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The Relationship between Premature Membrane Rupture and Neonatal Asphyxia at Gunung Jati Regional Hospital, Cirebon City

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Abstract. One significant risk factor associated with the occurrence of Premature Rupture of Membranes (PROM) is Neonatal Asphyxia. Premature rupture of membranes is a condition where the amniotic membrane breaks before the onset of labor, which can lead to infections and other complications, including asphyxia in newborns. According to several studies, the incidence of PROM ranges from 2% to 20% of all pregnancies, with the incidence varying depending on various factors, including access to healthcare services and the medical conditions of pregnant women. Neonatal asphyxia is a condition where a newborn baby experiences a lack of oxygen (hypoxia) that can lead to permanent organ damage or death. This study aims to determine the relationship between the incidence of Premature Rupture of Membranes (PROM) and the incidence of Neonatal Asphyxia at Gunung Jati Regional Hospital, Cirebon City in 2024.This research is a type of descriptive-analytical study, using the cross-sectional method. The population in this study consists of all deliveries recorded in the medical records of Gunung Jati Regional Hospital, Cirebon City for the period of January-April 2024, totaling 365. The sampling technique in this study is proportionate purposive random sampling taken from deliveries during the period of January-April 2024, amounting to 100 samples. The research results showed an incidence rate of Premature Rupture of Membranes (PROM) at Gunung Jati Regional Hospital, Cirebon City during the period of January–April 2024, with 53 cases (53%), an incidence rate of Asphyxia with 88 cases (88%), and a p-value of 0.017, which is less than 0.05. The conclusion of this study shows that the number of respondents who experienced PROM and asphyxia was 51 people (51%). The chi-square test results showed a significance value of 0.017 (p-value <0.05) and an Odds Ratio (OR) value of 6.892. From this study, it was found that there is a relationship between the incidence of premature rupture of membranes and the incidence of neonatal asphyxia at Gunung Jati Regional Hospital, Cirebon City during the period of January-April 2024.

Keywords: Premature Rupture of Membranes, Neonatal Asphyxia

INTRODUCTION

The infant mortality rate is one of the important indicators for assessing the health status of a community in a particular area. According to the World Health Organization

(WHO, 2023) report, approximately 2.4 million newborns die worldwide each year within the first 28 days of their lives, with neonatal asphyxia being one of the main causes of neonatal mortality. Neonatal asphyxia is a condition where newborns experience a lack of oxygen (hypoxia) that can lead to permanent organ damage or death.

In Indonesia, although there has been a decline in the infant mortality rate over the past few decades, the infant mortality rate remains a significant health issue. Based on data from the Central Statistics Agency and the Indonesian Ministry of Health in 2023, the infant mortality rate in Indonesia is around 20 per 1,000 live births. Neonatal asphyxia contributes approximately 23% of all neonatal deaths in Indonesia, making it one of the largest factors contributing to infant mortality in the country.

In West Java Province, including Cirebon City, the infant mortality rate trend shows that this region has a relatively high infant mortality rate compared to several other provinces in Indonesia. According to the West Java Provincial Health Office, the infant mortality rate in this province reached 22 per 1,000 live births in 2023, with neonatal asphyxia being one of the main causes.

Cirebon City, as one of the cities in West Java Province, also faces similar challenges. Data from the Cirebon City Health Office shows that in 2023, the infant mortality rate in this city was 21 per 1,000 live births, and neonatal asphyxia contributed approximately 25% of the total infant deaths.

One significant risk factor associated with the occurrence of Premature Rupture of Membranes is Neonatal Asphyxia. Premature rupture of membranes is a condition where the amniotic membrane breaks before the onset of labor, which can lead to infections and other complications, including asphyxia in newborns. According to several studies, the incidence of premature rupture of membranes ranges from 2% to 20% of all pregnancies, with the incidence varying depending on various factors, including access to healthcare services and the medical conditions of pregnant women.

From the results of the Premature Rupture of Membranes study at Panti Abdi Dharma Hospital for the period January-December 2021, there were 248 cases (24.2%) and the incidence of Neonatal Asphyxia at Panti Abdi Dharma Hospital Cirebon City for the year 2021 was 129 cases (12.6%). The number of deliveries at Gunung Jati Regional Hospital in 2023 was 1,048 deliveries. From the 1048 deliveries, the incidence rate of Premature Rupture of Membranes was 22.23% or around 233 cases, 48% or 112 cases of newborns experienced asphyxia, 15% or 35 cases of asphyxia became severe and required more

intensive care, the remaining were 77 cases of newborns with mild and moderate asphyxia (Gunung Jati Regional Hospital, 2023). Meanwhile, in 2024, the number of deliveries from January to April 2024 was 365 deliveries, with 53 cases of Premature Rupture of Membranes, and 21 newborns experiencing asphyxia (Gunung Jati Regional Hospital, 2024).

Efforts to handle Premature Rupture of Membranes to reduce the incidence of asphyxia include providing care to the mother, such as observing the condition of the mother and fetus, in accordance with the Word of Allah SWT in QS. Al Isra' verse 70:

وَلَقَدْ كَرَّمْنَا بَنِىٓ ءَادَمَ وَحَمَلْنَٰهُمْ فِى ٱلْبَرِّ وَٱلْبَحْرِ وَرَزَقْنَٰهُم مِّنَ ٱلطَّيِّبَٰتِ وَفَضَّلْنَٰهُمْ عَلَىٰ كَثِيرٍ مِّمَّنْ خَلَقْنَا تَفْضِيلًا

Meaning: "And indeed, We have honored the children of Adam, We carried them on land and at sea, We provided them with good and pure sustenance, and We have preferred them over many of Our creatures."

This verse reminds us of the dignity of human beings and the responsibility to preserve human life and health as creatures honored by Allah SWT, which means giving serious attention to medical conditions that can threaten their lives and well-being.

LITERATURE

Understanding Premature Rupture of Membranes (PROM)

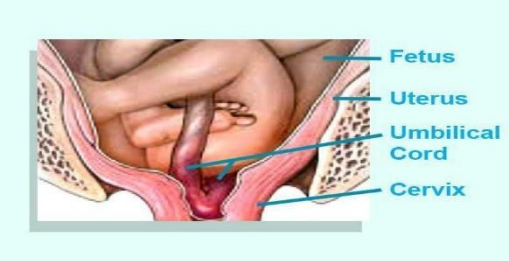
According to (Fujiyarti, 2016), Premature Rupture of Membranes (PROM) is the rupture of the amniotic sac that occurs before the due time, usually before 37 weeks of gestation, or the occurrence of chorioamnionitis leading to sepsis, which increases morbidity and mortality. PROM can influence gestation and parturition. The duration between membrane rupture and the commencement of labor is referred to as the latent phase or the lag period. Multiple computations can be employed to assess the Lag Period, including 1 hour or 6 hours before to intrapartum, and exceeding 6 hours post-rupture of membranes. Prolonged latent period following the rupture of the amniotic sac may result in infection both for the mother and the infant.

Andalas et al. (2019) assert that obstetric examinations are crucial for detecting numerous pregnancy problems, including premature rupture of membranes. Premature rupture of membranes transpires when the membranes encasing the fetus rupture prior to the expected delivery, resulting in the effusion of amniotic fluid. The diagnosis of preterm rupture of membranes can be established by noting various physical indicators. For example, amniotic fluid can be seen pooling in the posterior fornix (the upper back part of the vagina) or flowing out of the cervical canal. Additionally, during the Valsalva maneuver, where the

mother is asked to bear down, fluid discharge from the cervix can also be observed.To ensure the diagnosis, one of the tests used is the Nitrazine test or litmus test.This test uses litmus paper that changes color when it comes into contact with alkaline amniotic fluid, thereby helping to confirm the presence of premature rupture of membranes.

According to Demiarti & Suharti (2017), Premature Rupture of Membranes (PROM) is a complication that often occurs in preterm pregnancies and significantly contributes to the perinatal mortality rate in preterm infants. Management of premature rupture of membranes (PROM) in pregnancies less than 34 weeks is very complex, with the primary goal of preventing prematurity and respiratory distress syndrome (RDS) in infants. Proper management is crucial to improving the chances of survival and long-term health for premature babies.

The predominant consequence of preterm premature rupture of membranes (PPROM) before to 37 weeks of gestation is respiratory distress syndrome, affecting 10-40% of neonates. The risk of infection increases in cases of preterm premature rupture of membranes (PPROM). All pregnant women with premature rupture of membranes (PROM) should be evaluated for the possibility of chorioamnionitis (inflammation of the chorion and amnion). In addition, the occurrence of cord prolapse can happen in PROM. The risk of fetal disability and death increases in preterm PROM. Pulmonary hypoplasia is a fatal complication that occurs in preterm premature rupture of membranes (PPROM).The incidence reaches almost 100% if this preterm premature rupture of membranes occurs at a gestational age of less than 23 weeks.



Source: Research Images
Figure 1. Umbilical Cord Prolapse

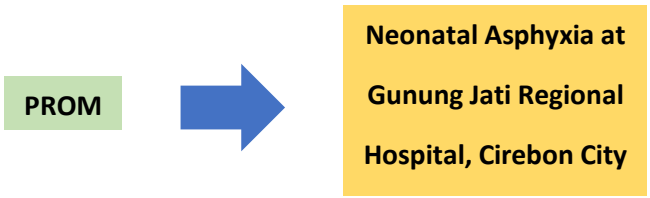
According to Wahyuni et al. (2023), to prevent infections and reduce pain, it is important to collaborate with an obstetrician in providing the appropriate therapy. This therapy involves the use of medications that can help prevent infections and reduce the discomfort experienced by pregnant women. Collaboration with obstetricians ensures that the therapy provided is appropriate for the patient's health condition and needs.

In addition, the obstetrician will recommend taking medication according to the prescribed schedule. Adherence to the medication schedule is very important to ensure the effectiveness of the treatment and reduce the risk of complications. The prescribed medications usually include antibiotics to prevent infections and analgesics to reduce pain, which must be taken according to the doctor's instructions.

This collaboration not only involves obstetricians but also other medical teams, such as nurses, who ensure that patients receive holistic care. Routine monitoring and open communication between patients and the medical team are crucial for managing conditions well and ensuring the well-being of both the mother and baby during pregnancy and childbirth.

According to Prastina (2023), there are several preventive measures to avoid premature rupture of membranes, including reducing physical activity and increasing rest time at the end of the second trimester or the beginning of the third trimester of pregnancy. Avoiding predisposing factors, such as infections and excessive physical stress, is also highly recommended. Although there is no fully effective method yet, these measures may mitigate the risk of early rupture of membranes. Midwives, as trained medical professionals who are embedded within the community, play an important role in this prevention. They are expected to be conservative by not performing too many unnecessary medical interventions.

However, if premature rupture of membranes occurs, immediate and appropriate action is crucial. The midwife must ensure that the patient is immediately referred to a higher-level healthcare facility for appropriate treatment. Inadequate or postponed care can elevate the risk of morbidity and mortality for both the mother and the infant. Therefore, cooperation between midwives, doctors, and healthcare facilities is very important to ensure the safety and well-being of mothers and babies during pregnancy and childbirth.



Source: Research Images
Figure 2. Concept Map

METHOD

Research design is a systematic approach for acquiring data with defined objectives and applications (Sugiyono, 2017). This research employs a quantitative design utilizing an

analytical survey approach and a cross-sectional research framework. Cross-sectional research is a study design in which variables, including their effects, are observed concurrently at a single point in time. Notoatmodjo, 2014. This cross-sectional study seeks to investigate the correlation between the incidence of premature rupture of membranes (PROM) and infant hypoxia at a designated time, excluding prior medical history. This study was carried out in Gunung Jati Regional Hospital in Cirebon City from May to July 2024, with 365 participants involved.

This Operational Definition contains the actual characteristics that will be measured (Research Variable). In this research variable, the number of mothers giving birth with preterm or term PROM.

Tabel 1. Operational Definition

Variables	Operational Definition	Measuring Instrument	Measurement Method	Measurement Results	Measurement Scale
Independent Variable					
Premature Rupture of Membranes	The release of amniotic fluid from the birth canal before the onset of labor in preterm or term pregnancies.	Checklist sheet	Looking at the inpatient medical record report	Premature Rupture of Membranes (PROM) 1. Yes 2. No	Nominal
Dependent Variable					
Asphyxia	The condition of the newborn baby is not breathing or breathing in gasps.	Checklist sheet	Looking at the inpatient medical record report	Asphyxia 1. Yes 2. No	Nominal

Source: Research Data

DISCUSSION

The investigation revealed that the incidence of Premature Rupture of Membranes (PROM) at Gunung Jati Regional Hospital in Cirebon City from January to April 2024 was 53 individuals (53%).

Premature Rupture of Membranes (PROM) refers to the rupture of the amniotic sac prior to term, typically occurring before 37 weeks of gestation, or the onset of chorioamnionitis resulting in sepsis, which elevates morbidity and mortality risks. PROM can influence gestation and parturition. (Fujiyarti, 2016).

The author concurs with the research findings indicating that PROM influences pregnancy and childbirth, potentially resulting in morbidity and mortality in newborns.

Obstetric checks are crucial for detecting numerous pregnancy problems, including premature rupture of membranes. Premature rupture of membranes transpires when the fetal membrane ruptures prior to the expected delivery, resulting in the leakage of amniotic fluid. Andalas et al. (2019).

In this study, the author concurs with the research findings, which entail verifying the integrity of the fetal membrane to ascertain whether it has burst, hence facilitating the diagnosis of PROM by a litmus test.

Research conducted by Laela Mardiyanti and Iis Sri Hardiati in 2023 revealed that 87 out of 100 respondents (87%) had early rupture of membranes. The findings of this study align with the studies by Laela Mardiyanti and Iis Sri Hardiati, which indicated that most respondents encountered preterm rupture of membranes.

In term pregnancies, one of the causes of amniotic membrane rupture is the weakness of the fetal membrane. In addition, invasive examination procedures performed during labor, such as amniocentesis, chorionic villus sampling, fetoscopy, and cerclage, can also damage the amniotic membrane and cause the rupture of the amniotic sac. However, it should be noted that these invasive procedures are rarely performed, so the risk of amniotic membrane rupture due to these procedures is very small. (Karo, 2020).

This study posits that invasive treatments conducted during the pre-labor phase, such as amniocentesis and cerclage, can occasionally induce contractions in patients and result in the rupture of the amniotic membrane.

The pathophysiology of premature rupture of membranes involves alterations in cellular structure, cell quantity, and collagen catabolism, resulting in modifications to collagen activity that ultimately precipitate membrane rupture. During early pregnancy, the amniotic sac is robust; but, by the end of pregnancy, it becomes increasingly susceptible to rupture due to the deterioration of the amniotic membrane, which is influenced by uterine expansion, contractions, and fetal activity. (Nanda, 2023).

Researchers argue that when premature rupture of membranes occurs, it can disrupt fetal development, potentially leading to hypoxia and neonatal asphyxia.

Description of Neonatal Asphyxia Incidence at Gunung Jati Regional Hospital, Cirebon City

The investigation revealed that the incidence of Neonatal Asphyxia at Gunung Jati Regional Hospital in Cirebon City from January to April 2024 was 88 cases (88%).
Neonatal asphyxia is a situation wherein a newborn does not initiate spontaneous and regular respiration immediately following birth. The primary cause is a disruption in the transit exchange of O2 from the mother to the fetus during pregnancy, labor, or immediately postpartum. (Prawirohardjo, 2018).

This study posits that the determination of a newborn's asphyxiation should rely on the Apgar score.

This study aligns with the investigation by Alif Rachma Kusumawati et al. in 2022, which identified 129 infants (13%) at Panti Abdi Dharma Hospital in Cirebon City who experienced Neonatal Asphyxia.

The Correlation Between Premature Rupture of Membranes and the Occurrence of Neonatal Asphyxia.

The investigation yielded a p-value of 0.017, which is below the threshold of 0.05. The data indicates a correlation between the occurrence of premature rupture of membranes and the prevalence of infant asphyxia at Gunung Jati Regional Hospital, Cirebon City, from January to April 2024. The calculated Odds Ratio (OR) was 6.892. This indicates that individuals who undergo premature rupture of membranes possess a 6.892-fold increased likelihood of encountering newborn hypoxia. This study's results are corroborated by the research of Vevi Gusnidarsih and Liya Lugita Sari in 2019, which yielded a p-value of 0.000, less than 0.05, and an Odds Ratio (OR) of 6.055.

This study's results align with those of Arifah Istiqomah and Yesi Astria's 2016 study, which reported a p-value of 0.024, below 0.05, and an Odds Ratio (OR) of 3.189.

Premature Rupture of Membranes (PROM) may result in infant hypoxia if associated with further problems. This results from fetal hypoxia in the uterus, which is associated with variables occurring during pregnancy, labor, or immediately postpartum. The rupture of the amniotic sac results in oligohydramnios, which compresses the umbilical cord, causing suffocation or hypoxia. A correlation exists between the incidence of fetal distress and the severity of oligohydramnios; less amniotic fluid correlates with increased severity of fetal distress. (Prawirohardjo, 2018)

Researchers agree and argue that if the amniotic fluid decreases or oligohydramnios occurs, it can cause the baby to experience asphyxia, leading to fetal distress.

Based on the research by Arindiah Puspo Windari et al. in 2019, the classification of neonatal asphyxia incidents shows that the majority did not experience neonatal asphyxia, with 74 respondents (67.9%), and a small portion experienced neonatal asphyxia, with 35 respondents (32.1%).

The study done at the Pelauw Health Center utilizing the Chi-Square test to examine the correlation between Premature Rupture of Membranes (PROM) and the occurrence of neonatal asphyxia yielded a significant value of 0.000 or ρ= 0.000, which is below the 0.05% threshold. There exists a correlation between Premature Rupture of Membranes (PROM) and the occurrence of infant asphyxia at the Pelauw Health Center.

The outcomes of this study align with the research conducted by Ria Citra Wulan et al. in 2019, which reported a p-value of 0.025, below the threshold of 0.05. The data indicates a correlation between early rupture of membranes and the occurrence of hypoxia in neonates at Dr. H. Abdul Moeloek Regional General Hospital Bandar Lampung.

This research substantiates the assertion that premature rupture of membranes impedes the maternal-fetal blood flow of oxygen, resulting in neonatal hypoxia.

The findings of this study align with the notion that the rupture of the amniotic sac results in a reduction in amniotic fluid, hence causing oligohydramnios. The occurrence of oligohydramnios happens when the amniotic fluid is between 200-500 ml, which can compress the umbilical cord, thereby disrupting the exchange of O_2 and CO_2 at the placenta, potentially causing asphyxia/hypoxia in the fetus. The rupture of the amniotic sac long before birth can result in the infection of the amniotic fluid and subsequently lead to lung infections as well as systemic infections in the fetus.

Premature Rupture of Membranes can also cause maternal infections that can reduce maternal placental blood flow, thereby decreasing the O_2 received by the fetus and resulting in hypoxia, which causes the baby to experience asphyxia at birth. Fetal hypoxia leading to asphyxia arises from impairments in gas exchange and oxygen delivery from the mother to the fetus, resulting from maternal diseases or anomalies that disrupt the oxygen supply system. (Ferawati, 2018)

In cases without PROM but with asphyxia, 37 people (37%) likely experienced it due to other factors, and there is no available data, which poses a limitation for the researchers. The researchers have not yet been able to conduct further studies regarding 2 people (2%) who experienced PROM but did not experience asphyxia and 10 other people (10%) who did not experience PROM and did not experience asphyxia due to time constraints in the research. In the end, the researchers only studied one factor, which is PROM.

CONCLUSION

Conclusions may be obtained from the research on the relationship between Premature Rupture of Membranes and the Incidence of Neonatal Asphyxia at Gunung Jati Regional Hospital Cirebon City for the period of January to April 2024. First, most of the mothers giving birth at Gunung Jati Regional Hospital in Cirebon city experienced PROM, totaling 53 people (53%). Second, the incidence of Neonatal Asphyxia at Gunung Jati Regional Hospital, Cirebon City from January to April 2024 was 88 people (88%). Third, a correlation exists between the occurrence of early rupture of membranes and the frequency of infant asphyxia at Gunung Jati Regional Hospital, Cirebon City, over the period from January to April 2024.

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