

MIDWIFE ANTENATAL CARE QUALITY AS A DETERMINANT OF THE ACCURACY OF EARLY PRE-ECLAMPSIA DETECTION IN PRIMARY HEALTHCARE FACILITIES

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Abstract

Preeclampsia remains an important contributor to maternal mortality and requires early detection through quality Antenatal Care (ANC). This study aimed to analyze midwives' ANC quality as a determinant of early preeclampsia detection accuracy in primary care facilities. A quantitative analytical cross-sectional design was used. The sample consisted of 30 midwives in Madiun Regency selected by total sampling. The instrument was valid, with r values ranging from 0.374 to 0.861 ($> r$ table 0.361), and reliable with Cronbach's α of 0.882. Data were analyzed using Pearson correlation and simple linear regression. ANC quality was significantly related to early preeclampsia detection accuracy ($r = 0.61$; $p = 0.001$), with $\beta = 0.527$ ($p = 0.002$) and $R^2 = 0.31$. ANC quality is a significant determinant of early preeclampsia detection accuracy in primary care facilities.

Keywords: Antenatal Care, Early Detection, Midwives, Preeclampsia

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1. Introduction

Preeclampsia is a form of hypertensive disorder in pregnancy that remains a leading cause of maternal morbidity and mortality in various countries, including Indonesia [1][2]. The global prevalence of preeclampsia in pregnancies is reported to be approximately 4.43% [2]. In Indonesia, hypertensive disorders in pregnancy remain a significant direct cause of maternal mortality [3]. The national Indonesia Pre-eclampsia Study (INAPRES) shows that pregnancies complicated by pre-eclampsia are associated with high rates of complications, preterm birth, and both maternal and perinatal mortality [4]. The 2021 ISSHP recommendations also emphasize the importance of the accurate classification, diagnosis, and management of hypertensive disorders in

pregnancy [5]. This situation underscores the importance of the early detection of preeclampsia through quality antenatal care (ANC) services at the primary care level, particularly by midwives acting as frontline healthcare workers.

Several previous studies have examined the knowledge, attitudes, and perceptions of healthcare workers specifically midwives regarding preeclampsia screening. Qualitative studies have found that midwives' perceptions of screening are influenced by knowledge, experience, and the availability of clinical guidelines [6]. Other studies report that factors related to healthcare workers are associated with the effectiveness of screening implementation in primary care facilities [7]. Training on screening for early-onset preeclampsia risk factors has been shown to improve midwives' knowledge and

support earlier prevention in primary care settings [8]. Thus, strengthening midwife competence is a crucial component in the implementation of early detection of preeclampsia at primary care facilities.

In the context of service quality, the quality of Antenatal Care (ANC) is measured not only by the number of visits but also by the completeness and consistency with which clinical screening indicators relevant to preeclampsia are implemented. In accordance with maternal health service regulations and the Maternal and Child Health (MCH) Handbook, ANC services must be delivered in a comprehensive and standardized manner, be properly documented, and be integrated with the referral system [9][10]. Integrated antenatal care also emphasizes aspects of input, process, and output, including resource availability, the implementation of the "10T" services, and record-keeping and reporting [11]. In this study, the preeclampsia screening indicators were defined as twelve specific measures: maternal age, obstetric history, medical history or comorbidities, blood pressure measurement, urine protein testing, assessment of preeclampsia symptoms, assessment of preeclampsia history, body mass index (BMI) assessment, measurement or calculation of mean arterial pressure (MAP), education on pregnancy danger signs, education on the importance of regular antenatal care (ANC), and documentation of screening results in the Maternal and Child Health (MCH) handbook or medical records. Thus, the implementation of these preeclampsia screening indicators can be viewed as a reflection of the quality of ANC provided by midwives within the context of service quality.

Several previous studies have explored the factors influencing the early detection of preeclampsia. Factors related to healthcare workers including knowledge, attitudes, and clinical experience play a role in optimizing preeclampsia screening [6][7]. Training

on risk factor screening has been shown to improve midwives' knowledge, while an evaluation of the Ministry of Health's scoring system indicates that screening for risk factors at a gestational age of less than 20 weeks can help predict the occurrence of early-onset preeclampsia in primary care settings [8][12]. However, most of this research tends to focus separately on individual cognitive aspects, screening methods, or scoring systems, and has not extensively examined the quality of the ANC service process as a unified clinical determinant. This study addresses that gap by focusing its analysis on the quality of ANC standard implementation as a direct determinant of detection accuracy.

Although various studies have addressed midwives' knowledge, attitudes, and perceptions regarding preeclampsia screening and evaluated specific screening methods such as mean arterial pressure (MAP) assessment research specifically analyzing the quality of midwives' antenatal care (ANC) based on the completeness of preeclampsia screening indicator implementation in primary care facilities remains limited [12][13][14][15]. In fact, the completeness of blood pressure measurements, proteinuria checks, MAP assessments, risk factor evaluations, and documentation in the Maternal and Child Health (KIA) handbook is crucial for the accurate identification of preeclampsia risk. In Madiun Regency, independent practicing midwives and midwives at community health centers (Puskesmas) are key players in antenatal care (ANC) services; however, quantitative data regarding the relationship between ANC quality and the accuracy of early preeclampsia detection remains limited.

Based on this background, this study aims to analyze the quality of antenatal care (ANC) provided by midwives as a determinant of the accuracy of early preeclampsia detection in primary care facilities. The study evaluates ANC quality and the accuracy with which twelve preeclampsia screening indicators are implemented,

subsequently examining the relationship and impact of ANC quality on the accuracy of early detection. The findings are expected to serve as a basis for enhancing midwife capacity, improving maternal health program supervision, providing screening facilities, and strengthening recording and referral systems within primary care.

2. Method

This study employs an analytical quantitative design with a cross-sectional approach. It was conducted from September to October 2025 at primary healthcare facilities in Madiun Regency. The study population consisted of 30 midwives providing antenatal care (ANC) services at independent midwife practices, community health centers (Puskesmas), and primary or private clinics with high antenatal care coverage. A total sampling technique was used because the number of eligible midwives was relatively limited, making it feasible to include the entire population. Inclusion criteria comprised midwives who had been actively providing ANC services for at least the past year, were willing to participate as respondents, and possessed documented ANC records for pregnant women (either in Maternal and Child Health [KIA] booklets or medical records). Exclusion criteria included midwives who were on extended leave or not actively practicing during the data collection period.

The independent variable in this study is the quality of antenatal care (ANC) provided by midwives, while the dependent variable is the accuracy of early preeclampsia detection. The operational definition of midwife-provided ANC quality is the degree to which the antenatal services delivered align with service standards and preeclampsia risk screening protocols, encompassing assessment, clinical examination, education, and documentation. ANC quality was measured using a structured questionnaire and an observation checklist. Each item performed in

accordance with standards was assigned a score of 1, whereas items not meeting standards or not performed were assigned a score of 0. The total ANC quality score was converted into a percentage using the formula: $(\text{score obtained} / \text{maximum score}) \times 100\%$. The categorization thresholds for ANC quality were established as follows: "good" for scores of 76–100%, "adequate" for scores of 56–75%, and "poor" for scores below 56%.

The operational definition of accuracy in the early detection of preeclampsia refers to the extent to which midwives correctly perform preeclampsia screening based on 12 indicators: maternal age during pregnancy; pregnancy history/parity; history of medical conditions or hypertension; blood pressure measurement; calculation of mean arterial pressure (MAP); urine protein testing; assessment of preeclampsia symptoms; history of preeclampsia; body mass index (BMI) assessment; education on danger signs; education on the importance of regular antenatal care (ANC); and documentation of screening results in the Maternal and Child Health (MCH) handbook or medical records. Each indicator is assigned a score of 1 if performed and fully documented, and a score of 0 if not performed or not documented. The total score for preeclampsia early detection accuracy ranges from 0 to 12. The accuracy categories are defined as follows: "accurate" for scores of 10–12 (equivalent to 76–100%), "moderately accurate" for scores of 7–9 (56–75%), and "inaccurate" for scores of 0–6 (less than 56%). Numerical scores for both variables are used in Pearson correlation and simple linear regression analyses, while the categories are used to present frequency distributions and percentages.

The research instruments were developed based on regulations regarding maternal health services, the Maternal and Child Health (MCH) Handbook, and literature concerning preeclampsia screening [9,10,12-15].

Validity and reliability testing was conducted prior to data collection. Content validity for the ANC quality questionnaire and the observation sheet regarding the accuracy of early preeclampsia detection was assessed through expert review by specialists in midwifery and research methodology. Empirical validity of the instrument items was tested using Pearson Product Moment correlation with 30 respondents at a 5% significance level. Validity test results indicated that all items were valid, with calculated r-values ranging from 0.374 to 0.861, exceeding the critical r-table value of 0.361. Instrument reliability was analyzed using Cronbach's alpha, yielding a value of 0.882; the instrument was thus deemed reliable as it surpassed the minimum threshold of 0.70. Consequently, the questionnaire and observation sheet were considered suitable for measuring midwives' ANC quality and the accuracy of early preeclampsia detection. Data were collected through midwife-completed questionnaires and by reviewing ANC documentation in MCH Handbooks or medical records. Data were analyzed descriptively using frequency distributions and percentages. Inferential analysis involved the Pearson correlation test to assess the relationship between ANC quality scores and early preeclampsia detection accuracy scores, as well as simple linear regression to measure the extent of the influence of ANC quality on detection accuracy. All research procedures adhered to ethical principles for health research, including informed consent, data confidentiality, and respect for respondent autonomy.

3. Results and Discussion

Table 1. Distribution of demographic characteristics of midwives in primary care facilities in 2025

Characteristics	f (%)
Age	
21-30 year	8 (26,7)
31-40 year	12 (40,0)
41-50 year	7 (23,3)

>50 year	3 (10,0)
last education	
Diploma III in Midwifery	17 (56,7)
Diploma IV/Bachelor's Degree in Midwifery	8 (26,7)
The Midwifery Profession	5 (16,6)
Practice location	
Community Health Center	18 (60,0)
Primary/private clinic	5 (16,7)
Independent midwifery practice (PMB)	7 (23,3)

Based on Table 1, the respondents' characteristics indicate that the largest group of midwives falls within the 31–40 age range (12 individuals or 40.0%), followed by the 21–30 age group (8 individuals or 26.7%), the 41–50 age group (7 individuals or 23.3%), and those over 50 years of age (3 individuals or 10.0%). These findings suggest that the majority of respondents are in a productive and professionally mature age group, implying potential for substantial clinical experience in providing Antenatal Care (ANC) services. Regarding educational background, the majority held a Diploma III (D3) in Midwifery (17 individuals or 56.7%), followed by those with a Diploma IV (D4) or Bachelor's degree (S1) in Midwifery (8 individuals or 26.7%) and those with a Professional Midwife qualification (5 individuals or 16.6%). In terms of practice setting, the majority worked at Community Health Centers (Puskesmas) (18 individuals or 60.0%), while 7 individuals (23.3%) practiced at Independent Midwife Practices (PMB) and 5 individuals (16.7%) worked at primary or private clinics.

Table 2. Distribution of midwife-provided antenatal care quality in primary care facilities in 2025

ANC Quality	f (%)
Good	18 (60,0)
Fair	10 (33,3)

Poor	2 (6,7)
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Based on Table 2, the quality of ANC provided by midwives shows that the majority of respondents fell into the "good" category, comprising 18 individuals (60.0%). Ten respondents (33.3%) fell into the "fair" category, while two (6.7%) were in the "poor" category. These results indicate that the quality of ANC provided by midwives in primary care facilities in Madiun Regency is generally at a relatively good level. However, the presence of midwives in the "fair" and "poor" categories indicates that service quality is not yet fully consistent, highlighting the need for continued, consistent reinforcement of service standards.

Table 3. Distribution of the accuracy of early preeclampsia detection by midwives in primary care facilities in 2025

Accuracy category	f (%)
Accurate	17 (56,7)
Moderately Accurate	11 (36,6)
Inaccurate	2 (6,7)

Based on Table 3, the accuracy of early preeclampsia detection by midwives shows that 17 respondents (56.7%) fell into the accurate category, 11 respondents (36.6%) were moderately accurate, and 2 respondents (6.7%) were inaccurate. These findings indicate that the majority of midwives are capable of effectively performing early preeclampsia detection; however, variations in accuracy persist, suggesting gaps in the implementation of specific screening indicators.

Table 4. Results of the analysis of ANC quality regarding the accuracy of early preeclampsia detection

Analysis	Results
Pearson correlation	$r = 0,61$; $p = 0,001$
Linear regression	$\beta = 0,527$; $p = 0,002$; $R^2 = 0,31$

Based on Table 4, the Pearson correlation test results show an r-value of 0.61 ($p = 0.001$). This indicates a strong, significant positive relationship between the quality of ANC provided by midwives and the accuracy of early preeclampsia detection. In other words, the higher the quality of ANC provided by midwives, the greater the accuracy in the early detection of preeclampsia. Simple linear regression analysis yielded values of $\beta = 0.527$, $p = 0.002$, and $R^2 = 0.31$. This means that the quality of ANC provided by midwife accounts for 31% of the variation in the accuracy of early preeclampsia detection, while the remaining 69% is influenced by factors outside the research model.

The results of this study confirm that the quality of the service process plays a crucial role in determining the accuracy of clinical screening. Empirically, the more optimally ANC components including clinical examinations, education, and documentation are implemented, the greater the accuracy in identifying preeclampsia risk. These findings align with research indicating that training and skills strengthening for midwives can enhance knowledge and preeclampsia screening capabilities in primary care settings [8]. An evaluation of the Ministry of Health's scoring system also shows that risk factor screening implemented in primary care settings can help identify groups of pregnant women at risk [12].

The findings of this study are also consistent with studies stating that factors related to healthcare workers including knowledge, attitudes, experience, and system support play a role in the implementation of preeclampsia screening [6][7]. Thus, the quality of ANC is determined not only by the execution of clinical procedures but also by human resource capacity and service support systems. In primary care practice, the accuracy of early detection relies heavily on midwives' adherence to performing blood pressure checks, urine protein testing, symptom assessment,

MAP measurement, education on danger signs, and documentation of screening results.

From the perspective of clinical mechanisms, the accuracy of early preeclampsia detection relies heavily on the comprehensive use of risk indicators. A combination of maternal factors, mean arterial pressure (MAP), proteinuria, and first-trimester screening approaches can enhance the ability to detect preeclampsia risk [12][13][14][15]. This is relevant to the study's findings, as there were still respondents with only adequate or inaccurate detection accuracy; this may be linked to the suboptimal implementation of follow-up assessments, such as proteinuria and MAP checks.

From an analytical perspective, the quality of Antenatal Care (ANC) must be understood as a multidimensional concept encompassing technical aspects, healthcare provider behavior, and the service system. The technical dimension involves the accuracy of clinical examinations; the behavioral dimension covers knowledge and adherence to standards; and the system dimension includes the availability of screening tools, record-keeping, supervision, and referral mechanisms. Deficiencies in any of these dimensions can compromise the effectiveness of early detection. Therefore, efforts to improve ANC quality must be comprehensive, involving not only the enhancement of midwives' knowledge but also the provision of adequate examination equipment and documentation systems.

An R^2 value of 0.31 indicates that the quality of ANC explains a portion of the variation in the accuracy of early preeclampsia detection. This implies the existence of other factors not yet examined, such as midwife workload, pregnant women's adherence to ANC visits, the availability of examination equipment, policy support, and the effectiveness of the referral system. Findings regarding the implementation of integrated ANC indicate that input factors, service processes, and record-

keeping and reporting practices can influence antenatal service outcomes [11]. This study has limitations due to its cross-sectional design, relatively small sample size, and restriction to a single region; therefore, the findings should be generalized with caution. Future research is recommended to employ longitudinal or experimental designs, involve larger sample sizes, and incorporate systemic variables such as facilities, supervision, and referral systems.

4. Conclusion

This study demonstrates that the quality of antenatal care (ANC) provided by midwives has a significant relationship with and influence on the accuracy of early preeclampsia detection in primary care facilities. Higher quality ANC encompassing clinical examinations, education, and documentation correlates with greater accuracy among midwives in identifying preeclampsia risks at an early stage. Although most midwives demonstrated good service quality, variations in detection accuracy persist, indicating gaps in the implementation of screening standards, particularly regarding proteinuria testing and mean arterial pressure assessment. Therefore, comprehensive improvements to ANC quality are required, involving capacity building for midwives, the provision of adequate screening facilities, optimized documentation, and strengthened referral systems. These efforts are expected to enhance the effectiveness of early preeclampsia detection and contribute to reducing maternal morbidity and mortality within primary care settings.

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