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Determinant Factors of Neonatal Mortality in Preeclampsia Mother

Hirfa Turrahmi[1,2]*, Hadyana Sukandar[3], Hadi Susiarno[4], Rudi Supriyadi[5], Fatimah Fatimah[2]

[1]Doctoral Student, Faculty of Medicine, University of Padjadjaran, Bandung, Indonesia; [2]Department of Obstetric, Faculty of Medicine and Health, University of Muhammadiyah Jakarta, Jakarta, Indonesia; [3]Department of Public Health Sciences, University of Padjadjaran, Bandung, Indonesia; [4]Department of Obstetrics and Gynecology, University of Padjadjaran, Bandung, Indonesia; [5]Department of Internal Medicine, University of Padjadjaran, Bandung, Indonesia

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***Correspondence:** Hirfa Turrahmi, Doctoral student, Faculty of Medicine, University of Padjadjaran, Bandung, Indonesia. E-mail: hirfaturrahmi@umj.ac.id
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Abstract

BACKGROUND: Preeclampsia (PE) is a specific multisystemic disorder in pregnancy and a significant cause of maternal and fetal death. The percentage of infant mortality due to preeclampsia is greater than maternal mortality. Infant mortality occurs due to several risk factors in mothers with preeclampsia.

AIM: This study aims to analyze the determinants of infant mortality in mothers with preeclampsia.

METHODS: An observational analytic study with a cross-sectional design was undertaken at the Department of Obstetrics and Gynecology at the Koja Hospital, North Jakarta, from June to September 2021. Three hundred and twenty-eight research subjects met the research criteria. Bivariate analysis using Chi-square and Fisher's exact test and multivariate analysis using logistic regression test. All data analyzed with SPPS version 22.0

RESULTS: In this study, there was no relationship between maternal age (p = 0.842), body mass index (p = 0.768), education (p = 0.345), occupation (p = 1,000), mode of delivery (p = 0.753), anemia (p = 0.707), leukocytosis (p = 0.772), hypoalbuminemia (p = 0.688), and bacteriuria (p = 0.245) with neonatal mortality in mothers with preeclampsia. In addition, the results showed that the factors that contributed to neonatal mortality in mothers with preeclampsia were parity (PR (CI 95%) =15.279 (2.304–101.301); p = 0.005) and proteinuria (PR (CI 95%) =9.649 (1.123–82.875); p = 0.039).

CONCLUSION: It can be concluded that parity and proteinuria are determinants of neonatal mortality in mothers with preeclampsia.

Introduction

One of the Sustainable Development Goals (SDGs) is to ensure children's survival through efforts to reduce the mortality rate of newborns, infants, and toddlers. The trend of child mortality from year to year has shown a decline. Based on data reported to the Directorate of Family Health, in 2019, out of 29,322 under-5 deaths, 69% (20,244 deaths) occurred in the neonatal period. Of all reported neonatal mortality, 80% (16,156 deaths) occurred during the first 6 days of life [1].

Preeclampsia (PE) is a specific multisystemic disorder of pregnancy and the leading cause of maternal and fetal mortality [2], [3]. PE occurs in 4.6% of pregnancies worldwide. Preeclampsia can lead to serious, even fatal, complications [4]. In low- and middle-income countries, the consequences of developing this disease can lead to severe maternal and neonatal morbidity and mortality, including fetal growth restriction, placental abruption, premature birth, and stillbirth [5].

In the developing countries, preeclampsia is one of the leading causes of maternal mortality (range 1.5–2.5%) and neonatal mortality (range 45–50%). Based on these data, the percentage of neonatal mortality due to preeclampsia is greater than that of maternal mortality. Neonatal mortality occurs due to several risk factors in mothers with preeclampsia [6].

A study by Hodgins in 2021 reported the factors that contributed to neonatal mortality in preeclampsia mothers, including maternal age, gestational age, and mode of delivery [7]. Another study stated that proteinuria levels were more significant in preeclamptic women with neonatal mortality than in preeclamptic women without neonatal mortality [8]. Other studies have shown that parity is significantly associated with neonatal mortality. A study on hypertensive and normotensive nulliparous women found that maternal and neonatal mortality were significantly higher in nulliparous women with hypertension [3]. This study analyzed the determinants of neonatal mortality in mothers with preeclampsia who were admitted to the Koja Hospital, North Jakarta, from January 2015 to October 2019.

Methods

An observational analytic study with a cross-sectional design was undertaken at the Department

of Obstetrics and Gynecology at Koja Hospital, North Jakarta, from June to September 2021. Three hundred and twenty-eight research subjects met the research criteria. The respondents of this study were mothers with preeclampsia who were admitted to the Koja Hospital from January 2015 to October 2019.

The dependent variable in the study was neonatal mortality. In contrast, the independent variables included demographic factors (mother's age, body mass index/ BMI, education, and occupation), obstetric factors (parity and mode of delivery), and laboratory factors (hemoglobin, leukocytes, albumin, bacteriuria, and proteinuria).

The relationship between the independent and dependent variables was analyzed using Chi-square and Fisher's exact test. The logistic regression test analyzed the multivariate test to determine the most important determinants of neonatal mortality in mothers with preeclampsia. All data were analyzed with SPPS version 22.0.

Results

In this study, from 328 mothers with preeclampsia, there were 15 neonatal mortalities (4.6%). Based on the demographic characteristics, the results showed that there was no relationship between maternal age (PR (CI 95%) =1.320 (0.439–3.972); p = 0.842), body mass index (PR (CI 95%) =1.397 (0.384–5.074); p = 0.768, education (PR (CI 95%) =1.902 (0.661–5.473); p = 0.345), and occupation (PR (CI95%) =1.478 (0.325–6.731); p = 1.000) with neonatal mortality in mothers with preeclampsia (Table 1).

Based on obstetric characteristics, it was found that there was a significant relationship between parity (PR (CI 95%) =7.872 (1.447–42.824); p = 0.047) and neonatal mortality in mothers with preeclampsia. However, there was no relationship between mode of delivery (PR (CI 95%) =1.359 (0.481–3.838); p = 0.753) and neonatal mortality in mothers with preeclampsia (Table 1).

In addition, based on laboratory results, there was a significant relationship between proteinuria (PR (CI 95%) =6.768 (0.878–52.177); p = 0.043) and neonatal mortality in mothers with preeclampsia. However, there was no relationship between anemia (PR (CI 95%)=1.407(0.498–3.980);p=0.707),leukocytosis(PR(CI 95%) =1.366 (0.456–4.090); p = 0.772), hypoalbuminemia (PR (CI 95%) =1.184 (0.257–5.459); p = 0.688), and bacteriuria (PR (CI 95%) =2.295 (0.755–6.975); p = 0.245) with neonatal mortality in mothers with preeclampsia (Table 1).

With the logistic regression test, it was found that the determinant factors that contributed to neonatal mortality in mothers with preeclampsia were parity (PR (CI 95%) =15.279 (2.304–101.301); p = 0.005) and proteinuria (PR (CI 95%) =9.649 (1.123–82.875); p = 0.039) (Table 2).

Table 1: Relationship of determinant factors with neonatal mortality

Characteristic	Neonatal mortality				PR (CI 95%)	p value
	Yes		No			
	n	%	N	%		
Age						
<20 and>35 years old	5	33.3	86	27.5	1.320 (0.439–3.972)	0.842*
20–35 years old	10	66.7	227	72.5		
BMI						
Overweight/obese	12	80.0	232	74.1	1.398 (0.384–5.074)	0.768**
Underweight/normoweight	3	20.0	81	25.9		
Education						
Low education	9	60.0	138	44.1	1.902 (0.661–5.473)	0.345*
High education	6	40.0	175	55.9		
Occupation						
No	13	86.7	255	81.5	1.478 (0.325–6.731)	1.000**
Yes	2	13.3	58	18.5		
Parity						
Primiparous/grand multiparous	2	13.3	6	1.9	7.872 (1.447–41.824)	0.047**
Multiparous	13	86.7	307	98.1		
Mode delivery						
Spontaneous	8	53.3	143	45.7	1.359 (0.481–3.838)	0.753*
Cesarean section	7	46.7	170	54.3		
Anemia						
Yes	7	46.7	120	38.3	1.407 (0.498–3.980)	0.707*
No	8	53.3	193	61.7		
Leukocytosis						
Yes	10	66.7	186	59.4	1.366 (0.456–4.090)	0.772*
No	5	33.3	127	40.6		
Hypoalbuminemia						
Yes	2	13.3	36	11.5	1.184 (0.257–5.459)	0.688**
No	13	86.7	277	88.5		
Bacteriuria						
Positive	5	33.3	56	17.9	2.295 (0.744–6.975)	0.245*
Negative	10	66.7	257	82.1		
Proteinuria						
Positive	14	93.3	211	67.4	6.768 (0.878–52.177)	0.043**
Negative	1	6.7	102	32.6		

*Chi-square test, p = 0.05. **Fisher's exact test, p = 0.05.

Table 2: Determinants of neonatal mortality in preeclampsia mothers

Variable	PR (CI95%)	p value
Parity	15.279 (2.304–101.301)	0.005
Proteinuria	9.649 (1.123–82.875)	0.039
Bacteriuria	2.861 (0.901–9.082)	0.074

Discussion

In this study, all the determinants were associated with neonatal mortality in mothers with preeclampsia, but the relationship obtained was not statistically significant. Parity and proteinuria factors were significantly associated with neonatal mortality. The first characteristic to be analyzed is demographic factors. Maternal age at risk (<20 years and >35 years) is 1.320 times more at risk, mothers with overweight and obese BMI are 1.398 times more at risk, mothers with low education are 1.902 times more at risk, and mothers who do not work are 1.478 times more likely to have neonatal mortality. However, these four demographic factors were not statistically significant as determinants of neonatal mortality in mothers with preeclampsia.

The second characteristic to be assessed was obstetric factors. Mothers with spontaneous delivery

were 1.359 times more likely to have neonatal mortality than mothers with cesarean section, but not statistically significant. Based on the labor characteristics, maternal anemia was 1.407 times more at risk, mothers with leukocytosis had 1.366 times more risk, mothers with hypoalbuminemia had 1.184 times more risk, and mothers with bacteriuria had 2.295 times risk of neonatal mortality. However, these four laboratory factors are also not statistically significant as determinants of neonatal mortality in mothers with preeclampsia. The neonatal mortality rate (death in the 1st week of life) is higher for the first pregnancy, even though it tends to increase again with the number of parties. In this study, primiparous/grand multiparous mothers were 15.279 times more likely to have neonatal mortality than multiparous mothers. Two out of 8 (25%) primiparous/grand multipara mothers have neonatal mortality, while in the multiparous group, only 13 of 320 (4.06%) mothers have neonatal mortality.

This is probably due to primiparous related to mothers' lack of experience and knowledge in pregnancy care. In addition, in the first pregnancy, the formation of antibodies that play a role in blocking placental antigenic sites may be impaired, thereby increasing the risk of preeclampsia [9]. In addition to the presence of foreign proteins, fetal or placental agents may elicit an immunologic response. The impaired immune response can cause preeclampsia syndrome, which will affect the fetus [10], [11].

Phipps *et al*. reported a neonatal mortality rate of 12.9 in 147 preeclampsia women with proteinuria [12]. In this study, neonatal mortality occurred in 14 of 225 mothers (6.22%) with proteinuria, while in mothers without proteinuria, infant mortality occurred in one in 103 mothers (0.97%). Mothers with proteinuria are 9.649 times more likely to have neonatal mortality than mothers without proteinuria.

Pathological changes in pregnant women with preeclampsia are systemic arteriolar spasms that can affect all organs, with the kidney most often affected [11], [13]. As a result of renal arteriolar spasm, renal perfusion volume, and glomerular filtration rate decreases, endothelial cells are damaged, glomerular basement membrane permeability is increased, and selective proteinuria occurs. In general, an increase in urinary protein means an increase in the degree of impaired renal function; therefore, the severity of preeclampsia can be considered to be directly related to the severity of proteinuria, and neonatal mortality is significantly higher in patients with severe than in mild preeclampsia [10], [14].

Conclusion

In this study, the determinant factors that significantly influence neonatal mortality in preeclampsia mothers who were admitted to the Koja Hospital, North Jakarta, were parity (primipara/grand multipara) and positive proteinuria.

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