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ORIGINAL ARTICLE

To Determine the Frequency of Thrombocytopenia in Neonatal Sepsis

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ABSTRACT

Background: During the first month of life, a baby may develop neonatal sepsis, a clinical state of bacterial infection marked by signs and symptoms of systemic involvement. There is a high mortality and morbidity rate linked with neonatal sepsis.
Objective: The goal of this study is to quantify the incidence of thrombocytopenia among babies with sepsis who come to the Hayatabad Medical Complex in Peshawar.
Methods: This cross-sectional study after the ethical approval the study was conducted at the Pediatrics Department of Hayatabad Medical Complex, Peshawar from 17-03-2020 to 17-09-2020. A total of 112 neonates up to 28 days of age with neonatal sepsis were included in the study in a consecutive manner and checked for platelet count to detect thrombocytopenia.
Results: The mean age of the sample was 14.2 ± 6.8 days. Out of 112 neonates included in the study, there were 66.1% male patients and 33.9% female patients. Mean gestational age at birth was 39.4 ± 1.7 weeks. Mean birth weight of the neonate according to records was 3.1 ± 0.8 kg. 46% of the neonates have the Thrombocytopenia. No significant difference in the age (P=0.445), gender of neonate (P=0.085), gestational age at birth (P= 0.356), weight at birth wise (P= 0.456) stratification of the Thrombocytopenia was observed in the study participants.
Practical implication: this study will help to determine the frequency of neonatal sepsis in Pakistani general population and will also highlight the factor associated with increased chance of neonatal sepsis in thrombocytopenia.
Conclusion: Neonates with sepsis often exhibit thrombocytopenia. No firm conclusions can be drawn about the relationship between Thrombocytopenia and sepsis from this research.
Keywords: Thrombocytopenia, neonatal sepsis, meningitis, platelet count

INTRODUCTION

The clinical course of 22-35% of ICU admissions is complicated by thrombocytopenia, which is defined as a platelet count (PC) below 150*109/L[1] . There has been a lot of focus on thrombocytopenia recently, particularly on the connection between PC and serious bleeding[2]. Despite the fact that PCs are still generally employed in transfusion recommendations, it seems that this association is not as strong as previously thought. More study of thrombocytopenia is needed since factors other than PC seem to be more significant drivers of the bleeding risk in neonates[3]. The lowest PC is usually attained within 24 to 48 hours following the beginning of illness, making sepsis a leading cause of thrombocytopenia in newborns[4]. PC and bleeding are two mysteries that may be resolved by learning more about the pathophysiology of thrombocytopenia in newborn sepsis[5]. It has been hypothesized that endothelial injury triggers reticule-endothelial evacuation of platelets in newborn sepsis[6]. Serum thrombopoietin levels have a causal role in the development of thrombocytopenia by causing the rate of platelet synthesis to lag behind platelet consumption[7]. One of the most significant, independent risk factors for sepsis-associated death in extremely low-birth-weight newborns was found to be thrombocytopenia, highlighting the significance of the link between thrombocytopenia and sepsis[8]. Patients with platelet counts 100*109/L were shown to be more critically unwell, have greater shock and organ failure, and had an increased mortality up to 1 year following intensive care unit admission in a study of people with sepsis[9]. As such, the diagnostic and prognostic significance of thrombocytopenia in sepsis has to be better defined. The purpose of this research is to better understand the relationship between the severity of newborn sepsis and thrombocytopenia, as well as the clinical course and outcome of thrombocytopenia[10, 11]. The pathogenic and clinical variations between the many causative microorganisms and clinical syndromes and presentations of newborn sepsis are overlooked when the condition is treated as a single entity[12]. Both Gram-positive and Gram-negative bacteria may cause sepsis, however previous research has either failed to find a significant difference in the occurrence and course of thrombocytopenia, or has documented a greater frequency of thrombocytopenia in Gram-negative sepsis[13]. The concentration of most research on (very) preterm newborns and the vast range of gestational ages of the populations investigated make it difficult to draw conclusions[14]. The purpose of this research is to quantify the prevalence of thrombocytopenia in cases of newborn sepsis presented to the Hayatabad Medical Complex in Peshawar. This study was the first study to determine the prevalence of thrombocytopenia in cases of newborn sepsis in Peshawar

METHODOLOGY

This cross-sectional study after the ethical approval the study was conducted at the Pediatrics Department of Hayatabad Medical Complex, Peshawar from 17-03-2020 to 17-09-2020. Through non-probability sampling all the newborns with neonatal sepsis were included in the study. The research eliminated all newborns with hyperbilirubinemia of higher than 5 mg/dl and newborns who received any sort of antibiotic after delivery. The diagnosis of newborn sepsis was confirmed by a thorough history and physical examination, including a temperature. From the included 112 newborns, a 2cc blood sample was obtained and forwarded to the hospital laboratory for the diagnosis of thrombocytopenia. A single pathologist with at least five years of expertise performed the laboratory investigation. If the platelet count was less than 150000/mm3, thrombocytopenia was considered positive. Age, gestational age, gender, and birth weight were all entered on the Proforma. Exclusion criteria were used to prevent bias in the study's findings. The statistical programme SPSS version 26 was used to input all the data from the proforma and conduct descriptive analysis. Age, gestational age, and birth were examples of continuous variables for which mean and standard deviation were determined. In order to calculate frequencies and percentages, categorical variables such as gender and thrombocytopenia were used. Age, gender, gestational age, and birth weight were used to stratify thrombocytopenia in order to observe the impact modification. A P value of ≥ 0.05 was used in the post-stratification chi-square test to determine significance.

RESULTS

The study was conducted on 112 neonates presenting neonatal sepsis (Table 1). The mean age of the sample was 14.2 ± 6.8

days. Out of 112 neonates included in the study, there were 66.1% male patients and 33.9% female patients. Mean gestational age at birth was 39.4 ± 1.7 weeks. Mean birth weight of the neonate according to records was 3.1 ± 0.8 kg. 46% of the neonates have the Thrombocytopenia. No significant difference in the age (P=0.445) (Table 2), gender of neonate (P=0.085) (Table 3), gestational age at birth (P= 0.356) (Table 4), weight at birth wise (P= 0.456) (Table 5) stratification of the Thrombocytopenia was observed in the study participants.

Table 1: Clinical and demographic characteristics of study participants

Parameters	Study participants (n=112) n (%)
Age (Mean ± S.D)	14.2 ± 6.8 days
3-10 days	35 (31%)
> 10-20 days	54 (48%)
> 20-28 days	23 (21%)
Gender	
Male	74 (66%)
Female	38 (33.9%)
Gestational Age	39.4 ± 1.7
37-40 weeks	74 (66%)
> 40-42 weeks	38 (34%)
Weight	3.1 ± 0.8 kg
LBW	33 (30%)
Normal Birth Weight	67 (60%)
Macrosomia	12 (11%)
Thrombocytopenia Frequency	
Yes	51 (46%)
No	61 (55%)

Table 2: Age Groups Wise Stratification of Thrombocytopenia

Age Groups	Thrombocytopenia		P value
	Yes	No	
3-10 days	16	19	0.445
	45.7%	54.3%	
> 10-20 days	22	32	
	40.7%	59.3%	
> 20-28 days	13	10	
	56.5%	43.5%	
Total	51	61	
	45.5%	54.5%	

Table 3: Gender Wise Stratification of Thrombocytopenia

Gender of neonate	Thrombocytopenia		P value
	Yes	No	
Male	38	36	0.085
	51.4%	48.6%	
Female	13	25	
	34.2%	65.8%	
Total	51	61	
	45.5%	54.5%	

Table 4: Gestational Age Groups Wise Stratification of Thrombocytopenia

Gestational age	Thrombocytopenia		P value
	Yes	No	
37-40 weeks	36	38	0.356
	48.6%	51.4%	
> 40-42 weeks	15	23	
	39.5%	60.5%	
Total	51	61	
	45.5%	54.5%	

Table 5: Birth Weight Groups Wise Stratification of Thrombocytopenia

		Thrombocytopenia		P value
		Yes	No	
Birth Weight	LBW	18	15	0.465
		54.5%	45.5%	
	Normal Birth Weight	28	39	
		41.8%	58.2%	
	Macrosomia	5	7	
		41.7%	58.3%	
Total		51	61	
		45.5%	54.5%	

DISCUSSION

While the correlation between low PCs and bleeding is puzzling, a better understanding of the underlying pathophysiology of thrombocytopenia in newborn sepsis should assist to clarify the situation[15]. It has been hypothesized that endothelial injury triggers reticule-endothelial evacuation of platelets in newborn sepsis. Serum thrombopoietin levels have a causal role in the development of thrombocytopenia, which occurs when the rate of platelet creation falls short of platelet consumption[6, 7].

Identification of thrombocytopenia as one of the most significant, independent risk factors for sepsis-associated death in extremely low-birth-weight newborns highlights the significance of the link between thrombocytopenia and sepsis[9,12]. Patients with PCs 100*109/L were more critically unwell, had greater shock and organ failure, and had a higher mortality up to 1 year after intensive care admission in a study of individuals with sepsis admitted to an Intensive Care Unit. It is important to better understand the diagnostic and prognostic significance of thrombocytopenia in sepsis[10].

The pathogenic and clinical variations between the numerous causative micro-organisms and clinical syndromes and manifestations of newborn sepsis are overlooked when the disease is treated as a single entity[16]. Therefore, we have decided to focus on thrombocytopenia caused by sepsis in this research. Previous research has either indicated a greater prevalence of thrombocytopenia in Gram negative sepsis (studies done between 1983 and 1986), or showed no compelling difference between the frequency and course of thrombocytopenia in sepsis caused by either Gram positive or -negative bacteria. The variation in gestational age across the study groups and the narrow scope of the majority of research makes it difficult to draw conclusions[13, 14].

Studies suggest that between 20% and 40% of babies admitted to the NICU have thrombocytopenia[17, 18]. A decrease in the number of blood platelets is another typical symptom of bacterial septicemia. Because their immune systems are still developing, newborns are more susceptible to disease. There are a number of maternal and infant risk factors that increase the likelihood of infection[19]. In order to improve the prognosis for babies with septicemia, doctors must diagnose and treat the condition quickly and accurately. As thrombocytopenia is seen early in the course of septicemia, the platelet count may be used as an early predictor for the diagnosis of septicemia. Low PC (150*103/L) was seen in 45.5% of newborns, making thrombocytopenia a significant finding in this cohort of ill neonates admitted to the NICU[20]. According to these results, a low PC is a critical indicator of bacterial septicemia. In most instances when a blood culture came back negative, thrombocytopenia was also present. Therefore, the research found that PC is a significant, but non-specific, indication of septicemia that is unrelated to blood culture[21].

The research confirmed what was found in a similar Jack et al. (2003) investigation, namely that GM+ve bacteria are more often identified in neonates with septicemia than Gram negative bacteria, despite several reports of the isolation of GM-ve bacteria from different locations in India[22]. All instances with Gm -ve septicemia revealed low PC, with a platelet count of 33*103/L. This was much lower than the platelet counts seen in Gm +ve septicemia patients23. Among patients with Gm -ve septicemia, 80% had thrombocytopenia, but only 65% did among those with Gm +ve septicemia, as described by Riedler et al[24].

The rates of growth of different organisms have been shown to vary widely. Different investigations have shown that the prevalence of newborn septicemia caused by coagulase-negative staphylococcus is between 4.46 and 90%[25]. Most newborns admitted to the NICU get infected with CONS103, but before it was linked to thrombocytopenia and other difficulties, this bacterium was not considered a pathogen and was routinely eliminated from the isolates [26].

In addition to other key pathogens, Klebsiella is known to proliferate in NICU admissions. Klebsiella spp. may be able to

colonies newborns and produce outbreaks of severe illness in the NICU due to their virulence and colonization abilities, the capacity to endure in a nonliving environment, and antimicrobial resistance. The fact that newborns are born without a normal flora and must develop one throughout the first several weeks of life is also linked to the high incidence of Klebsiella. Klebsiella is a common member of the gut flora of premature newborns. This serves as a source of infection for both the colonized newborns and other infants in the neonatal unit [27].

A study by Guida et al. found that 54% of septic Very Low Birth Weight (VLBW) neonates had thrombocytopenia [22]. According to research conducted by Khalada Binte Khair et al. observed a PC of less than 1,00,000/mm^3 has a sensitivity of 60%, specificity of 82%, positive predictive value (PPV) of 31%, and negative predictive value (NPV) of 94%. C-reactive protein and hematological parameters in newly-identified patients at the military hospital in Rawalpindi: a cross-sectional, analytical research conducted over a 7-month period. The study compared 100 clinically ill and 100 healthy newborns and found that NNT had a sensitivity of 64.3% for identifying NNS [28].

CONCLUSION

In newborns with sepsis, thrombocytopenia is quite prevalent. Although this research provides some evidence linking the two, it cannot prove cause and effect. We suggest more study, especially case control studies, on the role of thrombocytopenia in sepsis and whether or not it is a result of sepsis.

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