Maternal Characteristics and Perinatal Outcomes in Women with Severe Preeclampsia

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Abstract

Introduction: Preeclampsia is a major healthcare problem in Indonesia. Early detection and prompt treatment serve an important role in preventing complications caused by preeclampsia. Previous studies have described risk factors of preeclampsia with the majority of studies undertaken in developed countries. This study aims to evaluate the maternal characteristics and perinatal outcomes of patients with severe preeclampsia in Semarang, Indonesia.

Methods: This was a cross-sectional descriptive study conducted in K.R.M.T. Wongsonegoro General Hospital Semarang. A sample of women with severe preeclampsia who were treated between January and December 2018 Were reviewed through medical records. Variables regarding maternal characteristics and perinatal outcomes were documented. Data were analysed with SPSS vs. 22.

Results: Most patients fall into the age category of 20-34 years. The majority were obese, multigravida and multiparous. Most patients delivered through cesarean section. Most patients had no prior use of contraception. Maternal history was significant for chronic hypertension. Two patients were admitted to the ICU due to severe hypoalbuminemia and impending eclampsia. Despite the high prematurity rate, most neonates fall into the normal birth weight category.

Conclusion: Preeclampsia remains a major healthcare problem in Indonesia. Indeed, there are some discrepancies in maternal characteristics in this study with previous studies. This suggests that maternal characteristics of patients with severe preeclampsia in Indonesia might be different from that of developed countries due to different population characteristics. This concludes that all women of all backgrounds should be screened during antenatal visits as this can aid in early detection and prompt treatment of severe preeclampsia.

Keywords: severe preeclampsia, perinatal outcomes, maternal characteristics

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INTRODUCTION

According to the World Health Organization (WHO), maternal mortality is extremely high. In 2017, approximately 295.000 women died due to complications from pregnancy and childbirth. Preeclampsia is a major healthcare problem and a leading cause of maternal and perinatal morbidity and mortality in Indonesia. Also, previous data shows that women in low-resource countries are at a higher risk of developing preeclampsia compared with those in high-resource countries.[1]

Preeclampsia is the presence of hypertension with organ dysfunction after 20 weeks of gestation. The exact pathogenesis of preeclampsia remains unclear.[2] Previous studies show few risk factors that are associated with the development of preeclampsia: nulliparity, chronic hypertension, obesity, chronic renal disease, multiple gestation and age of >40.[2] Previous histories of preeclampsia are correlated with a higher risk of developing preeclampsia in the current pregnancy. The diagnosis of preeclampsia requires two criteria: 1. Elevated blood pressure (BP≥140/90 mmHg) after 20 weeks of gestation in a woman with previously normal blood pressure; 2. Presence of proteinuria (≥ 0.3 mg protein in 24-hour urine specimen) or new onset of symptoms in the absence of proteinuria.[3,4] Preeclampsia is further divided into mild and severe based on the degree of severity and symptoms.[5] Severe preeclampsia is diagnosed when blood pressure increases ≥160/110 mmHg with or without signs and symptoms of end-organ damage.[4]

The incidence of maternal and neonatal mortality caused by severe preeclampsia is 50,000-100,000 worldwide.[6] To reduce maternal mortality and mortality, greater efforts are required to provide more frequent prenatal care for women and thus earlier detection of preeclampsia. The majority of previous studies regarding severe preeclampsia was undertaken in developing countries where antenatal care is widely available. There are some inconsistencies, especially in developing countries where severe preeclampsia often presents late due to a lack of antenatal care. The study aims to evaluate maternal characteristics and perinatal outcomes associated with severe preeclampsia. Identification of maternal characteristics will aid in the early detection of preeclampsia and directing antenatal care towards these women. This can guide health care providers towards providing tighter surveillance and proper treatments to reduce complications associated with preeclampsia.

Materials and methods

This is a hospital-based descriptive observational study with a cross-sectional design. This study was conducted at one government hospital in Semarang, K.M.R.T Wongsonegoro General Hospital. Data were collected consecutively from medical records. All women admitted to the obstetric unit of the K.M.R.T Wongsonegoro General Hospital who delivered with severe preeclampsia from January to December 2018 were included in this study. Patients with incomplete data were excluded from the study.

Variables regarding maternal characteristics collected were age, gravidity, parity, history of abortion, Body Mass Index (BMI), history of hypertension, diabetes mellitus or preeclampsia and previous contraception used. Laboratory values obtained to assess maternal liver and kidney function were creatinine, albumin, urea, AST, and ALT. Variables regarding perinatal outcomes collected were gestational age at delivery, method of delivery and birth weight. Fetal and maternal complications during pregnancy were also documented.

In this study, severe preeclampsia is defined by:/ A systolic BP ≥160 mmHg or diastolic BP ≥110 mmHg on at least two occasions measured 4 hours apart and accompanied by one of the following signs, i.e. proteinuria ≥ 5 grams in 24-hour urine sample, thrombocytopenia ≤ 100.000/µL, renal insufficiency: serum creatinine >1.1 mg/dL or an increase ≥2 times baseline, liver failure: an increase in liver function test ≥ 2 times baseline or persistent epigastric pain, pulmonary edema, cerebral or visual dysfunction, Intrauterine growth restriction (IUGR).

All statistical analysis was performed using SPSS vs. 22.0. Continuous variables are presented as mean, standard deviation, and median. Categorical variables are presented as a proportion (%). This study has been approved by the Ethical Committee of K.R.M.T. Wongsonegoro General Hospital No. 070/4800/2019.

Result

In this study, we found a total of 78 women who delivered with severe preeclampsia in the year 2018. Out of 78 patients, three of them had incomplete data and were excluded from the study.

The incidence of severe preeclampsia is found highest in the age category of 20- 34 years. Obesity, defined as a BMI of ≥25 kg/m^2, was observed highest with a total of 61 (81.3%) cases with an average BMI of 30.89 kg/m^2. In this study, only 16 (21.3%) patients were primigravida. Multiparous women were observed in the majority of cases (74.7%). Most patients (78.7%) had no prior use of contraception. The hormonal injection was the most common contraception used, with a total of 11 cases. Maternal history was significant for the history of hypertension with 27 (36%) of cases observed. Only two women had a history of preeclampsia in a previous pregnancy.

The method of delivery was determined based on gestational age, fetal and maternal condition. Cesarean section was performed in most cases (61.3%), with only 38.7% of patients delivered spontaneously. The Breech presentation was present in one case and the cesarean section was performed. There was one case of neonatal death due to prematurity and its complications.

Multiple pregnancies were observed in one case and the cesarean section was performed. There were two cases of fetal distress, both of which cesarean section was performed. Oligohydramnios was the most frequent complication observed with a total of seven cases and IUGR was observed in three cases. Forty cases (53.4%) were delivered prematurely while only one post-term case observed. There were 17 cases of low birth weight observed with only one case of macrosomia.

Maternal complications

Maternal complications like low-lying placenta occurred in four cases, placenta previa in one, preterm labor in five, premature rupture of membranes in one, and hypertensive emergency in one. There was no maternal death. Four cases of morbidly adherent placenta were observed, and curettage procedure was performed. Two women were admitted to the intensive care unit (ICU) due to hypoalbuminemia (1.9 g/dL) and impending eclampsia.

Discussion and conclusion
Discussion
Age

A study by Reeta et al showed that advanced maternal age (AMA), defined as a woman who is 35 years or older at the time of delivery, is 1.5 times more likely to have preeclampsia than women under 35 years. AMA is also associated with preterm deliveries and impaired fetal growth.[7] Duckitt et al. reported this may be related to the aging of uterine blood vessels and increased villus reactions in AMA.[8] In this study, most patients fell into the age category of 20-34 years. The Previous study by Reeta et al. which took place in Finland mentioned an increasing incidence of AMA in many Western countries. In Finland, the proportion of women over 35 in 2009 was 18.7% and this percentage has been increasing exponentially. A different study population might explain the higher proportion of women falling into the 20-34 age category. In most developing countries, including Indonesia, the incidence of AMA is relatively low due to more proportion of pregnant women under the age of 35. This might explain the greater distribution of patients in the 20-34 age category.

Table I. Demographic characteristic of study population

Age	N (%)
< 20	1 (1.3%)
≥ 35	25 (33.3%)
20 – 34	49 (65.3%)
BMI categories (Asia Pacific) (kg/m^2)	

18.5-22.9 (Normal)	1 (1.3%)
23-24.9 (Overweight)	13 (17.3%)
≥25 (Obese)	61 (81.3%)
Gravidity	
1	16 (21.3%)
2	24 (32.0 %)
3	21 (28.0%)
≥4	14 (18.6%)
Parity	
Nullipara	19 (25.3%)
Multipara	56 (74.7 %)
History of Abortion	
Yes	9 (12.0%)
No	66 (88.0 %)
History of contraceptive use	
No Contraception	59 (78.7%)
IUD	1 (1.3 %)
OCP	4 (5.3%)
Hormonal Injection	11 (14.7%)
Comorbid factors	
Diabetes Mellitus	
Yes	7 (9.3%)
No	68 (90.7%)
Hypertension	
Yes	27 (36%)
No	48 (64%)
Preeclampsia	
Yes	2 (2.7%)
No	73 (97.3%)

Table II. Perinatal outcomes

Variables	Proportion n (%)
Method of delivery	
Cesarean Section	46 (61.3%)
Spontaneous Vaginal Delivery	29 (38.7%)
Gestational age at delivery (weeks)	
<28 (extremely pretem)	1 (1.3%)
28-32 (very preterm)	14 (18.7%)
32-37 (moderate to late)	25 (33.4%)
37-42 (aterm)	34 (45.3%)
>42 (post-term)	1 (1.3%)
Birthweight (grams)	
<2500	17 (22.7%)
2500-4000	57 (76.0%)
>4000	1 (1.3%)

BMI

In this study, the majority of patients (81.3%) fall into the obese category with a BMI of 25 kg/m^2. A previous study by Phipps et al. Reported obesity as a risk factor for preeclampsia and showed that the relationship between maternal weight and preeclampsia is a progressive risk which varies from 4.3% in women with BMI <19.8 kg/m^2 and up to 13.3% with BMI ≥ 35 kg/m^2.[9] Obesity associated with an increased risk of preeclampsia was explained by increased levels of serum triglycerides, very low-density lipoproteins, and formation of small dense low-density lipoprotein particles in obese women.[10]

Parity

Kashanian M, et al. described that primigravidas a risk factor for preeclampsia/ eclampsia.[11] Preeclampsia is more common in primigravida women and the risk of preeclampsia increases with a greater interval between pregnancies.[12] In this study, most patients (74.7%) were multiparous. A previous study by Chen CL, et al., which took place in Taiwan reported that nulliparity was associated with a significantly increased risk of preeclampsia. It is believed that this might be due to maternal first exposure to trophoblasts.[13]

Perinatal outcome

Preeclampsia results in dysfunctional uteroplacental blood flow which causes negative impacts on perinatal outcomes.[14] Previous studies have mentioned several fetal complications resulting from uteroplacental ischemia: IUGR, oligohydramnios, non-reassuring fetal status, and placental abruption. These complications in consequent cause increased risk of preterm delivery, either spontaneously or indicated.[15]

This might explain the high incidence of preterm delivery in this study, with a total of 40 (53.3%) cases delivered <37 weeks of gestation. One case of preterm labor in this study delivered at 32 weeks of gestation resulted in neonatal death caused by prematurity and its complications.

This study shows oligohydramnios is the most common complication encountered. A study by Erez et al. which aimed to study the association between oligohydramnios and maternal and fetal outcome in patients with preeclampsia showed oligohydramnios is an independent risk factor for fetal and/or neonatal morbidities, such as fetal distress, perinatal death, and low Apgar score. In this study, oligohydramnios was one of the indications of terminating pregnancy through cesarean section.[16]

Method of delivery in patients with preeclampsia should be individualized based on maternal and fetal considerations. Maternal conditions to be considered are the probability of successful vaginal delivery and the nature of preeclampsia disease progression. Recent guideline by ACOG shows vaginal delivery with labor induction can often be achieved in preeclampsia with severe features, but it is less likely to be accomplished with decreasing gestational age.[15] Studies comparing induction of labor vs. cesarean delivery in women with preeclampsia with severe features who had preterm labor showed no negative impacts of induction of labor on low-birth-weight infants.[17] Meanwhile, spontaneous vaginal delivery is the preferred method of delivery in patients with gestational hypertension or preeclampsia without severe features.[18-20] Previous studies showed the likelihood of cesarean section is as high as 97% with less than 28 weeks of gestation and as high as 65% with 28-32 weeks of gestation. The likelihood of cesarean delivery at less than 28 weeks of gestation could be as high as 97%, and at 28–32 weeks of gestation as high as 65%.[18-20] In this study, the high incidence of preterm delivery might result in a high percentage of cesarean delivery. Also, some of the cesarean section in this study were performed due to fetal indications such as fetal distress, oligohydramnios, IUGR, and breech presentation.

In this study, the majority of neonates had a normal birth weight. Although uteroplacental insufficiency results in IUGR, most patients are obese (BMI $\geq$25 kg/m^2) in this study. Maternal obesity results in a 2- to -3 fold of increased risk of developing fetal macrosomia. Furthermore, heavier women have less probability of having a pregnancy complicated by IUGR or a small-for-gestational-age infant.[21] A recent meta-analysis showed an increased prevalence of fetal macrosomia in obese and morbidly obese women compared to the normal-weight controls.[22] In this study, the high prevalence of obesity might explain the higher number of neonates with normal birth weight (76%). One case of macrosomia was shown in this study with a maternal BMI of 46.7 kg/m^2 and the cesarean section was performed at a gestational age of 36 weeks. This might demonstrate obesity as the cause of increased birth weight in the setting of preeclampsia.

Contraception

Most patients admitted to the obstetric unit at this hospital have low knowledge of contraception which explains why most had no prior use of contraception. Previous studies concluded that oral contraceptives increase systolic blood pressure by up to 8 mmHg and diastolic blood pressure by up to 6 mmHg. However, depot medroxyprogesterone acetate (DMPA) given as injections does not significantly alter blood pressure.[23] The most common contraception used in this study was a hormonal injection, followed by oral contraceptives (OCP). The hormonal injection might be the preferable method of contraception in this study population due to less compliance needed. Aside from high compliance needed, OCP is also contraindicated in women with hypertension, which may be the reason why OCP use was only seen in 4 cases.

Maternal history

History of hypertension was the most significant maternal history in this study, with 27 cases in total, followed by diabetes mellitus (7 cases) and previous preeclampsia (2 cases). In a cohort study by Bartsch et al., prior preeclampsia had the greatest relative risk of developing preeclampsia, followed by chronic hypertension. The pooled rate of preeclampsia was as high as 16% among women with chronic hypertension.[24] This study population might have inadequate prenatal care in previous pregnancies, causing preeclampsia to be underdiagnosed. This might be the reason why there were only two cases of prior preeclampsia. This study population might have a low level of education and lack of healthcare availability which resulted in uncontrolled hypertension and a higher risk of developing preeclampsia. This explains the high proportion of women with chronic hypertension in this study.

Previous studies have shown that approximately 20% of women with diabetes develop preeclampsia. The pathogenesis remains unclear. It is speculated that hyperglycemia causes dysfunctional cytotrophoblast function via stress signaling.[25]

Maternal Complications

Renal dysfunction in preeclampsia leads to GFR and renal plasma flow decrease by approximately 30-40% compared to normal pregnancy. Despite this, BUN and creatinine levels often remain in the normal range. In severe preeclampsia, prolonged renal hypoperfusion can lead to acute tubular necrosis.[26] A recent study stated that disruption of size and charge selectivity of the glomerular barrier leads to the development of albuminuria. The degree of severity of proteinuria ranges from less than one gram to 8-10 grams per day.[27] One patient in this study had severe hypoalbuminemia (1.9 g/dL) and was admitted to ICU for albumin replacement and continuous monitoring. The previous study reported proteinuria often spontaneously resolves after pregnancy is terminated.[28]

All patients with severe preeclampsia must be closely monitored for signs of impending eclampsia. The signs of impending eclampsia are headache, hyperreflexia, nausea, cerebral or visual disturbance, epigastric pain, pulmonary edema or cyanosis; impaired liver function, and thrombocytopenia and coagulation disorders. Impending eclampsia is one indication of admission to the ICU due to a higher risk of developing eclampsia.[29]

Conclusion

Higher prevalence of preeclampsia in developing countries might be due to inadequate and the suboptimal antenatal care and low level of education amongst patients belonging to low socioeconomic status. Indeed, there are some discrepancies in maternal characteristics in this study with previous studies. This suggests that maternal characteristics associated with severe preeclampsia in Indonesia might be different from that of developed countries due to different population characteristics. This concludes that all women of all backgrounds should be screened during antenatal visits as this can aid in early detection and prompt treatment of severe preeclampsia. Tighter prenatal surveillance should be addressed to those with risk factors. More studies should be done in developing countries in the future, particularly evaluating risk factors of preeclampsia

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