

Research Article

Relationship of History of Hypertension with Severity and Onset of Preeclampsia: A Retrospective Cohort

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Abstract

Objective: This study aimed to find correlation between a history of hypertension with severity and onset of preeclampsia.

Methods: A retrospective cohort study with retrospective analysis of medical record data in patients with preeclampsia and severe preeclampsia from November 2021 – February 2022 was conducted at dr. Soediran Mangun Sumarso Regional General Public Hospital, Wonogiri, Central Java. Analysis was performed between the history of hypertension with severity and onset (<34 weeks and age ≥ 34 weeks gestational age). Data analysis was performed using SPSS software with univariate Chi-Square analysis.

Results: A total of 44 medical record data were obtained in this study. A total of 20 patients (45.5%) had a history of hypertension and 24 (55.5%) patients had no history of hypertension. A total of 23 patients (52.3%) were diagnosed with severe preeclampsia and 21 patients (47.7%) were diagnosed with preeclampsia. Based on statistical analysis, it was found that there was no significant correlation between the history of hypertension and the severity of preeclampsia ($p=0.741$; OR (CI 95%): 0,818 (0,249 – 2,690)) and onset ($p=0.88$; OR (CI 95%): 1,133 (0,222 – 5,788)).

Conclusion: There is no relationship between history of hypertension with the severity and onset of preeclampsia. Further studies with larger populations are needed to analyze the relationship between history of hypertension and preeclampsia.

Keywords: blood pressure, cardiovascular disease, hypertension, onset, preeclampsia.

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INTRODUCTION

The incidence of preeclampsia is increasing every year, with the incidence of preeclampsia according to the World Health Organization (WHO) being in the range of 2 -10% of pregnancies worldwide.¹ The incidence of preeclampsia in Indonesia is 128,273 per year or around 5.3%. Preeclampsia affects 5-7% of pregnancies, causing 500,000 neonatal deaths each year.² The incidence of preeclampsia in Indonesia reaches 25% of all causes of maternal and infant mortality.³ Preeclampsia can develop from various risk factors such as individual factors (pregnancy history, age, family history of hypertension, diabetes, chronic kidney failure),

socioeconomic and environmental factors (where the risk is higher in low socioeconomic groups, poor education), and environmental (exposure to air pollution and cadmium).⁴⁻⁷ The rate of preeclampsia is greater in low- and middle-income countries due to the large disparity in maternal health outcomes with high-income countries.⁸

Preeclampsia is one of hypertension during pregnancy which is one of the most common pregnancy disorders. This is caused by the emergence of the risk of severe complications due to pregnancy disorders related to preeclampsia.⁹ For maternal, preeclampsia can increase the risk of hypertension after childbirth, coronary heart disease, stroke, venous thromboembolism, and

other related-cardiovascular diseases risk.¹⁰ In neonates, the condition of preeclampsia has the risk of inhibiting fetal growth and development due to impaired blood circulation resulting in low birth weight, premature birth, and other poor neonatal outcomes.¹¹ Hypertension during pregnancy is one of the main causes of maternal death worldwide, with preeclampsia being the second cause of maternal death in Indonesia.^{3,12} Although several existing studies attempt to find preeclampsia therapy targets and improve maternal and perinatal health outcomes, however, Preeclampsia risk prevention screening is still an effective measure to reduce the risk of maternal and fetal death in countries with limited health resources..^{13,14}

One of the main targets in antenatal care screening is a history of hypertension in pregnant women, either during or after pregnancy.¹⁵ A history of hypertension is a risk factor for pregnancy disorders and can develop into gestational hypertension, resulting in poor maternal and perinatal outcomes.² A history of hypertension found during early pregnancy screening is an indicator of a high-risk pregnancy that requires close specialist observation.¹⁶ Management of hypertension in pregnancy with adherence to therapy and regular monitoring of blood pressure is necessary to control blood pressure and reduce the risk of worsening the mother's condition.² Several studies have shown that untreated hypertension before pregnancy can also develop into preeclampsia.^{17,18} However, few studies exist to assess the risk of a history of hypertension on the development of more severe preeclampsia and the onset of preeclampsia. This study aims to analyze the effect of a history of hypertension on preeclampsia patients with a risk of severity and onset of preeclampsia in a secondary hospital.

METHODS

The inclusion criteria in this study were medical record data and complete patient identity, patients diagnosed with preeclampsia and severe preeclampsia based on the definition based on the Indonesian Society of Obstetrics and Gynecology, which is "specific hypertension in pregnancy and other organ system disorders at gestational age above 20 weeks" and confirmed by a hospital obstetric specialist, registered patients who gave birth at dr. Soediran Mangun Sumarso Regional General

Hospital, and inpatients. Exclusion criteria were incomplete medical records, patients diagnosed with eclampsia, and outpatients. Medical records that match the inclusion criteria then record their medical history to find out whether the patient has been diagnosed with hypertension. Analysis was performed between the history of hypertension with severity and onset (<34 weeks and age $\geq$ 34 weeks of gestation) of preeclampsia.

The sample size calculation was determined by the single population proportion formula based on the prevalence of preeclampsia from previous studies in previous study (14.54%)¹⁹ with the prevalence of preeclampsia in Indonesia (5.3%), $\alpha = 0.05$ ($z = 1.96$), the margin of error 10%. The results obtained amounted to 19 - 47 samples needed.

The data obtained was then analyzed using the Statistical Product and Service Solution program version 21 statistical software. All data were analyzed using univariate Chi-Square test to analyzed correlation between history of hypertension with preeclampsia severity and onset. Categorical data is then arranged in percentage form, while numerical data is displayed in mean $\pm$ standard deviation form. P-value <0.05 was considered significant.

RESULT

Subject Characteristics

A total of 44 cases of pregnant women with preeclampsia were recorded in the medical record. The mean age of the patients was 30.84 ± 7.2 (17 – 44) years. The majority of the population is aged 20-35 years (68.2%). We found that the majority of pregnant women with preeclampsia had no history of hypertension (24 patients (54.5%)), were diagnosed with severe preeclampsia (23 patients (52.3%)), and more than half had a late-onset diagnosis (37 patients (84. 1%). The characteristics of our sample are shown in Table 1.

Table 1. Characteristic of Sample Study

Variables	Number (%)
Age (Mean $\pm$ SD)	30.84 $\pm$ 7.2
$\leq$ 19 year-old	2 (4.5)
20 – 35 year-old	30 (68.2)
$\geq$ 36 year-old	12 (27.3)
Gestational age (weeks)	36.18 $\pm$ 4.2
Has history of hypertension	
Yes	20 (45.5)
No	24 (54.5)
Preeclampsia severity	
Preeclampsia	21 (47.7)
Severe preeclampsia	23 (52.3)
Onset	
Early-onset (<34 week)	7 (15.9)
Late-onset ($\geq$ 34 weeks)	37 (84.1)

Of the 21 patients with preeclampsia, 9 of them had a history of hypertension, while 11 of the 23 patients with severe preeclampsia had a history of hypertension. Based on statistical analysis, we found no association ($p > 0.05$; OR (CI 95%): 0.818 (0.249 – 2.690)) between a history of hypertension and the severity of preeclampsia. The results of the statistical analysis are shown in Table 2.

Table 2. Statistical analysis between history of hypertension with preeclampsia severity.

Variables		Severity degree		OR (CI 95%)	P-value
		Preeclampsia	Severe Preeclampsia		
History of hypertension	Yes	9	11	0.818 (0.249 – 2.690)	0.741
	No	12	12		
	Total	21	23		

Of the 44 patients, 37 of them were diagnosed with late-onset preeclampsia. A total of 17 of them had a history of hypertension. In 7 patients with early-onset preeclampsia, 3 patients had a history of hypertension. Based on statistical

analysis, we found no association ($p > 0.05$; OR (CI 95%): 1.133 (0.222 – 5.788)) between a history of hypertension and the severity of preeclampsia. The results of the statistical analysis are shown in Table 3.

Table 3. Statistical analysis between history of hypertension with preeclampsia onset

Variables		Preeclampsia onset		OR (CI 95%)	P-value
		Early-onset	Late-onset		
History of hypertension	Yes	3	17	1.133 (0.222 – 5.788)	0.88
	No	4	20		
	Total	7	37		

DISCUSSION

Based on our study, there is no relationship between history of hypertension in preeclampsia patients and the severity of the outcome and the onset of preeclampsia. Based on statistical analysis, it was found that there was no significant correlation between the history of hypertension and the severity of preeclampsia ($p=0.741$; OR (CI 95%): 0.818 (0.249 – 2.690)) and onset ($p=0.88$; OR (CI 95%): 1.133 (0.222 – 5.788)). The majority (more than 80%) of preeclampsia patients in our study period were diagnosed with late-onset preeclampsia. We found similar findings in a higher percentage of late-onset cases in the population-based study by You et

al (2018).²⁰ However, our population proportions differ from the study by Verbeek et al in which the majority of the sample was diagnosed with early-onset preeclampsia.²¹ Findings of late-onset preeclampsia are more common than early-onset and account for the majority of preeclampsia cases with a higher maternal death case in the early-onsets.^{22,23}

Several existing studies have shown different results regarding the relationship between a history of hypertension during pregnancy and the onset of preeclampsia. Our results are similar to the studies of Serra et al (2020) and Wadhwani et al (2020) which showed no significant difference between chronic hypertension and the onset of preeclampsia^{24,25}, but our results differ from the

findings of Veerbek et al (2015) and Huang et al (2021) which show that hypertension has an influence on the onset of preeclampsia.^{21,26} Early blood pressure checks in early pregnancy have been recommended by various guidelines for screening for the prevention of hypertension, whether it is gestational hypertension, superimposed preeclampsia, or preeclampsia.²⁷ Results from previous studies show although our findings show no association between a history of hypertension and onset, blood pressure checks during pregnancy are necessary for both healthy pregnancies and high-risk pregnancies.²⁸

Our other findings show that there is no relationship between the history of hypertension and the severity of preeclampsia, which is different from the findings of another study by Nzelu et al (2018) which showed a history of hypertension in previous pregnancies can develop severe hypertension, preterm preeclampsia, and small-for-gestational age (SGA).²⁹ Maternal hypertension, either before or after previous pregnancy, increases the risk of stroke and cardiovascular mortality.²⁷ In addition, hypertension that occurs during pregnancy results in poor perinatal outcomes such as SGA and preterm birth.³⁰ Although various guidelines suggest a target for reducing blood pressure during pregnancy in cases of gestational hypertension, systolic blood pressure tends to increase between 31 – 47 mmHg and 31 mmHg in diastolic blood pressure in the third trimester of pregnancy.³¹ This condition allows the development of pregnancy complications due to blood pressure which tends to increase which reflects vascular resistance.³¹

The unclear findings between hypertension and preeclampsia may be due to the overlapping pathophysiology of the development of hypertension into preeclampsia.³² Hypertension that develops chronically before pregnancy produces various biomarkers such as pro-inflammatory cytokines (IL-6 and TNF- α) which can damage vascular endothelial cells and cell adhesion molecules which increase the risk of endothelial dysfunction.³³ In addition, oxidative stress due to hypertension condition can reduce nitric oxide (NO) and vascular endothelial growth factor (VEGF) function in the process of vasodilation.³⁴ In cases of late-onset preeclampsia, blood vessels experience decompression which can cause the failure of important organs such as the heart, brain, and kidneys.¹⁰ Hypertensive conditions can develop endothelial dysfunction due to oxidative

stress, which also occurs in preeclampsia.³⁵ These findings can make the target of hypertension therapy and hypertension-related disorders of pregnancy and reduce the risk of complications of maternal hypertension.³²

A study by Guy et al (2020) showed that early detection in the first trimester, including administration of antihypertensive drugs early in pregnancy to control hypertension, has the effect of preventing increases in blood pressure during pregnancy and reducing the use of more antihypertensive drugs.³⁶ However, this approach is not effective as a predictive tool for preeclampsia, even this is useful in clinical settings.³⁷ In addition, early detection of hypertension in pregnancy before it develops into preeclampsia is important to determine the referrals needed for pregnant women for birth planning by maximizing the referral system properly and effectively and reducing the burden on the national healthcare system.³⁸ Further studies in larger populations in different clinical settings are needed to make the risk assessment of preeclampsia from a history of hypertension more effective in determining the progression of preeclampsia.

Nevertheless, this study still has some limitations. The small study sample size was due to the limited duration and one study center in our data collection. We also did not compare our population with a healthy population, so we could not analyze the risk of developing preeclampsia in a healthy maternal (normotensive, without a history of hypertension) population. We also not recorded the degree of hypertension and previous hypertension treatment, so that this might be a confounding factor that influences the development of preeclampsia. Further research is needed in a wider and more diverse population in the future to assess the relationship between hypertension and the severity and onset of preeclampsia to improve the quality of maternal care and postnatal perinatal outcomes.

CONCLUSIONS

The relationship between the history of hypertension and the severity and onset of preeclampsia were can't be conclude in this study. This study population shows that more pregnant women who do not have a history of hypertension can experience preeclampsia, where many preeclampsia occur in late-onset of pregnancy. Routine blood pressure screening

before pregnancy is useful for early detection of the risk of preeclampsia and better pregnancy planning to reduce the risk of maternal mortality.

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