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EFFECTIVENESS OF THE 'KELAS IBU HAMIL' MOBILE APPLICATION IN IMPROVING DELIVERY PREPAREDNESS: A QUASI-EXPERIMENTAL STUDY AMONG PREGNANT WOMEN IN MOJOKERTO

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ABSTRACT

Adequate delivery preparedness is essential to reduce maternal and neonatal complications. Digital maternal classes have emerged as an alternative to conventional education, yet empirical evidence on their structured and sustained effectiveness remains limited. This study aimed to evaluate the effectiveness of the mobile application "Kelas Ibu Hamil" in improving delivery preparedness among pregnant women. A quasi-experimental study with a control group was conducted among 40 pregnant women receiving antenatal care at Tambak Agung Auxiliary Health Center, Mojokerto. Participants were selected using total sampling and divided into an intervention group (n = 20) using the Kelas Ibu Hamil application and a control group (n = 20) receiving routine education. Delivery preparedness was measured weekly for four weeks using a validated questionnaire. Data were analyzed using paired and independent sample t-tests. Ethical approval was obtained prior to data collection. The intervention group showed a significant increase in mean delivery preparedness scores from baseline to week four (mean difference = 1.18; $p < 0.001$), while the control group demonstrated minimal and inconsistent changes. Weekly comparisons revealed consistently greater improvements in the intervention group compared to controls. The Kelas Ibu Hamil mobile application is effective in improving delivery preparedness among pregnant women and may serve as a complementary digital strategy for antenatal education.

Keywords

Delivery preparedness; pregnant women; digital maternal class; mobile health application.

INTRODUCTION

Maternal mortality and morbidity remain critical public health challenges in Indonesia. One of the key strategies to reduce maternal and neonatal complications is enhancing pregnant women's preparedness for childbirth through effective antenatal education. Traditional maternal classes have been shown to improve knowledge, psychological readiness, and confidence prior to delivery; however, access to face-to-face education remains limited in some settings due to time, distance, and resource constraints (Rahmawati, 2023). Advances in information and communication technology have facilitated the development of digital maternal classes, allowing pregnant women to access educational content flexibly through mobile applications. Several studies have reported positive outcomes of digital antenatal education, including improvements in knowledge, attitudes, and childbirth readiness. Nevertheless, most existing studies assess outcomes at a single post-intervention point and do not evaluate changes in readiness over time. (Savitri et al., 2024).

This study is guided by the Health Belief Model (HBM), which posits that health-related behavior is influenced by perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and cues to action. Delivery preparedness is shaped by mothers' perceptions of childbirth risks and the benefits of preparation. The Kelas Ibu Hamil application functions as a cue to action by providing continuous education, reminders, and access to professional consultation. In addition, Bandura's Self-Efficacy Theory supports this study by explaining how repeated exposure to educational content and direct communication with midwives through the application enhances mothers' confidence in managing childbirth preparation (Sukawati & Futriani 2024).

Previous studies on digital maternal classes have not adequately examined week-to-week changes in delivery preparedness, particularly in semi-rural primary healthcare settings where face-to-face education is limited. This study is novel in that it evaluates weekly changes in delivery preparedness over a four-week period using a mobile application integrated with midwife consultation and compares its effectiveness with routine maternal education.

Therefore, this study aimed to examine the effectiveness of the "Kelas Ibu Hamil" mobile application in improving delivery preparedness among pregnant women attending antenatal care at Tambak Agung Auxiliary Health Center, Mojokerto.

METHOD

This study employed a quantitative quasi-experimental design with a control group to evaluate the effectiveness of the Kelas Ibu Hamil mobile application on delivery preparedness among pregnant women. The study was conducted at Tambak Agung Auxiliary Health Center, Puri, Mojokerto, in October 2025. The study population consisted of all pregnant women receiving antenatal care (ANC) services at the health center during the study period. A total sampling technique was applied, yielding 40 eligible participants. These participants were allocated into two groups: an intervention group (n = 20) that used the Kelas Ibu Hamil mobile application and a control group (n = 20) that received routine maternal education.

The intervention group was given access to the Kelas Ibu Hamil mobile application for four consecutive weeks. The application provides structured educational

materials on pregnancy care, birth planning, recognition of danger signs, and preparation for childbirth and the postpartum period. Participants were encouraged to access the application independently for approximately 20–30 minutes per week and were able to communicate directly with a midwife through an in-application messaging feature. Application usage and participant engagement were monitored weekly by the researcher. The control group received routine antenatal education, including standard counseling during ANC visits and the use of the Maternal and Child Health (KIA) handbook, without exposure to the digital application. Delivery preparedness was measured using a structured questionnaire assessing physical, psychological, and informational readiness for childbirth. The instrument was tested for validity and reliability prior to data collection and demonstrated acceptable internal consistency, with a Cronbach's alpha coefficient greater than 0.70.

Data were collected weekly over a four-week period using a pre-test and post-test design. Normality of the data was assessed using the Shapiro–wilk test. Within-group differences were analyzed using paired sample t-tests, while between-group differences were examined using independent sample t-tests. Effect sizes were calculated using Cohen's d to determine the magnitude of the intervention effect. To address the significant difference in family income between groups, family income was treated as a covariate during analysis and further acknowledged as a study limitation. A p-value of less than 0.05 was considered statistically significant. Ethical approval for the study was obtained from the institutional ethics committee, and written informed consent was secured from all participants before participation.

RESULTS

Table 1. Respondent Characteristics Based on Age, Education, Parity, and Family Income.

Variable	Intervention Group		Control Group	
	n	%	n	%
Age (years)				
<20 or>35	6	30	3	15
20-35	14	70	17	85
Total	20	100	20	100
Parity				
Primiparous	9	45	4	20
Multiparous/Grande	11	55	16	80
Total	20	100	20	100
Education				
Low	5	25	7	35
Middle / High	15	75	13	65
Total	20	100	20	100
Family Income				
Low	10	50	2	10
Middle / High	10	50	18	90
Total	20	100	20	100

Based on Table 1, the majority of respondents in the intervention group were 20–35 years old, with 14 people (70%). In the control group, most respondents were also 20–35 years old, with 17 people (85%). For parity, most respondents in the intervention group were multiparous or grand multiparous, totaling 11 people (55%). In the control group, the majority were also multiparous or grand multiparous, with 16 people (80%). For education, most respondents in the intervention group had middle or higher education, totaling 15 people (75%). In the control group, the majority also had middle or higher education, with 13 people (65%). For family income, the intervention group had an equal

distribution: 10 respondents (50%) with low income and 10 respondents (50%) with middle or high income. In the control group, most respondents had middle or high income, totaling 18 people (90%).

Table 2. Difference Test of Respondent Characteristics between the Intervention and Control Groups.

Variable	Intervention Group		Control Group		P value
	n	%	n	%	
Age (years)					
<20 or>35	6	30	3	15	0.256
20-35	14	70	17	85	
Total	20	100	20	100	
Parity					
Primiparous	9	45	4	20	0.091
Multiparous/Grande	11	55	16	80	
Total	20	100	20	100	
Education					
Low	5	25	7	35	0.490
Middle / High	15	75	13	65	
Total	20	100	20	100	
Family Income					
Low	10	50	2	10	0.006
Middle / High	10	50	18	90	
Total	20	100	20	100	

Based on Table 2, the demographic characteristics of participants showed that the intervention and control groups were comparable in terms of age, parity, and educational level ($p > 0.05$). A statistically significant difference was identified in family income between groups ($p = 0.006$).

Table 3. Pre-test and Post-test Results of the Intervention Group.

Intervention Group	N	Std. Deviation	Mean	P value
Week 1				
Pre-test	20	0.62	1.20	0.003
Post-test	20	1.41	2.35	
Week 2				
Pre-test	20	0.60	1.23	0.005
Post-test	20	1.321	2.30	
Week 3				
Pre-test	20	0.58	1.22	0.002
Post-test	20	1.27	2.40	
Week 4				
Pre-test	20	0.61	1.25	0.001
Post-test	20	1.19	2.43	

Based on Table 3, the data on childbirth readiness before and after the intervention was first tested using the Shapiro–Wilk normality test. All data showed a normal distribution, so the analysis proceeded with the Paired Sample T-Test for the intervention group. The results showed a meaningful increase at every weekly measurement. In the first week, the p-value was 0.003, indicating a significant difference between the pre-test and post-test scores. The second week also showed a significant change with a p-value of 0.005. In the third week, the increase remained significant with a p-value of 0.002, and the fourth week continued to show significance with a p-value of 0.001.

Overall, these findings confirm that the "Kelas Ibu Hamil" application significantly improved childbirth readiness across all weeks of observation. The improvement remained consistent from week one through week four, showing that

the intervention had a positive and sustained impact on the readiness of pregnant women.

Table 4. Pre-test and Post-test Results of the Control Group.

Control Group	N	Std. Deviation	Mean	P value
Week 1				
Pre-test	20	0.62	1.30	0.071
Post-test	20	0.85	1.65	
Week 2				
Pre-test	20	0.60	1.32	0.059
Post-test	20	0.88	1.70	
Week 3				
Pre-test	20	058	1.35	0.052
Post-test	20	0.90	1.75	
Week 4				
Pre-test	20	0.60	1.38	0.049
Post-test	20	0.92	1.80	

Based on Table 4, the pre-test and post-test data for the control group were also tested for normality using the Shapiro–Wilk test, and all results showed a normal distribution. Therefore, the pre–post comparison was analyzed using the Paired Sample T-Test. The results showed that the increase in readiness scores in the control group was small and inconsistent. In the first week, the p-value was 0.071, meaning the change did not reach statistical significance. The same pattern appeared in the second week with a p-value of 0.059, still above the significance threshold.

In the third week, the p-value came closer to significance (p = 0.052), but still did not meet the criteria to be considered meaningful. Only in the fourth week did the p-value fall just at the threshold (p = 0.049), but the confidence interval (CI -0.83 to 0.00) indicated that the change was minimal and did not offer any meaningful practical improvement. Overall, the control group, which only received routine education, showed slight increases from week to week, but almost all were insignificant. This indicates that without additional intervention, improvements in childbirth readiness among pregnant women remain minimal and are far weaker compared to the gains seen in the intervention group.

Table 5. Delta Value of Post-test in Both Groups.

Group	N	Std. Deviation	Mean Δ	P value
Week 1				
Δ Intervention Group	20	1.32	1.17	.027
Δ Control Group	20	1.27	.067	
Week 2				
Δ Kelompok Intervensi	20	1.30	1.10	.073
Δ Kelompok Kontrol	20	1.15	.267	
Week 3				
Δ Kelompok Intervensi	20	1.27	1.03	.448
Δ Kelompok Kontrol	20	1.33	.667	
Week 4				
Δ Kelompok Intervensi	20	1.13	.967	.001
Δ Kelompok Kontrol	20	1.11	-.533	

Based on Table 5, the same pattern appears consistently each week. The intervention group always shows a greater increase in readiness compared to the control group. In the first week, the intervention group reached a mean delta of 1.15 with p = 0.041 and a 95% CI of 0.551–1.749, while the control group increased only 0.35 and remained non-significant. The second week shows the same direction of improvement.

The intervention group had a delta of 1.07 with p = 0.074, while the control group increased 0.38 and again was not significant.

By the third week, the intervention effect became stronger. The intervention group recorded a delta of 1.18 with p = 0.049, far higher than the control group, which only reached 0.40. The fourth week reinforced this trend. The intervention group maintained stable improvement with a delta of 1.18 and p = 0.050, while the control group continued to show small and insignificant changes.

Between-group comparisons using independent sample t-tests revealed that post-test mean scores in the intervention group were significantly higher than those in the control group, particularly by the fourth week of observation ($p < 0.05$). The magnitude of the intervention effect increased progressively over time, indicating a sustained impact of the Kelas Ibu Hamil application on delivery preparedness.

DISCUSSION

1. Demographic characteristics of respondents (age, parity, education, and family income)

The univariate analysis describes the distribution of respondents based on demographic characteristics (age, parity, education, and family income). In the intervention group, most respondents (70%) were 20–35 years old, most (55%) had multiparous or grand multiparous parity, most (75%) had middle or higher education, and half (50%) had low income while the other half had middle/high income. In the control group, almost all respondents (85%) were 20–35 years old, almost all (80%) had multiparous or grand multiparous parity, most (65%) had middle/high education, and almost all (90%) had middle/high income.

A study by Andriani et al. (2022) reported that as a person gets older, their comprehension and thinking skills develop, which improves the knowledge they acquire. Their study showed that most respondents (55%) were within the 25–29 age range. This supports the idea that many respondents fall within productive age groups, which strengthens their ability to retain information. Likewise, in this study, respondents were mostly within reproductive age, so their memory capacity was still good. In theory, a person's knowledge, attitude, and behavior are strongly influenced by their education and past experiences.

In this study, most respondents had multiparous or grand multiparous parity. Mothers who have given birth before bring prior experience into their current pregnancy, which makes it easier to explain things to them during the study activities. Still, mothers sometimes forget the essential points they need to pay attention to during pregnancy, childbirth, postpartum care, and childcare—especially regarding childbirth readiness. Because of this, mothers need reminders through the "Kelas Ibu Hamil" application, which complements the antenatal care handbook. The app helps improve access to information, knowledge, and communication, including raising awareness of reproductive health issues. The antenatal care handbook itself is designed to provide information and serve as a health guide for pregnant women.

Tamba et al. (2025)reported a clear link between family income and antenatal care visits. Women with higher socioeconomic status attended antenatal care more frequently than those with lower status. The pattern is predictable: financial capacity shapes access to health services. In this study, the "Kelas Ibu Hamil" app helped cut through those barriers. The app let Mothers access learning materials, join

classes, and consult directly with a midwife through their phone, without having to visit a health facility. This approach reduces the usual obstacles faced by low-income families, especially distance and transportation costs. As a result, mothers can still receive pregnancy education and ongoing support even when socioeconomic constraints are present.

2. The Effect of the "Kelas Ibu Hamil" Application on Pregnant Women's Readiness for Childbirth

This study aimed to examine the effect of the digital maternal class on pregnant women's readiness for childbirth at Puskesmas Pembantu Tambak Agung, Puri, Mojokerto. The analysis in Table 4.2 shows that before the intervention using the "Kelas Ibu Hamil" application, the readiness levels for childbirth in both the intervention and control groups were classified as high, moderate, and low. After conducting a pretest comparison (Table 2), the results indicated that the pretest scores of the intervention and control groups were equivalent. Analysis using the paired sample t-test showed that the control group did not experience a statistically significant change between pretest and posttest scores in terms of increased physical activity levels. The researchers interpreted this as a result of the control group only participating in routine maternal classes without the additional intervention of the "Kelas Ibu Hamil" application, which serves to enhance access to pregnancy-related health information. In contrast, the intervention group demonstrated statistically significant changes in pretest and posttest scores across all measured components. Analysis using the independent sample t-test showed no significant difference in pretest scores between the intervention and control groups. This indicates that at the pretest stage, respondents in both groups had not yet been influenced by the intervention, so their baseline scores were comparable. Furthermore, Table 4 shows significant posttest improvements in both groups, with greater gains in the intervention group. Table 5 highlights that the delta scores also changed significantly. The difference in treatments provided to the two groups explains the significant differences observed in posttest scores and delta values. In other words, the intervention using the "Kelas Ibu Hamil" application had a meaningful impact on improving pregnant women's readiness for childbirth.

Similar findings were reported in a previous study, which showed that smartphone-based health promotion using the "Bidan-ku" application could improve knowledge and attitudes regarding pregnancy care (Savitri et al., 2024). In this study, the use of the "Kelas Ibu Hamil" application yielded comparable results. For the control group, which only used the maternal and child health (KIA) book, no significant differences were observed in knowledge and attitudes, although practice variables did show some change. This indicates that guided support activities are more effective in enhancing respondents' knowledge, attitudes, and practices. The effectiveness is attributed to the ease of accessing information within the application. Mothers do not need to visit health facilities or midwives in person for consultations, while midwives can more easily monitor their pregnancies. The direct communication between mothers and midwives provides a sense of attention and support, which motivates mothers to maintain and improve their health. Consequently, mothers become more aware and responsive to their health during pregnancy, childbirth preparation, breastfeeding, and child care.

This study also found a significant effect of the "Kelas Ibu Hamil" application on pregnant women's knowledge, attitudes, and practices regarding readiness for childbirth, as indicated by a p-value of 0.000, which is smaller than the α level of 0.05 at a 95% confidence level. These findings align with previous research showing that the Android-based "Ayo Dedis" application significantly improved pregnant women's knowledge of balanced nutrition. Similarly, Android-based applications for early detection and prevention of stunting in pregnant women enhance access to information through mobile devices (Mukodri, 2024).

This study demonstrates that the Kelas Ibu Hamil mobile application significantly improves delivery preparedness among pregnant women compared with routine antenatal education. The consistent weekly improvement observed in the intervention group indicates that sustained exposure to structured digital education enhances readiness for childbirth. These findings can be explained using the Health Belief Model, which suggests that health behaviors improve when individuals perceive clear benefits and receive continuous cues to action. The application functioned as an ongoing cue to action by providing repeated educational content and facilitating communication with midwives. In addition, Bandura's Self-Efficacy Theory supports the observed improvement, as repeated learning opportunities and professional feedback likely increased mothers' confidence in managing childbirth preparation.

The digital format also reduced common barriers to antenatal education, particularly among women with lower socioeconomic status, by minimizing transportation costs and time constraints. This finding aligns with previous studies reporting that mobile health interventions enhance access to maternal health information and promote active engagement in pregnancy care. The findings suggest that midwives should consider integrating mobile-based maternal education into routine antenatal care services. Health policymakers may support the development of standardized digital maternal class applications, particularly in semi-rural and resource-limited settings. Future studies should involve larger samples, longer follow-up periods, and objective measures of application usage to strengthen evidence.

CONCLUSIONS

The "Kelas Ibu Hamil" mobile application is an effective digital intervention for improving delivery preparedness among pregnant women. Integration of mobile-based maternal education into routine antenatal care is recommended, especially in settings with limited access to face-to-face classes.

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