Original Article

Effect of the Antenatal Care Group Model on Childbirth Preparedness among Pregnant Women: A Quasi-Experimental Study

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ABSTRACT

Background: Childbirth preparedness is essential to prevent complications and improve the safety of both mothers and infants. Knowledge, attitudes, and social support strongly influence maternal readiness. Group antenatal care (ANC) has been shown to enhance maternal engagement, but most studies have focused on face-to-face services. However, limited studies have examined digital ANC groups in Indonesian primary care settings. Therefore, this study aimed to analyze the effect of WhatsApp-based group ANC on maternal readiness for childbirth..

Methods: This study employed a quasi-experimental pre–post design with a control group, following the TREND reporting guideline. A total of 40 pregnant women in their second or third trimester were purposively selected. Inclusion criteria were residence in Samarang, no medical complications, and willingness to participate; exclusion criteria included refusal or diagnosed complications. The instrument was a validated childbirth preparedness questionnaire (15 items, Cronbach's alpha = 0.87). The intervention was delivered via a WhatsApp group over two weeks (six sessions), facilitated by trained midwives using validated materials. Data were analyzed using independent t-tests after testing normality and homogeneity, with a significance level of 0.05, 95% confidence interval (CI), and effect size calculated using Cohen's d.

Results: The mean preparedness score was higher in the experimental group (58.80 ± 5.01) compared to the control group (54.35 ± 6.43). The mean difference of 4.45 points was statistically significant ($p < 0.001$; 95% CI [2.1–6.7]) with a moderate-to-large effect size (Cohen's d = 0.78). These findings indicate that WhatsApp-based ANC groups significantly improved maternal knowledge and childbirth preparedness..

Conclusion: WhatsApp-based group ANC effectively enhances maternal childbirth preparedness and is feasible for implementation as a maternal health education strategy in primary care settings.

Keywords: Childbirth Preparedness; Antenatal Care; Health Education; Social Support; WhatsApp.

Implications for Practice:

- ANC group interventions via WhatsApp can increase maternal knowledge and preparedness.
- Integration of group ANC into primary care services can strengthen maternal health outcomes.
- Digital health strategies provide an evidence-based approach to reducing childbirth-related anxiety and complications.

Introduction

Childbirth is a natural physiological process in which the baby, placenta, and amniotic membranes are expelled from the mother's uterus. A normal delivery occurs at full term, after 37 weeks, and occurs without complications that endanger the mother or baby. This process marks the culmination of pregnancy and requires physical and psychological readiness from the mother and healthcare professionals' supervision to ensure a safe delivery (Evareny et al., 2022). The stages of labor begin with regular, increasing uterine contractions, which trigger changes in the cervix, including dilation and effacement. During this process, the mother experiences the urge to push until the baby is born. Labor ends when the placenta is delivered intact, marking the completion of the physiological process. All these stages require careful monitoring to ensure that any potential complications can be promptly addressed, maintaining optimal maternal and fetal health (Cohen et al., 2023). The following is a picture of the stages of labor (**Figure 1**).

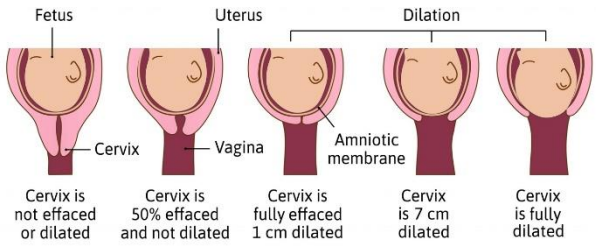

Figure 1. Stages of labor
(Source: American Pregnancy Association)

Childbirth preparation is primarily aimed at pregnant women in the third trimester, because during this period, mothers actively prepare themselves to face birth and their new role as parents (Alizah-Dibazari et al., 2024). These preparatory activities can be done at any time by the mother, either independently or with guidance, and she usually receives guidance and important information during prenatal checkups conducted by a midwife or other healthcare professional. This approach helps the mother understand the signs of labor, manage anxiety, and improve physical and mental readiness for the birth of her baby (Jannah & Qomariah, 2024).

Based on data from the Central Statistics Agency (BPS)'s Susenas (National Survey of Births), the prevalence of childbirth in Indonesia by province shows variations in the use of skilled birth attendants. Nationally, most births are attended by midwives (56.49%) and doctors (37.80%), while other health workers contribute only 0.87%. However, a significant percentage of mothers still give birth with the assistance of traditional birth attendants (TBAs) (4.29%) or other assisting personnel (0.55%). Several provinces show a predominance of medical personnel, for example, Bali, with 71.63% of births assisted by doctors, and Yogyakarta Special Region (DI Yogyakarta) with 61.44%. Conversely, provinces such as East Nusa Tenggara (12.35%), Maluku (26.25%), North Maluku (17.58%), and Papua (12.57%) still show a relatively high percentage of births assisted by TBAs. This indicates that although access to health services has improved, disparities remain between regions, particularly in eastern Indonesia. Therefore, efforts are needed to strengthen maternal health services, increase access to medical personnel, and educate the public to reduce non-medical births (BPS, 2020).

WhatsApp can be used as an effective medium for providing health education to the public, including pregnant women, because, in addition to conveying information, it also allows for interaction through questions and discussions. Through WAGs, classes for pregnant women can be held in the form of collaborative learning presented in text and audio-visual materials, thereby supporting

increased understanding of maternal health and pregnancy. WAGs also serve as a means of collaboration within antenatal care (ANC) groups, where pregnant women can discuss various matters related to pregnancy and childbirth, complementing routine check-ups typically conducted at integrated health posts (Posyandu). The ANC group model was chosen because the public prefers accessing information through social media, including Instagram, Facebook, and especially WhatsApp, which is widely used. Thus, WAGs function as a communication forum and a practical and easily accessible health learning platform (Rathbone et al., 2020).

Previous studies have shown that birth preparedness is influenced by medical, psychological, and social factors, including the frequency of ANC visits, anxiety levels, and family support (Gusmadewi et al., 2022); (Jannah & Qomariah, 2024). In Ghana, a study by Kukula et al., (2024) found that the group antenatal care (G-ANC) model significantly improved birth preparedness compared to individual services. However, most studies still focus on conventional ANC services provided face-to-face, thus failing to explore the potential of digital media as a means of maternal health education. In Indonesia itself, research testing the effectiveness of WhatsApp-based group ANC models is still very limited. In fact, the use of digital platforms has the potential to expand the reach of education, provide social support, and increase mothers' readiness for childbirth, especially in areas with limited access to formal health services.

However, most studies still focus on conventional ANC services provided face-to-face, thus failing to explore the potential of digital media as a means of maternal health education. In Indonesia itself, studies testing the effectiveness of WhatsApp-based ANC group models are still very limited, especially at the primary care level, such as community health centers (Puskesmas). In fact, the use of digital platforms has the potential to expand the reach of education, provide social support, and improve mothers' readiness for childbirth, especially in areas with limited access to formal health services.

This study is based on Bandura's Social Learning Theory framework, which emphasizes that human behavior is learned through observation, interaction, and social experience. In the context of group ANC, pregnant women can learn from each other through discussion, sharing experiences, and obtaining support from health workers and fellow participants. In addition, this study also refers to the Health Belief Model (HBM), which explains that an individual's readiness to act is influenced by their perception of risk (susceptibility), the severity of the problem (severity), the benefits of action (benefits), barriers, and motivating factors (cues to action). Through WhatsApp-based group ANC, pregnant women obtain information about pregnancy warning signs, the benefits of preparing for childbirth, and social encouragement to improve health behaviors (**Figure 2**).

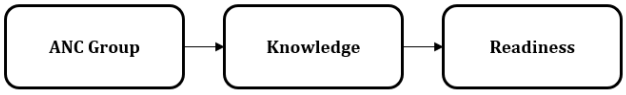

Figure 2. Conceptual Framework

The purpose of this study was to analyze the effect of implementing a WhatsApp-based antenatal care (ANC) group model on the readiness of pregnant women to face childbirth. This study seeks to assess the extent to which an educational and supportive approach in ANC groups can increase knowledge, reduce anxiety, and strengthen the physical and psychological readiness of mothers, compared to conventional ANC services. Thus, the results of this study are expected to provide

practical contributions to the development of maternal health service strategies at the primary level, particularly in utilizing digital technology as a medium to support the improvement of readiness for childbirth.

Methods

Study Design

This study used a quasi-experimental pre-post test design with a control group, following the Transparent Reporting of Evaluations with Nonrandomized Designs (TREND) reporting guidelines.

Participants

The study population consisted of 216 pregnant women in their second and third trimesters in the working area of the Samarang Community Health Center, Garut Regency. The sample was determined purposively using a two-proportion correlation analysis, resulting in a total of 40 respondents (20 in the intervention group and 20 in the control group).

The inclusion criteria were pregnant women who: (1) were in their second or third trimester, (2) resided in the working area of the Samarang Community Health Center, and (3) were willing to participate in the study by signing an informed consent form. The exclusion criteria included pregnant women with diagnosed medical complications and those who refused to participate. There were no dropouts during the study.

Instruments

The research instrument used a childbirth readiness questionnaire that had undergone content validity testing by three midwifery and public health experts, as well as reliability testing with a Cronbach's alpha value of 0.87, indicating a high level of internal consistency. The questionnaire consisted of 15 items with a 1–5 Likert scale, covering the dimensions of knowledge, attitude, and childbirth readiness skills. The scoring system produced a total score of 15–75, with low, medium, and high categories. The instrument used is attached in the appendix of the article.

Intervention

The intervention took the form of a WhatsApp-based antenatal care (ANC) group model that was implemented over 2 weeks with a total of 6 sessions. Each session was guided by a trained midwife using materials that had been validated by experts. The material covered childbirth preparation, signs of pregnancy complications, signs of childbirth complications, factors affecting childbirth readiness, and signs of childbirth. The intervention was implemented according to the established standard operating procedures (SOPs). Fidelity monitoring was conducted through participant attendance logs and facilitator records of each session. The control group only received routine education through the integrated health service post (posyandu).

Data Collection

The data collection process was carried out in the following stages: (1) respondent recruitment, (2) provision of explanations and written consent, (3) completion of pre-test questionnaires, (4) provision of ANC group intervention, and (5) completion of post-test questionnaires. The enumerators involved received prior training to ensure consistency in data collection. Data were entered into an SPSS version 25 database using the double-entry method to avoid errors. Missing or incomplete data were handled using the listwise deletion method.

Data Analysis

Data analysis was performed using an independent t-test to compare the differences in birth preparedness scores

between the intervention and control groups. Prior to analysis, tests of normality (Kolmogorov–Smirnov) and homogeneity (Levene's test) were performed. The significance level was set at $p < 0.05$ with a 95% confidence interval. In addition, effect sizes were calculated using Cohen's d to measure the magnitude of differences between groups.

Ethical Considerations

This study received ethical approval from the institutional ethics committee. All participants provided written informed consent after being informed about the study's purpose and procedures. Participation was voluntary, and confidentiality was maintained by using coded data. The research followed the ethical principles of the Declaration of Helsinki.

Results

Table 1. Demographic Characteristics of Respondents

Characteristic	Category	n (%)
Gender	Male	-
	Female	40 (100%)
Age (years)	18–25	12 (30%)
	26–35	25 (62.5%)
	36–45	3 (7.5%)
	46–55	-
	>55	-
Educational Level	Primary school	-
	Junior high school	10 (25%)
	Senior high school	20 (50%)
	Diploma	3 (7.5%)
	Bachelor's degree	7 (17.5%)
	Master's/Doctoral degree	-
Marital Status	Single	-
	Married	40 (100%)
	Widowed/Divorced	-
Occupation	Unemployed	-
	Housewife	25 (62.5%)
	Government/private employee	-
	Entrepreneur	10 (25%)
	Others	5 (12.5%)

Table 1 shows that all research participants were female (100%) and married (100%), which is in line with the target population of the study, which was pregnant women. Most respondents were in the 26–35 age group (62.5%), followed by those aged 18–25 (30%), while only 7.5% were in the 36–45 age group. In terms of education, the majority of respondents had completed high school (50%), followed by junior high school graduates (25%), bachelor's degree holders (17.5%), and diploma holders (7.5%), while there were no respondents with elementary or postgraduate education. Based on occupation, most respondents were housewives (62.5%), followed by entrepreneurs (25%) and other occupations (12.5%). This demographic distribution shows that the research respondents were dominated by housewives of productive age with a secondary education level, which could potentially influence their level of knowledge and readiness for childbirth.

Table 2. Distribution of Maternal Childbirth Preparedness in the Experimental Group & Control Group

Group	Means	SD	Min	Max
Experiment	58.80	5,012	53	72
Control	54.35	6,434	36	67

Table 2 shows the distribution of birth readiness in the experimental and control groups. The average childbirth readiness score for mothers in the experimental group was 58.80 with a standard deviation of 5.012, a minimum score of 53, and a maximum score of 72. Meanwhile, in the control group, the average childbirth readiness score was lower, at 54.35 with a standard deviation of 6.434, a minimum score of 36, and a maximum score of 67. These results indicate that pregnant women who received intervention through the ANC group model had a higher level of birth

readiness compared to women who only attended conventional ANC services, with relatively smaller score variations.

Table 3: Results of Independent Sample Analysis of Childbirth Preparedness Test

Group	N	Maximum	minute	Means	P-value	95%	CI
Experiment	20	72	53	58.80	0.000	0.758	8.42
Control	20	67	36	54.35			

Based on **Table 3**, the results of the independent sample test show a significant difference between the experimental and control groups regarding childbirth readiness. The experimental group had an average score of 58.80 with a score ranging from 53 to 72, while the control group had an average score of 54.35 with a score range of 36–67. A p-value of 0.000 indicates that the difference between the two groups is statistically significant, with a 95% confidence interval of 0.758–8.42. This confirms that the Antenatal Care (ANC) Group model has a significant influence on childbirth readiness.

Discussion

The results showed that childbirth education through WAGs significantly increased participants' knowledge, with a p-value of 0.000 < 0.05. This increased knowledge has a direct impact on pregnant women's anxiety levels, as a better understanding of the labor process can reduce the uncertainty and worry that often arise. Childbirth counseling via WAGs allows mothers to participate in interactive discussions, ask questions in real time, and receive clear information about labor preparation. This differs from conventional methods, which are limited to face-to-face meetings at health facilities, because the use of digital platforms allows for more flexible delivery and ubiquitous access. Therefore, using WAGs as an educational medium not only increases knowledge but also provides a sense of security and confidence for pregnant women approaching labor (Sunarmi et al., 2022).

These results are supported by Sulistianingsih & Hasyim (2021), who showed that childbirth education through WAGs can improve pregnant women's knowledge in preparing for childbirth. This aligns with the findings of current research, which found that ANC group interventions, including those through digital media, significantly contributed to improving maternal childbirth preparedness. Therefore, integrating technology into ANC services can be an effective strategy to support pregnant women's childbirth readiness.

During pregnancy, women can experience increased stress levels due to physical and psychological changes, especially in the first and last trimesters. Stress tends to be higher in the third trimester as labor approaches. This stressful condition has the potential to impact the well-being of both mother and fetus, both during pregnancy and after delivery, such as increasing the risk of pregnancy depression, postpartum depression, or premature birth. Physiologically, stress can trigger an increase in adrenaline and a decrease in oxytocin. Furthermore, muscle tension caused by stress can disrupt uterine muscle function, making labor longer and more difficult (Putri et al., 2022. One way to reduce stress and prepare for childbirth is through regular ANC. ANC helps pregnant women receive information, education, and health monitoring, thereby reducing stress

and optimizing physical and psychological childbirth preparedness (Wahyuni et al., 2025).

Pregnant women who receive education about childbirth preparation and potential complications during ANC visits are 1.84 times more likely to be well-prepared for childbirth than those who do not attend ANC regularly. Furthermore, pregnant women who attend four or more ANC visits show a 4.5 times higher level of childbirth preparedness compared to those who attend fewer than four ANC visits. This suggests that the frequency and quality of ANC visits play a significant role in improving maternal childbirth preparedness (Khairunisa et al., 2022).

Pregnant women who regularly attend ANC have a greater opportunity to monitor their health and fetal development. With regular checkups, healthcare providers can detect early signs of danger during pregnancy, such as high blood pressure, anemia, bleeding, or fetal growth disorders, so that preventive measures or treatment can be initiated promptly (Hu et al., 2021).

Through ANC, healthcare providers can identify important signs during pregnancy, such as changes in blood pressure, hemoglobin levels, fetal growth, fetal position, and symptoms that pose a risk to the health of the mother and baby. This examination allows for early detection of pregnancy problems, allowing for appropriate intervention. Furthermore, ANC also serves as an educational tool for pregnant women regarding childbirth preparation, nutrition, and healthy behaviors, thus ensuring a safer and more optimal pregnancy and delivery (McCauley et al., 2021).

ANC checkups should be conducted at least six times during the nine months of pregnancy to ensure optimal monitoring of the health of the mother and fetus. Of these, at least two should be performed by a doctor and should include an ultrasound to monitor fetal development (Kundu et al., 2025). The implementation of this USG is supported by synergistic coordination between midwives, general practitioners, and specialist doctors, as well as integration with advanced referral facilities such as PONED and PONEK, so that ANC services become more comprehensive and effective in detecting and managing pregnancy risks early on (Groos et al., 2024).

Most pregnant women tend to focus on financial preparations before giving birth, such as preparing for delivery costs, baby supplies, determining the location of delivery, and choosing medical personnel or birth attendants (Jusmawati & Hasrida, 2024). However, other equally important aspects of preparation are often overlooked, such as preparing for blood donation, appointing a decision-maker in case of complications, maintaining physical fitness through prenatal exercises, and preparing psychologically to better prepare for labor. This comprehensive approach is crucial for reducing risks and improving overall maternal preparedness (Malawat et al., 2023).

A mother's preparedness for childbirth is a crucial factor influencing her mental health after delivery, including the risk of postpartum blues. Mothers who are physically and psychologically prepared and knowledgeable about the birth process tend to be better able to cope with the hormonal, physical, and emotional changes that follow. This thorough preparation helps mothers manage stress and anxiety, thus minimizing postpartum blues symptoms (Satriawati et al., 2023).

In addition to maternal preparedness, husband's support has also been shown to significantly influence the incidence of postpartum blues. A husband's presence, both emotionally and practically, provides a sense of security, comfort, and motivation for mothers after giving birth. Good husband support can help mothers navigate

the initial challenges of baby care, reduce psychological burdens, and prevent the onset of mild depressive symptoms that often occur during the postpartum period (Anisa & Natalia, 2023). Therefore, the husband's role in supporting the mother during and after childbirth is crucial. With the husband's active involvement, the risk of postpartum blues can be reduced, allowing the mother to be more emotionally and physically prepared to care for the baby and adjust to new role changes. Therefore, educational and counseling programs for married couples prior to childbirth are an important strategy for improving maternal well-being after childbirth (Ginting, 2024).

In normal labor, the first stage, or dilation stage, lasts from the beginning of contractions until the cervix is fully dilated to 10 cm. In primigravida's, this phase typically lasts about 12 hours. A first stage lasting less than 12 hours is categorized as a rapid labor, while a first stage lasting longer than 12 hours is considered a prolonged labor. Prolongation of the first stage can occur if uterine contractions weaken, resulting in slower cervical dilation, or due to a lack of maternal pushing strength. Several other factors also influence the course of labor, including power (strength of contractions), passage (birth canal), passengers (fetus and placenta), the mother's psychological state, and the skills of the birth attendant. If the cervix is dilated too long, this condition is known as a prolonged first stage (Yuriati & Khoiriyah, 2021) (**Figure 3**).

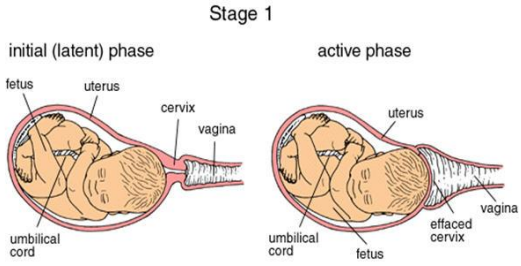

Figure 3. Two Phases of the First Stage of Labor (Source: Lestari, 2021)

Danger signs in pregnancy are symptoms or conditions that indicate that the health of the mother or fetus is at serious risk. The appearance of these signs indicates the need for swift and appropriate action, as if left untreated, they can endanger the lives of both the mother and the baby.

According to the National Institute of Health (Ningsih et al., 2023), there are ten danger signs in pregnancy that require special attention. These include continuous vomiting that leads to weakness and refusal to eat, and inadequate weight gain, which may indicate nutritional disorders or disease. Bleeding at any stage of pregnancy poses a high risk to both mother and fetus, while swelling of the hands or face accompanied by dizziness and convulsions may signal eclampsia. A decrease or absence of fetal movement indicates potential danger to the baby's life, and abnormal fetal positions such as breech or transverse require hospital delivery. Other warning signs include premature rupture of membranes, which increases infection risk, and prolonged labor lasting more than 12 hours, which can cause complications. Maternal illnesses such as heart disease, severe anemia, tuberculosis, malaria, and genital infections also endanger pregnancy outcomes. Finally, a high fever during the postpartum period may suggest a life-threatening infection requiring urgent medical attention (**Figure 4**).

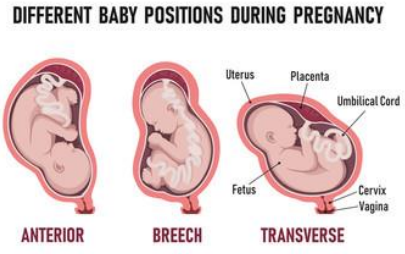

Figure 4. Several Baby Positions (Source: mamabear.co.id)

To prevent various risks that can occur during pregnancy, increasing pregnant women's knowledge is crucial. One effective way is through the use of WAGs, where pregnant women can obtain health information, discuss matters with medical personnel and other pregnant women, and share experiences related to pregnancy and childbirth preparation. This platform not only facilitates the rapid and practical dissemination of information but also provides emotional support that can help mothers better prepare for pregnancy and childbirth safely (Gami et al., 2025).

In addition to increasing knowledge, WAGs have also been shown to be effective in providing significant emotional and social support for pregnant women. Rahmandiani et al., (2019). Studies have shown that interacting through these groups makes mothers feel more supported, better prepared, and connected to other participants and healthcare providers. This social support is important because it can reduce stress and anxiety during pregnancy, thus improving physical and psychological childbirth preparedness. Hasan, (2018) added that WAGs strengthen interpersonal communication, enable the sharing of relevant health information, and provide guidance on physical and mental exercises to prepare for childbirth. Therefore, integrating WAGs into antenatal care services serves not only as an educational tool but also as a platform for building social support networks that contribute to childbirth preparedness, making ANC services more comprehensive and effective.

Thus, selecting the right antenatal care model, particularly through the Antenatal Care (ANC) Group approach and supported by the use of digital media such as WAGs, can increase knowledge, reduce anxiety, and strengthen the physical and psychological readiness of pregnant women in facing childbirth.

This study has several limitations that should be noted. First, the sample size is relatively small (N=40), so the results cannot be generalized widely. Second, this study was only conducted in one location, namely the working area of the Samarang Community Health Center, so the contexts of social, cultural, and health facility contexts in other places may produce different findings. Third, the intervention period was relatively short, only two weeks with six sessions, so the long-term impact of the WhatsApp-based ANC group model could not be fully evaluated.

Nevertheless, this study makes an important contribution to the literature on maternal health in Indonesia. It is one of the first studies to explore the effectiveness of a WhatsApp-based digital ANC model in primary care, which is relevant to developments in public health technology. The results reinforce the understanding that the use of digital media can improve birth preparedness through increased knowledge and social support. These findings can serve as a basis for further research with larger samples, across locations, and longer intervention periods, while also providing practical recommendations for health workers in designing technology-based maternal education strategies.

This study demonstrates that integrating WhatsApp-based ANC groups into community health services can enhance maternal readiness for childbirth. Healthcare providers should adopt group ANC methods as complementary to routine ANC to strengthen psychological preparation and informed decision-making.

Implications and limitations

This study highlights that WhatsApp-based antenatal care (ANC) groups effectively improve pregnant women's knowledge and readiness for childbirth, showing the potential of digital platforms as

supportive educational tools in maternal health. However, the study had limitations, including a small sample size, short intervention duration, and being conducted in only one primary care setting, which may limit generalizability. Future research with larger, multi-site samples and longer follow-up is recommended to evaluate long-term outcomes and broader applicability.

Relevance to Practice

The findings suggest that integrating WhatsApp-based ANC groups into routine maternal health services can strengthen education, emotional support, and childbirth preparedness among pregnant women. Midwives and healthcare providers can use this digital approach as a complementary method to traditional ANC, especially in resource-limited or remote areas, to enhance maternal engagement and improve overall maternal and neonatal health outcomes.

Conclusion

This study shows that the implementation of a WhatsApp-based antenatal care (ANC) group model is effective in improving pregnant women's readiness for childbirth compared to conventional ANC services. This improvement is particularly evident in terms of mothers' knowledge, attitudes, and psychological readiness, which contribute to overall readiness for childbirth. The results of this study emphasize the importance of utilizing digital technology to support maternal health services, especially in areas with limited access. These findings can serve as a basis for developing group-based and digital intervention strategies to strengthen the quality of midwifery services at the primary level.

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CrediT Authorship Contributions Statement

Kurniawan Dewi Budiarti: Conceptualization, Methodology, Supervision, Writing – Original Draft.

Eti Sulliyawati: Software, Validation, Formal Analysis, Writing – Review & Editing.

Sulastin: Investigation, Resources, Data Curation, Project Administration.

Suci Badriyah: Writing – Original Draft, Review & Editing, Visualization, Funding Acquisition.

Conflicts of Interest

There is no conflict of interest.

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