Maternal characteristics and delivery method in patients with preeclampsia in PKU Muhammadiyah Bantul, Yogyakarta

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ABSTRACT

Preeclampsia is the condition of pregnancy that has high mortality of mother and result some complication for the childbirth. The incidence of preeclampsia in the world reaches 10% whereas 3% -5% of them experience complications of eclamptic pregnancy. The objective of this study is to explore maternal characteristics and delivery methods of preeclampsia in order to predict the prognosis of the diseases and direct proper antenatal care. The study was descriptive observational with a cross-sectional design at PKU Muhammadiyah Bantul during 2018-2020. Data were collected from medical records. The variables were compared using the Mann-Whitney, Kruskall Wallis, and crosstabs as appropriate. In this study, we found 77 women with preeclampsia. The age of the majority patients are less than 35 years old. Five patients (6.50%) were mild preeclampsia and 52 patients (67.50%) were severe preeclampsia. Forty-seven (61.04%) patients with preeclampsia were multigravida and 37 patients (48.05%) have normal BMI. Almost all patients without comorbid disease (96.10%) and history of preeclampsia (98.70%). Sixty-eight patients (88.31%) have interpregnancy interval less than 5 years and without complication after delivery. Preeclampsia's patients delivered at aterm gestational age (67.53%). Most of the preeclampsia patients were delivered their baby with cesarean section method (74.03%; p = 0.01%).

INTRODUCTION

Preeclampsia is a form of complication of pregnancy with hypertension and is accompanied by organ dysfunction, one of which is the kidneys, resulting in proteinuria. The incidence of preeclampsia in the world reaches 10% and 3% -5% of them experience complications of eclamptic pregnancy [1,2]. According to the World Health Organization (WHO), In 2017, approximately 295.000 women died due to complications from pregnancy and childbirth [3]. The International Society for the Study of Hypertension in Pregnancy (ISSHP) defines preeclampsia as the presence of new-onset hypertension and proteinuria or other end-organ damage occurring after 20 weeks of gestation. Classification of preeclampsia are mild preeclampsia and severe preeclampsia. Severe preeclampsia is preeclampsia with any of the following features: blood pressure ≥160/110 mmHg on two separate occasions; platelet count 1.1 mg/dl (97.2 μmol/l); or doubling of the serum creatinine level, pulmonary oedema or newonset cerebral or visual disturbance[4]. Mild preeclampsia is characterized by systolic blood pressure (SBP) ≥140 mmHg or diastolic blood pressure (DBP) ≥90 mmHg, and proteinuria >300 mg/24 h[5]. The risk factor of preeclampsia are history of hypertensive disease during a previous pregnancy and underlying maternal diseases including chronic kidney disease, autoimmune diseases, diabetes, or chronic hypertension. Pregnancy has moderate risk if they are nulliparous, ≥40 years of age, a body mass index (BMI) ≥ 35 kg/m, a family history of preeclampsia, a multifetal pregnancy, gestational diabetes, or a pregnancy interval of more than 10 years. Condition that increase the possibility of preeclampsia are raised mean arterial blood pressure before 15 weeks' gestation, polycystic ovarian syndrome, sleep disordered breathing, and various infections such as periodontal disease, urinary tract infections, and helicobacter pylori[1,6,7]. Neonatal morbidity and mortality become an impact of preeclampsia, as it can cause fetal growth restriction with oligohydramnios, nonreassuring fetal status, preterm birth, low birth weight, severe birth asphyxia, stillbirth, and intrapartum death[8]. The primary objective of this study was to explore maternal characteristics and delivery methods of preeclampsia in order to predict the prognosis of the diseases and direct proper antenatal care particularly in Bantul.

METHODS

We conducted a descriptive observational study with a cross-sectional design at one private hospital in Bantul, Yogyakarta, PKU Muhammadiyah Bantul during 2018-2020. Data were collected consecutively from medical records. All women that were diagnosed preeclampsia were included in this study. Patients with incomplete data were excluded from the study.

Statistical Analysis

Descriptive statistics were used to summarize the patient's characteristics, disease subtypes, and clinical characteristics of the patients. The variables was compared using the Mann-Whitney, Kruskall Wallis, and crosstabs as appropriate. All p-values were presented as two-tailed, with values <0.05 being considered as statistically significant.

RESULTS

Table 1. Characteristic of patients

Variable	Mild Preeclampsia n(%)	Severe Preeclampsia n(%)	Total of preeclampsia n (%)	p-value
Age				
>35 years old	3 (3.90%)	17 (22.10%)	20 (25.97%)	0.435
<35 Years old	5 (6.50%)	52 (67.50%)	57 (74.03%)	
Gravida				
Primigravida	2 (2.60%)	28 (36.40%)	30 (38.96%)	0.395
Multigravida	6 (7.80%)	41 (53.20%)	47 (61.04%)	
BMI				
Underweight	0 (0%)	6 (7.80%)	6 (7.79%)	0.253
Normal	6 (7.80%)	31 (40.30%)	37 (48.05%)	
Overweight	2 (2.60%)	32 (41.60%)	34 (44.16%)	
Comorbid disease				
yes	0 (0%)	3 (3.90%)	3 (3.90%)	0.550
No	8 (10.40%)	66 (85.70%)	74 (96.10%)	
History of Preeclampsia				
Yes	0 (0%)	1 (1.30%)	1 (1.30%)	0.733
No	8 (10.40%)	68 (88.30%)	76 (98.70%)	
Interpregnancy interval				
> 5 years	0 (0%)	9 (11.70%)	9 (11.69%)	0.280
<5 years	8 (10.40%)	60 (77.90%)	68 (88.31%)	
Gestational age at delivery				
Preterm	2 (2.60%)	23 (29.90%)	25 (32.47%)	0.636
Aterm	6 (7.80%)	46 (59.70%)	52 (67.53%)	
Delivery method				
Cesarean Section	2 (2.60%)	55 (71.40%)	57 (74.03%)	0.001
Spontaneous Vaginal Delivery	6 (7.80%)	14 (18.20%)	20 (25.97%)	
Complication				
Yes	1 (1.30%)	8 (10.40%)	9 (11.69%)	0.940
No	7 (9.10%)	61 (79.20%)	68 (88.31%)	

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In this study, we found 77 women with complete data whose delivered with preeclampsia during 2018-2020. Eight of them was mild preeclampsia and 69 women was severe preeclampsia. The age of the Majority of patients are less than 35 years old. Five patients (6.50%) were mild preeclampsia and 52 patients (67.50%) were severe preeclampsia. Forty-seven (61.04%) patients with preeclampsia were multigravida, and 37 patients (48.05%) have normal BMI. Mostly patients without comorbid disease (96.10%) and history of preeclampsia (98.70%). Sixty-eight patients (88.31%) have interpregnancy interval less than 5 years and without complication after delivery. Preeclampsia's patients delivered at aterm gestational age (67.53%). Significantly, delivery method of the patients was cesarean section (74.03%; p = 0.01%).

DISCUSSION

Most of preeclampsia patients less than 35 years old, like in Sweden, China, and some region in Indonesia (Palembang and Makassar). They said that maternal age of 35 or older was significantly associated with preeclampsia [9–11]. The risk of preeclampsia increase along with maternal age. Older maternal age was significantly associated with the risk of preeclampsia (late onset and early onset of preeclampsia) and cesarean section in preeclampsia [12,13].

In this research, Preeclampsia was more prevalent in multigravida than primigravida. It similar to the research in Surabaya, Indonesia and also Sweden [6,14]. Multigravida are responsible for the progress of preeclampsia but the causes were less well defined [15]. Study in Pakistan showed that higher parity increase chance become preeclampsia [16].

In our study, less than a half of severe preeclampsia patients was overweight even though some study stated that obesity related to increasing risk of preeclampsia [17,18]. Recent issue about obesity, not only maternal obesity, but also paternal obesity increased risk of the disease. Paternal obesity related to preeclampsia caused by induction of epigenetic changes in sperm before conception, alteration of placental function, fetal HLA-G variants that increased immune incompatibility with mother [19]. Elevation of pre-pregnancy BMI and gestational weight gain became the risk of preeclampsia by increasing level of oxidative stress, stimulate system inflammatory response, and accelerate damage to vascular endothelial cells [20]. Placenta also produce Leptin during pregnancy. In preeclamptic placenta, the concentration of leptin become higher. This condition triggered some research using leptin as biomarker for predicting preeclampsia [21]. Contrary, a systematic review study stated that BMI has no correlation with preeclampsia [22].

Most of preeclampsia patients in this study were without comorbid disease, history of preeclampsia, and has interpregnancy interval less than 5 years. Majority of preeclampsia cases is

simultaneously with other pathologies in a comorbid manner such as diabetes mellitus and obesity. There are also rare co-occurrences related to preeclampsia that connected to molecular genetic level. Comorbid genes on one hand were contribute directly to preeclampsia, but on the other hand, may triggers the promoting factor of preeclampsia. There are 2 genes dominantly related to preeclampsia. First, ACE (Angiotensin-converting enzyme) as a regulator of blood pressure by influencing vascular tone by activating angiostensin II and inactivating bradykinin. Second, TNF-α (Tumor necrosis factor – alpha) related to insulin resistance [23]. Study in India and Canada informed that comorbidities related fetal outcome (NICU admission, neonatal death, intrauterine death, prematurity, and neonatal jaundice) and maternal complication (Postpartum haemorrhage, acute kidney injury, HELLP syndrome, puerperal sepsis) [24].

In this study, interval of pregnancy less than 5 years is more common in preeclampsia (mild and severe) and this finding contrary with study in Macedonia and Armenia[25,26]. They said that pregnancy interval more than 10 years has the risk of preeclampsia about the same as nulliparous women. Another study (a systematic review) informed that comparison between interpregnancy interval less than 2 years with 2-4 years, there is no significant increase in risk. Comparison of intervals 2-4 years and >4 years stated significant small increase. The expected confounding factor of their research was partner changes that induced maternal immune system to react to paternal antigen [27] . Risk of preeclampsia falls sharply after the first birth, but the risk increases over time. Interpregnancy interval more than 5 years was associated with sevenfold higher odds of preeclampsia development among women without history of preeclampsia [25].

The delivery method of severe preeclampsia was majority by cesarean section at aterm gestational week. Patients with severe preeclampsia have eightfold risk to terminate their pregnancy by caesarean section compared to normal pregnancy and sometimes preceded by failed induction. This decision also considering about fetal outcome such as apgar scores, NICU admission, and intrauterine growth restriction. Fetal apgar score of preeclampsia patients who were delivered by emergency caesarean section was higher than patients in normotensive pregnancy. The complication of preeclampsia in our study as mentioned in other study, they are HELLP (Hemolysis, ELevated liver enzymes, and Low Platelet) syndrome, solution placenta, and intrauterine growth restriction (IUGR) [28].

CONCLUSION

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The increasing of preeclampsia's incidence was in line with increasing of preeclampsia's complication. Characteristics of the patients may vary from one region to another. Some differences were not well defined so the picture of the disease in a region was important to take some action to prevent the increasing of the incidence. Preeclampsia patients in Bantul mostly less than 35 years old, multigravida, and normal BMI. The majority of them was no history of preeclampsia, comorbidity and interval of pregnancy less than 5 years. They delivered their baby at aterm gestational age with caesarean section as choice of delivery methods. Only a few of them has complication such as HELLP syndrome, solution placenta, and IUGR.

REFERENCES

1. Fox R, Kitt J, Leeson P, Aye CYL, Lewandowski AJ. Preeclampsia: Risk Factors, Diagnosis, Management, and the Cardiovascular Impact on the Offspring. *J Clin Med*. 2019;8(10):1625.
2. Chaiworapongsa T, Chaemsaithong P, Yeo L, Roberto R. Pre-eclampsia part 1: current understanding of its pathophysiology. *Rat Rev Nephrol*. 2014;10(9):466-480.
3. Pramana C, Budi K, Juliani V, Laras C, Harini NN. Maternal Characteristics and Perinatal Outcomes in Women with Severe Preeclampsia. 2020;11(11):549-553.
4. Phipps EA, Thadhani R, Benzing T, Karumanchi SA. Pre-eclampsia: pathogenesis, novel diagnostics and therapies. *Nat Rev Nephrol*. 2019;15(5):275-289. doi:10.1038/s41581-019-0119-6
5. Peres GM, Mariana M, Cairrão E. Pre-eclampsia and eclampsia: An update on the pharmacological treatment applied in Portugal. *J Cardiovasc Dev Dis*. 2018;5(1). doi:10.3390/jcdd5010003
6. Yang Y, Ray I Le, Zhu J, Zhang J, Hua J, Reilly M. Preeclampsia Prevalence , Risk Factors , and Pregnancy Outcomes in Sweden and China. 2021;4(5):1-14. doi:10.1001/jamanetworkopen.2021.8401
7. Saxena N, Bava AK, Nandanwar Y. Maternal and perinatal outcome in severe preeclampsia and eclampsia. 2016;5(7):2171-2176.
8. Kongwattanakul K, Saksiriwuttho P, Chaiyarach S, Thepsuthammarat K. Incidence , characteristics , maternal complications , and perinatal outcomes associated with preeclampsia with severe features and HELLP syndrome. *International Journal of Womens's*. 2018;10:371-377.
9. Putra HK, Adnan Abadi, Dinda Radeta. Factors Affecting Delivery Methods in Severe Preeclampsia Patients at Dr. RSUP. Mohammad Hoesin Palembang January 2018 – December 2019. *Bioscientia Medicina : Journal of Biomedicine and Translational Research*. 2021;5(4):978-987. doi:10.32539/bsm.v5i4.375
10. Suleman DM, Nurdin A, Setiawati D. *252 PREECLAMPSIA-ECLAMPSIA GRAVIDARUM AND THE DELIVERY OF THE CESAREAN SECTION METHOD*. Vol 3.; 2021.
11. Yang Y, Le Ray I, Zhu J, Zhang J, Hua J, Reilly M. Preeclampsia Prevalence, Risk Factors, and Pregnancy Outcomes in Sweden and China. *JAMA Netw Open*. Published online 2021. doi:10.1001/jamanetworkopen.2021.8401
12. Ogawa K, Urayama KY, Tanigaki S, Sago H, Sato S, Saito S. Association between very advanced maternal age and adverse pregnancy outcomes : a cross sectional Japanese study. *BMC Pregnancy Childbirth*. Published online 2017:1-10. doi:10.1186/s12884-017-1540-0
13. Robillard P yves, Dekker G, Scioscia M, et al. Increased BMI has a linear association with late-onset preeclampsia : A population-based study. *PLoS One*. 2019;5:1-14.
14. Tyas BD, Lestari P, Akbar MAA. Maternal Perinatal Outcomes Related to Advanced Maternal Age in Preeclampsia Pregnant Women. *J Family Reprod Health*. 2019;13(4):191-200.

15.   Alrubaee MA, Kadim L. Feto-maternal outcome of preeclampsia in multigravida compared to primigravida women. *The Medical Journal of Basrah University*. 2019;37(2).

16.   Soomro SB, Bosan R, Shaikh S, Shaikkh AB, Shaikh AA, Shaikh S. Frequency of pre-eclampsia in multigravida at Shaikh Zaid Women Hospital Larkana, Pakistan.pdf. *Rawal Medical Journal*. 2019;44(4).

17.   Robillard PY, Dekker G, Scioscia M, et al. Increased BMI has a linear association with late-onset preeclampsia: A population-based study. *PLoS One*. 2019;14(10). doi:10.1371/journal.pone.0223888

18.   Motedayen M, Rafiei M, Tavirani MR, Sayehmiri K, Dousti M. The relationship between body mass index and preeclampsia: A systematic review and meta-analysis. *Int J Reprod Biomed*. 2019;17(7):465-474. doi:10.18502/ijrm.v17i7.4857

19.   Lin J, Gu W, Huang H. Effects of Paternal Obesity on Fetal Development and Pregnancy Complications: A Prospective Clinical Cohort Study. *Front Endocrinol (Lausanne)*. 2022;13. doi:10.3389/fendo.2022.826665

20.   Shao Y, Qiu J, Huang H, et al. Pre-pregnancy BMI, gestational weight gain and risk of preeclampsia: A birth cohort study in Lanzhou, China. *BMC Pregnancy Childbirth*. 2017;17(1). doi:10.1186/s12884-017-1567-2

21.   Thagaard IN, Hedley PL, Holm JC, et al. Leptin and Adiponectin as markers for preeclampsia in obese pregnant women, a cohort study. *Pregnancy Hypertens*. 2019;15:78-83. doi:10.1016/j.preghy.2018.12.002

22.   Motedayen M, Rafiei M, Tavirani MR, Sayehmiri K, Dousti M. The relationship between body mass index and preeclampsia: A systematic review and meta-analysis. *Int J Reprod Biomed*. 2019;17(7):465-474. doi:10.18502/ijrm.v17i7.4857

23.   Glotov AS, Tiys ES, Vashukova ES, et al. *Molecular Association of Pathogenetic Contributors to Pre-Eclampsia (Pre-Eclampsia Associome)*.; 2014. http://www.biomedcentral.com/1752-0509/9/S2/S4

24.   M. C. A, Taye MK, Saikia N, Teron L, Kalita P. The effect of comorbidities of preeclampsia and eclampsia on maternal and fetal outcome. *Int J Reprod Contracept Obstet Gynecol*. 2023;12(3):721-725. doi:10.18203/2320-1770.ijrcog20230545

25.   Harutyunyan A, Armenian H, Petrosyan V. Interbirth interval and history of previous preeclampsia: a case-control study among multiparous women. *BMC Pregnancy Childbirth*. 2013;13. doi:10.1186/1471-2393-13-244

26.   Jasovic-Siveska EI, Jasovic VI. The Interval Between Pregnancies as A Risk Factor for Mild and Severe Forms of Preeclampsia. *The Open Access Journal of Science and Technology*. 2014;2. doi:10.11131/2014/101065

27.   Cormick G, Betrán AP, Ciapponi A, Hall DR, Hofmeyr GJ. Inter-pregnancy interval and risk of recurrent pre-eclampsia: Systematic review and meta-analysis. *Reprod Health*. 2016;13(1). doi:10.1186/s12978-016-0197-x

28.   Sukmawati S, Sunarno I, Arsyad MA, Idris I. Vaginal and cesarean section delivery with severe preeclampsia and preeclampsia with complications. *Enferm Clin*. 2020;30:537-540. doi:10.1016/j.enfcli.2019.07.155

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