

Original Research Report

The Relationship between Birth Weight and Neonatal Sepsis Incidence: Literature Review

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Article History

Received:
29.07.2021

Revised:
19.08.2021

Accepted:
17.09.2021

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Abstract: Neonatal sepsis contributes as much as 75% in increasing the neonatal mortality rate that occurs first week of birth. Neonatal sepsis is characterized by entry of bacteria in the blood that can be life-threatening. Process of neonatal sepsis can occur very quickly, if not treated with adequate treatment, death can occur within 24-48 hours. Neonatal sepsis is affected by infant factors like low birth weight (LBW). LBW in neonates can be easily infected due to immature immune formation. The study used literature review methods. Literature sourced from five databases: Biomed Central, Plus One, Pubmed, Proquest and Science Direct. Search with PICOS framework 15 articles used to analyze and obtained. Results showed the incidence of neonatal sepsis with the percentage incidence of sepsis at 16.9%-77.8%. LBW is risk of developing sepsis with the highest percentage compared to other birth weight classifications. Majority of articles stated there was a significant relationship between birth weight and neonatal sepsis (p value: 0, 0131-0,001). Nurses play a role in conducting assessment begin ranging from pregnant to the birth and give a comprehensive nursing care earlier for birth babies less than 2.500 gram. It is effort decrease incidence of neonatal sepsis.

Keywords: Birth Weight, Neonates, Neonatorum, Sepsis.



1. Introduction

Every year the number of neonatal deaths is 34 per 1000 live births, the neonatal mortality rate accounts for 25% to 45% of deaths in children under 5 years [1]. Neonatal mortality also accounts for 75% in the first week of life, where neonatal sepsis accounts for almost 80% of these neonatal deaths [2]. In 2019, it was found that from 20,244 neonatal deaths were caused by LBW, which was 35.5% (7,150 deaths) [3]. 209 deaths, sepsis as many as 19 deaths and other incidence rates [4]. Based on data from RSUD Dr. H. Moch Ansari Saleh Banjarmasin obtained data on infant mortality with neonatal sepsis in 2016 as many as 55 cases (1.2%), in 2017 as many as 256 cases (11.2%) but in 2018 there was a decrease in the incidence of 152 cases (7.4%) while in 2019 there was an increase in the incidence of 176 cases (12.6%) [5].

Newborns with neonatal sepsis can experience long-term complications such as meningitis, Disseminated Intravascular Coagulation (DIC) and can cause death [6]. Therefore, efforts are needed to reduce the number of neonatal sepsis such as paying attention to the risk factors that cause neonatal sepsis, namely maternal factors, infant factors and factor [7]. One of the factors causing the baby is birth weight. Low birth weight has 3 categories, namely low birth weight (LBW) with a weight of less than 2500 grams, very low birth weight (BLSR) less than 1500 grams and extreme low birth weight (LBW) who weighs less than 1000 grams [1]. Therefore, it is necessary to analyze the relationship between birth weight and the incidence of neonatal sepsis in an effort to reduce the incidence of neonatal sepsis in newborns.

2. Literature Review

Normal newborn birth weight is 2,500-4000 grams [8]. Birth weight is categorized into three based on birth weight, if it is less than 2500 grams it is called LBW, if it is less than 1500 grams it includes very low birth weight (LBW) or very low birth weight (VLBW), and if it weighs less than 1000 grams categorized as extremely low birth weight (LBW) or extremely low birth weight (ELBW) [9].

Low birth weight (LBW) or LBW, is defined as a baby weighing less than 2500 grams [10]. Birth weight is one of the factors causing neonatal sepsis, some research results state that birth weight is a factor causing neonatal sepsis is low birth weight less than 2500 grams [11-12], this is also supported by the theory which states that LBW tends to experience infection because the immune system in the body is not yet fully formed [1]. LBW can occur in preterm infants (<37 weeks) or in term infants (intrauterine growth restriction (IUGR) [12]. However, the results of previous study stated that birth weight did not have a significant relationship with the incidence of neonatal sepsis [13].

From the results of previous studies conducted by several researchers, there is a gap regarding there is a relationship and there is no relationship between birth weight and neonatal sepsis. Based on the above phenomena and seeing the high mortality and morbidity of neonatal sepsis that requires attention from health workers, for example, nurses as one of the health workers who treat patients for 24 hours to be able to play a significant role in assessing the birth weight of infants with neonatal sepsis.

3. Methods

This study uses a literature review research design, literature searches using the Boolean AND operator keyword which is used to expand or specify in the search and make it easier to determine the journal to be used. Keyword is Neonatal Sepsis AND Birth Weight. The literature review search strategy in this study is to use an accredited electronic based such as:

1. Biomed Central
2. Plus One
3. PubMed
4. ProQuest
5. Science Direct

The literature criteria used were determined through the PICOS framework assessment. In this study, 15 literatures were used according to the criteria determined by the researcher by looking at the significance level (α) of the relationship between birth weight and the incidence of neonatal sepsis used in this study was 0.05.

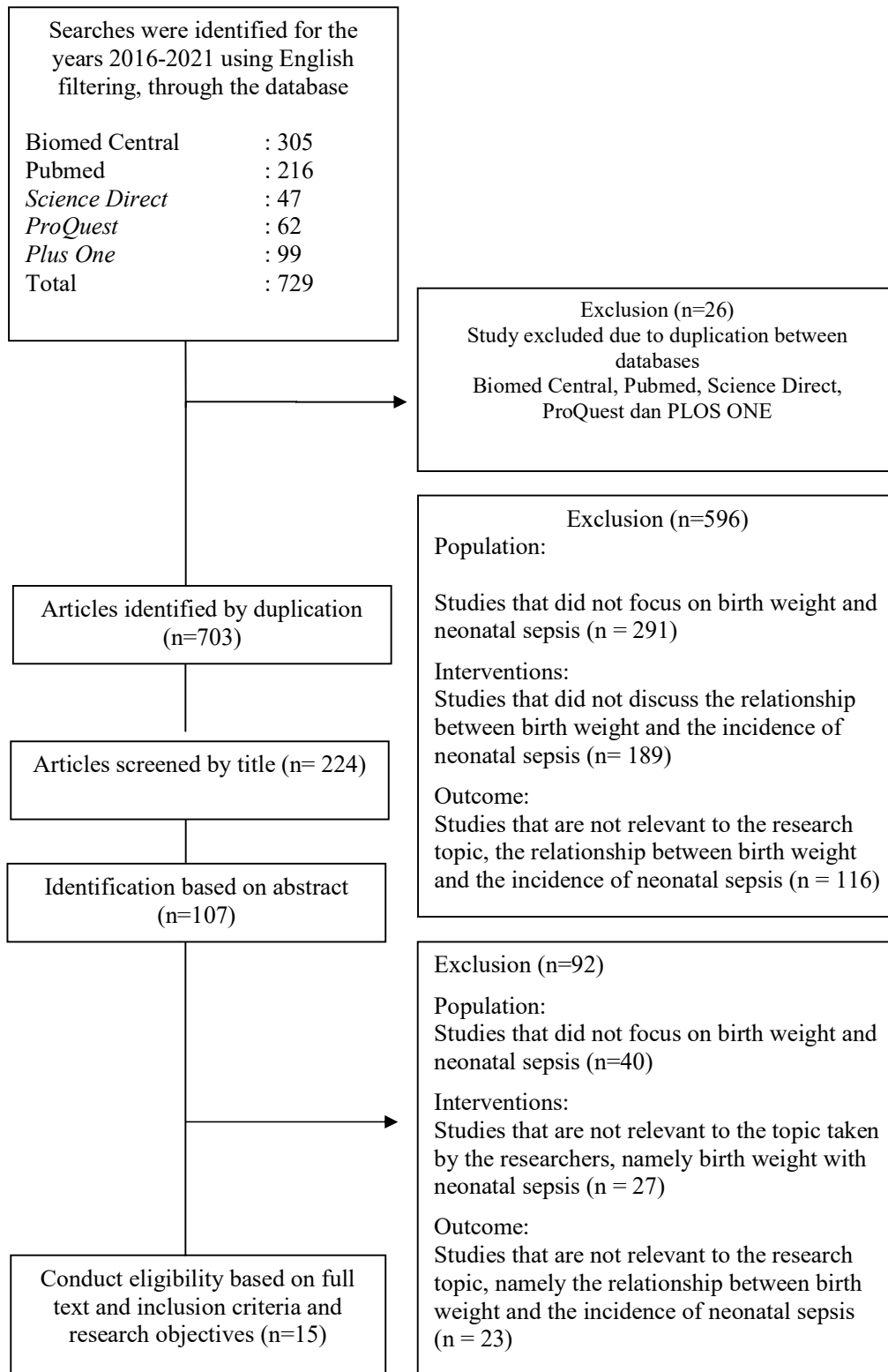


Figure 1. Literature Search Relationship between Birth Weight and Neonatal Sepsis

4. Result

4.1. Incidence of Neonatal Sepsis Analysis

Table 1 shows the prevalence and percentage of results from a journal analysis of neonatal sepsis incidence. Neonatal sepsis events were obtained from 11 articles that discussed the incidence of neonatal sepsis to determine the range value for neonatal sepsis events resulting from journal analysis that had been collected later in the analysis and collected from articles stating prevalence results and percentage of neonatal sepsis incidence. The results of the analysis of 11 articles were obtained that the total sample of the overall incidence of neonatorum sepsis as much as 8. 208 and the number of prevelences amounted to 1.824.

Table 1. Prevelence and Percentage From Journal Analysis of Neonatal Sepsis Incidence

No	Journal Author	Publication Years	Sample	Prevalence (n)	Percentage (%)
1.	Nyishime <i>et al.</i>	2018	1723	392	23.6%
2.	Geyesus <i>et al.</i>	2017	251	117	46.6%
3.	Bulkowstein <i>et al.</i>	2016	558	141 (EOS) 417 (LOS)	25.3% 74.7%
4.	Yadav <i>et al.</i>	2019	350	59	16.9%,
5.	Braye <i>et al.</i>	2019	65	50	77.8%,
6.	Ogundaro <i>et al.</i>	2019	72	56 (EOS) 16 (LOS)	77.8% 22.2%
7.	Balderrama <i>et al.</i>	2016	85	43 (EOS) 42(LOS)	50.5%. 50.5%
8.	Koc <i>et al.</i>	2019	3381	112(LOS)	21.1%
9.	Wynn <i>et al.</i>	2020	44	25	57%
10.	Sorsa <i>et al.</i>	2019	901	303	34%
11.	Assyifa <i>et al.</i>	2019	778	51	55.43%
Total			8.208	1.824	-
Avarage			-	-	0.22%

The majority of participants in this study were neonates under 30 days old and had sepsis. Analysis showed that neonate's common symptoms of neonatal sepsis are fever, unstable temperature, vomiting, and diarrhea, lethargy, breathing problems, low blood sugar, jaundice, reduced suction and seizures. Sepsis can occur in 2 categories is early onset sepsis (EOS) and late onset sepsis (LOS) [14]. Early onset sepsis occurs in the first 72 hours after birth, EOS usually occurs due to infant and maternal factors. Factors from the baby include low birth weight, low APGAR score and asphyxia and factors from the mother can be caused by exposure to infection before the delivery process and premature rupture of the membranes. LOS (Late Onset Sepsis) infection that occurs after 72 hours of birth, this infection can be caused by environmental factors including long hospitalization and infections transmitted from others. Analysis result of 11 articles, a total sample of 8.208 was obtained with a prevalence of 1.824 people with a percentage of 0.22%. The highest of prevalence is research from Bulkowstein et al with a total of 417 (74.7%) neonates with LOS (late onset sepsis) and the lowest of prevalence was obtained from the study of Ogundaro et al as many as 16 (22.2%) neonates with LOS (late onset sepsis).

4.2. Birth Weight Analysis

Table 2 describes the distribution of the frequency and percentage of each birth weight classification divided into low birth weight (LBW), very low birth weight (VLBW), extreme low birth weight (ELBW), normal birth weight (NBW) and extra birth weight. This study analyzed 12 articles by collecting the percentage and prevalence of each birth weight classification.

Table 2. Birth Weight Analysis of the Neonatal Sepsis Incidence

No	Author	Respondent		Birth Weight				
				LBW (n%)	VLBW (n%)	ELBW (n%)	NBW (n%)	EBW (n%)
1.	Nyishime <i>et al.</i>	1518	Sepsis	817 (55.3%)	-	-	556 (36.4%)	-
			No sepsis	-	-	-	-	-
2.	Geyesus <i>et al.</i>	251	Sepsis	37 (31.6%)	40 (34.2%)	-	40 (34.2%)	-
			No sepsis	24 (17.9%)	6 (4.5%)	-	104 (77.6%)	-
3.	Bulkowstein	558	Sepsis	24/70 (34.3%) EOS	-	-	-	-
			No sepsis	7/111 (6.3%) Ca-los	-	-	-	-
4.	Pereira <i>et al.</i>	2655	Sepsis	-	461 (17.3%)	-	-	-
			No sepsis	-	-	-	-	-
5.	Abdallah <i>et al.</i>	164	Sepsis	-	152 (92.7%)	12 (7.3%)	-	-
			No sepsis	-	-	-	-	-
6.	Yadav <i>et al.</i>	350	Sepsis	37 (62.7%)	2 (2.3%)	-	20 (33.9%)	-
			No sepsis	50 (17.2%)	1 (0.3%)	-	240 (82.5%)	-
7.	Braye <i>et al.</i>	65	Sepsis	43 (66%) EOS	-	-	22 (34%) EOS	-
			No sepsis	-	-	-	-	-
8.	Balderrama <i>et al.</i>	85	Sepsis	11 (25.5%)	15 (65.2%)	10 (23%)	6 (13.9%)	1 (2.3%)
			No sepsis	21 (50%)	5 (11.9%)	1 (2.3%)	14 (33.3%)	1 (2.3%)
9.	Koc <i>et al.</i>	3.381	Sepsis	-	324 (9.6%)	-	226 (6.7%)	-
			No sepsis	-	-	-	-	-
10.	Sorsa <i>et al.</i>	303	Sepsis	23 (31.5%)	-	-	55 (24%)	-
			No sepsis	50 (68.5%)	-	-	175 (76%)	-
11.	Assyifa <i>et al.</i>	51	Sepsis	39 (76.47%)	-	-	11 (21.56%)	1 (1.6%)
			No sepsis	-	-	-	-	-
12.	Simamrta <i>et al.</i>	100	Sepsis	60	40	-	-	-
			No sepsis	-	-	-	-	-
Total		9.481	Sepsis	1.091	1.034	22	936	2
			No sepsis	152	12	1	533	1
Avarage			Sepsis	0,11%	0,11%	0,002%	0,10%	0,0002%

Based on the results of table 2 from a total of 12 articles, obtained of samples as much as 9.481, the percentage and prevalence of neonates based on the classification of birth weight, LBW is the risk of sepsis with the highest percentage of 39 (76.47%) in the study of Assyifa et al and the lowest percentage of 11 (25, 5%) neonates with LBW in the study of Balderrama et al. The percentage of LBW neonates with sepsis was (1,091, 1,034 and 22) while for LBW and BB it was more (533 and 2). The results obtained are the number of neonates with low birth weight <2500 higher than normal birth weight and more birth weight.

4.3. The Relationship between Birth Weight and Neonatal Sepsis Incidence

Table 3 shows the results of the analysis from 12 articles. Table 3 reflects a probability p value < 0.05. This indicates that there was associated low birth weight with incidence of neonatal sepsis. This shows that low birth weight <2500 grams has a significant relationship between neonatal sepsis. The process of neonatal sepsis can occur very quickly and is often not monitored so that if it is not treated with adequate treatment, death can occur within 24-48 hours [15] the role of nurses can carry out a comprehensive assessment to evaluation, especially in infants with low birth weight this can help reduce neonatal morbidity [16].

Table 3. The Relationship between Birth Weight and Neonatal Sepsis Incidence

No	Author	p value	OR
1.	Nyishime <i>et al.</i>	0,0131	-
2.	Geyesus <i>et al.</i>	-	AOR 12,37 AOR 2,63
3.	Bulkowstein <i>et al.</i>	< 0,001	OR 5,9
4.	Pereira <i>et al.</i>	<0,001	-
5.	Abdallah <i>et al.</i>	0,0015	OR 3.0
6.	Yadav <i>et al.</i>	<0,05	-
7.	Ogundaro <i>et al.</i>	0,001	-
8.	Guo <i>et al.</i>	0,038	-
9.	Balderrama <i>et al.</i>	0.001	OR 8,3
10.	Sorsa <i>et al.</i>	0,015	-
11.	Assyifa <i>et al.</i>	0.035	-
12.	Simamarta <i>et al.</i>	0,001	-

Analysis relationship birth weight with incidence of neonatal sepsis, based on the probability value of 0.05 which is greater than the significant level (0.05), the null hypothesis is accepted. This means that there is no significant relationship between relationship birth weights with incidence of neonatal sepsis. Sepsis begins with bacterial invasion and systemic contamination can be caused by premature rupture of membranes, leukopenia, thrombocytopenia, fever and long hospitalization [17]. Risk factors with the incidence of neonatal sepsis are caused by several factors, namely maternal, infant, and nosocomial factors. These factors that affect neonatal sepsis include APGAR scores, gestational age and low birth weight.

The relationship between birth weight and the incidence of neonatal sepsis from the study of Bulkowstein et al there is a significant relationship between neonatal sepsis and low birth weight (LBW) p value <0.001 OR: 5.9, Balderrama et al's study found that very low birth weight (VLBW) had a p value o 0.001 OR: 8.3 and in Geyesus et al study stated that there was a relationship between

very low birth weight (VLBW) and the incidence of neonatal sepsis with OR: 12.37. The 10 articles from 15 articles analyzed, stated that neonatal sepsis was associated with infant birth weight and 5 articles stated that there was no relationship between birth weight and neonatal sepsis.

The results of the study explained that birth weight was associated with the incidence of neonatal sepsis with an average p value of <0.001 , and for the birth weight of infants who were at high risk of sepsis, the baby's weight was <2500 grams. This is in line with the results of research [19] which states that there is a relationship between low birth weight and the incidence of neonatal sepsis with a p-value of 0.000 and an Odd Ratio (OR) value of 8.820 neonatal sepsis compared to infants with normal birth weight.

5. Discussion

Neonatal sepsis is a systemic infection that occurs in newborns such as septicemia, meningitis, pneumonia, arthritis, osteomilitis and urinary tract infections [14]. Incidence of neonatal sepsis in neonatal with neonatal sepsis was obtained from 11 articles that were analyzed as neonatal sepsis events ranging from 16.9% to 77.8%. Causes of neonatal sepsis are premature rupture of amniotic fluid, leukopenia, thrombocytopenia, fever and prolonged long hospitalization [17]. Infant factors affecting neonatorum sepsis include APGAR score, gestational age and low birth weight [18]. In the study Geyesus et al neonates with a very low birth weight < 1500 gr (AOR = 12.37) and neonates with a birth weight of less < 2500 gr (AOR = 2.63). This is in line with studies conducted Hidayati (2016) neonates with BBLR often have difficulty or less able to suck and digest breast milk that results in a decrease in endurance and facilitate the occurrence of infection. The association between birth weight relationship with the incidence of neonatorum sepsis from Bulkowstein et al research there is a significant association of neonatal sepsis with low birth weight (BBLR) p value <0.001 and OR : 5.9, Balderrama et al research found very low birth weight has a p value of 0.001 OR : 8.3. Geyesus et al research states there is a very low birth weight relationship with the incidence of neonatorum sepsis with OR: 12.37. Of the 15 articles analyzed there were 10 articles that stated that neonatorum sepsis was associated with infant birth weight and 5 articles that stated there was no association between birth weight and neonatorum sepsis.

The results explained the weight of babies born is related to the incidence of neonatoral sepsis with an average p value of <0.001 , and for the weight of babies born at high risk of sepsis, namely the weight of infants <2500 grams.

6. Conclusion

This study uses the literature review method by analyzing the 15 literature used. Birth weight is more or less at risk of infection than normal birth weight this is due to decreased maternal immunoglobulin reserves, incomplete organ maturation, inhibited ability to form antibodies, decreased ability to suck breast milk, causing malnutrition and prolonged hospitalization. Recommendation for pregnant women to gain knowledge such as conducting routine ANC (Antenatal Care) examinations and ultrasound which can contribute to reducing the incidence of neonatal sepsis.

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