**Original Article**

# Effect of Pre-Eclampsia with risk factors for birth weight and neonatal asphyxia: A retrospective study in pregnant women

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**Objective:** To analyze the risk factors for preeclampsia with birth weight and the incidence of asphyxia.

**Methodology:** This study used a case-control (retrospective) design with data sources of medical records for 255 mothers who gave birth with a diagnosis of preeclampsia at a referral hospital in East Java, Indonesia the period 2019 to 2020. The indicator for assessing birth weight is seen if it is less than 2500 grams, it is said to be low birth weight, and if it is more than 2500 – 3000 normal body weight. Assessment of neonatal asphyxia uses the Apgar score if the score is 1 – 3 severe asphyxia, 4 – 6 moderate asphyxia, and 7 – 10 mild asphyxia. Research data analysis was carried out using SPSS 21.

**Results:** The findings of the study on the relationship between preeclampsia status and newborn body weight obtained a p-value of 0.00, (OR 84.00 95%, CI 27.91 – 253.574), preeclampsia with asphyxia p-value 0.00 (OR 52.00, 95% CI 19.7 – 137.24), gestational age with infant weight at birth p-value 0.00 (OR 16.142, 95% CI 4.89 – 53.27), the Birth weight of infants with asphyxia p-value 0.00 (OR 0.329, 95% CI 0.235 – 0.459), and gestational age with asphyxia p-value 0.00 (OR 1.697, 95% CI 1.50 – 1.91).

**Conclusion:** Newborns can suffer from nutritional deficiencies and asphyxia due to inadequate uterine-placental blood flow and impaired uteroplacental perfusion, vasospasm, and disruption of spiral arteries while in the womb.

**Keywords:** Asphyxia, newborn, preeclampsia, pregnancy.

## INTRODUCTION

Preeclampsia is a complication in pregnancy and is one of the causes of maternal and fetal death.[1,2] Maternal mortality according to the Tenth Revision of The International Classification of Disease (ICD-10) is a woman's death that occurs during pregnancy, or within 42 days after the end of pregnancy.[3] In developing countries, the incidence of pre-eclampsia and eclampsia ranges from 1:100 to 1:1700.[4] The pre-eclampsia can be called a public health problem if the Case Fatality Rate (CFR) of pre-eclampsia/eclampsia reaches 1.4 – 1.8%.[1,5] From developed countries, the maternal mortality rate is reported to be 0 – 1.8%. The perinatal mortality rate due to eclampsia in the United States and Great Britain ranges from 5.6% to 11.8%, while in developing countries the maternal mortality rate reaches 14%.[6] Preeclampsia complications that occur in the fetus are nutritional deficiencies due to inadequate uterine-placental blood flow and can lead to premature birth, LBW, or stillbirth.[7,8]

LBW can be an important marker for the health and nutrition of mothers and fetuses.[9] Globally, the incidence of LBW is estimated to be around 15% of all births/year.[10] Decreased uteroplacental perfusion can significantly increase the risk of intrauterine growth restriction, preterm birth, and other neonatal comorbidities (such as respiratory distress syndrome, and intraventricular hemorrhage).[1,10] Pre-eclampsia can also cause asphyxia in newborns whichoccurs due to impaired uteroplacental perfusion due to vasospasm and damage to the spiral arteries during pregnancy.[3,11] This results in hypovolemia, vasospasm, decreased uteroplacental perfusion, and damage to the endothelial cells of the placental blood vessels.[9,12] This study aims to analyze the risk factors for preeclampsia with birth weight and the incidence of asphyxia.

## METHODOLOGY

This study used a case-control (retrospective) design with data sources of medical records in the period 2019 – 2020 for mothers who gave birth with a diagnosis of pre-eclampsia at a referral hospital in East Java, Indonesia. The variables of this study were pre-eclampsia status, baby weight, and asphyxia status at birth. The sample was 255 women who gave birth and were diagnosed with pre-eclampsia with the inclusion criteria for live births, while the exclusion criteria were pregnant women with a history of previous hypertension.

The baby weight indicator was taken from medical

records of mothers. If the birth weight was less than 2500 grams it was said to be LBW and if > 2500 was said to be normal weight. For asphyxia, if Apgar score was 1 – 3 it was labeled as severe asphyxia, 4 – 6 moderate asphyxia, and 7 – 10 mild asphyxia. The diagnosis of preeclampsia was established using blood pressure indicators; if the systolic pressure was more than 140 mmHg and the diastolic more than 80 mmHg, then pre-eclampsia was classified as mild, whereas if the systolic pressure was more than 160 mmHg with a diastolic pressure of 100 mmHg, then preeclampsia was labeled severe. Another assessment uses protein urine, as well as a history of pre-eclampsia before being referred to the hospital.

**Statistical Analysis:** Analysis of data was carried out using SPSS version 21 with a chi-square analysis. P-values < 0.05 were considered statistically significant and the rough/adjusted odds ratio was calculated.

## RESULTS

Most of the mothers had mild pre-eclampsia 68.9%, normal baby weight (2500 – 3500 gr) 64.7%, and 70% gestational age 38 – 40 weeks (Table 1). The relationship between pre-eclampsia status and newborn body weight has a p-value of 0.00, (OR 84.00 95%, CI 27.91 - 253.574) (Table 2).

Pre-eclampsia with asphyxia p-value was 0.00 (OR 52.00, 95% CI 19.7-137.24) (Table 3), gestational age with infant weight at birth p-value 0.00 (OR 16.142, 95% CI 4.89-53.27) (Table 4), Birth weight of infants with asphyxia had p-value 0.00 (OR 0.329, 95% CI 0.235 – 0.459), andage of gestation with asphyxia had p-value 0.00 (OR 1.697, 95% CI 1.50 – 1.91). There was a relationship between preeclampsia status and the incidence of neonatal asphyxia p-value 0.00 (OR 52.00, 95% CI 19.7 – 137.24), mothers with severe preeclampsia had a 52 times risk of experiencing asphyxia.

**Table 1: Age of pregnant women, gestational age, mother's education and other factors.**

| Characteristic | Catagory | n (%) |
|---|---|---|
| Age of pregnant women | Less than 20 years | 78 (30,6) |
| | 20 – 30 years | 103(40,4) |
| | Over 30 years | 74 (29) |
| Gestational age | Less than 36 weeks | 76 (30) |
| | 36 – 40 weeks (aterm) | 179 (70) |
| Mother's education | Elementary school | 52 (17,7) |
| | Middle school | 134 (45,7) |
| | High school | 59 (20,1) |
| | College | 10 (3,4) |
| Mother's job | Housewife | 101 (34,5) |
| | Laborer | 9 (3,1) |
| | self-employed, | 141 (48,1) |
| | Civil servants | 4 (1,4) |
| Pre-eclampsia type | Mild preeclampsia | 204 (69,8) |
| | Severe preeclampsia | 51 (17,4) |
| ANC compliance | Obey | 147 (59,2) |
| | Disobey | 108 (36,9) |
| Baby weight | Low | 90 (35,4) |
| | Normal | 165 (64,7) |
| Neonatus asphyxia status | Severe | 70 (23,9) |
| | Moderate | 185 (72,5) |
| Maternal weight during pregnancy | Low | 8 (3,1) |
| | Normal | 202 (79,2) |
| | Overweight | 45 (17,6) |

**Table 2: Relationship between newborn weight and pre-eclampsia.**

| Variable | Pre-eclampsia Type | | Total | OR (95% CI) | p value |
|---|---|---|---|---|---|
| | Preeclampsia Severe, Mild | Preeclampsia Mild | | | |
| Low birth weight | 47 | 50 | 47 | 84,00 27,91 – 253,574 | 0,00 |
| Normal birth weight | 4 | 204 | 208 | | |
| Total | 51 | 204 | 255 | | |

**Table 3: Association of neonatal asphyxia with preeclampsia.**

| Variable | Preeclampsia Type | | Total | OR (95% CI) | p-value |
|---|---|---|---|---|---|
| | Preeclampsia Severe | Preeclampsia Mild | | | |
| Severe asphyxia | 51 | 19 | 70 | 52,00 19,7-137,24 | 0,00 |
| Moderate asphyxia | 0 | 108 | 208 | | |
| Total | 51 | 204 | 255 | | |

**Table 4: Relationship between gestational age and newborn body weight.**

| Variable | Newborn Weight | | Total | OR (95% CI) | p-value |
|---|---|---|---|---|---|
| | Low | Normal | | | |
| Gestational age aterm (37-40 week) | 3 | 59 | 63 | 16,142 4.89 – 53,27 | 0,00 |
| Gestational age pre term (less than 36 weeks) | 87 | 106 | 193 | | |
| Total | 90 | 165 | 255 | | |

## DISCUSSION

Pre-eclampsia (PE) is associated with 3 major risks to the fetus which are perinatal death, intrauterine growth restriction (IUGR), and preterm birth. Perinatal mortality is increased in infants with IUGR or asphyxia.[13,14] Premature infants with IUGR are at high risk of prolonged respiratory insufficiency.[15] During pregnancy, the increased demand for oxygen causes an increase in the rate of free radical production.[16,17] Oxidative stress is implicated in preeclampsia and IUGR.[13,18] The level of oxidative stress and decreased antioxidant capacity may contribute to the incidence of perinatal asphyxia.[15]

In preeclampsia, there is a decrease in placental blood perfusion as well as vasospasm and endothelial injury.[4,19] A placenta that experiences ischemia and hypoxia produces free radicals in the form of reactive hydroxyl radicals and lipid peroxides which circulate in the bloodstream and can damage the cell membrane, nucleus, and endothelial cell proteins which result in endothelial dysfunction.[18]

The results of this study indicate that there is a relationship between pre-eclampsia status with the incidence of LBW and asphyxia. Babies born with LBW and asphyxia are babies born to severe preeclampsia mothers with a gestational age of fewer than 38 weeks.[20] Pre-eclampsia causes mothers to give birth earlier than their gestational age. Infants born prematurely are smaller and have a higher incidence of hyaline membrane disease, patent ductus arteriosus, pulmonary air leakage, and hypotension.[21]

Efforts have been made to prevent preeclampsia during pregnancy including prophylactic aspirin therapy, which is effective in reducing the risk of preeclampsia if given before 16 weeks of gestation.[14] Other efforts that can be made to prevent preeclampsia are nutritional supplements and diet and lifestyle interventions. Vitamin D deficiency can increase the risk of preeclampsia.[22,23] Another therapy that has been given to mothers with pre-eclampsia is the administration of MgSO4.[6]

The only definitive treatment for preeclampsia is pregnancy termination although babies born with LBWhave an increased incidence of asphyxia.[24]Optimal delivery time requires a careful balance of risks to both the mother and the fetus.[14] If the condition of the fetus worsens, delaying labor can put the risk of impairing brain development due to prolonged fetal hypoxia, but early delivery also has risks associated with prematurity.[14]

## CONCLUSION

Pre-eclampsia increases the incidence of preterm labor and asphyxia in newborns. There is a relationship between pre-eclampsia with LBW and asphyxia. The primary prevention program needs to be further improved through early detection of pregnant women at basic level services so that preeclampsia treatment can be carried out earlier.

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