characteristics of the participants because most respondents were aged 20–35 years, were homemakers, had intermediate educational attainment, and were multigravida. Previous pregnancy experience may facilitate comprehension of maternal health information because multigravida women may already be familiar with antenatal services, common pregnancy symptoms, and previous counseling. Educational background may similarly influence the ability to understand written and verbal health information, and previous research has identified educational status and gravid status as factors associated with knowledge of obstetric danger signs (Kumar et al., 2022). These characteristics may have contributed to the participants' responsiveness to the intervention and should be considered when applying the findings to populations with different demographic or obstetric profiles. Health promotion programs implemented among adolescents, women with lower literacy levels, first-time

mothers, or populations with limited access to antenatal services may require different educational formats and more intensive support (Getachew et al., 2022).

Several methodological limitations should be considered when interpreting the findings. The pre-experimental one-group pretest-posttest design did not include a comparison or control group, which limits the ability to attribute the observed changes exclusively to the health promotion intervention (Bierer et al., 2025). Repeated administration of the same questionnaire may have introduced a testing effect, as participants may have become familiar with the questions during the pretest and subsequently performed better on the posttest (Pan & Carpenter, 2023). External information received between assessments, participant motivation, interaction with health professionals, or other unmeasured factors could also have influenced the outcomes. The significant pretest-posttest differences should therefore be interpreted primarily as evidence of improvement following exposure to the intervention rather than definitive evidence of a causal effect.

The small sample size and single-site setting are additional limitations that affect the precision and generalizability of the results (Cao et al., 2024). The study included only 15 pregnant women recruited through total sampling from a single Independent Midwife Practice, which may not represent the broader population of pregnant women attending public or private health facilities (Yom et al., 2022). The limited sample also limits opportunities to examine whether intervention effects differ by maternal age, parity, education, occupation, or other relevant characteristics. Larger multicenter studies would provide more precise effect estimates and enable subgroup analyses to identify populations that require more targeted educational strategies. Future research using controlled or randomized designs would provide stronger evidence regarding the effectiveness of health promotion interventions for improving maternal knowledge and attitudes.

The assessment strategy also limits interpretation of whether the observed improvements were sustained or translated into actual preventive behavior. Knowledge and attitudes were measured using questionnaires before and after the intervention. In contrast, behavioral outcomes such as adherence to antenatal visits, timely reporting of danger signs, use of referral services, birth preparedness, or emergency care-seeking were not assessed. The available methodological description also does not establish whether the posttest was administered immediately after the intervention or after a defined follow-up period, making it difficult to determine the durability of the observed changes. Future studies should incorporate longer follow-up periods and objective or behavioral outcomes to determine whether improvements in knowledge and attitudes lead to sustained changes in maternal health practices and clinically meaningful reductions in delays related to pregnancy complications (Arifah et al., 2023; Gurara et al., 2023).

The practical significance of these findings lies in the potential role of structured health promotion as a feasible component of routine maternal healthcare, particularly at the primary-care and independent midwifery levels. Counseling supported by presentations and take-home educational materials requires comparatively modest resources and can be integrated into existing antenatal services without substantially altering the clinical care pathway. Repeated education across pregnancy could reinforce essential messages, identify persistent misconceptions, and strengthen preparedness for obstetric emergencies (Okafor et al., 2024). Program implementation should prioritize standardized content, culturally appropriate communication, assessment of individual learning needs, and periodic evaluation of educational outcomes (Neely & Reed, 2023). Such an approach would allow health promotion to function as an integral component of maternal risk communication rather than as an isolated educational activity.

CONCLUSION

Health promotion was associated with significant improvements in pregnant women's knowledge and attitudes regarding the prevention of pregnancy complications, as reflected by higher post-intervention scores and statistically significant differences between pretest and posttest measurements. The shift from insufficient or adequate knowledge toward good knowledge, accompanied by more positive attitudes toward preventive practices, indicates that structured health education may strengthen pregnant women's understanding of pregnancy-related risks and their readiness to respond appropriately to potential complications. These findings support the integration of systematic health promotion into routine antenatal care, particularly through counseling and educational media delivered by midwives and other maternal health professionals. The pre-experimental design and limited sample size require cautious interpretation of causality and generalizability. However, the observed improvements highlight the potential value of continuous, accessible, and context-appropriate health education in strengthening maternal preparedness and supporting preventive efforts to reduce pregnancy-related complications and improve the quality of maternal healthcare.

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