CORRELATIONS OF BIRTH TYPES, BIRTH COMPLICATIONS, AND APGAR SCORE WITH NEONATAL SEPSIS INCIDENT

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ABSTRACT

The incidence of neonatal sepsis reported by WHO from January 1979 to May 2019 is estimated at 2824 per 100,000 births. This prevalence is higher in developing countries like Indonesia. The incidence rate in Indonesian hospitals is reported to vary in each referral hospital between 8.76% - 30.29%. From preliminary data obtained in 2022 at the University of Indonesia Hospital, 38 babies who received treatment in perinatology or NICU experienced neonatal sepsis out of 103 babies born at the hospital. This research was conducted to determine whether there was a correlation or relationship between birth types, birth complications, and Apgar score with neonatal sepsis incident at the University of Indonesia Hospital in 2023. The research method used was an analytical survey, with a retrospective approach. The results of the study showed that there was a relationship between birth types and the 5th minute APGAR score with the incidence of neonatal sepsis at the University of Indonesia Hospital in 2023. However, there was no significant relationship between birth complications and the incidence of neonatal sepsis at this hospital. This research provides scientific results that can be used as a reference in efforts to improve maternal and child health services in hospital

Keywords: Birth Types, Birth Complications, APGAR Score, Neonatal Sepsis

INTRODUCTION

A recent scientific publication estimated that in 2017 there were 48.9 million cases and 11 million sepsis-related deaths worldwide, accounting for nearly 20% of all global deaths. And based on data obtained by WHO, it is also stated that half of the cases of sepsis in the world occur in children with an estimated 20 million cases and 2.9 million global deaths in children under 5 years of age. (WHO, 2020).The incidence of neonatal sepsis reported by WHO from January 1979 to May 2019 is estimated at 2824 per 100,000 births. This prevalence is higher in developing countries like Indonesia. The incidence rate in Indonesian hospitals is reported to vary in each referral hospital between 8.76% - 30.29%. (Suwarna, et al. 2022)

Neonatal sepsis is defined as a systemic condition caused by bacteria, viruses or fungi that is associated with hemodynamic changes and clinical signs that cause severe morbidity and mortality. Clinical manifestations range from subclinical infection to severe systemic or local disease. Although infectious agents can originate from intrauterine or maternal microbiota, they can also originate from the hospital or community. Neonatal sepsis is classified into early-onset, late-onset, and very late-onset neonatal sepsis based on when the signs appear.

Several previous studies stated that the type of delivery is also closely related to the incidence of neonatal sepsi. Research conducted by Utomo, et.al in 2022 saidThere was a significant difference in the relationship between birth route and neonatal sepsis in term babies (p=0.046). Babies born via caesarean section are 3.25 times more likely (95% CI 1.00 – 10.60) to experience early onset neonatal sepsis compared to vaginal birth.

From preliminary data obtained in 2022 at the University of Indonesia Hospital, 38 babies who received treatment in perinatology or NICU experienced neonatal sepsis out of 103 babies born at the hospital. Based on this backgroundResearchers decided to conduct research to find out whether there is a correlation or relationship between type of delivery, birth complications,

and APGAR score with the incidence of neonatal sepsis at the University of Indonesia Hospital in 2023.

METHOD

Participant Characteristics and Research Design

This research uses an analytical survey research design, with a retrospective approach. The inclusion and exclusion criteria in this study are:

Inclusion:

a) Babies born at the University of Indonesia Hospital,
b) Birth weight < 2500 grams & ≥2500 grams,
c) Born vaginally or Caesarean,
d) Receiving treatment in the perinatology room or NICU

Exclusions:

- Babies born at the University of Indonesia Hospital, but do not have complete medical record data

Sampling Procedure

The sample used in this research was taken using a total sampling technique. Which is the sample for this researchnamely all babies born at the University of Indonesia Hospital either vaginally or Caesarean in the period January – December 2023 and received treatment in the perinatology room or NICU, and met the inclusion and exclusion criteria.

Sample Size, Power and Precision

The sample in this study was all 110 babies born at the University of Indonesia Hospital, either vaginally or Caesarean in the period January – December 2023.The measuring tool used in this research is the medical records of patients who are the research sample by collecting data using a checklist sheet, which has been prepared by the researcher.

Measures and Covariates

The data collection method in this research uses secondary data obtained not from respondents, but from other sources, namely patient medical record data. Some of the data taken are: a.) Gender, b.) Gestational Age, c.) Birth Weight, d.) Birth Type of the baby underwent, e.) Whether or not they experienced birth complications, f.) Birth complications experienced , g.) Experienced neonatal sepsis or not, h.) Type of Sepsis experienced, i.) Indicators of sepsis experienced.

Data analysis

The data that has been collected is in accordance with the inclusion and exclusion criteria, processed using SPSS 25 software. The data is analyzed using univariate analysis and bivariate analysis with the Chi Square test. Variables that are declared to have a significant relationship are if the p value <0.05.

RESULTS AND DISCUSSION

Results

This study took 110 medical record data from newborn babies who received treatment in the perinatology/NICU room at the University of Indonesia Hospital in 2023 who met the research inclusion requirements. The research results obtained are,

Univariate Analysis

Table 1. Characteristics of Respondents Based on Gender

Gender	Frequency N = 110	Percentage
Man	60	54.5
Woman	50	45.5
Total	110	100.0

Data source: SPSS 2024 processing

The table above shows that 60 (54.4%) of the respondents were male, while the other 50 (54.5%) babies were female.

Table 2. Characteristics of Respondents Based on Gestational Age

Gestational Age Category	Frequency N = 110	Percentage
Extremely premature< 28 Weeks	1	0.91
Premature≥ 28 – 36 Weeks	41	37.27
Mature> 36 – 40 Weeks	63	57.27
Postmature> 40 Weeks	5	4.55
Total	110	100.0

Data source: SPSS 2024 processing

The table above shows that 63 (57.27%) respondents were of mature gestational age (> 36-40 weeks), 41 (37.27%) were of premature gestational age (≥ 28 – 36 weeks), 5 (4.55%) postmature gestational age (> 40 weeks), and 1 (0.91%) extremely premature gestational age (< 28 weeks).

Table 3. Characteristics of Respondents Based on Birth Weight

Birth Weight	Frequency N = 110	Percentage
< 2500 grams	42	38.2
≥ 2500 grams	68	61.8
Total	110	100.0

Data source: SPSS 2024 processing

The table above shows that 68 (61.8%) respondents had birth weight ≥2500 grams, and the other 42 (38.2%) had a birth weight < 2500 grams.

Table 4. Characteristics of Respondents Based on Birth Types

Types of Childbirth	Frequency N = 110	Percentage
Vaginal	30	27.3
Caesarean section	80	72.7
Total	110	100.0

Data source: SPSS 2024 processing

The table above shows that as many as 80 (72.7%) respondents serve Caesarean section delivery, and another 30 (27.3%) serve vaginal delivery.

Table 5. Characteristics of Respondents Based on Maternal Childbirth Complications

Status	Frequency N = 110	Percentage
Bleeding		
No	110	100.0
Congested Parturition		
No	107	97.3
Yes	3	2.7
Total	110	100.0
Presentation Abnormalities		
No	104	94.5
Yes	6	5.5
Total	110	100.0
Eclampsia		
No	98	89.1
Yes	12	10.9
Total	110	100.0
Fetal Distress		
No	104	94.5
Yes	6	5.5
Total	110	100.0
Infection In Pregnancy		
No	106	96.4
Yes	4	3.6
Total	110	100.0
Premature rupture of membranes		
No	85	77.3
Yes	25	22.7
Total	110	100.0

Post-Month Pregnancy		
No	105	95.5
Yes	5	4.5
Total	110	100.0
Premature Labor		
No	76	69.1
Yes	34	30.9
Total	110	100.0
The umbilical cord grows		
No	110	100.0
Other		
No	71	64.5
Yes	39	35.5
Total	110	100.0

Data source: SPSS 2024 processing

The table above shows that 34 (30.9%) respondents were born to mothers who experienced complications from premature birth, 25 (22.7%) premature rupture of membranes, 12 (10.9%) eclampsia, 6 (5.5%) abnormalities presentation, 6 (5.5%) fetal distress, 5 (4.5%) post-term pregnancy, 4 (3.6%) infection in pregnancy, 3 (2.7%) obstructed labor, and the majority were 39 (35.5%) other complications. Meanwhile bleeding and umbilical cord complications increased to 0 (0%).

Table 6. Characteristics of Respondents Based on APGAR Score

1st Minute APGAR Score		
APGAR Score value	**Frequency N = 110**	**Percentage**
< 7	26	23.6
≥ 7	84	76.4
Total	110	100.0
5th Minute APGAR Score		
APGAR Score value	**Frequency N = 110**	**Percentage**
< 7	10	9.1
≥ 7	100	90.9
Total	110	100.0

Data source: SPSS 2024 processing

The table above shows that respondents got the APGAR score in the first minute≥7 as many as 84 (76.4%), and as many as 26 (23.6%) with a score < 7. Meanwhile in the fifth minute APGAR Score≥7 as many as 100 (90.9%) and 10 (9.1%) < 7.

Table 7. Characteristics of Respondents Based on Neonatal Sepsis

Types of Neonatal Sepsis	Frequency N = 110	Percentage
Didn't experience sepsis	52	47.3
Early Onset Neonatal Sepsis	58	52.7
Late Onset Neonatal Sepsis	0	0.0
Total	110	100.0

Data source: SPSS 2024 processing

Based on the table above, 58 respondents experienced early onset neonatal sepsis (52.7%). and late-onset neonatal sepsis 0 (0%).

Bivariate Analysis

Table 8. Relationship between type of delivery and incidence of neonatal sepsis

		Neonatal Sepsis		Total	P Value	OR
		Yes	No			
Types of Childbirth	Vaginal	21	9	30	0.026	2,712
		70.0%	30.0%	100.0%		
	Caesarean section	37	43	80		
		46.3%	53.8%	100.0%		
Total		58	52	110		
		52.7%	47.3%	100.0%		

Data source: SPSS 2024 processing

The table above shows that of the 30 respondents who underwent vaginal delivery, 21 (70%) experienced neonatal sepsis, and 9 (30%) did not experience neonatal sepsis. Meanwhile, of the 80 respondents who underwent Caesarean section delivery, 37 (46.3%) experienced neonatal sepsis and 43 (53.8%) did not experience neonatal sepsis. With a p value of 0.026 (OR: 2.712)

Table 9.The Relationship between Childbirth Complications and the Occurrence of Neonatal Sepsis

		Neonatal Sepsis		Total	P Value	OR
		Yes	No			
Childbirth Complications	Yes Complications	52	41	93	0.117	2,325
		55.4%	44.6%	100.0%		
	No Complications	6	11	17		
		35.3%	64.7%	100.0%		
Total		58	52	110		
		52.7%	47.3%	100.0%		

Data source: SPSS 2024 processing

The table above shows that of the 93 respondents who experienced birth complications, 52 (55.4%) experienced neonatal sepsis, and 41 (44.6%) did not experience neonatal sepsis. Meanwhile, of the 17 respondents who did not experience birth complications, 11 (64.7%) did not experience neonatal sepsis and 6 (35.3%) experienced neonatal sepsis. With a p value of 0.117 (OR: 2.325).

Table 10. Correlation of APGAR Score Values with the Occurrence of Neonatal Sepsis

Table 10.1 Correlation of 1st Minute APGAR Score with the Incident of Neonatal Sepsis

		Neonatal Sepsis		Total	P Value	OR
		Yes	No			
1st Minute APGAR Score	<7	17	9	26		
		65.4%	34.6%	100.0%		
	≥7	41	43	84		1,981
		48.8%	51.2%	100.0%		
Total		58	52	110	0.139	
		52.7%	47.3%	100.0%		

Data source: SPSS 2024 processing

The table above shows that of the 26 respondents with a first minute APGAR Score < 7, 17 (65.4%) experienced neonatal sepsis, and 9 (34.6%) did not experience neonatal sepsis. Meanwhile, of the 84 respondents with an APGAR Score ≥ 7, 43 (51.2%) did not experience neonatal sepsis and 41 (48.8%) experienced neonatal sepsis. With a p value of 0.139. OR: 1.981

Table 10.2 Correlation between the 5th Minute APGAR Score and the Occurrence of Neonatal Sepsis

		Sepsis Neonatorum		Total	P Value	OR
		Yes	No			
5th Minute APGAR Score	< 7	9	1	10		
		90.0%	10.0%	100.0%		
	≥ 7	49	51	100	0.013	9,367
		49.0%	51.0%	100.0%		
Total		58	52	110		
		52.7%	47.3%	100.0%		

Data source: SPSS 2024 processing

The table above shows that of the 10 respondents with a fifth minute APGAR score <7, 9 (90%) experienced neonatal sepsis, and 1 (10%) did not experience neonatal sepsis. Meanwhile, of the 100 respondents with an APGAR Score ≥7, 51 (51%)) did not experience neonatal sepsis and 49 (49%) experienced neonatal sepsis. With a p value of 0.013. OR 9,367

DISCUSSION

This study shows the characteristics of newborns receiving care in the perinatology/NICU room at the University of Indonesia Hospital in 2023, most of whom are male with mature gestational age (> 36 – 40 weeks) and birth weight ≥ 2500 grams. And more babies are born by Caesarean section.

This is in accordance with the results of a study conducted by (Wangaya, et.al 2023), where it was found that the characteristics of newborns treated in the NICU and Perinatology rooms at Wangaya Regional Hospital with neonatal sepsis tended to be male, born with a body weight of ≥ 2500 grams, birth at term or gestational age ≥ 37 weeks, and birth by Caesarean section.

Based on the results of bivariate analysis, it was found that of the 30 respondents who were born by vaginal delivery, 21 (70%) experienced neonatal sepsis, and 9 (30%) did not experience neonatal sepsis. Meanwhile, of the 80 respondents who were born by Caesarean section, 37 (46.3%) had neonatal sepsis and 43 (53.8%) did not have neonatal sepsis. With a p value of 0.026 (OR: 2.712)

This shows that there is a significant relationship between birth types and the incidence of neonatal sepsis at the University of Indonesia Hospital in 2023 where the p value obtained is $p < 0.05$. Babies born via Caesarean section have a 2.71 times greater risk of developing neonatal sepsis compared to those born via vaginal delivery.

This is in line with the results of research conducted by(Utomo et al., 2022)which states that there is a significant relationship between the type of delivery and the incidence of neonatal sepsis. Where full-term babies born via Caesarean section have a 3.25 times greater risk of experiencing early neonatal sepsis compared to babies born vaginally.

In contrast to vaginal delivery, cesarean delivery may lead to variations in initial microbial colonization, which has subsequent consequences on the immune system. Neonatal systemic immune function is known to be altered by cesarean section, especially in the absence of labor.Specific associations such as faster rates of colonization in infancy with Streptococcus mutans after cesarean delivery have been reported in small cohort studies.(Olivier et al., 2016).

Based on the results of bivariate analysis, it was found that of the 93 respondents who experienced birth complications, 52 (55.4%) experienced neonatal sepsis, and 41 (44.6%) did not experience neonatal sepsis. Meanwhile, of the 17 respondents who did not experience birth complications, 11 (64.7%) did not experience neonatal sepsis and 6 (35.3%) experienced neonatal sepsis. With a p value of 0.117, OR 2.325.

This shows that there is no significant relationship between birth complications and the incidence of neonatal sepsis at the University of Indonesia Hospital in 2023 where the p value obtained is $p > 0.05$. However, babies born with birth complications may have a 2.3 times greater risk of developing neonatal sepsis than those who do not experience birth complications.

These results are not in line with research conducted by(Adatara et al., 2019)900 respondents said that birth complications withbleeding disorders during pregnancy andPremature rupture of membranes (PROM) has a significant association with the risk of neonatal sepsis ($p < 0.001$).

The absence of a significant relationship between birth complications and the incidence of neonatal sepsis at the University of Indonesia Hospital in 2023 does not mean that the research carried out failed. However, in theory, research results that are not significant can be

caused by the sample data used not being successful in proving the hypothesis, because sometimes a larger sample is needed to prove research results.

Based on the results of bivariate analysis, of the 26 respondents with a first minute APGAR Score <7, 17 (65.4%) experienced neonatal sepsis, and 9 (34.6%) did not experience neonatal sepsis. Meanwhile, of the 84 respondents with an APGAR Score ≥ 7, 43 (51.2%) did not experience neonatal sepsis and 41 (48.8%) experienced neonatal sepsis. With a p value of 0.139. OR: 1.981

This shows that there is no significant relationship between the first minute APGAR Score value and the incidence of neonatal sepsis at the University of Indonesia Hospital in 2023 where the p value obtained is p > 0.05. However, babies born with a first minute APGAR Score <7 have a 1.9 times greater risk of developing neonatal sepsis.

Based on the results of bivariate analysis, it showed that of the 10 respondents with a fifth minute APGAR score <7, 9 (90%) had neonatal sepsis, and 1 (10%) did not experience neonatal sepsis. Meanwhile, of the 100 respondents with an APGAR Score ≥7, 51 (51%) did not experience neonatal sepsis and 49 (49%) experienced neonatal sepsis. With a p value of 0.013. OR 9,367

This shows that there is a significant relationship between the fifth minute APGAR Score and the incidence of neonatal sepsis at the University of Indonesia Hospital in 2023 where the p value obtained is p < 0.05. However, babies born with a fifth minute APGAR Score <7 have a 9.3 times greater risk of developing neonatal sepsis.

These results are in line with research conducted by (Wangaya et al., 2023)of 114 neonate respondents with a 1st minute APGAR value < 7 with a P value of 0.000 had a 2.55 times risk of developing sepsis compared to an APGAR value ≥ 7. Likewise with a 5th minute APGAR value with a P value of 0.000, an APGAR value < 7 had a risk of 2, 94 times develop sepsis compared to an APGAR score ≥ 7.

Theory mention Neonatal sepsis occurs in 0.5 to 8.0/1000 births. The highest rates occur in: 1.) Babies with low birth weight (LBW), 2.) Babies with depressed function at birth as indicated by a low Apgar score. 3.) Babies with maternal perinatal risk factors (eg, low socioeconomic status, rupture of membranes before delivery). 4.) Boys.(Tesini, 2022)

RESEARCH LIMITATIONS

The weakness in this research is that the research did not make direct observations of patients, only using medical record data. In collecting this data there is the possibility of bias, which is caused by:

1. There are other risk factors not included in the study that can cause neonatal sepsis
2. The medical record data taken was only the baby's medical record without looking at the mother's medical record.

CONCLUSIONS AND SUGGESTIONS

Conclusions

There is a significant relationship between the type of delivery and the incidence of neonatal sepsis at the University of Indonesia Hospital in 2023 where the p value obtained was p < 0.026, OR: 2.712. There is no significant relationship between birth complications and the incidence of neonatal sepsis at the University of Indonesia Hospital in 2023 where the p value

obtained is 0.117. OR: 2.325 There is a significant relationship between the fifth minute APGAR Score value and the incidence of neonatal sepsis at the University of Indonesia Hospital in 2023 where the p value obtained is 0.013. OR: 9.317

Suggestions

1. Client/Family canseek information regarding neonatal sepsis, both signs and symptoms and management, from professional health workers.
2. Relevant health facilities can improve the quality and improvement of obstetric and pediatric services, in order to reduce the incidence of neonatal sepsis

ETHICAL CONSIDERATIONS

This research has met the ethical feasibility of the Ethics and Research Committee of the University of Indonesia Hospital with number S-024/KETLIT/RSUI/II/2024, and has also been declared ethically appropriate by the Health Research Ethics Committee of the University of Indonesia Advanced with number 670/SKet/Ka -Dept/RE/UIMA/II/2024.

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CONFLICT OF INTEREST

There is no conflict of interest in writing this research report

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