

CORRELATION OF RISK FACTORS FOR PREECLAMPSIA WITH BLOOD PRESSURE AND PROTEINURIA

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ABSTRACT

Background: Preeclampsia is related to the inability to adapt to the physiological changes of pregnancy that result in decreased maternal organ perfusion. This complex clinical syndrome in preeclampsia can affect all organ systems such as the hemodynamic system, kidney, retina, and blood chemistry, which is manifested by increased blood pressure and protein urine.

Purpose: This study aimed to determine the correlation of the factors causing preeclampsia with blood pressure and protein urine.

Methods: This correlational study using the 127 respondents, sampling purposive sampling techniques, the independent variable factor in preeclampsia (age, genetics, history of diabetes mellitus, history of hypertension), and the independent variable blood pressure and protein urine. The measuring instrument used is a sheet checklist and analyzed by Spearman rank.

Results: The results showed the risk of preeclampsia in the age factor of 40.9% occurred in the 28-35-year-old respondents; 100% of patients had no history/genetic preeclampsia, 100% of respondents did not have a history of diabetes mellitus, and 88.9% did not have a history of hypertension. Systole blood pressure increased moderately and high by 26.0% and 22.0%, while diastolic blood pressure increased moderately and high by 26.0% and 11.0%. Respondents had positive proteinuria of 52%. The results of the analysis are not found a significant correlation between the factors of age, genetics, history of diabetes, and history of hypertension with blood pressure and preeclampsia protein urine on respondents.

Conclusion: History of hypertension associated with blood pressure and proteinuria in preeclampsia. History of hypertension is related to the condition of the blood vessels that manifest hypertension and decreased renal function (protein urine). Therefore, it is recommended in women with a history of hypertension to control blood pressure and perform routine prenatal care during pregnancy to prevent further complications.

Keyword: Risk factors, blood pressure, protein urine, preeclampsia

BACKGROUND

Preeclampsia is a complex clinical syndrome and has the potential to affect all organ systems. Preeclampsia is associated with physiological changes in pregnancy, in which the inability to adapt to the physiological changes that occur results in decreased maternal organ perfusion, including fetal-uteroplacental perfusion, resulting in decreased maternal oxygen capacity. There are several predisposing factors for the occurrence of preeclampsia, including

age, parity, genetic factors, diet, environment, socio-economics, chronic hypertension, and hyperplacenta¹. Literature studies conducted in Indonesia between 2008-2018 have identified factors associated with preeclampsia, namely maternal characteristics, pregnancy history, body weight, chronic disease history, knowledge, and history of contraception. : This report on the risk factors for preeclampsia is expected to be used as a basis for analyzing preeclampsia prevention programs and determining more appropriate management of pregnant women with preeclampsia². Predict preeclampsia risk factors helps in preventive treatment and early detection and early intervention of complications of preeclampsia will reduce the impact on the fetus and the mother

OBJECTIVE

In the early stages of this study, the researchers are interested in examining risk factors for preeclampsia correlation with blood pressure and protein urine in patients with preeclampsia in hospitals Pare.

METHODS

This study used a correlational design with a sample of 127 respondents in April 2019 at Pare Hospital, Kediri Regency. The research instrument was a checklist sheet and analyzed with the Spearman rank. This research has received ethical approval from the Health Research Ethics Commission no. 22/EC/STIKES/KH/04/2019.

RESULTS

Table 1. Characteristics of The Women

No	Characteristics	n	%
1	Education		
	• Elementary school/Junior high school	70	55,1
	• Senior High School	42	33,3
	• College	15	11,8
2	Profession		
	• Housewife	80	63,0
	• Farmers	14	11,0
	• Entrepreneur	24	19,0
	• Teacher	5	3,9
	• Nurse	4	3,1
3	Marital status		
	• Not married	5	3,9
	• Married	122	96,1

The majority of respondents' characteristics are elementary/junior high school education with 70 respondents (55.1%), high school education with 42 respondents (33.3%), and an undergraduate degree with 15 respondents (11.8%). While the majority of jobs are housewives (IRT) with 80

respondents (63.0%), self-employed 24 respondents (19.0%), farmers 14 respondents (11.0%), 5 teachers as teachers (3, 9%) and nurses as many as 4 respondents (3.1%).

Identification of Risk Factors for Preeclampsia

Table 2. Risk factors for preeclampsia

No	Variable	n	%
1	Age		
	1. <20 years	9	7,1
	2. 20-27 years	28	22,0
	3. 28-35 years	52	40,9
	4. > 35 tahun	38	30,0
2	History of preeclampsia		
	1. There is a history	0	0
	2. There is no history	127	100
3	History of Diabetes mellitus		
	1. There is a history	0	0
	2. There is no history	127	100
4	History of Hypertension		
	1. There is a history	14	11,1
	2. There is no history	113	88,9

The results of the study were found in preeclamptic mothers, they were mostly 28-35 years old as many as 52 respondents (40.9%), while those aged > 35 years were 38 respondents (30.0%), 20-27 years as many as 22 respondents (22, 0%), and <20 years as many as 9 respondents (7.1%). Of all respondents (100%) previously none had a history of preeclampsia and diabetes mellitus. Meanwhile, 14 respondents (11.1%) had a history of hypertension and 113 respondents (88.9%) had no history of hypertension.

Identification of Blood Pressure At Preeclampsia

Table 3. Blood Pressure in Patients with Preeclampsia

No	Blood Pressure	n	%
1.	Systolic blood pressure		
	1. Normal	66	52,0
	2. Moderate	33	26,0
	3. High	28	22,0
2.	Diastolic blood pressure		
	1. Normal	80	63,0
	2. Moderate	33	26,0
	3. High	14	11,0

The research found systole blood pressure maternal preeclampsia, which has normal systole pressure values were 66 (52.0%), moderate hypertension systole 33 respondents (26.0%), and hypertension high systole 28 respondents (22.0%). Whereas in diastolic blood pressure, respondents who had normal diastolic blood pressure values of 80 (63.0%), moderate hypertension diastole 33 respondents (26.0%), and high diastolic hypertension 14 respondents (11.0%).

Identification of Protein Urine in Patients with Preeclampsia

Table 4. Protein Urine in Patients with Preeclampsia

No	Proteinurine	n	%
1	1. Negatif	61	48,0
	2. +1	28	22,1
	3. +2	5	3,9
	4. +3	19	15,0
	5. +4	14	11,0
Total		127	100

The results of the study on preeclamptic mothers, 61 respondents (48.0%) protein urine levels were negative (-), 28 respondents (22.1%) protein urine levels were positive (+1), 5 respondents (3.9%) protein urine levels were positive (+2), 19 respondents (15.0%) protein urine content was positive (+3), 14 respondents (11.0%) protein urine content was positive (+4).

Table 5. Correlation Analysis of Preeclampsia Causing Factors and Blood Pressure and Protein urine in Patients with Preeclampsia

Causing Factors			Age		History of preeclampsia		History of Diabetes mellitus		History of Hypertension	
			Mea n	SD	(-)	(+)	(-)	(+)	(-)	(+)
Systolic blood pressure	Mea	152,96	31,3	7,0	127	0	127	0	133	14
	n		3	4	(100%)	(0%)	(100%)	(0%)	(88,9%)	(11,1%)
	SD	18,77))))))
pV			0,658		0,458		0,458		0,032	
Diastolic blood pressure	Mea	93,33	31,3	7,0	127	0	127	0	133	14
	n		3	4	(100%)	(0%)	(100%)	(0%)	(88,9%)	(11,1%)
	SD	10,00))))))
pV			0,431		0,321		0,321		0,032	
Proteinurine	(-)	61	31,3	7,0	127	0	127	0	133	14
		(48,0%)	3	4	(100%)	(0%)	(100%)	(0%)	(88,9%)	(11,1%)
)))))))
(+1)		66								

s/d (52,0% (+4))				
pV	0,658	0,458	0,458	0,032

The results showed an average blood pressure of 152.96 mmHg systole and diastole 93.33 mmHg. At the risk factor for a mean age of 31.33 years, there was no significant relationship between age and blood pressure, either systole or diastole. Likewise, the risk factors for a history of preeclampsia and diabetes mellitus were also not found to be significant, but there was a significant relationship (0,032) between a history of hypertension and an increase in blood pressure, both systole, and diastole. The results of the correlation analysis between the causes of preeclampsia and protein urine found a significant relationship (0.032) with a history of hypertension.

DISCUSSION

The results of this study found that almost half of the preeclamptic respondents (40.9%) were between the ages of 28-35 years. The age range of patients is almost by the findings of Khuzaiyah in 2016, which has reported that more cases of preeclampsia occur at the age of 20-35 years by 68.8%³. Likewise, Manuaba reported that in 2017, preeclampsia cases were more often found in pregnant women aged 20-35 years of 64.61%⁴. Whereas severe preeclampsia mostly occurs at the age of 31-35 years, housewives work, primigravida, nutritional status with obesity category, and previous history of hypertension are not found⁵. Different opinions with other experts who reported that preeclampsia occurs more frequently at too young an age of <20 years of age are too old or > 35 years. Mothers aged > 35 years are 6 times more likely to suffer from preeclampsia⁶. The same opinion also reports that age > 30 years, preobese, obese, primiparous, early age of menarche can be used as significant predictors for the development of preeclampsia⁷. Meanwhile, the risk of preeclampsia occurs at too young or <20 years of age and the risk is more increased in women who were born to their mothers at the age of <20 years⁸ and in the age group who are too young or old⁸. At age too young, a female reproductive organ is not yet ready for fetal growth and development is supported with nutritional problems in young mothers at risk of abortion and hypertension. While women above 35 years of age the risk of preeclampsia was supported by a theory that explains that with increasing age, the degenerative process will occur as well as bone loss and narrowing of blood vessels that increase the risk of chronic hypertension. Women with the risk of chronic hypertension will have a greater risk of developing preeclampsia^{9,10}.

In this study, there were no risk factors for preeclampsia in the history of the respondent of his biological mother or grandmother's history of respondents. In contrast to the findings of Saraswati and Mardiana in 2017 who said there was a significant relationship between a history of preeclampsia (genetic) and the risk of preeclampsia¹¹. Analysis of a group of pregnant women in Sweden showed that the risk of preeclampsia was due to paternal factors in 13% of cases, which was associated with genetic interactions with the mother's genetic factors. The fetal HLA-G variant from the father increases immune incompatibility with the mother and is also significantly associated with preeclampsia in multigravida pregnancies¹². Using a candidate gene approach, the focus has been on genes likely to be involved in the final systemic stage of the disorder particularly genes affecting endothelial function (eg, renin-angiotensin system), the oxidative stress, and thrombophilia pathways¹³.

Researchers also found no history of diabetes mellitus and hypertension among respondents. Following the reported Saraswati and Mardiana 2017, which found no significant association between the risk of diabetes mellitus and a history of hypertension in patients with preeclampsia¹¹. Likewise, the findings Anggraini et al 2017 in which a history of diabetes mellitus is not a risk factor for preeclampsia, but a history of hypertension is a factor associated with preeclampsia¹⁴. Different opinions state that there are five high-risk factors associated with preeclampsia. The following sequence of risk factors is by the Odds Ratio (OR) value: the history of hypertension (OR = 7,487), advanced age (OR = 6.321), high blood lipids (OR = 5.578), body mass index (OR = 5.412), and history of diabetes mellitus (OR = 4,568)¹⁵. There are similarities between the pathophysiology of preeclampsia and insulin resistance, namely endothelial dysfunction, atherosclerosis, and inflammation. Pregestational insulin resistance or women who have developed insulin resistance before pregnancy or have a higher degree of insulin resistance during pregnancy play a co-adjutant role in the development of preeclampsia¹⁶. Preeclampsia affects 2-7% of pregnancies in non-diabetic women but women with a history of type 1 diabetes, type 2 diabetes, and gestational diabetes can increase the risk of preeclampsia in developed countries. Known risk factors for preeclampsia in women with type 1 and type 2 diabetes include nulliparity, maternal old age, and poor blood sugar control¹⁶.

At the time of the study, systolic and diastolic blood pressure by more than half of the respondents are already in the normal state (52% and 63%). While that is still moderate and high in systole by 26.0% and 22%, in diastole by 26.0% and 11.0%. Instead, Ayatollah et al 2019 respondents reported that hypertension and preeclampsia as much as 59.3% and that do not develop preeclampsia as much as 40.7%¹⁷. While that does not have a history of hypertension and preeclampsia 44.2% and that did not develop preeclampsia as much as 95.8%¹⁸. High blood pressure or hypertension in pregnancy signifies extra pressure on the work of the heart and kidneys so that it risks reducing the flow of nutrients to the placenta and fetus, which results in stunted fetal growth or Intra Uterine Growth Restriction (IUGR) and low birth weight, placental abruption and preterm birth^{19,28}.

Protein urine levels indicate a leak protein in the urine due to a decrease in the glomerular filtration rate (GFR). The discovery of proteinuria at gestational age less than 20 weeks indicates the presence of kidney disease that has been suffered before pregnancy. Meanwhile, the discovery of proteinuria at gestational age for more than 20 weeks indicates preeclampsia^{20,27}. Proteinuria in pregnancy is also found in conditions of primary or secondary kidney disorders due to systemic disorders such as Diabetes Mellitus and hypertension²¹. Not all the results of this study are the same as the previous theory, it is evident from preeclampsia respondents found that 48.0% of them did not experience proteinuria, while 52.0% experienced positive proteinuria (+1 - +4).

This study found a significant relationship between a history of hypertension and positive urine protein with blood pressure (both systole and diastole), following the findings of Karkata in 2016 and Mutiara et al., In 2018 which reported more relationships with preeclampsia risk factors such as age (p -valued 0,000), the relationship between pregnancy (p-value 0,000), the relationship of parity with blood pressure (p-value 0,000), urine protein (p-value 0.014), history of diabetes mellitus (p-value=0,000), none multiple pregnancy relationship (p-value = 0.607)^{22,23,26}. The most dominant multivariate results with the incidence of blood pressure and urine protein were age with blood pressure beta (0.499) and urine beta-protein (0.38). This is in line with the theory that the increase in urine protein in preeclampsia is caused by blood vessel resistance. The renal blood flow and glomerulus filtration rate (GFR) in preeclampsia patients

are lower than in patients with normal pregnancies of the same gestational age. The decrease in renal blood flow is caused by constriction in afferent blood vessels which can cause damage to the glomerular membrane and then increase the permeability of the protein resulting in proteinuria. Vascular resistance causes an increase in vascular resistance and decreases blood supply including the uteroplacental circulation^{24,25}.

CONCLUSION

Of the four factors causing preeclampsia are age factor, history of preeclampsia (genetic), history of diabetes mellitus, and history of hypertension, which correlates with blood pressure and proteinuria is a historical factor of hypertension. The history of hypertension is related to the condition of blood vessels that have constriction so that it manifests hypertension and decreased renal function (protein urine). Therefore, it is recommended in women who have a history of hypertension to control blood pressure before deciding to get pregnant or do regular antenatal care while pregnant to prevent further complications.

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CONFLICTS OF INTEREST

We do not have any conflict of interest in research

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