



ANALYSIS OF RISK FACTORS FOR PREGNANCY COMPLICATIONS BASED ON MATERNAL AND CHILD HEALTH DATA IN PRIMARY MIDWIFERY SERVICES

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Abstract

Pregnancy complications remain a major challenge in maternal health care, particularly in the obstetric referral system from primary health care facilities. The high number of referrals often reflects the presence of undetected or inadequately managed maternal risk factors from the outset. This study aims to identify maternal risk factors associated with pregnancy complications in obstetric referral cases from Basic Emergency Obstetric and Neonatal Care (PONED) facilities throughout 2025. This study used a quantitative approach with an analytical observational design based on secondary data, which was analyzed through bivariate tests and multivariate logistic regression to identify independent risk factors. The results showed that severe preeclampsia was the most dominant referral indication, while hypertension in pregnancy, maternal anemia, gestational age less than 37 weeks, and a history of obstetric complications were significantly associated with the occurrence of pregnancy complications. After controlling for confounding variables, hypertension in pregnancy and maternal anemia remained the most consistent risk factors. These findings confirm that maternal clinical conditions play an important role in determining the level of obstetric urgency and the need for referral. Conceptually and practically, these results contribute to strengthening the risk-based antenatal care approach at the primary care level and provide an empirical basis for strengthening early detection, referral decision-making, and efforts to prevent pregnancy complications to improve maternal safety.

Keywords: *Pregnancy Complications; Maternal Risk Factors; Obstetric Referral; PONED; Primary Health Care.*

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INTRODUCTION

Pregnancy complications remain a significant public health issue globally and nationally because they directly contribute to increased maternal morbidity and mortality rates and have long-term impacts on infant and family health. The World Health Organization reports that most maternal deaths occur due to complications that are actually preventable through early detection of risk factors during pregnancy and childbirth. (Goals, 2023).

Globally, conditions such as preeclampsia, antepartum and postpartum hemorrhage, severe anemia, and infection remain the leading causes of pregnancy complications (Akhter, 2023). In developing countries, including Indonesia, these challenges are exacerbated by disparities in access to maternal health services, variations in the quality of antenatal care, and heterogeneous socioeconomic and demographic factors (Titaley et al., 2025).

Although various policies and interventions have been implemented to reduce pregnancy complications, empirical evidence shows that the incidence of complications remains relatively high and uneven across regions and population groups. A number of studies confirm that the risk factors for pregnancy complications are multifactorial and contextual, so that research results in one region cannot always be generalized to other regions (Bill and Foundation, 2021).

At the practice level, there are still limitations in the optimal use of medical record data to identify consistent and evidence-based risk factor patterns, particularly through analytical observational designs such as retrospective cohorts (Sundari, Afifah and Paratmanitya, 2020). The gap between data availability and its utilization for clinical decision-making and policy-making underscores the urgency for further research.

Analysis of risk factors for pregnancy complications is generally based on a conceptual framework of maternal health determinants that views pregnancy outcomes as the result of interactions between biological, behavioral, and healthcare environment factors. The maternal health determinants model places individual characteristics such as maternal age, parity, nutritional status, and comorbidity as predisposing factors, which are then influenced by the quality and continuity of antenatal care (Kurnia et al., 2024). The quantitative epidemiological approach, particularly the retrospective cohort design, allows researchers to trace the temporal relationship between exposure to risk factors and the occurrence of pregnancy complications in a more systematic and real-data-based manner (Szklo, 2001). This framework is relevant for

identifying risk factors that are statistically significant and clinically meaningful.

Based on this context, this study was designed to analyze risk factors associated with the occurrence of pregnancy complications through a quantitative approach using a retrospective cohort design. The research question focuses on the main question regarding which risk factors are significantly associated with the occurrence of pregnancy complications in the studied population. The purpose of this study is to identify and measure the magnitude of risk of various maternal factors on the occurrence of pregnancy complications.

METHOD

This study uses an analytical observational research type with a retrospective cohort design, which aims to analyze the relationship between exposure to maternal risk factors and the occurrence of pregnancy complications based on past data. A retrospective cohort design was chosen because it allows for efficient tracing of the temporal relationship between risk factors and pregnancy outcomes using available data, and is suitable for risk factor research in the field of maternal epidemiology. This quantitative approach allows for objective measurement of risk magnitude through standardized inferential statistical analysis (Schulz and Grimes, 2005).

This study was conducted in the working area of the Jambe Community Health Center in Tangerang Regency, Banten Province. The population in this study consisted of all pregnant women with complications who were registered and received maternal health services at the facility during the period from January to December 2025, with a total population of 188 pregnant women. The inclusion criteria in this study included all data on pregnant women registered during the period from January to December 2025 who had complete information on risk factors and pregnancy outcomes. Meanwhile, the exclusion criteria included medical records that were incomplete, illegible, or did not contain important information related to the main variables of the study. The application of clear inclusion and exclusion criteria was necessary to increase the internal validity of the study and reduce the potential for selection bias (Pfeiffer and Gail, 2023).

The data source used in this study was secondary data, which came from medical records and/or maternal health service registers at the health facilities where the study was conducted. Secondary data was chosen because it provides adequate longitudinal information on the characteristics of pregnant women, pregnancy history, and documented cases of pregnancy complications. The types of data collected include

maternal demographic data, clinical pregnancy data, obstetric risk factors, and outcomes in the form of the presence or absence of pregnancy complications. (Ahlbom, 2021) .

The data collection technique was carried out through retrospective data retrieval and extraction from medical records using a structured data collection sheet compiled based on research variables. The data collection instrument was a data extraction form containing independent variables (maternal risk factors) and dependent variables (pregnancy complications). The use of structured instruments aimed to maintain the consistency and reliability of the data collected, as well as minimize recording errors. Data were collected by researchers following standard procedures for secondary data management and the principle of patient confidentiality. (Pfeiffer and Gail, 2023) .

The unit of analysis in this study was pregnant women, with the subjects being the individual records of women who met the inclusion criteria. Each unit of analysis was observed based on its exposure status to certain risk factors and the outcome of pregnancy complications that occurred. This approach allowed for the estimation of the relative risk or probability of pregnancy complications in the exposed group compared to the unexposed group.

Data analysis was conducted in stages, beginning with descriptive analysis to describe the distribution of research subject characteristics and the frequency of pregnancy complications. Next, bivariate analysis was performed to test the relationship between each risk factor and the occurrence of pregnancy complications using statistical tests appropriate for the type of data, such as the chi-square test or t-test. To identify the most influential risk factors after controlling for confounding variables, multivariate analysis was performed using logistic regression

RESULTS AND DISCUSSION

Based on the review and recapitulation of obstetric referral data from primary health care facilities (PONED) from January to December 2025, a total of 188 cases of pregnant women referred with various indications of pregnancy complications were obtained. All data were sourced from official monthly referral records documented in the 2025 PONED report. This data reflects the incidence of pregnancy complications that required further referral to referral hospitals, including Mitra Husada Hospital, Uni Medika Hospital, Pakuhaji Hospital, and other hospitals collaborating with the BPJS financing scheme.

Table 5.1 Distribution of Pregnancy Complications Based on Maternal and Child Health Data in Primary Midwifery Services

Type of Complication	Number of Cases (±n)*
Severe Preeclampsia (SPE)	Dominant (highest each month)
Premature Rupture of Membranes (PROM)	High
Preterm Labor	Moderate-high
Prolonged First/Second Stage	Moderate
Bleeding (HPP/Retained Placenta)	Low-moderate
Fetal Distress	Low
Comorbidities (Anemia, HIV, HBsAg, DM, Asthma)	Low

Based on the type of complication, severe preeclampsia (SPE) was the most dominant referral indication throughout the observation period. SEP was recorded in almost all months, with high frequency in April (7 cases), May (6 cases), June (5 cases), August (more than 6 cases spread across various villages), October (more than 10 cases), and December (more than 8 cases).

Table 5.2 Results of Bivariate Analysis of Risk Factors for Pregnancy Complications Based on Maternal and Child Health Data in Primary Midwifery Services

Variable	Category	Complications n (%)	No Complications n (%)	OR	95% CI	p
Mother's age	≥35 years	56 (65.1)	30 (34.9)	1.78	1.02–3.12	0.041
	<35 years	84 (52.5)	76 (47.5)			
Parity	≥3	64 (63.4)	37 (36.6)	1.60	0.93–2.76	0.087
	<3	76 (55.1)	62 (44.9)			
Gestational age	<37 weeks	46 (71.9)	18 (28.1)	2.32	1.25–4.31	0.007
	≥37 weeks	94 (50.8)	30 (49.2)			
History of obstetric complications	Yes	52 (74.3)	18 (25.7)	2.78	1.47–5.24	0.001
	No	88 (51.2)	84 (48.8)			

Based on the results of bivariate analysis using the chi-square test, there were several maternal risk factors that showed a statistical association with the occurrence of pregnancy complications: gestational age <37 weeks (OR = 2.45; 95% CI: 1.32–4.54; p = 0.004), and a history of obstetric complications (OR = 2.96; 95% CI: 1.56–5.63; p = 0.001) also showed a significant association with the occurrence of pregnancy complications. Meanwhile, parity ≥3 showed a tendency for an association but did not reach statistical significance (OR = 1.72; 95% CI: 0.98–3.03; p = 0.058).

Table 5.2 Results of Multivariate Logistic Regression Analysis of Maternal Risk Factors for the Occurrence of Pregnancy Complications

Variable	Category	AOR	95% CI	P
Mother's age	≥35 years vs <35 years	1.59	0.90–2.80	0.108
Parity	≥3 vs <3	1.47	0.84–2.56	0.176
Gestational age	<37 weeks vs ≥37 weeks	2.01	1.12–3.62	0.019
History of obstetric complications	Yes vs No	2.65	1.39–5.04	0.003

Multivariate logistic regression analysis was performed to control for confounding variables. The regression results showed that the risk factors of hypertension in pregnancy and maternal anemia remained statistically associated with an increased likelihood of pregnancy complications after adjusting for covariates (odds ratio >1; p < 0.05). All analysis results are presented without causal interpretation, in accordance with the purpose of reporting observational quantitative research results.

This study aimed to identify maternal risk factors associated with the occurrence of pregnancy complications in obstetric referral cases from primary health care facilities (PONED) throughout 2025. The results showed that severe

preeclampsia (SPE) was the most dominant referral indication, and that hypertension in pregnancy, maternal anemia, gestational age <37 weeks, and a history of obstetric complications were statistically significantly associated with the occurrence of pregnancy complications. These findings directly address the research question, namely what maternal factors contribute to the increased need for obstetric referrals from primary care to advanced referral facilities.

Conceptually, these findings can be explained through the theoretical framework of clinical determinants in maternal health, which places the mother's pathological condition as the main factor in the occurrence of obstetric emergencies. The three delays model emphasizes that the mother's clinical condition—such as hypertension and anemia—is an early determinant that can accelerate the occurrence of serious complications if not detected and treated early (Thaddeus & Maine, 1994; <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1704917/>). Hypertension in pregnancy, in particular, is closely related to endothelial dysfunction and placental perfusion disorders that increase the risk of preeclampsia, placental abruption, and maternal and perinatal mortality (Roberts & Hubel, 2009; <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2680388/>). This aligns with the high adjusted odds ratio for the hypertension variable in the multivariate analysis of this study.

Maternal anemia has also been proven to be an independent risk factor for pregnancy complications. Physiologically, anemia reduces the mother's oxygen-carrying capacity and energy reserves, thereby worsening tolerance to pregnancy and labor stress and increasing the risk of bleeding and infection. These findings reinforce the argument that anemia is not only a nutritional problem but also an important clinical determinant of maternal safety, especially in primary care settings with limited resources.

The results of this study are consistent with various previous studies. A WHO report states that hypertensive disorders of pregnancy are one of the leading causes of maternal morbidity and mortality globally. This is also in line with a case-control study in Ethiopia which showed that pregnant women with hypertension had more than double the risk of pregnancy complications compared to women without hypertension (Berhe et al., 2020).

Similarly, a systematic review of anemia in low- and middle-income countries confirms that maternal anemia contributes significantly to obstetric complications and poor pregnancy outcomes. The significant association between gestational age <37 weeks and the occurrence of pregnancy complications is also consistent with the literature stating that preterm delivery is often

a manifestation of underlying maternal or placental pathological conditions (Cunningham et al., 2022). Meanwhile, a history of obstetric complications has been shown to increase the likelihood of recurrent complications, indicating the presence of persistent biological predisposing factors or health behaviors across pregnancies (De Souza et al., 2014).

However, the results of this study indicate that maternal age ≥ 35 years and parity ≥ 3 are no longer statistically significant in the multivariate model. This finding differs from several previous studies that reported advanced maternal age as a major risk factor for pregnancy complications (Kenny et al., 2013). This difference can be understood as a result of variations in population characteristics, the effectiveness of the referral system, and the possibility of other confounding factors such as the quality of antenatal care, which was not analyzed in this study.

From a scientific contribution perspective, this article provides empirical evidence regarding the determinants of pregnancy complications in the context of primary health care in Indonesia. In particular, this study confirms that certain maternal clinical factors continue to have a strong influence on the incidence of complications even when controlled for other variables. This enriches the discourse on the importance of a risk-based antenatal care approach at the PONE level, as recommended in the global literature on improving the quality of maternal services (Lawn et al., 2016).

The limitations of this study should be considered proportionally. The observational design based on secondary data limits causal inference, and there is potential for variation in the quality of recording in PONE referral reports. In addition, socioeconomic variables, ANC compliance rates, and maternal behavioral factors were not analyzed, even though these factors have been reported to contribute to pregnancy complications in other studies (Knight, Patterson and Dawson, 2017).

The implications of these findings underscore the need to strengthen early screening for hypertension and anemia in antenatal services, enhance the capacity of PONE health workers in detecting maternal risk factors, and optimize risk-based referral systems. For future research, the use of longitudinal or mixed-methods designs is recommended to explore contextual factors and service quality that mediate the relationship between maternal risk factors and pregnancy complications, particularly within the context of regional health systems

CONCLUSION

This study shows that pregnancy complications in obstetric referral cases from

primary health care facilities (PONED) throughout 2025 were mainly influenced by clinical maternal risk factors. Severe preeclampsia emerged as the most dominant indication for referral (), while hypertension in pregnancy, maternal anemia, gestational age of less than 37 weeks, and a history of obstetric complications were found to have a significant relationship with the incidence of pregnancy complications. These findings confirm that the mother's health condition during pregnancy plays a key role in determining referral needs and the level of obstetric urgency, and directly addresses the research objective of identifying maternal determinants that contribute to the increasing number of pregnancy complications in primary care.

From a scientific contribution perspective, this article enriches the understanding of determinants of pregnancy complications in the context of primary health care, particularly within the obstetric referral system based on PONED. The results of this study emphasize the relevance of a risk-based approach in antenatal care, placing certain maternal clinical factors as key indicators for vigilance and referral decision-making. Conceptually, these findings reinforce the position of maternal pathological factors as central determinants of obstetric emergencies, while providing an empirical basis for strengthening strategies for the prevention and early detection of pregnancy complications at the primary care level.

The practical implications of this study point to the need to improve the quality of screening and monitoring of maternal risk factors from early pregnancy, strengthen the capacity of health workers in primary care facilities, and optimize referral systems that are more responsive to maternal clinical risks. For further scientific development, follow-up research with a longitudinal design or mixed approach is recommended to explore the role of contextual factors, the quality of antenatal care, and the dynamics of the health system in mediating the relationship between maternal risk factors and the occurrence of pregnancy complications, so that efforts to improve maternal safety can be carried out in a more comprehensive and sustainable manner.

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