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Original Research

Age and Diastolic Blood Pressure Are Risk Factor of Preeclamsia: a Case Control Study in Semarang

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Abstract:

Preeclampsia is a very serious public health problem and requires appropriate treatment to avoid complications. Preeclampsia is a medical problem with a high level of complexity. This disease may affect mothers during pregnancy and childbirth, and cause postpartum problems due to endothelial dysfunction in various organs, such as the risk of cardio metabolic disease and other complications.This study aimed to determine the most dominant factors associated with preeclampsia during pregnancy. This study was designed as a case control study including 162 patients, consisting of 81 pregnant women with preeclampsia and 81 pregnant women without preeclampsia from August 2010 to August 2015 at RS I Sultan Agung Semarang. The univariate data were analyzed using frequency distribution, bivariate data were analyzed using chi square test and multivariate data were analyzed using logistic regression.

The chi square test showed that systolic blood pressure (p=0,000; OR=61,750; 95%CI=17,729-215,071), proteinuria (p=0,000; OR=2,328; 95%CI=1,920-2,814), Gameli (p=0,043; OR=2,052; 95%CI=1,749-2,408), IDDM (p=0,043; OR=2,052; 95%CI=1,749-2,408) and multiparaous (p=0,043; OR=2,052; 95%CI=1,749-2,408) were significantly correlated with preeclampsia. Logistic regression test showed that diastolic blood pressure (p=0,000; OR=85,957; 95%CI=17,655-418,496) and maternal age (p=0,001; OR=1,848; 95%CI=1,295-2,638). Pregnant woman with diastolic blood pressure ≥80 mmHg have 85,957 times higher risk to develop preeclampsia compared to those with a lower diastolic blood pressure. Pregnant women with maternal age > 40 years have 1.848 times higher risk to develop preeclamsia compared to those with younger maternal age.

Keywords: Preeclampsia, maternal age, diastolic blood pressure, proteinuria, multiparous woman.

Introduction

Hypertension in pregnancy can occur before 20 weeks or after 20 weeks of gestation. Hypertension during pregnancy that occurs after 20 weeks gestation accompanied by proteinuria is called preeclampsia. According to Prawirohardjo (2010), hypertension in pregnancy is one of the causes of high maternal mortality and morbidity in delivery process with 5-15% complications. The incidence of preeclampsia in Indonesia is 128.273 annually or about 5.3% (OHSU, 2009).

The survey in 2013 showed that hypertension in pregnancy ranked second (27, 1%) after bleeding (30.3%) in the leading cause of maternal mortality in Indonesia. Based on a survey in 2012 , maternal mortality in Indonesia is still high at 359 per 100,000 live births while the target of RENSTRA of 2015-2019 is 306 per 100,000 live birth and target of SDGs is 70 per per 100,000 live births by 2030 (Ministry of Health, 2016). There have been effors to achieve the target of decreasing maternal date rate.

The study was conducted from June 1, 2002 to February 29, 2004 in Kariadi Hospital Semarang resulted in 28.1% of cases of labor with severe preeclampsia. The high maternal mortality rate (MMR) remains a health problem in Indonesia and also reflects the quality of health services during pregnancy and childbirth. Maternal mortality rate in Indonesia is still one of the highest in Southeast Asian countries, in which there are 359 maternal death per 100,000 live births (Ministry of Health of the Republic of Indonesia, 2014).

Prevention of preeclampsia is divided into 3: primary, secondary, tertiary category. Primary prevention means avoiding disease. Secondary prevention in the context of preeclampsia means cutting off the ongoing process of disease before symptoms or clinical emergencies arise from the disease. Tertiary prevention means prevention of complications caused by the disease process, so prevention is also included in the disease management. (wibowo, 2010).

The course of preeclampsia disease initially gives no symptoms and signs, but at some point it can deteriorate rapidly. Primary prevention is the best but can only be done if the cause is well-known so it is possible to avoid or control the causes, but until now the exact cause of preeclampsia is still unknown (Prawirohardjo, 2010). Until now there are various

biomarker findings that can be used to predict the incidence of preeclampsia, but no single test has high sensitivity and specificity. It takes a series of complex checks to better predict a preeclampsia event. Health practitioners are expected to identify risk factors for preeclampsia and control it, allowing for primary prevention. From 17 studies, 17 factors have been shown to increase the risk of preeclampsia, including the history of more than 40 years of age, nulliparous, multiparaous with previous preeclampsia history, multiparas with pregnancies by new partners, multiparas with previous gestational distances of 10 years or more, preeclampsia history in mothers or sisters, multiple pregnancies, IDDM (Insulin Dependent Diabetes Mellitus), chronic hypertension, renal disease, antiphospholipid syndrome (APS), pregnancy with sperm donor insemination, oocytes or embryo, obesity before pregnancy and physical examination results in body mass index more than equal to 35, diastolic blood pressure more than equal to 80 mmHg and proteinuria (Wibowo, 2010).This study aimed to determine the most dominant risk factor correlated with preeclampsia in pregnant women in Semarang.

Methods

This study was designed as case control research. The independent variable were maternal age, diastolic blood pressure, proteinuria, gamely, history of chronic hypertension, Insulin Dependent Diabetes Mellitus, renal disease, antiphospholipid syndrome (APS), pregnancy with sperm donor insemination, oocytes or embryo, multiparous pregnancy. The dependent variable was pre-eclampsia. This study included consecutive 162 respondents consisting of 81 cases with preeclamsia and 81 without preeclampsia between August 2010 and August 2015 at Sultan Agung Islamic Hospital. The data were analyzed using univariate analysis using frequency distribution, univariate analysis used chi sqare test and multivariate analysis used logistic frequency. (Dahlan, 2013). The decision to accept or reject the hypothesis was based on α 5%. The data were aanalyzed using SPSS 22.0 for windows.

Result:

1. Univariate analysis

Table1. Shows comparable characteristics of respondents of the case and control group were history of chronic hypertension, Insulin Dependent Diabetes Mellitus, renal disease, antiphospholipid syndrome (APS), pregnancy with sperm donor insemination, multiparous and the maternal variables included diastolic blood pressure, proteinuria, gamely, IDDM showed a significant difference between case and control. The results is presented in table 1.

characteristic	Preeclamsia (Kasus)		Without Preeclamsia (Kontrol)		p-value	significancy
	Frequncy	%	Frequency	%		
Maternal age:						
- > 40 thn	5	6,2	28	34,4	0.000	significant difference *
- < 40 thn	76	94.8	53	65.6		
Diastolic blood pressure:					0,000	significant difference *
- ≥80 mmHg	76	96,3	24	29,6		
- < 80 mmHg	3	3,7	57	70,4		
Proteiuria:						
- Yes	20	24,7	0	0	0,000	significant difference *
- No	61	75,3	81	100		
Gamely:						
- Yes	4	4,9	0	0	0.043	significant difference *
- No	77	95.1	81	100		
CHH:						
- Yes	1	1,2	0	0	1.00	No significant difference
- No	80	98.8	81	100		**
IDDM:						
- Yes	4	4,9	0	0	0.043	significant difference *
- No	77	95.1	81	100		

Renal Disease:						
- Yes	0	0	0	0	1.00	No significant difference
- Tidak	81	100	81	100		**
APS:						No significant difference
- Yes	0	0	0	0	1.00	**
- No	81	100	81	100		
Artificial Insimination						No significant difference
:	0	0	0	0	1.00	**
- Yes	81	100	81	100		
- No						
Multiporous :						significant difference *
- Yes	4	4,9	0	0	0.043	
- No	77	95.1	81	100		

* significant difference
**no significant difference

2. Bivariate Analysis

Table 4. 2. Bivariate Analysis

Variabel	Preeclamsia (case)	without Prereclamsia (control)	p-value	OR	95%CI
Maternal age:					
- > 40 years	5 (6.2%)	28 (34.4%)	0.000	0.125	0.045-0.343
- < 40 years	76(94.8%)	53 (65.6%)			
Diastolic blood pressure:					
- ≥80 mmHg	76 (96.3%)	24 (29.6%)	0.000	61.750	17.729-215.071
- < 80 mmHg	3 (3.7)	57 (70.4%)			
Proteiuria:					
- Yes	20 (24.7%)	0 (0%)	0.000	2.328	1.920-2.814
- No	61(75.3%)	81 (100%)			
Gamely:					
- Yes	4 (4.9%)	0	0.043	2.052	1.749-2.408
- No	77 (95.1)	81(100%)			
CHD:					
- Yes	1(1.2%)	0	1.000*		
- Yes	80 (98.8%)	81 (100%)			
IDDM:					
- Yes	4 (4,9%)	0	0.043	2.052	1.749-2.408
- No	77 (95.1)	81(100%)			
Kidney Disease:	0 (0%)	0 (0%)	1.000*		
- Yes	81(100%)	81(100%)			
- No					
APS:					
- Yes	0 (0%)	0 (0%)	1.000*		
- No	81(100%)	81(100%)			
Insemination:					
- Yes	0 (0%)	0 (0%)	1,000*		
- No	81(100%)	81(100%)			
Multiparous:					
- Yes	4 (4.9%)	0	0.043	2.052	1.749-2.408
- No	77 (95.1%)	81 (100%)			

Variabel significantly correlated with preeclamsia were sistolic blood pressure (p=0.000; OR=61.750; 95%CI=17.729-215.071), proteinuria (p=0.000; OR=2.328; 95%CI=1.920-2.814), Gameliy(p=0.043; OR=2.052; 95%CI=1,749-2.408), IDDM (p=0.043; OR=2.052; 95%CI=1.749-2.408) and multiparous pregnancy (p=0.043; OR=2.052; 95%CI=1.749-2,408). The detail results is presented in tabel 2

3. Multivariate Analysis

Variables that can be analyzed using multivariate analysis is variable which in bivariate test have value p> 0.25. The results showed that diastolic blood pressure was the most dominant risk factor associated with preeclampsia (p = 0.000; OR = 85.957; 95% CI = 17.655-418.496), mothers with diastolic blood pressure ≥80 mmHg 85.957 times greater risk of preeclampsia when compared with those without diastolic blood pressure <80 mmHg. The next variable was maternal age (p = 0.001; OR = 1.848; 95% CI = 1.295-2.638), where pregnant woman at age of > 40 years are 1.848 times more likely to have preeclampsia compared with pregnant women <40 years old. The results can be seen in table 3

Tabel 3. Multivariate analysis

Variable	p-value	OR	95%CI
Maternal age	0.001	1.848	1.295-2.638
Diastolic Blood pressure	0.000	85.957	17.655-418.496

Discussion:

The results of this study indicate that diastolic blood pressure and age are the dominant risk factors affecting preeclampsia. This result is consistent with the Tessema (2015) study that pregnant women aged ≥ 35 years have are 4 times greater risk of preeclampsia than those aged 25-29. Pregnant women with a family history of hypertension are 7 times more likely to have preeclampsia than women who do not have a family history of hypertension (Tessema *et al*., 2015). Other researchers have suggested that women who had hypertension were 2.3 times more likely to develop preeclampsia compared to women who did not have hypertension. Similarly, women who had a family history of hypertension were 2.2 times more likely to develop preeclampsia as women who did not (Kiondo et al., 2012)

The ideal age for pregnancy and childbirth is 23-35 years. Maternal mortality is increased in pregnant and maternal women under the age of 20 and after age 35 due to the susceptibility (Cunningham *et al* 2006). Pregnant women above 35 years undergo changes in the womb and birth canal became less flexible (Rochjati, 2003). The diagnosis of preeclampsia alone in this study was diagnosed by obstetric and gynecologist at Sultan Agung Semarang Islamic Hospital.

The other characteristic was the pregnancy status. In this present study, samples were primigravida women because in other studies mentioned that in primigravida women, the formation of inhibiting antibodies (blocking antibodies) is not perfect, thus increasing the risk of preeclampsia. The development of preeclampsia increased in the first year of life (Cunningham, 2010). Preeclampsia is an increase in blood pressure at gestational age more than 20 weeks more than 140 mmHg for systolic and more than 90 mmHg for diastolic in this study increased diastolic blood pressure more than 80 mmHg showed significant results with the incidence of preeclampsia.

In preeclampsia there is a loss of serum proteins and increased capillary endothelial permeability leading to decreased intravascular volume.

The pathophysiology of preeclampsia is known as "disease of theory". One theory mentions the endothelial damage of blood vessels. Some of the changes caused by endothelial cell damage include prostaglandin metabolism disorders because endothelial function is to produce prostaglandins, Aggregation of platelet cells is in damaged endothelium. This aggregation leads to the production of thromboxane as a strong vasoconstrictor, distinctive glomerular capillary endothelial cellular changes, increased capillary permeability, increased production of vasopressor materials ie endothelia, NO levels (vasodilators) decreased, endothelin (vasoconstrictor) increases, coagulation factor increases (Prawirohardjo , 2010).In preeclampsia there are changes in the body system such as changes in neurotransmitters, cerebral blood flow and hematological changes. Changes in neurotransmitters especially glutamate cause injury and dysfunction in the brain that can cause seizures. Endothelial damage to blood vessels underlying preeclampsia occurs in localized brains and vasoconstriction may result in eclampsia seizures (Cunningham, 2010).

In some cases, inflammatory changes are considered to be a continuation of stage 1 changes caused by impairment of the placenta. Antiangiogenic and metabolic factors and other inflammatory mediators are thought to trigger endothelial cell injury. It has been proposed that endothelial cell dysfunction is caused by the active state of leukocytes in the maternal circulation. Briefly, cytokines such as tumor necrosis factor (TNF-) and interleukin (IL) can cause oxidative stress associated with preeclampsia. It is characterized by reactive oxygen species and free radicals that lead to the formation of self- adhesive lipid peroxides. This ultimately produces toxic radicals that injure endothelial cells, modify the production of nitric oxide, and disrupt prostaglandin balance. Other consequences of oxidative stress include the production of lipid-laden macrophage lipid cells seen in arthrosis. Activation of microvascular coagulation indicated by thrombocytopenia and a marked increase in capillary permeability by edema and proteinuria (Prawirohardjo, 2010). Uteroplacental perfusion and increased flow resistance produce an abnormal flow shape that is indicated by an increase in diastolic pressure. This is one way of predicting preeclampsia. (Conde-Agudelo, 200 9)

Conclusions:

Diastolic blood pressure is most dominant risk factor correlated with preeclampsia in which pregnant woman with ≥80 mmHg had a 85.957 times higher risk to have preeclamsia compared to those with diastolic blood pressure of <80 mmHg. The other risk factor correlated with prereclamsia was maternal age (p=0.001; OR=1.848; 95%CI=1.295-2.638), in which pregnant woman > 40 years old had a 1.848 times higher risk to get preeclamsia compared to those < 40 tahun

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