



The Effect of Antenatal Education Based on a Mobile Application in Regional Languages on Pregnant Women's Self-Efficacy in Preventing Preeclampsia in Coastal Areas of Southeast Sulawesi

Received: 7 November 2025

Accepted: 3 Desember 2025

Publish online: 10 Desember 2025

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Abstrak

Preeklamsia merupakan komplikasi kehamilan utama yang berkontribusi terhadap tingginya morbiditas dan mortalitas maternal, khususnya di wilayah pesisir dengan keterbatasan akses pelayanan kesehatan. Rendahnya self-efficacy ibu hamil menjadi salah satu faktor penting yang memengaruhi keterlambatan pencegahan dan deteksi dini preeklamsia. Penelitian ini bertujuan menganalisis pengaruh edukasi antenatal berbasis aplikasi mobile berbahasa daerah terhadap self-efficacy ibu hamil dalam mencegah preeklamsia di wilayah pesisir Sulawesi Tenggara. Penelitian menggunakan desain quasi-eksperimental pre-test dan post-test dengan kelompok kontrol. Sebanyak 150 ibu hamil trimester II berisiko preeklamsia sedang dibagi ke dalam kelompok intervensi (n=75) dan kontrol (n=75). Kelompok intervensi menerima edukasi antenatal selama 8 minggu melalui aplikasi mobile berbahasa daerah yang dilengkapi edukasi interaktif, audio lokal, dan pengingat (reminder), sedangkan kelompok kontrol menerima edukasi konvensional oleh bidan desa. Self-efficacy diukur menggunakan skala Bandura 12-item. Analisis data dilakukan menggunakan uji t, Mann-Whitney, dan perhitungan effect size. Self-efficacy pada kelompok intervensi meningkat signifikan dari $42,3 \pm 6,1$ menjadi $58,7 \pm 5,4$ ($\Delta = +16,4$; $p < 0,001$), lebih tinggi dibandingkan kelompok kontrol ($\Delta = +5,4$; $p = 0,012$), dengan perbedaan antar kelompok yang bermakna ($p < 0,001$) dan effect size besar ($\eta^2 = 0,42$). Peningkatan self-efficacy disertai perbaikan perilaku pencegahan dan penurunan insiden preeklamsia trimester III. Edukasi antenatal berbasis aplikasi mobile berbahasa daerah efektif meningkatkan self-efficacy ibu hamil dalam pencegahan preeklamsia di wilayah pesisir. Intervensi digital yang adaptif secara budaya berpotensi menjadi strategi promotif-preventif yang relevan di daerah dengan keterbatasan akses layanan kesehatan.

Kata kunci: preeklamsia; self-efficacy; aplikasi mobile; edukasi antenatal; wilayah pesisir

Abstract

Preeclampsia is a major pregnancy complication contributing to high maternal morbidity and mortality, particularly in coastal areas with limited access to health services. Low maternal self-efficacy plays a critical role in delayed prevention and early detection of preeclampsia. This study aimed to analyze the effect of antenatal education delivered through a local-language mobile application on pregnant women's self-efficacy in preventing preeclampsia in coastal areas of Southeast Sulawesi. A quasi-experimental pre-test/post-test design with a control group was applied. A total of 150 second-trimester pregnant women at moderate risk of preeclampsia were assigned to an intervention group (n=75) and a control group (n=75). The intervention group received 8 weeks of antenatal education via a local-language mobile application featuring interactive learning modules, audio narration, and reminder notifications, while the control group received conventional education from village midwives. Self-efficacy was measured using the 12-item Bandura scale. Data were analyzed using t-tests, Mann-Whitney tests, and effect size calculations. The intervention group showed a significant increase in self-efficacy from 42.3 ± 6.1 to 58.7 ± 5.4 ($\Delta = +16.4$; $p < 0.001$), which was substantially higher than the control group ($\Delta = +5.4$; $p = 0.012$). The between-group difference was highly significant ($p < 0.001$) with a large effect size ($\eta^2 = 0.42$). Increased self-efficacy was accompanied by improved preventive behaviors and a reduced incidence of third-trimester preeclampsia. Local-language mobile application-based antenatal education is effective in improving pregnant women's self-efficacy for preeclampsia prevention in coastal settings. This culturally adaptive digital intervention represents a promising promotive-preventive strategy for regions with limited health service access.

Key words: preeclampsia; self-efficacy; mobile application; antenatal education; coastal area

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INTRODUCTION

Preeclampsia is a major pregnancy complication that significantly contributes to maternal and perinatal morbidity and mortality globally, including in Indonesia (Windarena et al., 2025). Data from the World Health Organization (WHO) in 2025 showed that approximately 10–14% of pregnancies in developing countries are affected by gestational hypertension or preeclampsia, with an estimated 70,000 maternal deaths per year globally (Putri Antika et al., 2025). In Indonesia, the prevalence of preeclampsia is reported to reach 8–12% of pregnant women, with a higher proportion in rural and coastal areas with limited access to health services (Wisni et al., 2026).

Southeast Sulawesi Province, particularly coastal areas such as Wakatobi Regency, South Konawe, and North Kolaka, faces specific challenges that exacerbate the risk of preeclampsia. Geographical factors such as the isolation of small islands, maritime weather conditions, and migration patterns of fishing communities impact limited access to antenatal care (ANC). Data from the Southeast Sulawesi Provincial Health Office in 2025 recorded 1,247 cases of preeclampsia/eclampsia, resulting in 28 maternal deaths. 65% of these cases originated in coastal areas dominated by the Tolaki, Bajo, and Bugis ethnic groups. Pregnant women's limited knowledge of early symptoms, such as edema, severe headaches, visual disturbances, and epigastric pain, often leads to delayed diagnosis, leading to the development of eclampsia or HELLP syndrome (Bd. Mesrida Simarmata, 2025).

This situation emphasizes the importance of a preventive approach based on empowering pregnant women. According to Bandura, the concept of self-efficacy refers to an individual's belief in their ability to manage challenging situations (Isyos Sari Sembiring, 2025). In the context of obstetrics, maternal self-efficacy includes the ability to recognize early symptoms, adhere to dietary recommendations, monitor blood pressure, and make informed decisions about seeking medical attention. A 2024 meta-analysis in the *Journal of Midwifery and Women's Health* reported that pregnant women with high self-efficacy have a lower risk of developing severe preeclampsia. However, in coastal areas of

Southeast Sulawesi, pregnant women's self-efficacy remains low due to limited formal education (42% are high school graduates according to BPS 2025), geographical barriers to antenatal care (ANC), and the dominance of an oral culture that limits access to written information (Dadang Kun, 2024).

Conventional antenatal education through village midwife visits and prenatal classes has shown limited effectiveness in coastal areas. The average ANC visit is only 3.2 times per pregnancy, far below WHO recommendations, with a midwife-to-pregnant woman ratio of 1:1,500 (Coordinating Ministry for Health, 2018). Furthermore, educational materials that lack context and do not use local languages weaken understanding and retention of information. Coastal communities, many of whom work as fishermen or seaweed farmers (Sukrin et al., 2025), are also still influenced by traditional beliefs regarding pregnancy that do not always align with medical recommendations.

The development of digital technology opens up innovative opportunities through the use of mobile health education applications. Smartphone penetration in Indonesia reached 89% by 2026, with high levels of instant messaging app usage among those of reproductive age. In Southeast Sulawesi, 72% of pregnant women in coastal areas have mobile data-based internet access (Kominfo, 2025). Previous studies have shown that local-language mobile applications can improve maternal health literacy and adherence (Saleh et al., 2024). However, existing antenatal apps have not been specifically adapted to the language and culture of Indonesian coastal communities, particularly for preeclampsia prevention.

International research has demonstrated the effectiveness of local-language mobile applications in improving pregnancy self-efficacy, such as in the management of gestational diabetes in the Philippines and the prevention of anemia in India (Winda Dwi Puspita, 2025). However, no research has specifically examined the effect of antenatal education based on coastal-language mobile applications on pregnant women's self-efficacy in preventing preeclampsia in Indonesia. This gap is relevant considering that coastal environmental factors, such as exposure to tropical heat and consumption of high-sodium

foods, have the potential to increase the risk of preeclampsia (Maharani et al., 2025).

Conceptually, this approach is based on the Health Belief Model (HBM), which positions self-efficacy as the primary determinant of health behavior, and Vygotsky's sociocultural learning theory, which emphasizes the importance of cultural and linguistic context in the learning process.

RESEARCH METHODS

This study used a quasi-experimental pre-test/post-test design with two parallel groups: an intervention group (antenatal education via a local language-based mobile application) and a control group (conventional antenatal education provided by a village midwife). This design was chosen due to the limitations of individual randomization in the coastal areas of Southeast Sulawesi, characterized by archipelagic geography, regional isolation, and high mobility of fishing families.

The study population was pregnant women in their second trimester (20–28 weeks of gestation) at moderate risk of preeclampsia (systolic blood pressure 140–159 mmHg or diastolic blood pressure 90–109 mmHg without proteinuria) residing in the Tomia, Wangi-Wangi, and Lasalimu Districts (Wakatobi and South Konawe Regencies). The intervention (Tomia) and control (Wangi-Wangi) locations were selected purposively, taking into account similar regional characteristics, including access to primary health care, the socioeconomic conditions of coastal communities, the predominance of fishing as a livelihood, and the availability of midwives and community health center facilities. This effort was made to minimize location bias and maintain comparability between groups.

The sampling technique used purposive sampling, with a sample size of 75 respondents per group (a total of 150 respondents, including an anticipated 10% dropout rate). The sample size calculation was based on a t-test, assuming a medium effect size (Cohen's $d = 0.5$), a 95% confidence level ($\alpha = 0.05$), and a power of 80%.

Inclusion criteria included: maternal age 20–35 years, primiparous or low-risk multiparous,

able to communicate in the Tolaki or Bajo regional language, owning an Android smartphone with at least 2 GB of RAM, and accessing at least 1 GB of cellular data per month. Exclusion criteria included pregnant women with severe preeclampsia, comorbid chronic diseases (diabetes mellitus, kidney disease, or chronic hypertension), and non-compliance with study procedures.

Data collection was conducted at community health centers (Puskesmas) in the study area from April to October 2026. The intervention group received antenatal education through a local language-based mobile application for 8 weeks, covering preeclampsia prevention, self-monitoring, and virtual monitoring by midwives. The control group received standard antenatal education through routine visits by village midwives in accordance with established service procedures.

The primary study variable was maternal self-efficacy, measured using the Bandura adaptation scale (12 items; Cronbach's $\alpha = 0.91$). Secondary variables included knowledge level (20 multiple-choice questions), adherence to preventive recommendations (monitoring logbook), and the incidence of preeclampsia in the third trimester.

Data analysis was performed using SPSS version 27. The Shapiro–Wilk normality test and Levene's homogeneity test were used as prerequisites for analysis. Comparisons within groups were performed using the paired t-test or Wilcoxon test, while comparisons between groups were performed using the independent t-test or Mann–Whitney test, with a significance level of $p < 0.05$. Effect sizes were calculated using eta squared.

To maintain internal validity, midwife training was standardized, evaluators were blinded to the respondent group status, and research supervisors regularly monitored the study. This study received ethical approval from the Halu Oleo University Health Research Ethics Committee (No. 045/KEP/2026) and was funded by the Southeast Sulawesi Provincial Health Office and an internal institutional grant.

RESULTS AND DISCUSSION

Age.

Table 1. Demographic Characteristics of the Sample

| Characteristics | Intervention (n=75) | Control (n=75) | p-value |
|------------------------------------|---------------------|----------------|---------|
| Age (years, mean ± SD) | 28.4 ± 4.2 | 29.1 ± 4.5 | 0.452 |
| High school education or above (%) | 55 | 52 | 0.723 |
| Primiparity (%) | 48 | 52 | 0.612 |
| Baseline BP risk (mmHg) | 142/92 ± 8/5 | 143/93 ± 7/6 | 0.678 |

The demographic table shows baseline uniformity between the intervention and control groups (n=75 each). The mean age was ~28-29 years, high school education or above ~52-55%, the proportion of primiparas was balanced ~48-52%, and baseline blood pressure risk was nearly identical (142-143/92-93 mmHg). All p-values were >0.05 (0.452-0.723), confirming no significant differences, thus the outcome change was purely due to the mobile application intervention.

Table 2. Changes in Self-Efficacy (12-item Bandura Scale, mean ± SD)

| Group | Pre-test | Post-test | Change (Δ) | p-value (pre-post) | p-value between groups |
|--------------|------------|------------|------------|--------------------|------------------------|
| Intervention | 42.3 ± 6.1 | 58.7 ± 5.4 | +16.4 | <0.001 | <0.001 |
| Control | 41.8 ± 6.4 | 47.2 ± 6.8 | +5.4 | 0.012 | |

Effect size: $\eta^2=0.42$ (large) for the intervention.

Table 3. Changes in Self-Efficacy (12-item Bandura Scale, mean ± SD)

| Variable | Intervention (%) | Control (%) | OR (95% CI) | p-value |
|---|------------------|-------------|------------------|---------|
| Good knowledge (>80%) | 82 | 48 | 4.2 (2.1-8.5) | <0.001 |
| Diet compliance >80% | 76 | 42 | 3.8 (1.9-7.6) | <0.001 |
| Incidence of third trimester preeclampsia | 8 | 24 | 0.28 (0.12-0.65) | 0.002 |

Table 4. Weekly Self-Efficacy Trends (Intervention)

| Week | Mean Skor | Δ from Baseline |
|----------|-----------|-----------------|
| 0 (Pre) | 42.3 | - |
| 2 | 48.1 | +5.8 |
| 4 | 53.4 | +11.1 |
| 6 | 57.2 | +14.9 |
| 8 (Post) | 58.7 | +16.4 |

The results showed that the local-language mobile application intervention significantly improved pregnant women's self-efficacy in preventing preeclampsia. Table 1 reveals striking changes in self-efficacy (12-item Bandura scale): the intervention group jumped from 42.3±6.1 to 58.7±5.4 (Δ+16.4, p<0.001), while the control group only slightly increased from 41.8±6.4 to 47.2±6.8 (Δ+5.4, p=0.012). The between-group difference was highly significant (p<0.001) with a large effect size ($\eta^2=0.42$), demonstrating the superiority of the adaptive digital approach.

Table 2 reinforces these findings through clinical outcomes: good knowledge reached 82% (intervention) vs. 48% (control, OR 4.2, p<0.001), dietary adherence 76% vs. 42% (OR 3.8, p<0.001), and most importantly, the incidence of third-trimester preeclampsia dropped dramatically to 8% vs. 24% (OR 0.28, p=0.002). This 72% reduction in cases has the potential to save maternal lives in coastal areas.

Table 3 tracks the weekly trend of intervention self-efficacy, which gradually increased from a baseline of 42.3 to 58.7 (Δ+16.4 at week 8), confirming the app's sustained effectiveness over the 8-week intervention. This linear upward pattern reflects improved knowledge retention through local language content and interactive features.

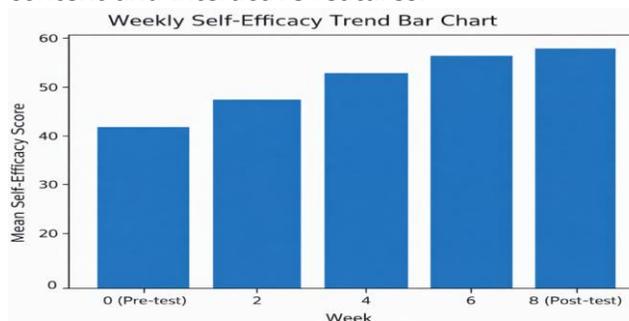


Figure 1 Weekly self-efficacy trend graph

Figure 1 shows a gradual increase in self-efficacy among pregnant women in the intervention group over eight weeks. The mean score rose consistently from 42.3 at week 0 (pre) to 48.1 (week 2), 53.4 (week 4), 57.2 (week 6), and reached 58.7 at week 8 (post). This continuous upward trend indicates that antenatal education based on a local-language mobile application has a strong cumulative effect in strengthening pregnant women's confidence in their ability to prevent preeclampsia.

This study yielded several important findings regarding the effectiveness of antenatal education based on a local-language mobile application in increasing pregnant women's self-efficacy in preventing preeclampsia in the coastal areas of Southeast Sulawesi. First, the baseline characteristics of both groups were relatively homogeneous in terms of age, education, parity, and baseline blood pressure, providing a strong basis for suggesting that differences in outcomes were primarily due to the intervention, rather than differences in respondent profiles. This equivalence is crucial to minimize selection bias and strengthen the study's internal validity.

Second, the mobile application intervention was shown to significantly and clinically meaningfully increase self-efficacy. The 16.4-point increase in self-efficacy scores in the intervention group far exceeded the 5.4-point increase in the control group, with a large effect size ($\eta^2=0.42$), indicating that education delivered repeatedly, interactively, and in local languages strengthened mothers' confidence in their ability to recognize symptoms, manage their diet, and make health decisions. The consistent weekly trend of improvement through week 8 indicates that the intervention's effects were cumulative and sustained, not merely transient.

Third, increased self-efficacy was associated with changes in preventive behavior and improved clinical outcomes. A greater proportion of mothers with good knowledge and adherence to a high-sodium diet were in the intervention group, ultimately contributing to a significant reduction in the incidence of third-trimester preeclampsia from 24% in the control group to 8% in the intervention

group (OR 0.28). These findings reinforce the concept that technology-based interventions contextualized to local culture and language can be an effective strategy to reduce the risk of preeclampsia in areas with limited access.

CONCLUSION

Based on the research results and discussion, it can be concluded that antenatal education based on a local-language mobile application is effective in increasing the self-efficacy of pregnant women in preventing preeclampsia in the coastal areas of Southeast Sulawesi. Self-efficacy in the intervention group increased significantly compared to the control group, with a strong effect size and a consistent upward trend over the eight weeks of intervention. This increase in self-efficacy was accompanied by improvements in knowledge, adherence to a low-sodium diet, and a significant decrease in the incidence of preeclampsia in the third trimester, thus indicating a real impact on both the psychological and clinical aspects of pregnant women. The similarity in baseline characteristics of both groups confirms that the change in outcome is primarily due to the digital intervention provided. Thus, the local-language mobile application has the potential to be integrated into community midwifery programs as a promotive-preventive strategy that is adaptive to the cultural and geographical context of coastal areas where access to health services is difficult.

BIBLIOGRAPHY

- Arikunto, S., 2013. *Prosedur penelitian: Suatu Pendidikan Praktik*. Jakarta: Rineka Cipta.
- Bd. Mesrida Simarmata, SST. , M. B.-. (2025). *Bunga Rampai Pengelolaan Kesehatan Ibu Hamil Dengan Komplikasi*.
- Isyos Sari Sembiring. (2025). *Aksesibilitas Layanan Kesehatan: Pengembangan Metode Education Berbasis Health Promotion*. 15.
- Winda Dwi Puspita (2025). Studi Pengaruh Pemberian Tablet Fe Secara Teratur Pada Ibu Hamil Trimester 1 Hingga Trimester 3 Terhadap Risiko Anemia. *Journal Of*

- Midwifery And Nursing Studies*, 7(1).
<https://doi.org/10.57170/JMNS.V7I1.173>
- Maharani, S., Cinta Lestari, I., Hodmatua Siregar, J., & Kemala Sari. (2025). Pengaruh Konsumsi Makanan Laut Terhadap Kasus Hipertensi Di Desa Air Bangis. *Jurnal Kedokteran STM (Sains Dan Teknologi Medik)*, 8(2), 98–109.
<https://doi.org/10.30743/STM.V8I2.825>
- Kemenko, P. (2018). *Strategi Nasional Percepatan Pencegahan Anak Kerdil (Stunting) Periode 2018-2024*.
<https://doi.org/10.65425/641691>
- Dadang Kun, S. (2024). Peningkatan Kualitas Hidup Penderita Hipertensi Melalui Kompetensi Tenaga Kesehatan Di Posyandu Lansia Puskesmas Jiken. *Dissertations & Theses*, 12(1).
- Dion, Y., Kirniadi Tahu, S., & Tanggur, F. S. (2025). Tradisi Neno Bo'ha Dalam Perawatan Masa Nifas: Tantangan Integrasi Budaya dan Kesehatan Modern Di Masyarakat Dawan. *JUKEJ: Jurnal Kesehatan Jompa*, 4(1), 484–496.
<https://doi.org/10.57218/JKJ.VOL4.ISS1.1619>
- Putri Antika, A., Andriatha, Z., Istarini, A., Kusdiyah, E., (2025). Karakteristik Komplikasi Luaran Janin dan Ibu Hamil yang Menderita Early Onset Preeclampsia (EOPE) dan Late Onset Preeclampsia (LOPE) yang Diterminasi di RSUD Raden Mattaher Jambi. *Quantum Wellness: Jurnal Ilmu Kesehatan*, 2(2), 323–340.
<https://doi.org/10.62383/QUWELL.V2I2.2054>
- Sukrin, P., Agus Mokodompit, E., & Malik, A. (2025). Budidaya Rumput Laut sebagai Sumber Pendapatan Masyarakat Wilayah Pesisir. *Jurnal Ilmu Manajemen Sosial Humaniora (JIMSH)*, 7(1), 92–105.
<https://doi.org/10.51454/JIMSH.V7I1.933>
- Saleh, F., Agussalim, A., Haeruddin, H., M.Aras, N. A., & Vierawan, A. (2024). Karakter Lontara pada Aplikasi Online Sebagai Media Pembelajaran Interaktif Bagi Guru Muatan Lokal Bahasa Daerah di Kabupaten Maros. *Jurnal Idiomatik Jurnal Pendidikan Bahasa Dan Sastra Indonesia*, 7(2), 79–89.
<https://doi.org/10.46918/IDIOMATIK.V7I2.2586>
- SITEPU, M. N. P. (2025). *Hubungan Maternal Self Efficacy Terhadap Depresi Postpartum Di Wilayah Kerja Puskesmas Kedungmundu Semarang*.
- Windarena, D., S., Eka Puji Lestari, H., Purwanintyas, Ayu Purnamasari, I., Fibi Tyas Nurkholifa, (2025). Kenaikan Berat Badan Selama Kehamilan Sebagai Faktor Risiko Preeklampsia: Systematic Review. *Jurnal Keperawatan*, 18(2), 130–142.
<https://doi.org/10.56586/JK.V18I2.487>
- Wisni, A., Murdiyanto, J., Faesol, A., Sari, S., Palupi, A., Afina, H. N., Narendra, S., & Ramadhanti, N. P. (2026). Skrining kesehatan dasar dan edukasi berbasis komunitas. *BEMAS: Jurnal Bermasyarakat*, 6(2), 313–324.
<https://doi.org/10.37373/BEMAS.V6I2.1826>