DETERMINANTS OF PREECLAMPSIA INCIDENCE IN PREGNANT WOMEN AT Dr. MOEWARDI HOSPITAL SURAKARTA IN 2022

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ABSTRACT

Maternal mortality rates continue to be a major concern in many developing countries. Preeclampsia, a hypertensive disorder experienced during pregnancy, is one of the leading causes of maternal and neonatal deaths worldwide. The occurrence of preeclampsia is theoretically influenced by various risk factors. This study aims to identify the determinants of preeclampsia among pregnant women at Dr. Moewardi Regional Public Hospital in Surakarta in 2022. The research utilizes an analytical observational design with a case-control approach. The study population includes all pregnant patients at Dr. Moewardi Regional Public Hospital in Surakarta in 2022. Sample selection is conducted using a purposive sampling technique, with cases consisting of patients diagnosed with preeclampsia and controls consisting of patients without preeclampsia. The sample size is 256 pregnant women, comprising 128 case samples and 128 control samples. Data analysis is performed using the Chi-Square statistical test, followed by determining the Odds Ratio (OR). Furthermore, multiple logistic regression analysis is conducted. The results of the analysis reveal that there is an influence of parity (p=0.008; OR 4.054, 95% CI), a significant influence of hypertension history (p=0.000; OR 25.84, 95% CI), a significant influence of twin pregnancy (p=0.038; OR 5.34, 95% CI), and a significant influence of obesity (p=0.014; OR 3.124, 95% CI) on the occurrence of preeclampsia among pregnant women at Dr. Moewardi Regional Public Hospital in Surakarta in 2022. Hypertension history is found to be the most influential variable based on logistic regression analysis with an OR value of 30.125. This study indicates that parity, hypertension history, twin pregnancy, and obesity are risk factors that significantly contribute to the occurrence of preeclampsia, with hypertension history being the most prominent factor.

Keywords: hypertension history, obesity, parity, preeclampsia, twin pregnancy

INTRODUCTION

The maternal mortality rate (MMR) remains a concern in many developing countries. The number of maternal deaths in 2020 in developing countries was 462 per 100,000 live births (WHO, 2021). In Indonesia, the maternal mortality statistics for 2021 recorded 6,856 cases, with 867 cases reported in Central Java (Dinkes Jawa Tengah, 2022). According to WHO (2020), the majority of maternal deaths are attributed to causes such as hemorrhage, hypertension, infections, and the correlation between pre-existing medical conditions and pregnancy.

Preeclampsia is a hypertensive disorder experienced during pregnancy and is one of the leading causes of maternal and neonatal deaths worldwide (Karrar & Hong, 2022). According to WHO data in 2020, the global incidence of preeclampsia is around 31.4%. In Indonesia, the prevalence of preeclampsia in 2020 was 9.4%, while in the Central Java Province in 2019, it was 27.27% out of 575,485 deliveries, and in 2020, it

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was 30.88% out of 568,295 deliveries (Kemenkes RI, 2021).

Risk factors for preeclampsia, as classified in the International Journal of Women's Cardiovascular Health (2021), are categorized into high and moderate risks. High-risk factors include a history of hypertension, obesity, and the presence of comorbidities such as diabetes mellitus, lupus, and kidney disorders. Moderate-risk factors include nulliparity (never having given birth), twins (gemelli), age, history of placental abruption (solutio placenta), and Intrauterine Fetal Death (IUFD). If not managed properly, preeclampsia can potentially lead to various complications such as decreased blood flow to the placenta, placental abruption, Hemolysis Elevated Liver Enzyme Low Platelets (HELLP) syndrome, and eclampsia. These complications can trigger prenatal mortality and morbidity (Manuaba, 2016).

Based on a previous study conducted by Umar & and Wardani (2018), the most influential factor in the occurrence of preeclampsia in pregnant women is a history of hypertension. A history of hypertension can increase the risk of preeclampsia by 8.258 times. Another influential factor is obesity; according to Mariati et al. (2022), women with obesity have a 9.546 times higher chance of developing preeclampsia. Obesity is recognized as a chronic condition with low-grade inflammation that can induce endothelial dysfunction and placental ischemia through immune-mediated mechanisms (Spradley et al., 2019).

According to Rosyidah's theory (2019), being a primiparous mother is a risk factor for preeclampsia related to exposure to chorionic villi for the first time. On the other hand, in grandemultiparous mothers, the risk of developing preeclampsia is associated with a decline in reproductive system function and a decrease in nutritional intake, which can lead to preeclampsia (Tarca et al., 2019).

Repetitive pregnancies and deliveries can cause damage to the blood vessels of the uterine wall and a decrease in tissue elasticity, resulting in abnormal positioning and growth disorders of the placenta (Prawirohardjo, 2017). According to Andriani et al. (2022), twin

pregnancies play a role in increasing the risk of preeclampsia due to the increased placental mass and hormone production.

Based on the preliminary study conducted in February 2023 at Dr. Moewardi Surakarta Regional General Hospital, specifically in the medical record installation, it is recorded that the number of preeclampsia cases during the year 2022 was 128 cases. Referring to the previous explanation, the researchers are interested in conducting a more in-depth assessment of the determinants of preeclampsia incidents in pregnant women at Dr. Moewardi Surakarta Regional General Hospital in the year 2022.

METHOD

The quantitative method employed a descriptive-analytic design with a case-control study using a retrospective approach. Sampling in this research used a purposive sampling technique, and for the sample size, total sampling was employed. In this study, the sample size was 256 mothers selected from the entire population, with a 1:1 ratio of cases (128) to controls (128).

Data collection was performed using secondary data. Data analysis involved frequency distribution and percentage tests to understand the characteristics of each variable under investigation. Chi-square tests and odds ratios were utilized to study the relationship between two independent and dependent variables. Multiple logistic regression analysis was conducted to identify the most dominant independent variable related to the dependent variable.

In conducting this research, the researcher has adhered to all institutional regulations and government policies related to the research. This study has obtained approval from the Research Ethics Commission of Dr. Moewardi Surakarta Regional General Hospital with approval number 628/IV/HREC/2023.

RESULTS AND DISCUSSION

The study has been conducted, involving the collection of data from 256 pregnant women, comprising 128 with preeclampsia and 128 without preeclampsia at Dr. Moewardi Surakarta Regional General Hospital from May 25 to June 3, 2023. Data were gathered through direct visits to the medical records department, utilizing assessment sheets. The research results include univariate, bivariate, and multivariate analyses, as follows:

Table 1. Characteristics of Pregnant Women at Dr. Moewardi Surakarta Regional General Hospital in 2022

No	Characteristics	n (%)
		n = 256
1	High Risk Parity	
	Yes	72 (28.1%)
	No	184 (71.9%)
2	History of Hypertension	
	Yes	52 (20.3%)
	No	204 (79.7%)
3	Gemelli	
	Yes	12 (4.7%)
	No	244 (95.3%)
4	Obesity	
	Yes	75 (29.3%)
	No	181 (70.7%)
5	Preeclampsia	
	Yes	128 (50%)
	No	128 (50%)

In this study, more than a quarter of pregnant women with risk factors, specifically nulliparous and grandmultiparous, totaled 72 mothers (28.1%). According to Hipni (2019), nulliparous women experience immunological disturbances (blocking antibodies), leading to a reduction in the production of inhibitory antibodies. This can hinder the invasion of the maternal spiral arteries by trophoblasts up to a certain extent, thereby disrupting placental function and potentially causing preeclampsia. Preeclampsia is not limited to nulliparous women but also occurs in grandmultiparous women who are at risk of experiencing preeclampsia. In pregnant women who have given birth more than three times, excessive

uterine stretching causes ischemia that can lead to preeclampsia.

A total of one-fifth of pregnant women at Dr. Moewardi Hospital in Surakarta in 2022, specifically 52 mothers (20.3%), had a history of hypertension. According to Widiastuti (2019), a history of hypertension is considered the most severe risk factor for the development of preeclampsia. Pre-existing hypertension before pregnancy results in disturbances to vital organs within the body. When compounded with pregnancy, it leads to more severe damage characterized by edema and the presence of urinary protein. Hypertension itself arises from vasospasm, triggering endothelial damage and leakage in endothelial cells, causing constituents of the blood, including platelets and fibrinogen deposits, to accumulate beneath the endothelium.

A small proportion of pregnant women at Dr. Moewardi Hospital in Surakarta in 2022, precisely 12 mothers (4.7%), experienced twin pregnancies. According to Purwanto (2019), twin pregnancies involve the gestation of two fetuses. Twin pregnancies pose a higher risk to both the infants and the mothers. The growth of twin fetuses is more prone to disturbances compared to single fetuses, such as occurrences of preeclampsia due to the additional burden on blood circulation to the fetuses. Women with twin pregnancies are at a higher risk of experiencing preeclampsia, often attributed to increased placental mass and hormone production. From the perspective of hyperplacentosis theory, twin pregnancies carry a risk of developing preeclampsia, with the incidence of preeclampsia in twin pregnancies increasing by 4-5 times compared to single pregnancies (Varney, as cited in SurYestini et al., 2022).

In this study, more than a quarter of mothers, accompanied by obesity, amounted to 75 mothers (29.3%). According to Robinson et al. (2020), obesity triggers the occurrence of preeclampsia through various mechanisms, including superimposed preeclampsia, as well as through metabolic triggers and other micro-molecules. The risk of preeclampsia increases

by 2-fold with every increase in body weight of 5-7 kg/m2.

Preeclampsia is a systemic syndrome in pregnancy that originates from the placenta due to inadequate invasion of trophoblasts, followed by widespread maternal endothelial dysfunction.

All clinical symptoms of preeclampsia result from glomerular endothelins, increased vascular permeability, and systemic inflammatory responses that lead to impairment and/or hypoperfusion of organs.

Table 2. The Relationship between Parity, History of Hypertension, Twin Pregnancy, and Obesity with the Occurrence of Preeclampsia at Dr. Moewardi Hospital, Surakarta.

	Preeclampsia		ρ - Value	OR
	Yes	No		
	n (%)	n (%)		
High Risk Parity				
Yes	53 (20.7%)	19 (7.4%)	0,008	4,054
No	75 (29.3%)	109 (42.6%)		
History of Hypertension				
Yes	49 (19.1%)	3 (1.2%)	0,000	25,84
No	79 (30.9%)	125 (48.8%)		
Gemelli				
Yes	10 (3.9%)	2 (0.8%)	0,038	5,34
No	118 (46.1%)	126 (49.2%)		
Obesity				
Yes	52 (20.3%)	23 (9.0%)	0,014	3,124
No	76 (29.7%)	105 (41%)		

Based on Table 2, it can be concluded that there is a significant relationship between parity, a history of hypertension, twin pregnancies, and obesity with the occurrence of preeclampsia in pregnant women. This is indicated by the p-value being < 0.05. According to the results of the odds ratio (OR) analysis, there is an influence of parity, a history of hypertension, twin pregnancies, and obesity on the occurrence of preeclampsia in pregnant women at Dr. Moewardi Hospital in Surakarta in 2022.

The research results regarding parity in pregnant women with preeclampsia indicate that the majority of pregnant women with preeclampsia had risky parity during pregnancy, totaling 53 (41.4%). The analysis results suggest a significant association between parity in pregnant women and preeclampsia. These findings are supported by Purba (2020), who established a significant relationship between maternal parity and the occurrence of preeclampsia with a p-value of 0.007. Additionally, this study aligns with Annisa (2020), asserting that maternal parity is a factor associated with the occurrence of preeclampsia

with a ρ-value of 0.013. From the analysis results, an odds ratio (OR) of 4.054 was obtained, meaning that respondents with risky parity (1 and >3) have a 4 times greater likelihood of experiencing preeclampsia.

The research results on pregnant women with preeclampsia indicate that the majority have a history of hypertension, totaling 49 individuals (38.2%). The analysis results lead to the conclusion that a history of hypertension in pregnant women is significantly associated with preeclampsia. Muzalfah (2018) states that there is a significant relationship between a history of hypertension in pregnant women and the occurrence of preeclampsia, with a p-value of 0.026. Additionally, this study is in line with Mariza (2021), asserting that a history of hypertension in pregnant women is a factor associated with the occurrence of preeclampsia with a ρ-value of 0.000. From the analysis results, an odds ratio (OR) of 25.84 was obtained, meaning that respondents with a history of hypertension have a 26 times greater likelihood of experiencing preeclampsia.

The research results on twin pregnancies and the occurrence of preeclampsia indicate that a small proportion of pregnant women with

preeclampsia had twin pregnancies, specifically 10 individuals (7.8%). The analysis results lead to the conclusion that twin pregnancies are associated with preeclampsia. This finding is in line with Saputri (2021), who explains that pregnant women with twin fetuses are a risk factor for the occurrence of preeclampsia. The results of this study are further supported by Parantika (2021), stating that there is a correlation between twin pregnancies and the occurrence of preeclampsia, with a p-value of 0.002. From the analysis results, an odds ratio (OR) of 5.34 was obtained, meaning that respondents with twin pregnancies have a 5 times greater likelihood of experiencing preeclampsia.

The research results on obesity in pregnant women with the occurrence of preeclampsia reveal that the majority of pregnant women with preeclampsia also have obesity, totaling 52 mothers. The analysis results lead to the conclusion that obesity in pregnant women is statistically associated with preeclampsia. These findings are reinforced by Meldia (2018), who established a connection between obesity in pregnant women and the occurrence of preeclampsia with a p-value of 0.000. Additionally, this study aligns with Silaban (2021), stating that obesity in pregnant women is a factor associated with the occurrence of preeclampsia with a ρ-value of 0.000. From the analysis results, an odds ratio (OR) of 3.124 was obtained, meaning that respondents with obesity have a 3 times greater likelihood of experiencing preeclampsia.

Table 3. Results of multiple logistic regression analysis on the relationship between parity, history of hypertension, twin pregnancies, and obesity with the occurrence of preeclampsia at Dr. Moewardi Hospital, Surakarta in 2022.

Risk Factor	*Adjusted* OR	CI 95%		ρ- value
		Batas bawah	Batas atas	
Parity	8,752	3,486	18,975	0,000
History of Hypertension	30,125	13,756	92,163	0,000
Gemelli	3,872	1,426	5,538	0,019
Obesity	4,365	1,968	7,453	0,000
Preeclampsia				
Nagelkerke R Square	45,3%			

Based on Table 3, after conducting multivariate analysis, the variables found to be associated with the occurrence of preeclampsia in mothers are parity, a history of hypertension, twin pregnancies, and obesity. The variable most influential in the occurrence of preeclampsia is a history of hypertension, where pregnant women with a history of hypertension are 30 times more likely to experience preeclampsia (95% CI: 13.756 – 92.163). Looking at the R-square value, it is 0.453 or 45.3% (Nagelkerke). This can be interpreted as, with the inclusion of four variables—parity, a history of hypertension, twin pregnancies, and obesity—45.3% of the occurrence of preeclampsia can be explained. This implies that simultaneously, these four independent variables collectively contribute to a 45.3% impact on the dependent variable preeclampsia, while the remaining 54.7% is influenced by other unexamined variables.

CONCLUSION

The research results can be summarized as follows: there is a relationship between parity, a history of hypertension, twin pregnancies, and obesity with the occurrence of preeclampsia in pregnant women. The variable that has the most significant impact is a history of hypertension in pregnant women at Dr. Moewardi Hospital in Surakarta in 2022. This study indicates that cases of preeclampsia are influenced by various risk factors that can be

detected early. Therefore, it is recommended that Dr. Moewardi Hospital enhance efforts in early screening during antenatal care and improve monitoring of pregnant and/or delivering women identified with a high risk of preeclampsia. Additionally, the hospital should actively engage in health promotion efforts within the community regarding the risk factors, impacts, and prevention of preeclampsia.

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