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Determinants of preeclampsia in pregnant women

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Abstract

Background: Preeclampsia is a serious pregnancy complication and a major contributor to maternal and fetal morbidity and mortality worldwide, including in Indonesia. This condition is generally characterized by hypertension that appears after >20 weeks of gestation, accompanied by proteinuria, and can progress to eclampsia if not treated appropriately.

Purpose: to determine the relationship between age, parity, gestational age, and occupation with the incidence of preeclampsia in pregnant women.

Method: Study quantitative with a cross-sectional design. The sample consisted of 58 pregnant women with preeclampsia and was selected using a total sampling technique. Bivariate analysis was performed using the chi-square test and odds ratio (OR).

Results: The results showed a significant relationship between age ($p = 0.002$; OR = 6.222), parity ($p = 0.002$; OR = 6.182), and gestational age ($p = 0.003$; OR = 7.104) with the incidence of preeclampsia. Meanwhile, there was no significant association between occupation and the incidence of preeclampsia ($p = 0.227$; OR = 0.577).

conclusion: there is a significant association between age, parity, and gestational age with the incidence of preeclampsia. It is hoped that health workers can improve early detection and more intensive monitoring of high-risk pregnant women based on age, parity, and gestational age to prevent the progression of preeclampsia to more severe conditions.

Keywords: Age; Gestational Age; Occupation; Parity; Preeclampsia.

INTRODUCTION

Preeclampsia is a serious complication of pregnancy and remains a leading cause of maternal and fetal morbidity and mortality worldwide. This condition is generally characterized by an increase in blood pressure after 20 weeks of pregnancy, accompanied by proteinuria, and in severe cases, can develop into eclampsia if not treated appropriately (Prawiroharjo, 2028; Indonesian Society of Obstetricians and Gynecologists, 2012). Approximately 810 mothers die every day due to pregnancy and childbirth complications, with pre-eclampsia being one of the leading causes. In Indonesia, the Ministry of Health (2024) noted that of the 4.482 maternal deaths that occurred in 2023, preeclampsia accounted for 412 cases (9.2%), ranking second after obstetric hemorrhage. Pathophysiologically, preeclampsia is caused by disturbances in the remodeling process of the spiral arteries in the placenta, leading to placental hypoperfusion, the release of free radicals, and endothelial activation (World Health Organization. (2023).

This endothelial activation causes increased vascular permeability and systemic vasospasm, resulting in hypertension and organ dysfunction (Leveno, Bloom, Spong, Dashe, Hoffman, Casey, & Sheffield, 2014). Several risk factors for preeclampsia have been identified, including maternal age (<20 or >35 years), parity (primipara and grandemultipara), third trimester of pregnancy, occupation, history of hypertension, multiple pregnancies, and nutritional status (Dartiwen & Nurhayati, 2019; Fajriah, 2021; Winkjosastro, 2015). Previous studies have shown that maternal age ($p = 0.002$) (Az-Zahra, Sasmito, & Maryanti, 2025). and gestational age ($p = 0.003$) (Marniarti et al., 2016). are significantly associated with preeclampsia. However, employment was not significantly related ($p = 0.227$) (Khayati & Veftisia, 2018).

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Preeclampsia is a disease characterized by hypertension, edema, and proteinuria that occurs during pregnancy. An estimated 800 women die each day from complications of pregnancy and childbirth. Approximately 99% of all maternal deaths occur in developing countries. Approximately 80% of maternal deaths are due to increased complications during pregnancy, labor, and the postpartum period. Risk factors that can increase the incidence of preeclampsia include parity, a history of hypertension, and the spacing of pregnancies (Putri, Setyawati, Saleha, & Situmorang, (2023). The maternal mortality rate (MMR) is one indicator of women's health. The latest WHO report, published in 2018, estimates that preeclampsia contributes to 70,000 maternal deaths and 500,000 infant deaths annually worldwide (Rakhmawati & Wulandari, 2021).

Previous research using literature review after selection obtained five journals to be reviewed, four journals were cross-sectional studies, and one other journal was a case control study. The conclusion of this study Risk factors for preeclampsia in pregnant women include a history of hypertension, a history of preeclampsia, age, BMI, parity, stress, knowledge, completeness of ANC, diet and exposure to cigarette smoke (Rahmawati, Amalia, Kahar, Rahayu, Nurfadillah, Samuel, & Situmorang, 2022).

According to the 2023 Lampung Province Health Profile, the number of maternal deaths has increased again from 96 in 2022 to 105 in 2023. The causes of maternal deaths in Lampung Province in 2023 were hemorrhage (36 cases), preeclampsia (24 cases), infection (4 cases), heart and blood vessel disorders (10 cases), autoimmune disorders (1 case), cerebrovascular disorders (1 case), Covid-19 cases, and other

causes in 28 cases. Of the 105 maternal deaths, 24 were caused by pre-eclampsia (Lampung Provincial Health Office, 2024).

RESEARCH METHOD

This study is quantitative and cross-sectional. The purpose of this study is to determine the determinants of preeclampsia among pregnant women, based on age, parity, gestational age, and occupation, at Dr. H. Abdul Moeloek Regional General Hospital in Lampung Province. The subjects of this study were 58 pregnant women with preeclampsia at Dr. H. Abdul Moeloek Regional General Hospital. The sampling technique used was a total sampling of 58 pregnant women. Data collection in this study used secondary data from medical records, which were then recorded in a checklist.

Data collection was conducted after the researchers obtained the institution's permission. After obtaining a letter of permission from the institution, the researcher submitted a research ethics proposal and then requested permission from the hospital to conduct the research. After obtaining approval from the hospital, the researcher requested permission from the person in charge of the medical records room by explaining the researcher's intentions and objectives. If approved, the researcher would identify respondents through medical records and document them using a checklist. The data were analyzed using univariate and bivariate analysis with the Chi-Square test.

This study has been approved by the Health Research Ethics Committee of the Poltekkes Kemenkes Tanjung Karang with number 012/Perst.E/KEPK-TJK/III/2025.

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RESEARCH RESULTS

Table Characteristics Respondent (N=58)

Variable	Results	P-value	RR (CI 95%)
Age (Mean±SD) (Range) (Year)	(29.67±10.050) 18-45	0.002	6.222 (1.916 – 20.205)
<20 - >35	37/63.8		
20–35	21/36.2		
Parity (n/%)		0.002	6.182 (1.913 – 19.974)
<2 - >3 (Primi and Grande)	30/51.7		
2 – 3 (Multipara)	28/48.3		
Gestational Age (n/%)			
>28 Weeks (High Risk)	43/74.1		
<28 weeks (Not at Risk)	15/25.9		
Occupation (n/%)		0.308	0.577 (0.199 – 1.669)
Working (High-Risk)	28/48.3		
Not Working (Not at Risk)	30/51.7		
Preeclampsia (n/%)		0.308	0.577 (0.199 – 1.669)
severe	35/60.3		
Mild	23/39.7		

The table above shows that the average age of respondents and standard deviation is (29.67±10.050) with an age range of 18-45 with the majority of respondents having primi and grande parity with the majority having a 28-week high risk pregnancy age, the majority of respondents not working not at risk, namely with a number of 30/51.7 and the majority having a history of severe preeclampsia.

The chi-square test results show a p-value of 0.002, indicating a statistically significant relationship between maternal age and preeclampsia incidence ($p < 0.05$). The Risk Ratio (RR) of 6.222, with a 95% Confidence Interval (CI) of 1.916–20.205, indicates that pregnant women aged <20 years or >35 years have a 6 times greater risk of developing preeclampsia than pregnant women aged 20–35 years. The chi-square test results show a p-value of 0.002, indicating a statistically significant relationship between parity and preeclampsia ($p < 0.05$). The Risk Ratio (OR) of 6.182, with a 95% Confidence Interval (CI) of 1.913–19.974, indicates that pregnant women with parity <2 or >3 have a 6 times greater risk of developing preeclampsia than women with parity 2–3. The chi-square test results show a p-value of 0.002, indicating a statistically significant relationship between gestational age and preeclampsia incidence ($p < 0.05$). The Risk Ratio (RR)

of 7.104, with a 95% Confidence Interval (CI) of 1.890–26.707, indicates that pregnant women with a gestational age of more than 28 weeks have a 7 times greater risk of developing preeclampsia than women with a gestational age of less than 28 weeks and the chi-square test results show a p-value of 0.308, indicating no statistically significant relationship between pregnant women's employment status and preeclampsia incidence ($p > 0.05$). The Risk Ratio (RR) of 0.577, with a 95% Confidence Interval (CI) of 0.199–1.669, indicates that employment status is not a significant risk factor for preeclampsia in pregnant women.

DISCUSSION

Statistical test results indicate a significant association between maternal age and preeclampsia incidence ($p = 0.002$; OR = 6.222). Pregnant women aged <20 years or >35 years are at greater risk of developing preeclampsia than those aged 20–35 years. According to theory, extreme ages (too young or too old) can cause hormonal imbalances and vascular dysfunction (Kamau, Musau, Mwakio, Amadi, Nyaguara, Bejon, & Snow, 2023). Young age is associated with suboptimal reproductive system maturity, while old age is

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associated with vascular degeneration and an increased risk of chronic diseases such as hypertension (Prawiroharjo, 2018).

According to researchers, there is a relationship between the age of pregnant women and the incidence of preeclampsia, supported by logical biological mechanisms and strong epidemiological data. This study makes an important contribution to literature by strengthening the evidence that age is a significant risk factor for the severity of preeclampsia, especially when combined with minimal prenatal monitoring and other factors. Therefore, early age-based screening is necessary to prevent pre-eclampsia.

Statistical test results indicate a significant association between parity and preeclampsia ($p = 0.002$; OR = 6.182). Primiparas and grandmultiparas are at greater risk of preeclampsia than multiparas. Theoretically, in primiparas, the mother's immune system is not yet accustomed to fetal antigens, which can cause vascular disorders (Pattipeilohy, Parti, Firdaus, Sakinah, Cahyana, & Fatmawati, 2023; Komalasari, Fauziah, Wulandari, & Suryani, 2021). Meanwhile, in grandmultiparas, repeated pregnancies lead to fatigue of the reproductive system and decreased blood vessel elasticity (Winkjosastro, 2015).

According to researchers, the relationship between parity and preeclampsia is not coincidental but can be explained by underlying biological, immunological, and physiological mechanisms. Critically, parity describes the body's experience of prior pregnancies, which significantly influences the adaptive responses of the maternal vascular and immune systems to subsequent pregnancies. Thus, the relationship between parity and preeclampsia is not merely statistical, but also causal and multifactorial, involving complex interactions between the mother's biological condition, immunity, and pregnancy burden, and social determinants.

Statistical test results indicate a significant association between gestational age and preeclampsia incidence ($p = 0.002$; OR = 7.104). Most cases of severe preeclampsia occur in the third trimester of pregnancy. Physiologically, the third trimester is characterized by increased blood flow and maternal cardiac work (Gayatri, Pramono, Isnaini, Dewi, Aman, & Rahman, 2022). If the mother's body does not adapt well, the risk of endothelial damage and high blood pressure increases (Leveno, 2014).

According to researchers, after the 28th week of pregnancy, the fetus grows larger, and the blood supply to the placenta increases. If there are problems with blood vessel formation in the placenta from the beginning of pregnancy, this condition will worsen as the pregnancy progresses. This can cause the mother's blood pressure to rise and symptoms of pre-eclampsia to appear. Additionally, in older pregnancies,

the mother's heart works harder due to increased blood volume, especially if she already had high blood pressure before pregnancy. Therefore, given the high risk of preeclampsia in pregnancies over 28 weeks, preventive interventions need to be implemented early on.

Previous research obtained bivariate analysis results showing a significant relationship between age and the incidence of preeclampsia with (p -value = 0.028 and OR = 3.048), as well as a history of hypertension with (p -value = 0.017 and OR = 2.877) and there was no significant relationship between parity, obesity, diabetes mellitus and twin pregnancy with the incidence of preeclampsia, parity (p -value = 0.651), obesity (p -value = 0.672), diabetes mellitus (p -value = 0.430), and twin pregnancy (p -value = 0.609). And from the results of multivariate analysis, it was found that maternal age was the most dominant factor in the incidence of preeclampsia with a Sig value = 0.022 (Rufaidah & Ery Khusnal, 2017).

Statistical test results indicate no significant association between employment and preeclampsia ($p = 0.227$; OR = 0.577). Employment status is not significantly associated with preeclampsia. According to theory, employment can be a risk factor if it is associated with heavy workloads, stress, or exposure to hazardous environments. However, in this study, the majority of mothers were housewives, so employment factors did not have a significant influence (Marlina, Santoso, & Sirait, 2022).

According to researchers, employment does not have a significant effect on preeclampsia incidence, as evidenced by statistical results and supported by several other studies. This may be because employment status alone does not adequately represent the actual levels of stress, physical activity, or psychological pressure experienced by pregnant women. A housewife who appears to be "unemployed" in a formal sense may still experience a high workload at home, psychological stress, or a lack of social support, which could actually trigger the risk of preeclampsia. However, this remains important to consider within the holistic context of a mother's condition, as employment factors can be linked to stress, economic status, and access to healthcare services. Therefore, preventive approaches must still target all pregnant women, regardless of employment status.

CONCLUSION

A significant association was found between maternal age, parity, and gestational age and the incidence of preeclampsia in pregnant women. Mothers aged <20 years or >35 years, primiparas and grandmultiparas, and those with a gestational age of ≥ 28 weeks had a higher risk of developing preeclampsia. Meanwhile, there was no significant relationship between the

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mother's occupation and the incidence of preeclampsia. Preeclampsia is a serious pregnancy complication that affects the safety of the mother and fetus, especially in high-risk groups. Therefore, midwives and health workers need to increase efforts to detect and monitor risk factors in pregnant women from the initial antenatal visit onward. Continuous education, regular blood pressure monitoring, and appropriate pregnancy planning based on age and parity are important steps in preventing preeclampsia. Pregnant women are also encouraged to actively attend prenatal check-ups, maintain their physical and mental health, and adhere to medical advice to achieve a healthy and safe pregnancy.

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