Association Between Antenatal Education and Maternal Knowledge of Preeclampsia Danger Signs: A Cross-Sectional Study

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| **ABSTRACT****Introduction**: Preeclampsia is a major cause of maternal and infant morbidity and mortality in Indonesia, highlighting the need to improve maternal knowledge of its warning signs. Antenatal education through classes and ANC visits aims to increase awareness and prevent pregnancy complications.**Aim**: To examine the relationship between antenatal education history (class participation and ANC education) and maternal knowledge of preeclampsia danger signs at Buleleng District Hospital.**Study Design**: Cross-sectional analytic study.**Setting and Duration**: Obstetric Outpatient Clinic, Buleleng District Hospital, March 6–April 25, 2025.**Methodology**: Thirty-eight pregnant women with preeclampsia were selected using total sampling. Data were collected via a validated questionnaire and analyzed with Fisher’s Exact test.**Results**: Most respondents were aged 20–35 years (86.8%) and had secondary or higher education. Overall, 60.5% of participants demonstrated a moderate level of knowledge about preeclampsia warning signs. Statistical analysis revealed significant associations between participation in antenatal classes (p=0.000) and receipt of standard education during ANC visits (p=0.001) with higher maternal knowledge levels.**Conclusion**: Antenatal education history is significantly associated with maternal knowledge of preeclampsia danger signs. Strengthening interactive education methods, especially by midwives, is essential to improve maternal awareness and reduce pregnancy-related complications. |

*Keywords:* [*antenatal education, maternal knowledge, preeclampsia warning signs*]

1. INTRODUCTION

Preeclampsia is one of the leading causes of maternal death globally, with an incidence seven times higher in developing countries than in developed countries. According to WHO (2023), preeclampsia accounts for 12% of maternal deaths worldwide. In Indonesia, the incidence of preeclampsia reached 9.4%, while in Bali in 2023, there were 718 cases, with 116 cases in Buleleng Regency (Bali Provincial Health Office, 2023). Preeclampsia also has a serious impact on the fetus, increasing the risk of prematurity, intrauterine growth restriction (IUGR), and low birth weight (LBW) (Sugiantari et al., 2019).

Efforts to prevent preeclampsia in Indonesia are a priority, one of which is through the role of midwives as frontline health workers. According to the Midwife Professional Standard (Ministry of Health RI, 2020), midwives have an important role in providing promotive, preventive, curative, and collaborative services. One of the preventive and promotive efforts carried out by midwives is antenatal education, which includes the participation of pregnant women in prenatal classes and educational sessions during antenatal care (ANC) visits. This antenatal education aims to increase maternal knowledge of pregnancy danger signs, including those of preeclampsia (Andira & Sri Rahayu, 2023; Erawati et al., 2019).

Adequate knowledge is expected to help mothers recognize the initial symptoms of preeclampsia, prevent complications, and encourage compliance with antenatal visits. However, field evidence shows that even mothers who attend antenatal classes and regular ANC examinations may still lack an understanding of preeclampsia signs and symptoms (Tamma et al., 2023). This gap highlights the need to evaluate the effectiveness of antenatal education, both in terms of participation in classes and the quality of education provided during ANC visits.

Therefore, this study aims to analyze the correlation between antenatal education history (participation in antenatal classes and education during ANC visits) and the level of maternal knowledge about the danger signs of preeclampsia in Buleleng Regency. The findings are expected to serve as a basis for improving antenatal education programs to be more effective in reducing maternal complications and mortality caused by preeclampsia.

2. material and methods

2.1 Participants and Survey Procedures

This study used an analytic observational design with a cross-sectional approach, which was carried out on march 6, 2025 to april 25, 2025 at the buleleng district hospital. The sample in this study consisted of 38 pregnant women with preeclampsia who attended the obstetric outpatient clinic at buleleng district hospital and met the inclusion criteria. Participants were selected using a total sampling technique. The inclusion criteria were pregnant women in their second and third trimesters diagnosed with preeclampsia and willing to participate in the study by signing an informed consent. The exclusion criteria were pregnant women with mental or verbal impairments. After obtaining ethical clearance and research permission, data were collected using a structured questionnaire administered directly by the researcher. Research ethics were obtained from the buleleng district hospital, with ethics approval letter number: 04/EC/KEPK-RSB/III/2025.

2.2 Questionnaire

The research instrument used a questionnaire developed and modified based on previous validated instruments (restika riski, 2019) to assess maternal knowledge of preeclampsia warning signs. The questionnaire consisted of 12 true-or-false questions concerning the definition of preeclampsia, risk factors, signs and symptoms, and complications. Respondents’ knowledge level was categorized into three levels based on the total correct answers: good (76–100%), fair (56–75%), and poor (≤55%). Prior to data collection, a validity and reliability test was conducted with 40 respondents outside the study setting. The validity test showed all items were valid with r-count > r-table (0.304), with r-count ranging from 0.310 to 0.513. The reliability test yielded a cronbach's alpha value of 0.843 (>0.6), indicating the instrument was reliable.

2.3 Statistical Analysis

Data were processed and analyzed using spss version 26.0. Descriptive statistics were used to summarize maternal characteristics and level of knowledge. Bivariate analysis was conducted using fisher's exact test to examine the relationship between antenatal education history and maternal knowledge of preeclampsia warning signs.

3. results and discussion

The results of the study showed that most respondents were 20-35 years old (86,8%), had a high school education (78,9%), were employed (78,9%), and multiparous (68,4%). However, more than half of the respondents did not attend antenatal class (55,3%), and almost half received non-standard compliant ANC education (47,4%). The level of maternal knowledge about the danger signs of preeclampsia was mostly in the moderate category (60,5%). The correlation analysis showed that the participation in antenatal class and ANC education quality had a significant correlation with the level of maternal knowledge.

Table 1. Distribution of Respondent Characteristics

| **Characteristics**  | **Frequency****(f)** | **Persentage****(%)** |
| --- | --- | --- |
| **Usia** |  |  |
| <20 and >35 Years | 5 | 13 |
| 20-35 Years>35 Years | 332 | 86,85.3 |
| Total | 38 | 100,0 |
| **Education** |  |  |
| Elementary & Junior High SchoolSenior/Vocational High School | 830 | 21,178,9 |
| Higher Education | 0 | 0 |
| Total | 38 | 100,0 |
| **Jobs** |  |  |
| Unemployed | 8 | 21,1 |
| Employed | 30 | 78,9 |
| Total | 38 | 100,0 |
| **Parity** |  |  |
| Primiparous | 6 | 15,8 |
| Multiparous | 26 | 68,4 |
| Grande Multiparous | 6 | 15,8 |
| Total | 38 | 100,0 |
| **Antenatal Class Participation** |  |  |
| Not Joining | 21 | 55,3 |
| Join | 17 | 44,7 |
| Total | 38 | 100,0 |
| **Education during ANC Visit** |  |  |
| Non-Standard Compliant | 18 | 47,4 |
| Standard Compliant | 20 | 52,6 |
| Total | 38 | 100,0 |
| **Level of Knowledge** |  |  |
| Poor | 0 | 0,0 |
| Moderate | 23 | 60,5 |
| Good | 15 | 39,5 |
| **Total** | **38** | **100,0** |

Table 2 illustrates the bivariate correlation between antenatal education history and the level of maternal knowledge about the danger signs of preeclampsia. Fisher Exact test results showed a significant correlation between participation in antenatal classes and maternal knowledge level (p = 0.000), and between education during ANC visits and maternal knowledge (p = 0.001).

Tabel 2.

Correlation between Antenatal Education History and Maternal Knowledge Level about Preeclampsia Danger Signs

|  |  |  |  |
| --- | --- | --- | --- |
| Variable  | Knowledge | Total | P *Value* |
| Enough | Good |
| F | % | F | % |
| **Antenatal Class Participation** |  |  |  |  |  |
| Did not attend  | 21 | 100,0 | 0 | 0,0 | 21 | 0,000 |
| Follow | 2 | 11,76 | 15 | 88,24 | 17 |  |
| Total | 23 | 60,5 | 15 | 39,5 | 38 |  |
| **Education during ANC Visit** |  |  |  |  |  |
| Non-Standard Compliant | 16 | 88,89 | 2 | 11,11 | 18 | 0,001 |
| Standard Compliant | 7 | 35,00 | 13 | 65,00 | 20 |  |
| Total | 23 | 60,50 | 15 | 39,50 | 38 |  |

The results of this study show that most expectant mothers are in in the range of 20-35 years, which is biologically the optimal reproductive age with a relatively low risk of complications (Tinta et al., 2020). However, most respondents in this group still experienced preeclampsia, indicating that other factors such as stress, lifestyle, and work contributed to the occurrence of complications (Christine, 2018; Khadari, 2025). The majority of respondents also had secondary education and were employed. Formal education plays a role in shaping basic understanding of pregnancy, but access to and engagement in active antenatal education remains a key determinant in improving maternal knowledge (Mattsson et al., 2022; Rachmawati et al., 2021). On the other hand, working mothers may experience barriers to attending antenatal classes or receiving maximum education due to time constraints and workload (Iskandar et al., 2024)

Although most of the respondents were multiparous, this did not necessarily correlate with increased knowledge, as previous pregnancy experience did not necessarily involve a proper understanding of the danger signs of preeclampsia (Khatiwada & Nepal, 2021; ACOG, 2020). This is reinforced by the fact that most respondents in this study had a level of knowledge that was only classified as fair, while the rest were good, and none were classified as poor. This suggests that although basic information has been conveyed, in-depth understanding of preeclampsia still needs to be improved through more effective interventions.

Bivariate analysis in this study emphasized that participation in antenatal classes was significantly associated with the level of maternal knowledge about the danger signs of preeclampsia. Mothers who actively attended classes had better knowledge than those who did not participate. Maternity classes provide a structured, interactive, educational tool that allows for the exchange of experiences between participants, making them an effective medium for improving maternal understanding (Koovimon et al., 2023; Kasmara, 2022). This study also supports the opinion that maternal participation in classes is greater among mothers with higher education and productive age, while housewives tend to be more flexible in attending classes than working mothers (Aljohani & Aljohani, 2020

Furthermore, education during ANC visits also showed a significant correlation with mothers' knowledge level. Mothers who received education according to the standard had more good knowledge. This suggests that ANC visits not only serve as a physical examination, but also as an important moment to convey relevant and comprehensive information about pregnancy complications. Research by Hassen and Lelisho (2022) and Ferdian et al. (2024) confirmed that the quality of counseling during ANC greatly determines the improvement of maternal knowledge. However, the fact that almost half of the respondents did not receive standardized education suggests the need for improvement in the delivery of education in health facilities. The education provided should not be biased based on parity or educational background, because every mother has the right to obtain adequate information (Tjandraprawira & Ghozali, 2019).

The role of midwives as health workers who provide education is very important in supporting the success of antenatal education. Both in antenatal classes and in anc services, midwives need to ensure that the material is delivered communicatively and in accordance with the characteristics of the mother. In accordance with permenkes no. 21 of 2021 and law no. 4 of 2019 concerning midwifery, midwives are required to monitor and provide counseling on pregnancy complications, including preeclampsia, at every stage of service. Continuous and inclusive education can be key in improving maternal knowledge and reducing the risk of pregnancy complications (Rahyani & Suardana, 2018).

These findings are consistent with previous studies emphasizing the critical role of early detection and education in reducing maternal and fetal complications associated with preeclampsia. Iqbal et al. (2020) highlighted that inadequate diagnosis or poor management of preeclampsia can lead to significant adverse feto-maternal outcomes, reinforcing the importance of comprehensive antenatal education as a key preventive measure. Moreover, advances in biomarker-based prediction methods (Alghifari et al., 2023) underscore the need to integrate patient education, clinical screening, and diagnostic innovation to enhance maternal and neonatal health outcomes.

Thus, the findings of this study confirm that improving maternal knowledge about the danger signs of preeclampsia is strongly influenced by active involvement in antenatal classes and the quality of education during anc. These two approaches complement each other in shaping expectant mother awareness of the risk of complications, and are an important part of preventive efforts that should continue to be strengthened in the midwifery service system.

This study has several limitations that should be considered in interpreting the results. Although the cross-sectional design and methodology were appropriate, the relatively small sample size (n=38) and single-center setting limit the generalizability of the findings. Additionally, data were collected solely through questionnaires without direct observation of the education process during ANC visits, restricting assessment of delivery quality, active maternal engagement, communication, and the use of educational media.

Psychological and physical conditions of the mothers (such as fatigue or anxiety) and health service factors (consultation duration, waiting times) were also not analyzed, despite their potential impact on educational effectiveness. Future research with larger, multi-center samples and more comprehensive methods—including direct observation, in-depth interviews, and evaluation of educational materials—is recommended to achieve a more thorough understanding of antenatal education effectiveness in improving maternal knowledge of preeclampsia warning signs.

4. Conclusion

This study confirms that participation in antenatal classes and education during anc visits is significantly associated with better maternal knowledge of preeclampsia warning signs. Strengthening interactive, high-quality education by midwives is essential to improve maternal awareness and reduce the risk of preeclampsia-related complications. Future research with larger, multi-center samples and comprehensive methods is recommended to enhance understanding of antenatal education effectiveness.

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Competing interests

Authors have declared that no competing interests exist.

Authors’ Contributions

Ni Putu Wiryastuti Sri Pratami Devi: conducted data collection and analysis, drafted the manuscript.
Ni Wayan Ariyani: provided guidance during research design and manuscript editing.
I Nyoman Wirata: supervised methodology and contributed to the review and revision of the manuscript.

Consent

As per international standards or university standards, participants’ written consent has been collected and preserved by the author(s).

Ethical approval

This research has received ethical approval from the ethics committee of the buleleng district hospital.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that no generative ai technologies such as large language models (chatgpt, copilot, etc) and text-to-image generators have been used during writing or editing of this manuscript.

References

Alghifari, R. M., Alhusayni, N. I., Alyamani, Z. F., Sabban, A., Almoghrabi, Y., & Bakheit, K. H. (2023). The Role of Biochemical Markers in the Prediction of Preeclampsia. International Journal of Biochemistry Research & Review, 32(8), 39–47. <https://doi.org/10.9734/ijbcrr/2023/v32i8833>

American College of Obstetricians and Gynecologists. (2020). Management of preeclampsia in multiparous women. *Obstetrics & Gynecology*, 135(6), e237–e260. https://doi.org/10.1097/AOG.0000000000003891

Aljohani, A., & Aljohani, S. (2020). The impact of employment status on maternal knowledge during pregnancy. *International Journal of Maternal Health*, 15(2), 112–120. https://doi.org/10.5539/gjhs.v8n9p37

Andira, & Sri Rahayu. (2023). Faktor-faktor yang berhubungan dengan preeklampsia pada ibu hamil trimester III. *Jurnal Sains Dan Kesehatan*, 2(1), 1–8. <https://doi.org/10.57151/jsika.v2i1.63>

Christine, D. (2018). *Preeklampsia dan eklampsia*. Jakarta: CV Budi Utama.

Dinas Kesehatan Provinsi Bali. (2023). Profil Kesehatan Provinsi Bali Tahun 2022. In *book* (Vol. 7, Issue 2)

Erawati, N. S. R. I., Somoyani, N. K., Darmapatni, & Darmapatni, M. W. G. (2019). Pendampingan kelas ibu hamil di UPT. Puskesmas Dawan I Tahun 2016. *Prosiding Poltekkes Denpasar*. <http://repository.poltekkes-denpasar.ac.id/1702/>

Ferdian, D., Hikmat, R., Zuqriefa, A. B., Ma’ruf, T. L. H., Noviana, M., Harahap, S. M. I., Sutanto, H., & Hutapea, M. R. R. (2024). Pengaruh edukasi kesehatan untuk meningkatkan pengetahuan tentang kesehatan mental. *MAHESA: Malahayati Health Student Journal*, 4(5), 2058–2067. <https://doi.org/10.33024/mahesa.v4i5.14585>

Hassen, S. S., & Lelisho, M. E. (2022). Determining factors associated with the prevalence of knowledge, attitude, and practice in seeking skilled maternal healthcare services among women in a remote area of Gesha district. *BMC Health Services Research*, 22(1), 1–13. <https://doi.org/10.1186/s12913-022-08710-y>

Iskandar, I., Syam, A., Fitrianingtyas, D., & Tajriani, T. (2024). The impact of chronic hypertension, kidney disorders, and employment status on preeclampsia in Makassar. *Jurnal Kesehatan Manarang*, 10(3), 238. <https://doi.org/10.33490/jkm.v10i3.1720>

Iqbal, Q. J., Javed, A., Marri, Z. A., & Sabeen, N. (2020). Feto-Maternal Outcome of Pregnancy Complicated with Preeclampsia. Journal of Pharmaceutical Research International, 32(22), 44–48. <https://doi.org/10.9734/jpri/2020/v32i2230770>

Kasmara, Dwi Pratiwi. (2022). Factors affecting knowledge about the danger signs of pregnancy. *INCH Journal of Infant and Child Healthcare*, 1(2), 69–76.

Kementerian Kesehatan RI. (2020a). Profil Kesehatan Indonesia 2020. *In Laporan Tahunan Kesehatan Ibu dan Anak* (Vol. 1, Issue 4). <https://doi.org/10.1080/09505438809526230>

Kementerian Kesehatan RI. (2020b). Pedoman Pelayanan Antenatal Terpadu Edisi Ketiga. In *Qualitative Health Communication* (Vol. 1, Issue 2). <https://doi.org/10.7146/qhc.v1i2.130396>

Kementerian Kesehatan RI. (2020c). Keputusan Menteri Kesehatan Republik Indonesia Nomor HK.01.07/MENKES/320/2020 tentang Standar Profesi Bidan (Vol. 8, Issue 75). https://doi.org/10.1016/j.jnc.2020.125798%0Ahttps://doi.org/10.1016/j.smr.2020.02.002%0Ahttp://www.ncbi.nlm.nih.gov/pubmed/810049%0Ahttp://doi.wiley.com/10.1002/anie.197505391%0Ahttp://www.sciencedirect.com/science/article/pii/B9780857090409500205%0Ahttp:

Kementerian Kesehatan RI. (2021). Pedoman dan Standar Penelitian dan Pengembangan Kesehatan Nasional. *In* *Komisi Etik Penelitian dan Pengembangan Keseheatan Nasional*.

Kementerian Kesehatan RI. (2024). Maternal Perinatal Death Notification (MPDN): Data Kematian Ibu Tahun 2024. Kementerian Kesehatan RI. <https://mpdn.kemkes.go.id/>

Khadari, M. (2025). Expectant management of severe preeclampsia in advanced maternal age with multiple risk factors: a case report. *Cureus*. <https://doi.org/10.7759/cureus.79600>

Khatiwada, S., & Nepal, M. (2021). Devastating outcome of late onset preeclampsia in a multiparous woman: a case report. *Journal of B.P. Koirala Institute of Health Sciences*, 4(2), 41–44. <https://doi.org/10.3126/jbpkihs.v4i2.44373>

Koovimon, P., Kaikaew, K., Mahoree, K., & Bumphenkiatikul, T. (2023). Knowledge of obstetric danger signs and associated factors among pregnant women attending antenatal care services at Thai community hospital. *F1000Research*, 12, 851. <https://doi.org/10.12688/f1000research.131267.2>

Mattsson, K., Juárez, S., & Malmqvist, E. (2022). Influence of socio-economic factors and region of birth on the risk of preeclampsia in Sweden. *International Journal of Environmental Research and Public Health*, 19(7), 4080. <https://doi.org/10.3390/ijerph19074080>

Permenkes. (2021). Peraturan Menteri Kesehatan Republik Indonesia Nomor 21 Tahun 2021 tentang Pelayanan Kesehatan Masa Kehamilan. *Peraturan Menteri Kesehatan Republik Indonesia*, *879*, 2004–2006.

Rachmawati, E., Rahmadhani, F., Ananda, M. R., Salsabillah, S., & Pradana, A. A. (2021). Faktor-faktor yang mempengaruhi pengetahuan keluarga terhadap penyakit hipertensi: Telaah narasi. *Jurnal Mitra Kesehatan*, 4(1), 14–19. https://doi.org/10.47522/jmk.v4i1.98

Rahyani, N. K., & Suardana, W. (2018). Inequity in applying midwifery standards of practice by midwives on early detection and management of maternal neonatal emergency in Denpasar City and Fakfak District, Papua Indonesia. *International Journal of Scientific Research*, 8(12), 895–898. https://doi.org/10.21275/ART20203301

Sugiantari, A. I. M., Surya, I. G. H. W., Aryana, M. B. D., & I. N. G. B. (2019). Karakteristik ibu preeklamsia berat yang melahirkan bayi berat lahir rendah di RSUP Sanglah Denpasar. *E-Jurnal Medika Udayana*, 8(6). <https://jurnal.harianregional.com/eum/id-51734>

Tamma, E., Adu-Bonsaffoh, K., Nwameme, A., Dako-Gyeke, P., Srofenyoh, E., & Browne, J. (2023). Maternal hypertensive mothers’ knowledge, attitudes and misconceptions on hypertension in pregnancy: A multi-center qualitative study in Ghana. *PLOS Global Public Health*, 3(1), e0001456. <https://doi.org/10.1371/journal.pgph.0001456>

Tinta, Y., Polopadang, V., & Rais, M. (2020). Related factors to preeclampsia incidence in pregnant women at Lasinrang Regional Hospital Pinrang. *South Asian Research Journal of Nursing and Healthcare*, 2(1), 12–16. <https://doi.org/10.36346/sarjnhc.2020.v02i01.002>

Tjandraprawira, K. D., & Ghozali, I. (2019). Knowledge of pregnancy and its danger signs not improved by maternal and child health handbook. *Journal of Obstetrics & Gynecology India*, 69(3), 218–224. <https://doi.org/10.1007/s13224-018-1162-0>