Utilization of the My ADA Application for ANC Visits for Pregnant Women in the City of Bengkulu

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Abstract

Antenatal care (ANC) plays an important role in the early detection and prevention of complications during pregnancy, childbirth, and the postpartum period. However, ANC utilization in Indonesia, including Bengkulu City, remains below the expected standard. Limited maternal knowledge and the less optimal use of conventional educational media, such as the Maternal and Child Health (KIA) book, contribute to low ANC attendance. Therefore, innovative digital-based educational media, such as the My ADA application, are needed to improve ANC utilization among pregnant women. This quantitative study employed a quasi-experimental design with a pretest–posttest two-group approach. The study was conducted at independent midwifery practices in Bengkulu City. A total of 50 second-trimester pregnant women who met the inclusion criteria were selected using purposive sampling and divided into two groups: the My ADA application intervention group and the KIA book comparison group. Data were collected before and after the intervention using structured questionnaires and ANC visit records. Statistical analysis was performed using appropriate parametric and non-parametric tests after normality testing with the Shapiro–Wilk test. The results demonstrated a statistically significant difference in ANC utilization and visit frequency between the intervention and comparison groups ($p < 0.05$). Pregnant women who used the My ADA application showed greater improvement in ANC utilization and higher ANC visit frequency compared to those who used the KIA book. The findings indicate that the My ADA application is more effective than conventional KIA book media in improving ANC utilization among second-trimester pregnant women. Digital health applications can be utilized as alternative educational and monitoring tools to support maternal health services and enhance adherence to antenatal care visits

Keywords**: **My ADA application, antenatal care, Pregnant women, Health technology, Maternal health, ANC utilization

INTRODUCTION

Pregnancy is a critical period that requires continuous monitoring to ensure the health and safety of both the mother and fetus. Maternal health remains a major global public health concern, particularly in developing countries. According to the World Health Organization, approximately 287,000 women died during pregnancy and childbirth in 2020, with the majority of these deaths occurring in low- and middle-income countries (LMICs) where access to quality maternal health services remains limited (WHO, 2023). Many of these maternal deaths are preventable through timely detection and management of pregnancy-

related complications, emphasizing the importance of comprehensive maternal healthcare services, particularly antenatal care (ANC).

Antenatal care is one of the most effective interventions to reduce maternal and neonatal morbidity and mortality. ANC services enable healthcare providers to monitor maternal health conditions, identify potential pregnancy risks, provide nutritional counseling, and deliver preventive interventions during pregnancy. Evidence suggests that adequate ANC attendance significantly reduces adverse pregnancy outcomes such as preterm birth, low birth weight, and maternal complications (Sari et al., 2024; Yoseph et al., 2025). Consequently, the World Health Organization recommends that pregnant women receive at least eight ANC contacts during pregnancy to ensure optimal maternal and fetal health outcomes (World Health Organization, 2023).

Despite the recognized benefits of ANC services, their utilization remains suboptimal in many parts of the world. Studies indicate that pregnant women in developing countries often fail to complete the recommended number of ANC visits due to various barriers, including geographical limitations, socio-economic constraints, limited health literacy, and lack of awareness regarding the importance of routine pregnancy (Titaley et al., 2025; Kachimanga et al., 2025). In addition, health system challenges such as limited healthcare workforce, inadequate service monitoring systems, and weak communication between healthcare providers and pregnant women further contribute to poor ANC utilization (Hailemariam et al., 2025).

In Indonesia, the government has implemented various policies to improve maternal health services, including strengthening antenatal care programs. National guidelines recommend that pregnant women attend at least six antenatal visits during pregnancy, consisting of two visits in the first trimester, one visit in the second trimester, and three visits in the third trimester (Ministry of Health Republic of Indonesia, 2020). However, despite these policies, the coverage of ANC services in several regions still falls below the Minimum Service Standard (SPM) target of 95%, indicating persistent challenges in ensuring optimal maternal healthcare utilization. Regional disparities in maternal health services also contribute to variations in ANC attendance across provinces, including Bengkulu (Ministry of Health of Indonesia, 2023; Badan Pusat Statistik (BPS) Provinsi Bengkulu, 2024).

Several interventions have been implemented to improve ANC utilization, including health education, counseling programs, and community-based maternal health initiatives. While these interventions have demonstrated positive effects on maternal health awareness, they often face operational limitations. For example, traditional monitoring systems that rely

on manual records and periodic follow-ups may not effectively ensure that pregnant women adhere to scheduled ANC visits. Studies have shown that pregnant women frequently miss appointments due to forgetfulness, competing household responsibilities, or lack of timely information regarding their scheduled visits (Hailemariam et al., 2025).

The rapid development of digital technology has created new opportunities to address these challenges through mobile health (mHealth) interventions. Mobile health technologies have increasingly been integrated into healthcare systems to improve access to health services, enhance communication between patients and healthcare providers, and facilitate real-time monitoring of patient health conditions. In maternal health services, mHealth applications can provide pregnancy education, appointment reminders, symptom monitoring, and consultation features that support continuous maternal health monitoring (Rashati & Akbar, 2025).

Several studies have demonstrated the effectiveness of mobile health interventions in improving antenatal care utilization. A systematic review by Mishra et al., (2023), found that mHealth interventions significantly increased ANC attendance among pregnant women in low- and middle-income countries. Similarly, reported that mobile health-based reminder systems were associated with improved compliance with recommended antenatal care visits. Digital reminder systems help pregnant women remember their scheduled appointments and reduce missed visits, thereby improving continuity of maternal healthcare services.

In addition to reminder systems, integrated mobile health applications have also been developed to support comprehensive maternal health monitoring. For example Jeddy (2025), that mobile health applications that combine educational resources, health monitoring features, and communication tools significantly improve pregnant women's engagement with maternal healthcare services. Furthermore, digital health platforms have been shown to improve maternal health literacy and empower pregnant women to actively participate in pregnancy care decisions (Rashati & Akbar, 2025).

However, despite the increasing use of digital health technologies in maternal healthcare, several limitations remain in the existing literature. First, many previous studies focus primarily on simple digital reminder systems such as SMS notifications, which offer limited functionality for comprehensive pregnancy monitoring. Second, although integrated maternal health applications have been developed in several countries, empirical evidence regarding their effectiveness in improving antenatal care adherence remains limited. Third, most studies have been conducted in high-income settings or large-scale national programs,

while evidence from localized digital health interventions in developing countries, including Indonesia, remains scarce.

These limitations highlight a significant research gap in evaluating the effectiveness of integrated maternal health applications in improving antenatal care adherence within local healthcare contexts. Understanding the effectiveness of such applications is important to determine whether digital health innovations can effectively support maternal healthcare services in regional healthcare settings where access to health information and services may be limited.

To address this gap, the My ADA application was developed as a digital platform designed to support pregnancy monitoring and improve pregnant women's adherence to antenatal care visits. The application integrates several features, including maternal health information, ANC visit scheduling, automated reminder notifications, and communication channels with healthcare providers. By combining multiple digital features into a single platform, the My ADA application aims to facilitate continuous maternal health monitoring and improve pregnant women's engagement with antenatal care services.

Therefore, this study aims to analyze the effectiveness of the My ADA application in improving antenatal care visits among second-trimester pregnant women in Bengkulu City. Specifically, this study evaluates behavioral changes related to ANC visit adherence, user satisfaction with the application, and barriers encountered during its implementation. The findings of this study are expected to contribute to the development of digital maternal health innovations and provide evidence-based recommendations for improving maternal and child healthcare services in Indonesia.

METHODS

This study employed a quantitative quasi-experimental two-group pretest–posttest design to evaluate the effectiveness of the My ADA application in improving antenatal care (ANC) visits among pregnant women. The research was conducted at several Independent Midwifery Practices (PMB) in Bengkulu City, Indonesia. The study population consisted of 6,279 pregnant women registered in PMB service areas in Bengkulu City in 2024.

The sample size was initially calculated using the Lemeshow formula with a 95% confidence level and a 10% margin of error, resulting in a minimum requirement of 95 respondents. However, this study was conducted as a pilot quasi-experimental study with limited accessibility of eligible participants during the data collection period. After applying the inclusion criteria and considering participant availability, 50 pregnant women were

successfully recruited and completed the study, consisting of 25 participants in the intervention group and 25 participants in the comparison group. The final sample size was considered adequate for preliminary intervention testing in repeated-measure quasi-experimental studies, as methodological references recommend a minimum of 20–25 participants per group for pilot intervention research.

Participants were selected using purposive sampling based on predetermined inclusion criteria, including second-trimester pregnant women, willingness to participate, and ownership of a smartphone capable of installing the My ADA application. Following recruitment, participants were allocated consecutively into two groups: the intervention group received the My ADA mobile application, while the comparison group received standard education using the Maternal and Child Health (KIA) book. Due to the nature of the intervention, blinding was not feasible for participants or researchers. Group allocation and intervention administration were conducted by the research team in collaboration with midwives at the participating PMBs.

The My ADA application provides pregnancy health education, antenatal visit scheduling, and reminder notifications to support pregnancy monitoring and improve ANC utilization among pregnant women.

Primary data were collected using a structured questionnaire assessing the utilization of the My ADA application and antenatal care visit behavior. The questionnaire was tested for validity and reliability, with a Cronbach's alpha coefficient greater than 0.70, indicating acceptable reliability. Data collection was conducted with the assistance of trained enumerators, who were responsible for explaining the study procedures, assisting respondents in completing the questionnaires, guiding participants in installing and using the application, and ensuring data accuracy. Prior to data collection, enumerators received training to ensure consistency in data collection procedures. Ethical approval was obtained from the Health Research Ethics Committee of Poltekkes Kemenkes Bengkulu with ethical clearance number No. KEPK.BKL/466/05/2025. The ethical approval was valid from May 29, 2025, to May 29, 2026. Informed consent was obtained from all participants prior to data collection. Data were analyzed using univariate and bivariate statistical methods. Data were analyzed using univariate and bivariate statistical methods. Normality testing using the Shapiro–Wilk test showed that the data were not normally distributed; therefore, non-parametric tests were used. The Wilcoxon signed-rank test was applied to analyze differences within groups, while the Mann–Whitney U test was used to compare differences between groups.

RESULTS

Table 1. Average Utilization and Visits of Pregnant Women in the Second Trimester

Variable	N	Mean	Δx̄	Min	Max	Standar Deviation
Utilization						
Intervention Group	25	80,80	26,80	60	100	11,150
Control Group	25	54,00		40	70	11,902
Visit						
Intervention Group	25	3,20	1,80	2	4	0,816
Control Group	25	1,40		0	2	0,707

**Source : Primary data*

Table 1. shows that respondents in the intervention group who used the My ADA application had a higher average utilization score (Mean = 80.80) compared to the control group that used the Maternal and Child Health (KIA) book (Mean = 54.00), resulting in a mean difference of 26.80 points. In addition, the average number of antenatal care visits in the intervention group was 3.20 visits, while the control group had an average of 1.40 visits, with a mean difference of 1.80 visits. These results indicate that pregnant women who used the My ADA application showed higher engagement in pregnancy monitoring and were more likely to attend recommended antenatal care visits.

Table 2. Normality test

	Shapiro-Wilk		
	Statistic	**df**	**Sig.**
Utilization			
Intervention Group	,253	25	0,51
Control Group	,209	25	,000
Visit			
Intervention Group	,276	25	,000
Control Group	,322	25	,000

From the results of the normality test, it was found that the data that was normally distributed was only data utilization of the intervention group, the test used to see the effect of utilization on visits was the Wilcoxon test, then to see the effectiveness of the application, the Mann-Whitney test was used.

Table 3. Effect of Utilization of the My ADA Application on Antenatal Care Visits for Pregnant Women in the Second Trimester

Variabel	N	Mean Rank	p-value
Visit			
Negative Ranks	0	0,00	<0.001
Positive Ranks	25	13,00	

Based on Table 3. the Wilcoxon test results obtained a p-value of <0.001 <0.05, meaning that there is an influence of the use of the My ADA application on antenatal care visits in pregnant women in the second trimester.

Table 4. The Effect of KIA Book Utilization on Antenatal Care Visits of Pregnant Women in the Second Trimester

Variabel	N	Mean Rank	p-value
Visit			
Negative Ranks	0	0,00	<0.001
Positive Ranks	25	13,00	

Based on Table 4. the Wilcoxon test results obtained a p-value of <0.001<0.05, meaning that there is an influence of the use of Maternal and Child Health (KIA) books on Antenatal Care visits in Pregnant Women in the Second Trimester.

Table 4.4 Effectiveness of the My ADA Application on Antenatal Care Visits (ANC) In Second Trimester Pregnant Mothers

Variable	Mean	Mean Difference	Mean Rank	P-Value
Utilization				
My ADA Application	80,80	26,80	36,74	<0.001
KIA Book	54,00		14,26	
Visit				
My ADA Application	3,20	1,80	36,44	<0.001
KIA Book	1,40		14,56	

The results of the Mann-Whitney test obtained P-Value = <0.001<0.05 which means there is a difference in the average utilization and visit scores between the My ADA application group and the Maternal and Child Health (KIA) book group, with a Mean Utilization difference (26.80) and a Mean Visit Difference (1.80) it can be concluded that the Utilization of the My ADA Application is more effective in increasing Antenatal Carevisits in pregnant women in the second trimester compared to the use of the Maternal and Child Health (KIA) book.

DISCUSSION

The findings of this study demonstrate that the My ADA application had a positive effect on antenatal care (ANC) utilization among pregnant women. Participants in the intervention group showed higher ANC utilization scores and more frequent ANC visits compared with the comparison group using the Maternal and Child Health (KIA) book. These findings indicate that digital health applications can improve pregnant women's engagement in pregnancy monitoring and increase adherence to recommended ANC schedules. The interactive features provided by the My ADA application, such as educational content,

appointment reminders, and pregnancy monitoring tools, may contribute to improving maternal awareness and encouraging more regular ANC attendance (Yuniarti et al., 2023).

From a practical perspective, the magnitude of the difference between groups suggests a substantial intervention effect. The increase in antenatal care visits among the intervention group reflects the potential effectiveness of digital health applications in supporting maternal health service utilization. Previous studies have reported similar findings, where mobile health (mHealth) interventions significantly improved antenatal care attendance and maternal health awareness by providing reminders, health education, and easier communication with healthcare providers (Mishra et al., 2023; Rashati & Akbar, 2025). Therefore, the results of this study support existing evidence that digital health technologies can play an important role in strengthening maternal healthcare services, particularly in regions where access to health information and monitoring systems may be limited.

Before conducting inferential analysis, a normality test was performed to determine the appropriate statistical tests. The results indicated that the utilization scores in the intervention group were normally distributed, whereas the control group data showed a non-normal distribution. This difference may be attributed to the more structured and standardized usage pattern of the My ADA application compared to the conventional use of the KIA book, which relies heavily on individual initiative and manual recording. Therefore, non-parametric tests such as the Wilcoxon signed-rank test and Mann–Whitney test were used to analyze differences between groups.

In addition to the overall comparison between intervention and control groups, further analysis could explore whether demographic factors such as maternal age, education level, or socio-economic status influence the utilization of digital health applications and antenatal care attendance. Previous studies suggest that women with higher educational levels or better digital literacy tend to adopt mobile health technologies more effectively. Therefore, subgroup analysis in future research may provide deeper insights into which populations benefit most from the My ADA application.

Overall, these findings highlight the potential contribution of digital maternal health interventions in improving antenatal care utilization. In the context of maternal health services in Indonesia, where antenatal care coverage in several regions remains below national targets, the integration of digital applications such as My ADA may serve as an effective strategy to enhance pregnancy monitoring and improve maternal healthcare outcomes.

The results are consistent with previous studies reporting that mobile health (mHealth) interventions improve maternal healthcare utilization and pregnancy-related health behaviors. A systematic review by Mobile Health researchers found that mHealth applications significantly support maternal healthcare delivery by improving maternal knowledge, self-monitoring behavior, and healthcare utilization during pregnancy (Ameyaw et al., 2024). Similarly, reported that digital technologies in antenatal care, including mobile applications and remote monitoring systems, improve healthcare accessibility and patient satisfaction with maternal health services (Mohamed et al., 2025).

Compared with conventional educational media such as the KIA handbook, digital applications offer several practical advantages. Printed materials rely heavily on mothers' motivation to read and manually record information, whereas mobile applications provide interactive and continuous engagement through automated reminders, digital tracking, and easy access to health information. These features may explain why the My ADA application showed better effectiveness in increasing ANC visits compared with the KIA book. This finding is supported by previous studies showing that mobile-based maternal health applications improve compliance with ANC visits and support early detection of pregnancy-related risks (Lestari, 2022 ;Kamila et al., 2024).

The reminder feature available in the My ADA application appears to play an important role in increasing ANC attendance. Reminder systems delivered through smartphones help pregnant women remember scheduled visits and encourage continuity of care. Similar findings, who demonstrated that reminder systems using digital notifications improved compliance with antenatal visits among third-trimester pregnant women (Ummah et al., 2020). In addition, explained that Android-based maternal health applications are effective health promotion tools because smartphone technology is widely accessible and increasingly integrated into daily life (Savitri et al., 2023).

The results of this study also support previous findings related to the effectiveness of digital maternal health platforms compared with conventional maternal health tools. Found that the Smart Continuity of Care (MONSCA) application was more effective than the KIA handbook in terms of convenience, speed, data security, and accuracy for early detection of pregnancy risk factors (Firdaus et al., 2025). Likewise, Reported that digital maternal health platforms showed better interaction quality and usability compared with the KIA handbook. These findings suggest that digital health technologies may provide a more practical and user-friendly approach for maternal health monitoring (Nahdia et al., 2024).

From a public health perspective, increasing ANC attendance is important because regular antenatal visits enable healthcare providers to identify pregnancy complications earlier, monitor fetal development, and provide timely interventions. The use of digital maternal health applications may therefore contribute to improving maternal and neonatal health outcomes, particularly in settings where healthcare access and health information remain limited. This finding is relevant to Indonesia's ongoing efforts to strengthen maternal healthcare services through digital health innovation.

However, the effectiveness of digital maternal health interventions may also depend on contextual factors such as digital literacy, internet availability, smartphone ownership, and healthcare provider support. Emphasized that user-friendly application design, adequate technological infrastructure, and healthcare provider involvement are important determinants of successful mHealth implementation in pregnancy care. In the context of this study, pregnant women with better digital literacy may have been more able to utilize the application features effectively, which could influence the intervention outcomes (Asadollahi et al., 2025).

This study has several limitations that should be considered when interpreting the findings. First, the study used a quasi-experimental design without randomization, which may increase the risk of selection bias. Second, the sample size was relatively small and limited to pregnant women attending independent midwifery practices in Bengkulu City, limiting the generalizability of the findings to broader populations. Third, the intervention duration was relatively short, so the long-term sustainability of ANC adherence after application use could not be evaluated. Additionally, factors such as internet access, digital literacy, and participants' previous experience using mobile health applications were not measured comprehensively and may have influenced the study outcomes.

Despite these limitations, the findings suggest that the My ADA application has potential as an alternative digital strategy to support maternal healthcare services. Integration of mobile health applications into routine antenatal care programs may improve maternal engagement, facilitate pregnancy monitoring, and strengthen communication between healthcare providers and pregnant women. Future studies with larger randomized samples and longer follow-up periods are recommended to evaluate the long-term effectiveness and scalability of the My ADA application in different healthcare settings.

CONCLUSIONS

The findings of this study demonstrated a statistically significant difference in the utilization and frequency of antenatal care visits between second-trimester pregnant women who used the My ADA application and those who relied solely on the conventional Maternal and Child Health (KIA) book. Pregnant women in the My ADA group exhibited notably higher levels of antenatal care utilization and a greater number of completed visits compared to those in the KIA book group. These results suggest that the My ADA application is more effective in supporting adherence to recommended antenatal care schedules, likely due to its integrated features such as automated reminders, accessible health information, and enhanced communication channels with healthcare providers.

From a practical standpoint, healthcare practitioners are encouraged to integrate digital health tools, such as the My ADA application, into routine maternal health services to strengthen pregnancy monitoring and improve antenatal care coverage. Policymakers are likewise encouraged to support the development, regulation, and large-scale implementation of digital maternal health platforms as part of comprehensive strategies to advance maternal and child health outcomes. Further research is recommended to examine the long-term effectiveness, scalability, user acceptability, and interoperability of digital maternal health technologies within existing healthcare systems, as well as their applicability across diverse populations and geographical contexts.

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