Research Article

Neonatal Asphyxia Risk in Cesarean Birth among National Health Insurance Beneficiaries: A Cross-Sectional Analysis

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Abstract

Objectives: To analyze the correlation between the outcome of neonatal asphyxia and the timing of cesarean section among National Health Insurance participants at a referral hospital in Kendari.

Methods: This was an analytical observational study using a cross-sectional method. The study population consisted of 338 cases of cesarean deliveries among National Health Insurance participants at Dr. Ismoyo Hospital in 2019. A sample of 183 cases was selected using a simple random sampling technique. Data were collected from medical records and analyzed using the Chi-Square test, with a significance level set at 0.05.

Results: Among the cases studied, 52.5% were elective cesarean sections, while 47.5% were emergency cesarean. Neonatal asphyxia occurred in 9.4% of elective cesarean sections and 6.9% of emergency cases. The analysis found no correlation between the timing of cesarean sections and the occurrence of neonatal asphyxia (p=0.542).

Conclusion: Neonatal asphyxia is not associated with the timing of cesarean deliveries among National Health Insurance participants. Providing appropriate and adequate treatment may help reduce the risk of neonatal asphyxia.

Keywords: cesarean section, elective, emergency, neonatal asphyxia.

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INTRODUCTION

Maternal mortality rate (MMR) and infant mortality rate (IMR) are the indicators of public health level. A higher MMR and IMR indicate a decline in health status. Factors such as inadequate services or delays in referral can lead to maternal and infant deaths. The referral process for childbirth is closely related to various elements, including financing, family role, knowledge, healthcare worker services, and access to healthcare services.[1] According to the World Health Organization, in 2020, 2.4 million children died within their first month of life.[2]

The newborn mortality rate in Indonesia remains high, with a neonatal mortality rate of 15 deaths per 1,000 live births and a perinatal mortality rate of 21 deaths per 1,000 pregnancies.[3] In Southeast Sulawesi, the infant mortality rate is 23.29, indicating that approximately 23 babies die before reaching one year of age for every 1,000 live births.[4]

A cesarean section is a surgical procedure used to deliver a baby through an incision in the abdominal wall and uterus. This method is employed to minimize complications during pregnancy and childbirth, ultimately aiming to reduce maternal and infant mortality rates.[5] Currently, cesarean deliveries account for 21% of all childbirths worldwide, and this percentage is indicated to rise to nearly one-third (29%) of all births by 2030.[6]

The number of cesarean deliveries in Indonesia continues to rise each year. The government has set a target that cesarean sections should be 20% of total births. However, the Riskesdas report from

2018 indicated that the rate of cesarean sections was 17.6%.[7] Furthermore, research conducted at Dr. Ismoyo Hospital Kendari revealed that the cesarean delivery rate reached 37.7% in 2019.[5]

Although a cesarean section is an effort to save both the mother and the baby, it can lead to complications for both. The potential effects on the baby include breathing problems at birth, asphyxia, and even death.[8] Maternal and neonatal complications are higher in an emergency than elective cesarean. Maternal infection, surgical wound dehiscence, thromboembolism, and infant death occur more frequently in emergency cesarean.[9]

The government promotes giving birth in healthcare facilities and provides guaranteed health services to pregnant women, those giving birth, and postpartum women under the National Health Insurance Program.[10] Three years after the launch of this program, hospital maternity services accounted for the highest number of claims and costs. On average, cesarean sections make up 55% of total deliveries. From 2014 to 2017, the total cost of cesarean deliveries consistently ranked the highest among claims in the Indonesian Case-Based Groups (INA-CBGs).[11]

Therefore, this study aims to analyze the correlation between neonatal asphyxia outcomes and the timing of cesarean sections for National Health Insurance participants at a referral hospital in Kendari City.

METHODS

This observational study, which had a cross-sectional design, was conducted at Dr. Ismoyo Hospital in Kendari City. It used secondary data from medical records. The population was 338 cases of cesarean deliveries in the National Health Insurance participants carried out at Dr. Ismoyo Hospital Kendari from January to December 2019.

Sampling used a simple random sampling technique. The minimum sample size was determined using the Slovin formula, resulting in a requirement of 183 cases. Inclusion criteria consisted of cesarean delivery cases involving National Health Insurance participants at Dr. Ismoyo Hospital, and exclusion criteria included incomplete medical records, which were missing information on medical indications, timing of the cesarean section, and Apgar scores. The timing of the cesarean section was either emergency or elective, depending on the preparation involved. The Apgar Score was used to assess neonatal asphyxia. The timing of the cesarean section was the dependent variable, whereas neonatal asphyxia was the independent variable. Data analysis used the Chi-square test with a significance value of $p \leq 0.05$.

This study has received ethical approval from the Health Research Ethics Committee, Faculty of Medicine, Halu Oleo University with number 087/UN29.17.1.3/ETIK/2023.

RESULTS

This study analyzed 183 cesarean deliveriy cases among National Health Insurance participants, as detailed in Table 1 below.

Table 1. Characteristics of the Sample

Characteristics	n	%
Maternal age (y o)		
Late Teenagers (17 - 25)	36	19.7
Early Adulthood (26 - 35)	121	66.1
Late Adulthood (36 - 45)	26	14.2
Level of education		
Elementary School	1	0.6
Junior High School	6	3.3
Senior High School	49	26.7
College	127	69.4
Occupation		
Non-Workers	84	45.9
Workers	99	54.1
Parity		
Primipara	123	67.2
Multiparous	60	32.8

Most cases were found in the early adulthood age group, particularly 26 to 35 years (66.1%). Additionally, late teenagers represented 19.7% of the cases. Most individuals in the study had a high level of education, with 69.4% being well-educated. Furthermore, 54.1% of the cases were workers. Based on parity, the majority were primiparous, comprising 67.2% of the cases (see Table 1).

Table 2. Timing of Cesarean Deliveries And neonatal Outcome among National Health Insurance Participants

Characteristics	n	%
Time of cesarean delivery		
Emergency	87	47.5
Elective	96	52.5
Neonatal Asphyxia		
Asphyxia	15	8.2
No Asphyxia	168	91.8
Birth Weight (grams)		
< 2500	9	4.9
2500 - 3999	173	94.5
> 4000	1	0.6

Based on the timing of cesarean sections, we found that the proportions for National Health Insurance participants were nearly equal, with 47.5% being emergency procedures and 52.5% being elective. Neonatal asphyxia occurred in 8.2% of cases. Regarding baby outcomes, the highest proportion of birth weight is 2500-3999 grams (94.5%). Additionally, 4.9% of babies have low birth weight (LBW), less than 2500 grams (see Table 2).

Table 3. Distribution of Neonatal Asphyxia based on Medical Indications and Timing of Cesarean Section among National Health Insurance participants

Indications	Neonatal Asphyxia				Total	
	Emergency cesarean		Emergency cesarean			
	n	%	n	%	n	%
Breech presentation/transverse lie	0	0	3	20.0	3	20.0
Severe preeclampsia	4	26.6	0	0	4	26.6
*Post-CS, post-term	0	0	3	20.0	3	20.0
*Post-CS, **CPD	0	0	3	20.0	3	20.0
*Post-CS, ***PROM	1	6.7	0	0	1	6.7
Obstructed labor	1	6.7	0	0	1	6.7
Total	6	40.0	9	60.0	15	100

*Post-CS: post cesarean section, **CPD: Cephalopelvic Disproportion,
***PROM: Premature Rupture of Membranes

Table 3 shows that neonatal asphyxia is most common in emergency cesarean performed due to severe preeclampsia, accounting for 26.6% of cases. Neonatal asphyxia appears at the same rate of 20% in elective cesarean for breech presentation or transverse lie, as well as in post-cesarean cases involving post-term pregnancy and cephalopelvic disproportion (CPD). Neonatal asphyxia is also found in emergency cesarean performed due to premature rupture of membranes (PROM) and obstructed labor in post-cesarean cases, respectively, 6.7%. Overall, neonatal asphyxia occurs more frequently in elective cesarean than in emergency cesarean, with rates of 60.0% and 40.0%, respectively.

Table 4. Correlation between NEONATAL asphyxia and the Timing of Cesarean Section among National Health Insurance participants

Time of cesarean section	Neonatal Asphyxia				Total		*P-value*
	Asphyxia		No Asphyxia				
	n	%	n	%	n	%	
Elective	9	9.4	87	90.6	96	100	0.542
Emergency	6	6.9	81	93.1	87	100	

Table 4 shows that neonatal asphyxia occurs more frequently in elective cesarean sections (9.4%) compared to emergency cesarean sections (6.9%). However, the analysis indicates no significant relationship between neonatal asphyxia and the timing of cesarean delivery, with a p-value of 0.542.

DISCUSSION

This study shows that the rate of emergency and elective cesarean sections among National Health Insurance participants in referral hospitals is nearly equal. This finding aligns with a previous study that found no significant difference in cesarean section rates across various groups.[5] Cesarean delivery is an alternative to spontaneous delivery and is an effort to reduce the risks associated with pregnancy and childbirth. Cesarean sections can be performed either as emergencies or electively, depending on the preparation and circumstances surrounding the procedure. An emergency cesarean section is performed in urgent, unplanned situations to effectively save the mother and fetus from potential complications during pregnancy and childbirth. In contrast, an elective cesarean section is proactively scheduled in advance, providing a clear choice for those who may prefer this delivery method.[12]

In this study, cesarean deliveries were most common among mothers aged 26 to 35 years, first-time mothers (primiparous), and those with a high level of education. However, there were also cases among late teenagers and individuals with lower education levels. Even though cesarean sections are performed based on medical indications, they are also related to sociodemographic factors. Maternal age is closely related to the time of cesarean delivery.[13,14] Therefore, it is crucial to ensure that pregnancy occurs under good physical and psychological conditions, allowing the mother to support the optimal growth and development of the baby while also reducing risks and complications for both mother and baby.[12]

In this study, we found that the incidence of neonatal asphyxia occurred in 8.2% of cases involving babies with LBW. While cesarean sections are performed to protect the health of both the mother and the baby, they can also lead to complications for both, including breathing problems at birth, such as asphyxia. Low birth weight and prematurity may contribute to respiratory problems. Neonatal asphyxia is the failure of a baby to breathe spontaneously and regularly at birth or shortly after, which is characterized by hypoxemia (decreased levels of paO2), hypercarbia (increased levels of paCO2), and acidosis (pH <7).[7]

In this study, we found that neonatal asphyxia is less common in cases of emergency cesarean. There was no correlation between the timing of the cesarean section and the incidence of neonatal asphyxia. This finding indicates that emergency cesareans have been effective in reducing complications associated with pregnancy and childbirth. Our results are consistent with previous studies suggesting that asphyxia is not related to cesarean section procedures.[15] Appropriate indications, proper techniques, and quick response for emergency cesarean can help minimize the risk of neonatal asphyxia. Previous studies have demonstrated a significant relationship between response time to cesarean sections and fetal distress; specifically, the risk of neonatal asphyxia increases if the response time for a cesarean section is late.[16]

Our study identified that the most prevalent cases of neonatal asphyxia in emergency cesarean occurred in instances involving severe preeclampsia. Additionally, intrapartum conditions, such as PROM and obstructed labor, also contribute to the incidence of neonatal asphyxia in emergency cesarean. The health status of the mother and fetus, both before and during labor, plays a crucial role in the well-being of the fetus and the overall outcome, including the risk of asphyxia. These findings align with other studies that antepartum conditions, such as preeclampsia, primiparous, and antepartum hemorrhage, are risk factors associated with neonatal asphyxia. Whereas, prolonged labor, placental abruption, PROM, and births occurring outside of hospitals with untrained attendants are intrapartum risk factors. [17] Thus, it is important to ensure the health of pregnant women so that early detection of potential complications can be carried out, thereby reducing risks. The government has implemented various measures to mitigate complications during pregnancy and childbirth. A significant initiative involves providing quality antenatal care and delivery services within health facilities that are part of the National Health Insurance program.

This study demonstrates that neonatal asphyxia can occur even in elective cesarean sections, particularly in cases of transverse

position, breech presentation, and repeat cesarean deliveries. Such occurrences are often related to intraoperative difficulties and the conditions during the cesarean procedure. The availability of complete equipment, standardized protocols for cesarean sections, and the proficiency of healthcare workers can significantly influence the outcome. Neonatal asphyxia is also found in elective cesarean sections, particularly in post-term infants. Post-term conditions are closely associated with oligohydramnios and the presence of meconium, both of which can lead to breathing difficulties at birth. These findings align with previous research, which identified several risk factors for neonatal asphyxia, including oligohydramnios and meconium. [17] The infrastructure of healthcare facilities plays a significant role in the preparation and treatment of cesarean procedures, which can help reduce the associated risks and complications. While some risk factors may increase the likelihood of neonatal asphyxia, timely and appropriate preventive measures can mitigate these risks.

In this study, neonatal asphyxia was found to occur more frequently in elective cesarean compared to emergency cesarean. It may be related to various risk factors associated with neonatal asphyxia, particularly obstetric and non-obstetrics factors. These obstetric risk factors include severe preeclampsia, polyhydramnios, oligohydramnios, macrosomia, gestational diabetes, infections during pregnancy, congenital heart disease in infants, use of certain medications during pregnancy, smoking, and LBW. A previous study indicated that factors such as maternal age, education, access to antenatal care, iron tablet consumption, and upper arm circumference, an important non-obstetric factor, can influence birth weight and the risk of asphyxia. Therefore, proper preparation for pregnancy and regular antenatal care are essential for identifying potential risks.[18] Routine antenatal care, adequate nutrition, emotional support from partners and families, and thorough preparation for cesarean delivery are crucial to minimizing the risk of asphyxia.[15] Likewise, it is necessary to intervene in the underlying non-obstetrics factors that assist in poor health among pregnant women, including poverty, education, cultural beliefs, and practices. By improving the health status of pregnant women and ensuring they have healthy reproductive ages, we can support pregnancies that are physically and psychologically healthy, thereby reducing risks and complications for the mother and fetus. Knowledge and community participation are essential to the success of this program.

CONCLUSION

Based on these studies, we concluded that neonatal asphyxia outcomes are less in cases of emergency cesarean sections. There is no correlation between the timing of cesarean sections and neonatal asphyxia among participants in the National Health Insurance program. Providing appropriate and adequate treatment can help reduce the risk of neonatal asphyxia. Enhancing healthcare worker training, ensuring proper equipment, implementing improved protocols for cesarean delivery, and improving antenatal care may be necessary.

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