

Preeclampsia as a risk factor for neonatal asphyxia: A case review at Aura Syifa Hospital

Ira Titisari¹, Finta Isti Kundarti¹

¹Department of Health, Midwifery, Poltekkes Kemenkes Malang, Indonesia

Corresponding Author: Ira Titisari; iratitisari@gmail.com

Abstract:

Neonatal asphyxia is a condition characterized by the failure of spontaneous and regular breathing at birth or shortly thereafter, marked by hypoxia. This condition occurs due to the suboptimal function of the newborn's organs, particularly in the gas exchange process. One of the maternal factors contributing to neonatal asphyxia is preeclampsia. In mothers with preeclampsia, reduced blood flow to the placenta occurs due to vasoconstriction, which leads to impaired placental function and triggers fetal hypoxia. Prolonged hypoxia disrupts the exchange of oxygen and carbon dioxide, thereby increasing the risk of asphyxia. This study aimed to determine the association between preeclampsia and the incidence of neonatal asphyxia at Aura Syifa Hospital, Kediri Regency. This research was an analytical observational study with a cross-sectional approach. The sample consisted of 118 subjects, selected using simple random sampling. Data were collected through medical record review over a three-month period. The association between preeclampsia and neonatal asphyxia was analyzed using the Chi-Square test, with a significance level of 0.05. The results of the Chi-Square test ($p = 0.003$) showed a significant association between preeclampsia and the incidence of neonatal asphyxia at Aura Syifa Hospital, Kediri Regency. The significant Chi-Square result ($p = 0.003$) indicates that mothers with preeclampsia have a higher risk of giving birth to neonates with asphyxia, likely due to impaired placental blood flow and fetal hypoxia. There is a significant association between preeclampsia and the incidence of neonatal asphyxia at Aura Syifa Hospital, Kediri Regency. It is recommended to monitor pregnant women with preeclampsia closely to prevent neonatal asphyxia, including timely interventions to improve placental perfusion and fetal oxygenation.

Keywords:

preeclampsia; asphyxia; neonatorum

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INTRODUCTION

The first month of life is the most vulnerable period, with 2.3 million newborn deaths in 2022, and nearly half of all under-five child deaths occurring during the neonatal period. These deaths are largely caused by prematurity, birth complications, infections, and limited access to quality care—particularly in regions like sub-Saharan Africa, which records the highest neonatal mortality rates.

Improving access to care led by professional midwives has been proven to significantly reduce the risk of neonatal deaths and preterm births (World Health Organization, 2024).

In 2023, a total of 27,530 infant deaths occurred during the neonatal period (0–28 days), accounting for 80.4% of all infant deaths, with 0.7% attributed to low birth weight (LBW) and prematurity (Kementerian Kesehatan RI, 2023). In East Java Province in the same year, the prevalence of premature births was recorded at 2.2%, with a total of 11,525 cases (Dinas Kesehatan Provinsi Jawa Timur, 2023). These data indicate that prematurity remains a significant public health issue and contributes to the high neonatal mortality rate in Indonesia.

Preeclampsia is one of the leading causes of preterm birth, as this condition often requires early delivery to save both the mother and fetus. In the fetus, preeclampsia disrupts blood and oxygen flow to the placenta, which can impair growth (Gatford et al., 2020) and trigger chronic fetal hypoxia, increasing the risk of fetal distress and neonatal asphyxia, particularly during labor. Additionally, exposure to preeclampsia during pregnancy poses a risk for long-term outcomes such as hypertension, obesity, and metabolic disorders in the child later in life (Bouter & Duvekot, 2020).

Preeclampsia is a hypertensive disorder that typically arises after 20 weeks of gestation and poses serious risks to both mother and fetus. This condition endangers maternal safety and can also impair fetal growth and survival (Chiabi et al., 2021). Globally, preeclampsia accounts for approximately 46,000 maternal deaths and around 500,000 fetal or neonatal deaths annually. In Asia and Africa, preeclampsia and eclampsia contribute to about 10% of all maternal deaths, while in Latin America, the rate reaches 25%, making it one of the leading causes of maternal and neonatal morbidity and mortality (World Health Organization, 2025).

Preeclampsia is not only a risk factor for prematurity but also contributes directly to impaired cardiovascular function in preterm infants. Early delivery is often necessary to save the lives of both mother and fetus due to severely compromised blood flow caused by preeclampsia (Frost et al., 2021). This study aims to analyze the relationship between preeclampsia and the risk of neonatal asphyxia, and to contribute to strengthening promotive and preventive interventions to optimize maternal and child health.

METHODS

This study employed an analytical observational design with a cross-sectional approach and a retrospective methodology. The study population consisted of all neonates born at Aura Syifa Hospital, Kediri, during the study period. A total of 166 neonates were selected using simple random sampling.

Data were collected through a review of patient medical records, which included information on maternal and neonatal conditions, such as maternal preeclampsia and the incidence of neonatal asphyxia. The research instrument was a standardized data collection form developed by the researchers to extract relevant information from the medical records.

The study was conducted from July to August. Data analysis was performed using descriptive and analytical methods, specifically the Chi-Square test, to assess the association between preeclampsia and neonatal asphyxia.

RESULTS

Distribution of Preeclampsia and Neonatal Asphyxia

Table 1. The Distribution of Preeclampsia and Neonatal Asphyxia from October to December 2017

Variable	Frequency	Percentage
Obstetric history		
Preeclampsia	77	65.3
Non-preeclampsia	41	34.7
Asphyxia		
Severe Asphyxia	2	1.7
Moderate Asphyxia	52	44.1
Mid Asphyxia	64	54.2

Table 1 revealed that most of the participants in this study (65.3%) had a history of delivery with preeclampsia. Most of the infant participants in this study had a history of mild asphyxia (54.2%)

Analysis of The Association between Preeclampsia and Neonatal Asphyxia

Table 2. Analysis of The Association between Preeclampsia and Neonatal Asphyxia

Obstetric History	Asphyxia Neonatorum			p-value
	Severe Asphyxia	Moderate Asphyxia	Mild Asphyxia	
Preeclampsia	2	42	77	0.003
Non-preeclampsia	0	10	41	

Table 2 shows a significant association between preeclampsia and the incidence of asphyxia ($p = 0.003$).

DISCUSSION

Based on Table 1, it was found that most mothers had a history of delivery with preeclampsia (65.3%). Preeclampsia is a leading cause of maternal and perinatal morbidity and mortality, characterized by new-onset hypertension after 20 weeks of gestation accompanied by proteinuria or other organ dysfunctions in previously normotensive women (Chaemsaihong et al., 2022). This condition is a serious pregnancy complication as it can cause organ damage, seizures, and increase long-term risks such as cardiovascular disease (Tanner et al., 2022).

Pathophysiologically, preeclampsia begins with abnormal development of placental blood vessels, leading to impaired blood flow to the fetus and triggering oxidative stress. The stressed placenta releases antiangiogenic factors into the maternal circulation, damaging the endothelial function of blood vessels. As a result, vasoconstriction and increased systemic blood pressure occur, which can lead to severe complications such as kidney failure, liver damage, coagulation disorders, and seizures in the mother (Haßdenteufel et al., 2023).

Preeclampsia is diagnosed after 20 weeks of gestation in previously normotensive women, indicated by blood pressure $>140/90$ mmHg on two measurements taken more than 4 hours apart. It may be accompanied by proteinuria of ≥ 300 mg/24 hours or a protein-to-creatinine ratio of ≥ 0.3 (Gyamfi-Bannerman et al., 2020). In the absence of proteinuria, diagnosis is based on signs of organ dysfunction such as thrombocytopenia, elevated liver enzymes, kidney impairment, pulmonary edema, or neurological symptoms. Preeclampsia is classified as mild, severe, or superimposed, depending on severity and the presence of organ complications (Chang et al., 2023).

Most infants experienced mild asphyxia (54.2%). Asphyxia is the failure of a newborn to breathe spontaneously and effectively, leading to hypoxia and carbon dioxide buildup in the body. Due to impaired oxygen and blood supply—especially to vital organs like the brain—cellular metabolism shifts from aerobic to anaerobic, triggering metabolic acidosis and the accumulation of lactate (Ahmed et al., 2021).

This results in organ dysfunction and neurological injuries such as hypoxic-ischemic encephalopathy (HIE), characterized by seizures, altered consciousness, and risk of long-term brain damage (Bayih et al., 2021). Clinically, asphyxia presents with weak breathing, cyanosis, bradycardia, poor muscle tone, and poor reflexes, assessed using the Apgar score at the first and fifth minutes after birth (Mota-Rojas et al., 2022).

Table 2 shows that there is a relationship between preeclampsia and the incidence of neonatal asphyxia. This finding is consistent with studies indicating that preeclampsia is a significant risk factor for perinatal asphyxia. Mothers with preeclampsia are more likely to give birth to infants with asphyxia

than mothers without preeclampsia, due to impaired maternal-fetal blood flow leading to decreased oxygen supply and increased risk of intrauterine hypoxia (Gebregziabher et al., 2020).

Another study also shows that preeclampsia directly affects placental perfusion, inhibiting oxygen transfer to the fetus and increasing the risk of hypoxia during labor (Berhe et al., 2020). Uncontrolled maternal hypertension may lead to fetal metabolic imbalance, resulting in birth asphyxia. Furthermore, infants of mothers with preeclampsia are more susceptible to respiratory complications due to disrupted physiological adaptation to hypoxic stress in utero.

Another study confirms that preeclampsia is a maternal risk factor clearly associated with neonatal asphyxia. Hemodynamic disturbances caused by preeclampsia reduce fetal blood and oxygen supply, increasing the likelihood of respiratory distress at birth. In addition, delivery complications commonly experienced by mothers with preeclampsia further raise the risk of suboptimal birth outcomes and asphyxia in neonates (Igboanugo et al., 2020).

Prevention of asphyxia in infants born to mothers with preeclampsia can be achieved through routine antenatal care for early detection and monitoring of both maternal and fetal conditions. Active pregnancy management, such as fetal growth monitoring and fetal evaluation using CTG or ultrasound, helps determine the optimal timing of delivery. Controlled delivery, whether spontaneous or operative, should be adapted to the clinical condition to prevent birth hypoxia. Additionally, readiness of neonatal facilities such as NICUs is essential to immediately manage the risk of asphyxia after birth (Darsareh et al., 2023; Joanna R. G et al., 2022).

Other studies found no significant association between preeclampsia and asphyxia based on low Apgar scores or the need for neonatal ventilation. These studies suggest that perinatal outcomes such as asphyxia can be minimized through optimal obstetric and neonatal management in tertiary care centers. Although preeclampsia is known as a potential risk factor, high-quality perinatal care can reduce its adverse effects on the infant (Matyas et al., 2022).

CONCLUSION

This study showed that most newborns with mild asphyxia were treated at Aura Syifa Hospital in Kediri Regency, and most mothers had a history of delivery with preeclampsia. The analysis results also demonstrated a significant association between preeclampsia and the incidence of asphyxia, indicating that preeclampsia is one of the contributing factors to the increased risk of asphyxia in this hospital.

This research is expected to serve as a consideration for Aura Syifa Hospital in Kediri Regency in screening for preeclampsia risk factors to improve the quality of care for newborns at

risk of asphyxia. Future researchers are encouraged to conduct broader studies on the risk factors for asphyxia, including those related to maternal health, labor processes, and placental conditions, to enrich and complement the findings of this study.

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CONFLICT OF INTEREST

The authors declare that they have no financial or personal conflicts of interest related to this study.

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