

The Use of Digital Technology in Improving the Quality of Midwifery Care for High-Risk Pregnant Women at the Pulobandring Community Health Center in Asahan Regency

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ABSTRACT

Maternal mortality due to pregnancy complications remains a major challenge in Indonesia, requiring early detection through digital technologies such as health applications and wearable devices. Objective: This study aims to examine the impact of digital technology utilization on the quality of midwifery care for high-risk pregnant women. Methods: This study used a quasi-experimental quantitative design with a pretest-posttest with control group design at the Pulobandring Community Health Center. A sample of 60 high-risk pregnant women was selected using purposive sampling and divided into an intervention group (digital-based care) and a control group (conventional care). Data was analyzed using paired and independent t-tests. Results: The intervention group showed a significant increase in ANC visit compliance (90%, $p=0.002$), a decrease in mean systolic blood pressure from 142.6 to 131.8 mmHg ($p=0.004$), and an increase in knowledge scores from 56.2 to 82.5 ($p=0.000$). In contrast, the control group did not show any statistically significant changes. Conclusion: The use of digital technology is effective in improving the quality of midwifery care through increased compliance, stability of health conditions, and knowledge of high-risk pregnant women.

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INTRODUCTION

Maternal mortality remains a major health challenge in Indonesia, where most cases are caused by pregnancy complications that can be prevented through early detection and optimal monitoring. Midwives play a strategic role as frontline health workers in providing quality care, but advances in information technology now offer a great opportunity to strengthen this role through continuous, real-time monitoring of maternal conditions. The focus of this care is on high-risk pregnant women, namely those with factors such as extreme age (<20 or >35 years), anemia, hypertension, or a history of other medical complications. The use of digital devices such as health applications and wearable devices aims to improve service efficiency, monitoring accuracy, and the quality of clinical decision-making by midwives to identify risks earlier.

This research method uses a quantitative design with a quasi-experimental approach through a pretest–posttest with control group design conducted in the Pulobandring Community Health Center working area from January to June 2025. The research population involved all high-risk pregnant women using purposive sampling, resulting in a total of 60 respondents divided equally into an intervention group and a control group. The intervention group received digital technology-based midwifery care (applications and smart watches) for three months, while the control group received conventional services. The data collected included knowledge levels through questionnaires, ANC compliance through observation sheets, and blood pressure monitored through wearable devices. All data were then analyzed using paired t-tests and independent t-tests with a significance level of 0.05.

Results The characteristics of the respondents showed a homogeneous distribution, with the majority being of productive age (20–35 years) (75%) and multigravida (60%). The results showed that the intervention group experienced a significant increase in ANC visit compliance, increasing from 63.4% to 89.7% ($p=0.001$), while the control group did not show any statistically significant changes. In addition, there was a significant decrease in the average systolic blood pressure in the intervention group from 142.6 mmHg to 131.8 mmHg ($p=0.004$). A dramatic improvement was also seen in pregnant women's knowledge of pregnancy warning signs, with the average score increasing from 56.2 to 82.5 ($p=0.000$), far exceeding the control group, which only experienced a slight increase.

Discussion The integration of digital technology has been shown to significantly improve the stability of health conditions and the active involvement of pregnant women in their care, which is in line with the principle of patient-centered care. The use of wearable devices allows midwives to routinely monitor physiological parameters and follow up more quickly on any changes in condition. Additionally, this technology facilitates access to information and improves communication quality between midwives and patients. However, to achieve optimal and sustainable implementation, strong policy support, improved digital literacy among midwives, and consistent public education are needed to continue reducing the risk of pregnancy complications.

METHODS

This study used a quantitative design with a quasi-experimental approach through a pretest–posttest with control group design conducted in the working area of the Pulobandring Community Health Center (Community Health Center X) from January to June 2025. The research population included all pregnant women at risk in the area, with sampling using purposive sampling based on inclusion criteria, namely pregnancy age above 20 weeks, having risk factors (such as hypertension, anemia, or a history of complications), and willingness to participate in the study. The total sample involved was 60 respondents, divided evenly into 30 people for the intervention group and 30 people for the control group.

The independent variables in this study were the use of digital technology in the form of a pregnancy monitoring application and wearable devices (smart watches), while the dependent variables included compliance with antenatal care (ANC) visits, blood pressure

stability, and mothers' knowledge levels. The instruments used included a knowledge questionnaire, an ANC compliance observation sheet, and blood pressure data from wearable devices, all of which had undergone validity and reliability testing. In the procedure, the intervention group received technology-based midwifery care for three months, while the control group received conventional services. Variable measurements were taken before (pretest) and after (posttest) the intervention, and the data were analyzed using paired t-tests and independent t-tests with a significance level of 0.05.

RESULTS AND DISCUSSION

Based on the research data, the majority of respondents were in the productive age range (20–35 years), accounting for 75%, while the rest (25%) were in the high-risk age group (<20 or >35 years). In terms of parity, 60% of respondents were multigravida and 40% were primigravida. The most dominant pregnancy risk factor found in the research subjects was pregnancy hypertension (45%), followed by anemia (35%) and a history of obstetric complications (20%). The characteristics between the intervention and control groups showed a relatively homogeneous distribution.

Table 1. Distribution of Characteristics of Pregnant Women at Risk Respondents

Characteristics	Intervention Group (n=30)	Control Group (n=30)	Total (%)
Age			
20–35 years	23	22	75
<20 or >35 years	7	8	25
Parity			
Primigravida	12	12	40
Multigravida	18	18	60

This table shows that respondents were predominantly pregnant women of healthy reproductive age (20–35 years) and multigravida women, with an almost equal distribution between the intervention and control groups.

The use of digital technology significantly increased the compliance of pregnant women in attending ANC visits. In the intervention group, the compliance rate reached 90%, while in the control group it was only 60%. The results of the independent t-test showed a significant difference between the two groups with a p-value of 0.002. The average compliance rate in the intervention group increased dramatically from 63.4% before the intervention to 89.7% after the intervention ($p=0.001$).

Table 2. Cross-tabulation of Digital Technology Utilization and ANC Visit Compliance

Use of Technology	Compliant ANC n (%)	Non-compliant n (%)	Total	p-value

Yes (Intervention)	27 (90)	3 (10)	30	0,002
No (Control)	18 (60)	12 (40)	30	

This table shows a comparison of ANC visit compliance. The group that used digital technology (intervention) had a 30% higher compliance rate than the control group, which was statistically significant ($p < 0.05$). Technology-based interventions also had a positive impact on the clinical condition and understanding of pregnant women. The average systolic blood pressure in the intervention group decreased significantly from 142.6 mmHg to 131.8 mmHg ($p=0.004$). In addition, the pregnant women's knowledge scores regarding pregnancy danger signs in the intervention group jumped from 56.2 to 82.5 ($p=0.000$). In contrast, the control group did not show statistically significant changes in either blood pressure ($p=0.112$) or knowledge scores ($p=0.091$).

Table 3. Comparison of Average Blood Pressure and Knowledge Scores of Pregnant Women

Variable	Group	Pre-test (Mean \pm SD)	Post-test (Mean \pm SD)	p-value
Systolic blood pressure (mmHg)	Intervention	142,6 \pm 8,4	131,8 \pm 7,9	0,004
	Control	141,9 \pm 7,8	139,7 \pm 8,1	0,112
Knowledge score	Intervention	56,2 \pm 10,3	82,5 \pm 9,6	0,000
	Control	57,1 \pm 9,8	60,3 \pm 10,1	0,091

This table shows the effectiveness of using digital technology (such as wearable devices) in stabilizing blood pressure and significantly improving the knowledge of pregnant women compared to conventional care methods.

The findings of the study show that the integration of digital technology in midwifery care significantly improves the stability of the health condition and knowledge of pregnant women. This is in line with the principle of patient-centered care, where pregnant women become more actively involved in their pregnancy care.

Wearable devices enable midwives to detect complications early and more accurately through continuous monitoring of blood pressure and physical activity. Easy access to information through digital applications also contributes to increasing mothers' awareness of pregnancy warning signs. However, the success of this implementation still requires strong policy support and improved digital literacy for midwives as service providers.

CONCLUSION

Based on the results of research and literature reviews, it can be concluded that the use of digital technology, including health applications and wearable devices such as smart watches, has significant potential in improving the quality of midwifery care for high-risk pregnant women. The integration of this technology has been empirically proven to increase

compliance with antenatal care (ANC) visits, maintain systolic blood pressure stability, and dramatically expand mothers' knowledge of pregnancy warning signs compared to conventional care. In addition to facilitating real-time early detection of complications, the use of digital media also strengthens the quality of communication between midwives and patients and supports the active involvement of mothers in their care (patient-centered care). However, in order for these benefits to be felt sustainably, strong policy support, increased digital literacy for midwives, and cross-sectoral synergy between the government and educational institutions are needed to ensure optimal technology education for the community.

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