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Original Research Article

SEVERE PREECLAMPTIC PATIENTS IN THE RESUSCITATION ROOM OF DR. SOETOMO GENERAL ACADEMIC HOSPITAL SURABAYA: A RETROSPECTIVE STUDY

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ABSTRACT

Introduction: Preeclampsia is the leading cause of maternal and fetal death and is an urgent issue in maternal health, especially in developing countries such as Indonesia. Patients with severe preeclampsia who were in critical conditions tend to be admitted to the resuscitation room for assistance from more skilled personnel and more sophisticated technology. **Objective**: This study aims to determine the complications, treatments, and outcomes of severe preeclampsia patients treated in the resuscitation room of Dr. Soetomo General Academic Hospital from January 1st, 2018 to December 31st, 2019. **Methods**: This was a retrospective, descriptive study that used medical records. Microsoft Excel was used to analyze the data. Eighty-one samples met the inclusion criteria. **Results**: The majority of patients were aged 20-35 years (65.43%) and had completed senior high school (88.89%). Most patients had stage 2 obesity (44.44%) and multigravida (41.97%). A history of preeclampsia and hypertension was not found in the majority of patients. Most patients were diagnosed with late-onset preeclampsia (69.14%) and most were referred from secondary health facilities (96.30%). The most common complication was pulmonary edema (53.09%) and the majority of patients had 2 complications (43.17%), with the most common combination being eclampsia and HELPP syndrome (13.58%). The majority of the patients were intubated (70.37%) and this was done mostly in patients with eclampsia (56.14%). The termination of pregnancy by cesarean section was conducted for the majority of patients (72.84%). There were no cases of maternal death in this study. Most of the babies were born premature (70.11%), with a low birth weight (60%), and asphyxia, as assessed by the first minute APGAR score (72.97%) and fifth minute APGAR score (54.05%). **Conclusion**: The majority of preeclampsia patients with complications in the resuscitation room at Dr. Soetomo's General Academic Hospital Surabaya from January 1st, 2018 to December 31st, 2019 had good maternal outcomes but not fetal outcomes.

Keywords: Complications of Preeclampsia; Intubation; Maternal and Fetal Outcome; Maternal Health; Resuscitation; Severe Preeclampsia.

ABSTRAK

Pendahuluan: Preeklampsia merupakan penyebab terbesar terjadinya kematian ibu hamil dan janin. Hal ini menjadi urgensi pada kesehatan maternal terutama di negara berkembang seperti Indonesia. Pasien dengan preeklampsia berat yang mengalami perburukan kondisi kerap kali harus dirawat di ruang resusitasi untuk mendapatkan bantuan dari tenaga yang lebih ahli dan teknologi yang lebih canggih. **Tujuan**: Penelitian ini bertujuan untuk mengetahui profil dan *outcome* pasien preeklampsia berat beserta komplikasi yang dialami di ruang resusitasi RSUD Dr. Soetomo Surabaya Periode 1 Januari 2018 – 31 Desember 2019. **Metode**: Metode yang digunakan pada penelitian ini adalah deskriptif retrospektif dengan menggunakan rekam medik dan dilakukan analisis menggunakan microsoft excel. Delapan puluh satu pasien memenuhi kriteria inklusi. **Hasil**: Mayoritas pasien berusia 20-35 tahun (65.43%) dengan tingkat pendidikan tamat SMA (88.89%). Sebagian besar pasien mengalami obesitas tingkat 2 (44.44%) dan multigravida (41.97%). Mayoritas pasien tidak memiliki riwayat preeklampsia (96.30%) dan riwayat hipertensi (76.54%). Diagnosis pasien terbanyak adalah *late onset preeclampsia* (69.14%). Mayoritas pasien dirujuk dari fasilitas kesehatan sekunder (96.30%). Komplikasi yang paling banyak terjadi adalah edema paru (53.09%). Kombinasi komplikasi terbanyak berjumlah 2 komplikasi (43.17%) dengan kombinasi terbanyak adalah eklampsia dan sindrom HELLP (13.58%). Mayoritas pasien ditangani dengan melakukan intubasi (70.37%) dan paling sering terjadi pada pasien dengan eclampsia (56.14%). Terminasi kehamilan secara sectio caesarea dilakukan pada mayoritas ibu (72.84%). Tidak ditemukan kasus ibu meninggal pada penelitian ini. Janin yang dilahirkan sebagian besar mengalami prematuritas (70.11%), BBLR (60%), dan asfiksia yang dinilai dari skor APGAR

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menit pertama (72.97%) dan kelima (54.05%). **Kesimpulan**: Mayoritas pasien preeklampsia dengan komplikasi yang masuk dan mendapatkan terapi di ruang resusitasi RSUD Dr. Soetomo Surabaya periode 1 Januari 2018-31 Desember 2019 memiliki *outcome* yang baik pada ibu tetapi outcome yang kurang baik pada janin.

Kata Kunci: Komplikasi Preeklampsia; Resusitasi; Intubasi; *Outcome* Ibu dan Janin; Kesehatan Maternal; Preeklampsia Berat

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INTRODUCTION

Preeclampsia is a hypertensive disorder that can occur in pregnancy and is accompanied by proteinuria at 20 weeks of gestation or more (1). Preeclampsia is considered a burden on maternal health in the world, especially in Indonesia, a low-income country (2). Preeclampsia and eclampsia affect between 3% and 5% of all pregnancies and are responsible for more than 60,000 maternal deaths and 500,000 fetal deaths per year worldwide (3). According to data from the East Java Provincial Health Office, the most common cause of maternal death in East Java is preeclampsia (4). Severe preeclampsia, eclampsia, and HELLP syndrome are common causes of intensive care unit (ICU) admissions among obstetric patients because these conditions are life-threatening and have high maternal and fetal mortality rates (5).

The pathophysiology of preeclampsia is the presence of angiogenic factors that affect the maternal circulation due to placental dysfunction. This can cause endothelial damage that will lead to preeclampsia (6). Several risk factors can increase preeclampsia incidences such as primigravida, primipaternity, the mother being less than 20 years old or more than 35 years old, history of preeclampsia or eclampsia, history of hypertension, history of kidney disease, multiple pregnancies, obesity with BMI above 30, systemic lupus erythematosus, diabetes mellitus types 1 and 2, and obstructive sleep apnea (7)(1).

Preeclampsia can cause some serious maternal and fetal complications. According to research conducted at Dr. Soetomo General Academic Hospital Surabaya, the most common maternal complication found in preeclampsia patients is pulmonary edema. Pulmonary edema occurs due to major proteinuria and systemic inflammation in preeclampsia. This causes albumin levels to decrease and lead to unmaintained oncotic pressure. In addition, preeclampsia can cause eclampsia which is a tonic-clonic seizure that may induce hypoxia, trauma, and aspiration pneumonia. Other maternal complications that can occur are HELLP syndrome, renal impairment, peripartum cardiomyopathy, stroke, myocardial infarction, as well as visual and motor disturbances (7). In addition, fetal complications can also occur, namely prematurity, intrauterine growth restriction, and fetal death (8).

Severe preeclampsia is characterized by the occurrence of several complications. Such cases are advised to undergo delivery after maternal stabilization if the gestational age has reached 34 weeks or more. This is done to reduce the risk of maternal and fetal death (7)

Patients with severe preeclampsia have a dangerous condition that requires serious treatment to stabilize the maternal condition. If the patient's condition cannot be treated at a secondary health facility, the patient will be referred to a tertiary health facility that has better technology and professional personnel such as Dr. Soetomo General Academic Hospital Surabaya. Referral preeclampsia

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patients are usually brought to the resuscitation room for stabilization and are treated with mechanical ventilation or intubation. Therefore, this study was conducted to investigate the demographic characteristics, complications, treatments, and outcomes of the severe preeclampsia patients who were admitted to the resuscitation room of Dr. Soetomo General Academic Hospital Surabaya.

METHODS

This is a descriptive, retrospective study that was done by collecting medical records. The data consists of sociodemographic characteristics, complications, treatments, as well as maternal and fetal outcomes from preeclamptic patients who were admitted to the resuscitation room of Dr. Soetomo General Academic Hospital Surabaya from January 1st, 2018 to December 31st, 2019. Eighty-one samples met the inclusion criteria, namely patients with severe preeclampsia who were admitted to the resuscitation room of Dr. Soetomo General Academic Hospital Surabaya from January 1st, 2018 to December 31st, 2019, and had a complete medical record. The total sampling technique was used in this study.

The data were analyzed with Microsoft Excel and presented in a distribution frequency table which then turned into a descriptive form. This study is ethically approved by the committee of ethics from Dr. Soetomo General Academic Hospital Surabaya (0237/LOE/301.4.2/XII/2020).

RESULTS AND DISCUSSION

The results of this study showed that as many as 81 samples met the inclusion criteria and 6 patients had multiple pregnancies, therefore the total number of babies born was 87 babies.

Table 1. Patient Characteristics

Characteristics	N (%)
Age (years)	
<20	7 (8.64)
20-35	53 (65.43)
>35	21 (25.93)
Education	
Primary School	6 (7.41)
Junior High School	0 (0.00)
Senior High School	72 (88.89)
Bachelor's Degree	3 (3.70)
Nutritional Status	
Underweight	0 (0.00)
Normal	8 (9.88)
Risk of Obese	10 (12.35)
Obese 1	27 (33.33)
Obese 2	36 (44.44)
Gravida	
Primigravida	37 (45.86)
Multigravida	34 (41.97)
Grand Multigravida	10 (12.35)
History of Preeclampsia	
Yes	3 (3.70)
No	78 (96.30)
History of Hypertension	
Yes	19 (23.46)
No	62 (76.54)
Diagnosis	
Early Onset Preeclampsia	25 (30.86)
Late-Onset Preeclampsia	56 (69.14)
Origin of Referral	
Primary Health Care	3 (3.70)
Secondary Health Care	78 (96.30)

The majority of patients were 20 to 35 years old (65.43%). This finding is similar to a study by Prof. Dr. Kandou Hospital in Manado that showed as many as 63% of patients with severe preeclampsia were aged 20 to 35 years old (6). Conversely, a study from Dr. Zaionel Abidin Hospital Aceh found that patients with ages <20 years and >35 years had 9.444 times higher risk of preeclampsia (9). According to theory, at the age of <20 years, the uterine size is still not normal and not ready to undergo the pregnancy process, while at the age of > 35 years, a degenerative process will occur which causes structural and functional changes in the peripheral blood vessels that play a role in regulating blood pressure (9). This difference suggests that age is not the only risk factor that can induce severe preeclampsia.

As many as 88.89% of patients had graduated from senior high school. However,

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only 3.70% of the patients had a bachelor's degree. According to a previous study, mothers with a lower education level had an 86% higher risk of developing preeclampsia (10). This is because education is one of the factors that influence the mother's knowledge to conduct pregnancy checks to minimize the possibility of pregnancy problems (11).

The majority of patients had level 2 obesity (BMI ≥ 30) at 44.44% of total patients and 33.33% of the sampled patients had level 1 obesity (BMI 25-29.9). This is in line with a previous study in Manado which stated that patients with severe preeclampsia were dominated by patients with a BMI≥30 (1). Obesity can be a risk factor for preeclampsia because it will stimulate inflammation, insulin resistance, dyslipidemia, and oxidative stress. All of these factors will induce the multiplication of ADMA as an endogenous inhibitor of nitric oxide synthase (NOS). Therefore, NOS will decrease, which results in oxidative stress, endothelial dysfunction, and the formation of superoxide anions which will cause preeclampsia (12).

This study showed that the majority of patients had multigravida which was seen in 44 patients (54.32%) including 10 patients (12.35%) with grand multigravida. However, these results contradict a previous study which stated that patients with primigravida had 5.5 times higher risk of developing preeclampsia. This may be due to the unfavorable immune response or the histoincompatibility of the placenta since the antibodies against placental antigens have not been fully formed (13). In addition, in the first pregnancy, the patient is more prone to experiencing stress in pregnancy which triggers an increase in cortisol levels and increase sympathetic activity (9).

A total of 78 patients (96.30%) had no previous history of preeclampsia and 3 patients (3.70%) had a history of preeclampsia. Patients with a history of preeclampsia have a 0.3 times higher risk of developing preeclampsia in their next pregnancy (14). The findings are in line with a previous study conducted at Dr. Soewandhi Hospital Surabaya which stated that there was a relationship between a history of preeclampsia and the incidence of preeclampsia with $p < 0.05$ (15).

Most of the patients (76.54%) had no history of hypertension. This is in line with a study done in Manado which stated that 95% of patients with severe preeclampsia had no history of hypertension (1). In this study, 19 patients (23.46%) had a history of hypertension. According to a previous study in Bantul, there is a relationship between a history of hypertension and the incidence of preeclampsia with a p-value of 0.00. This is because a history of hypertension can cause serious damage to the patient's organ and lead to superimposed preeclampsia or more severe disorders such as proteinuria and edema (16).

This study showed that 56 patients (69.14%) were diagnosed with late-onset preeclampsia or preeclampsia that occurred after 34 weeks of gestation. According to a study conducted in Kenya, eclampsia, low diastolic blood pressure, low hemoglobin, low platelets, and high creatinine levels are more often found in patients with late-onset preeclampsia and can cause more serious complications for the patients (17). A total of 25 patients (30.86%) had a diagnosis of early-onset preeclampsia. According to a previous study, patients with early-onset preeclampsia have worse maternal and fetal outcomes than patients with late-onset preeclampsia (18). In addition, more severe inflammation is seen in early-onset preeclampsia and is characterized by low levels of IL-10. This will cause impaired fetal growth in patients with early-onset preeclampsia (19).

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In this study, almost all patients (96.30%) were referrals from secondary health facilities in East Java. This means that the patients in this study have very serious complications that cannot be treated in secondary health facilities. After further review, most of the patients are from Surabaya (29.63%). This supports the results of previous studies which stated that preeclampsia/eclampsia was the biggest cause of maternal death in Surabaya (20). In addition, as many as 18 patients (22.22%) were referred from Madura. A study stated that patients of Madurese ethnicity had a higher severity of preeclampsia than Javanese and Chinese ethnic patients. This is because patients of the Madurese ethnicity have low levels of calcium which can induce preeclampsia (21).

Table 2. Patient Complications

Complications	N (%)
Pulmonary Edema	43 (53.09)
Eclampsia	41 (50.62)
HELLP Syndrome	20 (24.69)
Kidney Disorders	14 (17.28)
Fetal Distress	10 (12.35)
Liver Disorders	6 (7.41)
Oligohydramnion	6 (7.41)
Infections	5 (6.17)
Heart Failure	5 (6.17)
Cardiomyopathy Peripartum	4 (4.94)
Neurologic Deficit	2 (2.47)
Intrauterine Growth Restriction	1 (1.23)

*Each patient could experience more than one complication

The most common complication in this study was pulmonary edema which occurred in 43 patients (53.09%). This supports a previous study that stated that pulmonary edema was the most common complication in preeclampsia patients who were referred to tertiary health facilities (8). Pulmonary edema is characterized by the accumulation of fluid in the interstitial spaces of the lungs and alveoli, thereby inhibiting the diffusion of oxygen and carbon dioxide and causing shortness of breath. Therefore, it is necessary to monitor the patient in the intensive room for hemodynamic monitoring and mechanical ventilation (22). In addition, pulmonary edema can cause complications with HELLP syndrome which occurred in 9 patients (11.11%) According to previous studies, pulmonary edema can increase the incidence of HELLP syndrome where patients can fall into a more serious situation (23).

Eclampsia was the second most common complication occurred in 41 patients (50.62%). Previous research conducted in Sub-Saharan Africa and India stated that of 2,692 women who had eclampsia, 6.9% died and 15.9% of their babies died. These figures indicate the dangers of eclampsia (24).

In this study, HELLP syndrome occurred in 20 patients (24.69%). A study in Zimbabwe stated that the most common complication in preeclampsia patients was HELLP syndrome and all of these cases were treated in the Intensive Care Unit (25). HELLP syndrome is characterized by hemolysis, elevated liver enzymes, and low platelets. Other complications could occur by HELLP syndrome, including pulmonary edema, eclampsia, DIC, ARDS, intracerebral hemorrhage, hematoma, liver rupture, and maternal death (26). The distribution of other complications can be seen in Table 2.

This study also showed that the majority of patients (43.17%) had 2 complications. The number of preeclampsia complications ranges from 1 to 5 complications in each patient. The most common complication combination was eclampsia and HELLP syndrome which was seen in 11 patients (13.58%), followed by the combination of pulmonary edema and HELLP syndrome in 9 patients (11.11%).

Table 3. Patients with Intubation

Intubation	N (%)
Yes	57 (70.17)
No	34 (29.63)

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Management of intubation in the resuscitation room was administered to 57 patients (70.37%). Intubation is performed to secure the airway and prevent the risk of aspiration (27). Intubation was given to the 32 eclamptic patients (56.14%). This is because eclampsia patients tend to experience altered consciousness (28). Moreover, a total of 29 patients (50.88%) with pulmonary edema required intubation. This is necessary since pulmonary edema will cause respiratory failure as a result of ventilation/perfusion mismatch which could lead to a shunt. A shunt is a condition in which the blood in the left ventricle of the heart has not undergone gas exchange and will lead to hypoxemia (29). In addition, as many as 14 patients with HELLP syndrome require intubation. A study states that HELLP syndrome can cause acute respiratory distress syndrome and patients will require breathing assistance (5). Patients with other complications who were intubated are shown in Table 4.

Table 4. Complications in Patients with Intubation Treatment

Complications	N (%)
Eclampsia	32 (56.14)
Pulmonary Edema	29 (50.88)
HELLP Syndrome	14 (24.56)
Kidney Disorders	7 (12.28)
Fetal Distress	7 (12.28)
Liver Disorders	5 (8.77)
Infections	4 (7.02)
Oligohydramnion	4 (7.02)
Heart Failure	3 (5.26)
Neurologic Deficit	2 (3.51)
Cardiomyopathy Peripartum	1 (1.75)

*Each patient could experience more than one complication

In this study, the maternal outcome after being treated in the resuscitation room was a termination of pregnancy which occurred in 65 patients (80.25%). Termination of pregnancy is recommended when the gestational age has reached 37 weeks. However, for patients with severe preeclampsia and who are in an unstable condition, a gestational age of 34 weeks or more is sufficient and recommended for delivery after the stabilization of the mother (30). The most widely used method for termination of pregnancy was a cesarean section, which was performed on 59 patients (72.84%). According to ACOG, the recommended delivery method for people with preeclampsia must be adapted to the conditions of each individual. However, in severe preeclampsia cases, cesarean sections were found in 97% of patients with a gestational age of fewer than 28 weeks and 65% of patients with a gestational age of 28-32 weeks (7). In addition, there is no maternal death in this study, this indicates that the patients received good treatments in the resuscitation room.

Table 5. Maternal Outcomes

Maternal Outcomes	N (%)
Termination of Pregnancy	
Sectio Caesarea	59 (72.84)
Per Vaginam	6 (7.41)
Observation	
Intensive Care Admission	9 (11.11)
Maternity Ward Admission	7 (8.64)
Died	0 (0.00)

In addition, 16 patients (19.75%) did not have their pregnancies terminated either by cesarean section or *pervaginam* after being treated in the resuscitation room. A total of 9 patients (11.11%) required further observation in the intensive care room because of their unstable condition, and 7 patients (8.64%) who had stable conditions were sent to the delivery room for observation and conservative treatment.

This study showed that the fetal outcome of mothers with severe preeclampsia was poor. This can be seen in the majority (70.11%) of babies born prematurely. This is in line with a previous study in New York which states that preeclampsia patients have a 2.69 times higher risk of experiencing premature birth (31). This occurs because patients with severe

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preeclampsia would require a termination of pregnancy which usually occurs before 37 weeks of gestation. In addition, preeclampsia causes endothelial dysfunction that interferes with the delivery of nutrients and oxygen exchange in the fetus which may cause asphyxia, IUGR, and fetal death (32).

Table 6. Fetal Outcomes

Fetal Outcomes	N (%)
Prematurity	
Yes	61 (70.11)
No	26 (29.89)
Birth Weight	
Extremely Low Birth Weight	6 (7.50)
Very Low Birth Weight	7 (8.75)
Low Birth Weight	35 (43.75)
Normal	32 (40.00)
1 Minute APGAR Score	
0-3	39 (52.70)
4-6	15 (20.27)
7-10	20 (27.03)
5 Minute APGAR Score	
0-3	31 (41.89)
4-6	9 (12.16)
7-10	34 (45.95)

In this study, the majority of the babies (60%) were born with below-normal weight, where 35 infants (43.75%) had low birth weight (1500-<2500 grams), 7 infants (8.75%) had very low birth weight (1000-<1500 grams), and 6 babies (7.50%) experienced extreme low birth weight (<1000 grams). A previous study conducted in Palu stated that there was a relationship between preeclampsia and low birth weight with an OR of 2.4. This is because preeclampsia can cause vasoconstriction of uterine blood vessels, resulting in decreased blood flow to the fetus and leading to IUGR and low birth weight (33).

Neonatal asphyxia can be seen through the APGAR scores which were measured in the first and fifth minutes after the birth of the baby. In this study, 54 infants (72.97%) had an APGAR score of below 7 at the first minute and 40 infants (54.05%) had an APGAR score of below 7 at the fifth minute. This is in line with a previous study in Bantul, which stated that there was a relationship between preeclampsia and asphyxia *neonatorum* with a p-value of 0.00. This occurs because of a lack of oxygen and nutrition in the fetus due to vasoconstriction of blood vessels (34). Asphyxia can be associated with premature birth and low birth weight. A study states that premature birth has 12 times higher risk of developing asphyxia *neonatorum*. In addition, a study found that there was a relationship between low birth weight and asphyxia with a p-value of 0.00. This is due to the incomplete development of organs in infants (35). The distribution of fetal outcomes could be seen in table 6.

CONCLUSION

The most common complication of preeclampsia patients in the resuscitation room of Dr. Soetomo General Academic Hospital Surabaya from January 1st, 2018 to December 31st, 2019 was pulmonary edema. Most patients had 2 complications with the most common combination being eclampsia and HELPP syndrome. Intubation was given to the majority of patients and most often in patients with eclampsia. Termination of pregnancy by cesarean section was conducted in the majority of patients. There were no cases of maternal death in this study. However, most of the babies were born premature, had low birth weights, and asphyxia as assessed by the first and fifth-minute APGAR scores.

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Conflict of Interest

The authors stated there is no conflict of interest in this study.

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