

Neonatal Outcomes in Women with Preeclampsia, Severe Preeclampsia, and Eclampsia at RSUD Dr. Soetomo Surabaya in 2022

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ABSTRACT

Preeclampsia, severe preeclampsia, and eclampsia are still a common condition in pregnant women, resulting in adverse outcomes in both the maternal and the fetal. The aim of this study is to describe the neonatal outcomes in women with preeclampsia (PE), severe preeclampsia (SP), and eclampsia (E) at RSUD Dr. Soetomo Surabaya. This research implements a descriptive observational study, utilizing medical records of pregnant women with preeclampsia, severe preeclampsia, and eclampsia, and their neonates at RSUD Dr. Soetomo Surabaya from January to December 2022. A total of 185 pregnant women and 190 neonates were included in this study. Severe preeclampsia has the highest number of incidences (130 out of 185). Mothers with PE mostly have normal birth weight (NBW) neonates (57.9%), while mothers with SP mostly have low birth weight (LBW) neonates (34.3%). Mothers with eclampsia have the same amount of LBW and NBW neonates (33.3%), however, the number of very low birth weight (VLBW) neonates was the highest in mothers with eclampsia (PE: 7.9%; SP: 15.7%; E: 22.2%). A total of 23 cases of intrauterine fetal death (IUFD) were recorded with the most cases seen in mothers with SP (19 out of 23). Of 24 cases of neonatal death, most cases were seen in mothers with SP (22 out of 24). From these results, it can be concluded that between PE, SP, and eclampsia, adverse outcomes were more severe in neonates born from mothers with severe preeclampsia and eclampsia compared to the ones from preeclampsia.

Keywords: preeclampsia; severe preeclampsia; eclampsia; neonatal outcomes.

INTRODUCTION

In the world, preeclampsia incidents range between 2% and 10% of pregnancies, with up to 17% of them occurring in developing countries [1]. Some of the factors contributing to the more severe outcomes in low-resource settings or developing countries are due to patients failing to book antenatal visits because of financial constraints. Other factors are missed diagnosis by poor attenders and patients' own delay in seeking treatment due to taking the condition lightly. Few health workers in low-resource settings were not well-trained to manage maternal and fetal complications early enough to prevent poor outcomes [2].

In Indonesia, the incidence of preeclampsia is 128.273 cases/year. In 2017, there were a total of 210 preeclampsia cases in Jember and the number was increased to 284 cases in 2018 [3]. In Surabaya, there were 1.145 cases of preeclampsia in 2015 and the number increased in 2016 to 1.411 cases [4].

Another research conducted in RSUD Ibnu Sina Gresik Regency observing pregnant women in 2015 revealed a number of preeclampsia, severe preeclampsia, and eclampsia. Out of 77 cases, there were 22 cases of mild preeclampsia, 44 cases of severe preeclampsia, and 11 cases of eclampsia [5]. This data shows how preeclampsia, severe preeclampsia, and eclampsia are still a common condition in pregnant women. In addition, one of the impacts of these conditions is maternal death. In East Java in 2016, there were 97.39 maternal deaths per 100,000 live births and preeclampsia is the biggest contributor to the total maternal death, accounting for 30.9% [3].

The adverse outcomes not only burdened the mother but also the fetus. According to research conducted by Backes et al., some of the effects are intrauterine growth restriction (IUGR), bronchopulmonary dysplasia (BPD), neurodevelopmental outcome, and may cause hypertension or diabetes later on in their life [6].

On top of that, preeclampsia and eclampsia increase the risk of fetal death or stillbirth. According to the data collected by Kemenkes in 2021, the total number of fetal deaths in Indonesia is 20.154 and among these numbers, East Java is the second highest province of total cases of fetal deaths, accounting for 2,725 cases [7]. Further, a study stated that low birth weight is a significant determinant of stunting. It is due to the baby being more susceptible to infectious disease because their immune systems are not fully developed, which increases the risk of stunting. Neonates born prematurely were also twice as likely to be stunted compared to neonates who were not premature due to problems in the digestive absorption system that was unable to absorb nutrients completely [8].

Responding to these phenomena, this author intends to conduct research at RSUD Dr. Soetomo Surabaya as a referral hospital from the East Indonesia region. Through this research, this author hopes that this research will be a suggestion for maternal care programs and to increase maternal and fetal surveillance and outcomes.

MATERIALS AND METHOD

This research implements a descriptive observational study, utilizing medical records of pregnant women with preeclampsia, severe

preeclampsia, and eclampsia, and their neonates at RSUD Dr. Soetomo Surabaya from January to December 2022. A total of 185 pregnant women and 190 neonates were included in this study. Inclusion criteria of the study were complete medical records of all pregnant women diagnosed with preeclampsia, severe preeclampsia, and eclampsia with both singleton and multiple pregnancies. Neonates born alive, neonates that die in the first 28 days of life, and stillbirth neonates are also included in this study.

ETHICS

This study has been approved by the Research Ethics Committee at RSUD Dr. Soetomo Surabaya (No. 1672/LOE/301.4.2/V/2024). The patient’s identity is not written in the study so the confidentiality of the patient will be maintained by the author and all data obtained will only be used for the purpose of research and education.

RESULT

In this study, a total of 264 patients were diagnosed with preeclampsia, severe preeclampsia, and eclampsia. Out of 264 patients, 185 pregnant women met the inclusion criteria and were included in the study. From 185 pregnant women, a total of 190 neonates met the inclusion criteria and were included in the study.

TABLE 1: Incidence of Preeclampsia, Severe Preeclampsia, and Eclampsia Based on Age.

Age	Preeclampsia N (%)	Severe Preeclampsia N (%)	Eclampsia N (%)
18 – 34	25 (67.6%)	81 (62.3%)	14 (77.8%)
35 – 47	12 (32.4%)	49 (37.7%)	4 (22.2%)
Total	37	130	18

TABLE 2: Education Distribution in Women with Preeclampsia, Severe Preeclampsia, and Eclampsia.

Education	Preeclampsia N (%)	Severe Preeclampsia N (%)	Eclampsia N (%)
Elementary School	2 (5.4%)	20 (15.4%)	3 (16.7%)
Junior High School	7 (18.9%)	17 (13.1%)	1 (5.6%)
Senior High School	16 (43.2%)	58 (44.6%)	12 (66.7%)
Vocational High School	4 (10.8%)	8 (6.2%)	1 (5.6%)
Diploma Programs	4 (10.8%)	7 (5.4%)	1 (5.6%)
Bachelor’s Degree	4 (10.8%)	18 (13.8%)	0 (0%)
Master’s Degree	0 (0%)	2 (1.5%)	0 (0%)
Total	37	130	18

TABLE 3: Occupation Distribution in Women with Preeclampsia, Severe Preeclampsia, and Eclampsia.

Occupation	Preeclampsia N (%)	Severe Preeclampsia N (%)	Eclampsia N (%)
Housewife	28 (75.7%)	104 (80%)	14 (77.8%)
Student	0 (0%)	0 (0%)	1 (5.6%)
Private Employee	4 (10.8%)	7 (5.4%)	0 (0%)
Entrepreneur	2 (5.4%)	4 (3.1%)	2 (11.1%)
Teacher	0 (0%)	9 (6.9%)	0 (0%)
Civil Servant	1 (2.7%)	2 (1.5%)	0 (0%)
Midwife	0 (0%)	1 (0.8%)	0 (0%)
Nurse	0 (0%)	1 (0.8%)	1 (5.6%)
Others	2 (5.4%)	2 (1.5%)	0 (0%)
Total	37	130	18

TABLE 4: Gestational Age at Delivery in Women with Preeclampsia, Severe Preeclampsia, and Eclampsia.

Gestational Age at Delivery	Preeclampsia N (%)	Severe Preeclampsia N (%)	Eclampsia N (%)
20 – 33	6 (16.2%)	65 (50%)	8 (44.4%)
34 – 36	11 (29.7%)	36 (27.7%)	5 (27.8%)
37 – 42	20 (54%)	29 (22.3%)	5 (27.8%)
Total	37	130	18

TABLE 5: Neonatal Birth Weight Based on Gestational Age at Delivery.

Gestational Age at Delivery (weeks)	Birth Weight (g)				
	High Birth Weight (≥4000 g) N (%)	Normal Birth Weight (2500 – 3999 g) N (%)	Low Birth Weight (1501 – <2500 g) N (%)	Very Low Birth Weight (1001 – 1500 g) N (%)	Extremely Low Birth Weight (≤1000 g) N (%)
20 – 33	0 (0%)	3 (4.7%)	23 (36.5%)	25 (89.3%)	32 (97%)
34 – 36	1 (50%)	16 (25%)	37 (58.7%)	2 (7.1%)	1 (3%)
37 – 42	1 (50%)	45 (70.3%)	3 (4.8%)	1 (3.6%)	0 (0%)
Total	2	64	63	28	33

TABLE 6: Intrauterine Fetal Death Based on Gestational Age at Delivery.

Gestational Age at Delivery (weeks)	IUFD N (%)	Liveborn N (%)
20 – 33	17 (73.9%)	66 (39.5%)
34 – 36	4 (17.4%)	53 (31.7%)
37 – 42	2 (8.7%)	48 (28.7%)
Total	23	167

TABLE 7: Neonatal Death Based on Gestational Age at Delivery.

Gestational Age at Delivery (weeks)	Neonatal Death N (%)	Live at Discharge N (%)
20 – 33	20 (83.3%)	46 (32.2%)
34 – 36	3 (12.5%)	50 (35%)
37 – 42	1 (4.2%)	57 (39.9%)
Total	24	143

TABLE 8: Distribution of Neonatal Birth Weight from Women with Preeclampsia, Severe Preeclampsia, and Eclampsia.

Birth Weight (g)	Types		
	Preeclampsia N (%)	Severe Preeclampsia N (%)	Eclampsia N (%)
High Birth Weight (≥4000)	0 (0%)	2 (1.5%)	0 (0%)
Normal Birth Weight (2500 – 3999)	22 (57.9%)	36 (26.9%)	6 (33.3%)
Low Birth Weight (1501 – <2500)	11 (28.9%)	46 (34.3%)	6 (33.3%)
Very Low Birth Weight (1001 – 1500)	3 (7.9%)	21 (15.7%)	4 (22.2%)
Extremely Low Birth Weight (≤1000)	2 (5.3%)	29 (21.6%)	2 (11.1%)
Total	38	134	18

TABLE 9: Distribution of IUFD from Women with Preeclampsia, Severe Preeclampsia, and Eclampsia.

IUFD	Types		
	Preeclampsia N (%)	Severe Preeclampsia N (%)	Eclampsia N (%)
20 – 33 weeks	2 (66.7%)	14 (73.7%)	1 (100%)
34 – 36 weeks	1 (33.3%)	3 (15.8%)	0 (0%)
37 – 42 weeks	0 (0%)	2 (10.5%)	0 (0%)
Total	3	19	1

TABLE 10: Distribution of Neonatal Death from Women with Preeclampsia, Severe Preeclampsia, and Eclampsia.

Neonatal Death	Types		
	Preeclampsia N (%)	Severe Preeclampsia N (%)	Eclampsia N (%)
1 – <7 days	0 (0%)	19 (86.4%)	0 (0%)
≥7 – <28 days	2 (100%)	3 (13.6%)	0 (0%)
Total	2	22	0

DISCUSSION

Hypertension in Pregnancy

Among 185 pregnant women who were included in the study, 37 women were diagnosed with preeclampsia, 130 were diagnosed with severe preeclampsia, and 18 were diagnosed with eclampsia. A similar result was seen in research conducted from January 2016 to May 2017 at Airlangga University Hospital comparing preeclampsia and severe preeclampsia. In the study, severe preeclampsia was the majority of the cases observed with a total of 135 out of 148 cases (91.2%) [9]. Another result conducted in Zimbabwe in 2017 comparing severe preeclampsia and eclampsia also shows a higher incidence of severe preeclampsia with a number of 95 out of 121 cases (78.5%) [2].

All preeclampsia, severe preeclampsia, and eclampsia mostly occurred in women aged 18 – 34 years old. This result aligns with a previous study by Tyas et al., that reveals a higher percentage of severe preeclampsia in reproductive age (20 – 35 years old) with a total of 97 (71.9%) cases out of 135 compared to severe preeclampsia in advanced maternal age that only encompasses 38 (28.1%) cases. A study conducted in 2019 by Setyorini et al., explains that the occurrence of preeclampsia in young reproductive age was due to physical unreadiness to be pregnant and maternal negligence to pay attention to the pregnancy, causing irregular blood pressure left untreated [10]. However, there are studies that state otherwise, that preeclampsia, severe preeclampsia, and eclampsia were 1.5 times more likely to occur in advanced maternal age (above 35 years old) compared to women under 35 years old [11]. Other studies also show similar results whereas preeclampsia occurs the most in maternal age above 35 years old with 121 (29%) cases out of 417. Theoretically, the placenta is thought to have a prespecified lifetime and the functional capacity of the placental cells declines as age advances, which explains the occurrence of hypertension in pregnancy in advanced maternal age [12].

Across all education levels, preeclampsia, severe preeclampsia, and eclampsia occurred mostly in patients who had completed Senior High School. This result aligns with research done by Bahri et al., in 2019 that shows a level of education in patients with preeclampsia, severe preeclampsia, and eclampsia. In those studies, patients with preeclampsia and have a senior high school degree accounted for 199 (49.4%) out of 404 patients. Patients with severe preeclampsia and eclampsia with a senior high school degree accounted for 182 (45.2%) out of 403 patients [13]. Another study by Khan et al., in 2022 also shows the highest percentage of a senior high school degree in patients with preeclampsia with a total of 44 (48.9%) patients [1]. Ajah et al., reveal in their study that severe preeclampsia and eclampsia patients were more common among poorly educated mothers, accounting for a total of 145 (70%) out of 207 patients. Lower education mother tends to exhibit social deprivation by being ignorant and showing poor- health-seeking behavior [14].

Among all types of occupation, most of the patients were unemployed or registered as a housewife. Other studies also correspond with the current study, as Tyas et al., reveal a total of 99 (66.9%) out of 148 patients with preeclampsia and severe preeclampsia to be unemployed [9]. Another study conducted by Ajah et al., also proved that severe preeclampsia and eclampsia were more common among unemployed mothers with a total of 126 (60.9%) out of 207 patients. Being unemployed may be a contributor to mothers not being able to fulfill nutrition during pregnancy [10]. However, there was research that had different results, suggesting higher incidence in employed mothers. Previous research by Aistania et al., reveals that the incidence of preeclampsia, severe preeclampsia, and eclampsia was higher in employed mothers, especially in preeclampsia, accounting for 44.2%. Work is associated with a higher risk of developing preeclampsia due to physical activity and stressors that are produced by the working environment [15].

Based on the gestational age at delivery, patients with preeclampsia gave birth at more mature weeks, accounting for 20 (54%) deliveries. However, patients with severe preeclampsia and eclampsia tend to give birth in a preterm gestational week. A study by Khan et al., shows that in preeclampsia cases, delivery was mostly conducted in a more term gestational week (34 – <37 weeks of gestation). Another research by Ika et al., also proved that severe preeclampsia has a higher incidence of preterm birth, accounting for 16 (53.3%) cases compared to term birth which only accounts for 14 (46.7%) cases [16].

There is an option for pregnancy with severe preeclampsia, aimed at reducing neonatal adverse outcomes from preterm delivery, namely expectant management. It consists of delaying labor, the administration of magnesium sulfate to prevent convulsion, the administration of antihypertensive drugs, and the administration of corticosteroids to promote fetal lung maturity. However, expectant management may cause maternal complications due to prolonged pregnancy, hence, close monitoring is very necessary in performing expectant management [17]. Some of the maternal complications that may occur comprise maternal death, eclampsia, HELLP syndrome, abruption placenta, acute renal failure, disseminated intravascular coagulopathy (DIC), and pulmonary edema. Fetal complications also may occur due to expectant management, namely severe IUGR, absent or reversed end-diastolic flow on umbilical artery Doppler imaging, abnormal fetal heart rate, and oligohydramnios [18].

If there were no signs of maternal complications or impaired fetal well-being, expectant management or delaying delivery will improve neonatal outcomes and reduce neonatal complications [14].

Neonatal Outcomes

There are three main outcomes observed in this study, consists of neonatal birth weight, intrauterine fetal death, and neonatal death. Among all outcomes observed, the neonates were mostly born with normal birth weight and low birth weight with only one case difference (NBW vs LBW: 33.7% vs 33.2%). Although the number of normal birth weight infants was higher, the timing of delivery explains the distinction. Neonatal birth weight varies depending on the gestational age at which the neonates are delivered. Preterm birth and intrauterine growth restriction (IUGR) is a cause of low birth weight of an infant, by causing insufficient uterine-placental perfusion [19]. In this study, it can be seen that neonates born between 37 – 42 weeks of gestation tend to have a more favorable birth weight, accounting for 45 (70.3%) neonates that were born with normal birth weight. In comparison with neonates born in a more preterm week (20 – 33 weeks of gestation), the neonatal birth weight is much lower, accounting for 32 (97%) neonates with extremely low birth weight and 25 (89.3%) neonates with very low birth weight. This result aligns with a previous study done in 2023 by Genowska et al., in 2023, reveals that neonates born in full-term gestational age have a birth weight above 3000 g, compared to neonates born between 20

– 33 weeks of gestation that show lower birth weight below 2500 g [20]. There is not much research that reveals otherwise, however, some studies suggest that low birth weight in non-preterm individuals may occur due to lower parental occupational category and a previous history of major adverse cardiovascular events in the maternal [21].

Based on the patient's demographic, this study tries to observe neonatal birth weight based on maternal age, education, and occupation. The biggest portion of neonatal birth weight in this study is normal birth weight as stated before, and most of those neonates born from a mother aged 18 – 34 years old. This result aligns with several researches, namely by Tyas et al., that demonstrate normal birth weight in women aged 20 – 35 years old with a number of 87 (82.9%) out of 105 neonates [9]. Another result by Olapeju et al., also demonstrates a low portion of low birth weight in women aged 20 – 29 years old with only 1065 (24.7%) out of 4305 cases [22].

Socioeconomic factors such as education also play a role in determining neonatal birth weight. In this research, normal birth weight neonates were most seen in mothers with higher education, specifically high school degrees. This result aligns with previous research in India that shows in uneducated mothers the rate of low birth weight neonates was significantly high (43.47%). Mothers with bachelor's degrees and normal birth weight neonates took the biggest portion with 65.6% of the neonates. The second highest percentage in the level of education that results in normal birth weight neonates were high school degrees with 51.2% [23]. However, it is still possible for higher educational mothers to give birth to low birth weight neonates, as shown by Choudary in 2019, whereas there were approximately 34% of low birth weight infants from mothers with bachelor's and master's degrees. More favorable neonatal birth weight in mothers with higher education may be due to higher income and better nutrition for the neonate. It is also explained by behavioral changes in higher-educated women as they tend to implement healthier lifestyles, such as smoking cessation. Women with higher educational levels also demonstrate better health awareness and attitude by showing adherence to provider advice on positive pregnancy-related behavior [23]. Mothers with high education levels are also more prone to take care of themselves and have adequate knowledge of which action should be performed to ensure the healthiness of the pregnancy [24].

Other than education, the mother's occupation also plays a role in determining the neonatal birth weight. In this study, unemployed mother shows a bigger portion compared to employed mothers, and the highest number of unemployed mothers give birth to normal birth weight infants. Mahmoodi et al., reveal in their research that unemployed mother has a higher percentage of normal birth weight neonates compared to employed mothers (unemployed vs employed: 94.2% vs 5.8%) [25]. However, several studies show otherwise. Unemployed mothers will reduce the birth weight of the neonates by 80 grams.

This is due to maternal stress that results from reduced financial well-being and financial difficulties that lead to negative health behaviors such as smoking and drinking [26].

Hypertension in Pregnancy and Neonatal Outcomes Descriptively, patient with preeclampsia, severe preeclampsia, and eclampsia shows several neonatal characteristics. There are a total of 190 neonates from 185 mothers. Out of 190 neonates, 167 (87.9%) were liveborn and 23 (12.1%) showed intrauterine fetal death. From 190 neonates, neonatal birth weights are further classified based on the maternal diagnosis. Neonates born from mothers with preeclampsia tend to have a more favorable birth weight, accounting for 22 (57.9%) neonates with normal birth weight. However, neonates born from mothers with severe preeclampsia show a bigger portion in low birth weight, and neonates born from mothers with eclampsia show the same amount for low birth weight and normal birth weight. This result aligns with a previous study that reveals in mild preeclampsia, birth weight did not differ from the expected weight, however, in severe preeclampsia, birth weight was 12% lower than the expected weight, suggesting that neonates from mothers with severe preeclampsia tended to have more lower birth weight [27]. The pathophysiology behind this phenomenon was uteroplacental malperfusion. The placenta in mothers with severe preeclampsia tends to have a higher risk of infarcts, such as old vascular infarcts, large infarct size, and a greater number of infarcts. Also, the risk of developing vascular lesions is higher in severe preeclampsia [28].

In this study, the rates of IUFD were the highest at 20 – 33 weeks of gestation with a total number of 17 (73.9%) out of 23 cases. It can be seen that the number is decreasing as the gestational age increases, thus, resulting in the lowest rate in 37 – 42 weeks of gestation with only 2 (8.7%) cases of IUFD. A similar result was demonstrated by Chaitra et al., which revealed 63.5% of IUFD cases in 25 – 32 weeks of gestation, and only 11.3% occur in gestational age above 37 weeks [29]. Although many studies suggest that fetal complications such as IUFD occur the lowest at term gestational week, one study in Serbia collecting data from January 2010 to December 2022 shows a different result, revealing that IUFD occurs at early-term pregnancies in more than half of the population (58.3%) and at full-term pregnancies (39 – 40 weeks of gestation) in 38.3% of the population. These results were due to maternal hypertension during pregnancy followed by obesity and gestational diabetes having poor glycemic control during pregnancy, especially in the third trimester [30].

Other than IUFD, neonatal death is also one of the neonatal outcomes that occur in women with preeclampsia, severe preeclampsia, and eclampsia. In this study, there was no neonatal death recorded from a mother with eclampsia. There were a total of 24 neonatal deaths with 2 deaths being from preeclamptic mothers and 22 deaths from severe preeclamptic mothers. It can be seen that all neonatal

deaths in preeclampsia cases happened after seven days up to 28 days of life. However, neonatal death in severe preeclampsia cases mostly happened in the first seven days of life, accounting for 19 (86.4%) cases. Oostwaard et al., reveal in their study that the cases of neonatal death in women with severe preeclampsia are indeed higher in the early neonatal period or in the first seven days of life, accounting for 13 (8.5%) cases compared to neonatal deaths above seven days of life which only accounts for 10 (7.9%) cases [31]. The occurrence of neonatal death was due to uteroplacental insufficiency that resulted in a decreased blood flow to the fetus [6]. In severe preeclampsia, the insult to the placenta is more severe due to the longer duration of poor placentation, starting in the first trimester [32].

CONCLUSION

Based on the obtained data, it can be concluded that severe preeclampsia was the most common diagnosis of hypertension in pregnancy in RSUD Dr. Soetomo Surabaya from January to December 2022. Among all types, adverse outcomes in the neonates were more severe in neonates born from mothers with severe preeclampsia and eclampsia compared to the ones from preeclampsia.

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