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Research Article

Neonatal Sepsis: The Frequency of Thrombocytopenia

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ABSTRACT

Aim: To determine the frequency of thrombocytopenia in neonatal sepsis.

Materials and methods: This descriptive cross sectional study was conducted in Neonatology unit, Ayub Teaching hospital Abbottabad on 119 participants. Children of both genders having less than one month age, positive blood culture and birth weight of 1-4 kg were included in the study. Infants with birth asphyxia, blood transfusion, premature birth, maternal history of placental insufficiency, and familial bleeding disorders were excluded. Age, gender and thrombocytopenia were recorded. Descriptive statistics were calculated. Frequency of thrombocytopenia was stratified by age groups, gender, and weight to see effect modifiers using chi-square test at 5% level of significance.

Results: The mean age was 9.87 ± 7.68 days and mean weight was 2.11 ± 1.14 Kg. The frequency of thrombocytopenia was 82 (68.9%). The males (n=71, 59.7%) were more than female (n=48, 40.3%). The most common weight category was <2 kg (n=60, 50.4%). Most of ages was in range of 7-30 days (n=64, 53.8%). The most common bacteria involved in neonatal sepsis were *Staph. aureus* present in 26(21.85%) followed by *E. coli* found in 22(18.49%) and *Klebseilla Pneumonae* found in 16(13.45%). Thrombocytopenia has no statistically significant association with age, weight and gender of the neonates (P>0.05).

Conclusion: The frequency of thrombocytopenia in neonatal sepsis is quiet higher so the clinicians while attending neonatal sepsis should be vigilant in prompt diagnosis and management of thrombocytopenia to avoid serious complications.

Key words: Thrombocytopenia, Neonatal sepsis, Septicemia in neonates, Platelet count

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INTRODUCTION

Neonatal sepsis is a systemic infection that found in under one month newborns (Mitul AR, 2015). Though a lot advances in medical and surgical fields are available but the rate of morbidity and mortality from neonatal sepsis is still high (Amare D, *et al.*, 2019). A study conducted in Pakistan on 2480 admitted neonates found 29.5% incidence of neonatal sepsis (Ahmed M, *et al.*, 2018). neonatal sepsis is due to increased susceptibility is present in newborns for bacterial infection (Kollmann TR, *et al.*, 2017). The common risk factors are premature and low birth weight. In neonatal sepsis there is less number of neutrophils, abnormal chemotaxis of neutrophils, less production of cytokines and other complement agents, immature natural killer cells and low level of antibodies (IgG, IgA and IgM) (Carbone F, *et al.*, 2020).

The platelet count below 15×10^9 per liter is called thrombocytopenia. Thrombocytopenia is common issue neonatal Intensive Care Units (ICUs) responsible for 22% to 35% admissions to the ICUs (Stanworth SJ, *et al.*, 2009). In recent time interest has been raised in thrombocytopenia in relation to the clinically significant bleeding which is helpful in transfusion guidelines (Ree IM, *et al.*, 2017). One of the main etiologic factors for neonatal thrombocytopenia is sepsis. Sepsis can lead to severe thrombocytopenia having lowest platelet count with 24 hours after infection (Murray N, *et al.*, 2002). The exact mechanism of neonatal sepsis inducing thrombocytopenia is still unclear. But suggestion has been made that damage of endothelial cells in neonatal sepsis activating reticule-endothelial removal of platelets. As a result, due to imbalance in platelets production and consumption thrombocytopenia occurs (Eissa DS and El-Farrash RA, 2013; Manzoni P, 2015).

An Indian study on thrombocytopenia on neonatal sepsis including under 28 days neonates reported 82.6% frequency of thrombocytopenia (Sindhura Y and Reddy R, 2017). Another study conducted in Islamabad reported that thrombocytopenia in neonatal sepsis was 68.24% (Kausar M, *et al.*, 2020). However another international study reported frequency of thrombocytopenia in neonatal sepsis to be 49% (Brown RE, *et al.*, 2008).

The rationale of this study is that neonatal sepsis is commonly associated with low platelet count resulting in life threatening complications. Virtually any pathogens involved neonatal sepsis can cause thrombocytopenia. Most of the studies conducted on this topic are at international level and reported higher incidence of thrombocytopenia in neonatal sepsis. So this study aimed to know the frequency of thrombocytopenia in neonatal sepsis in our set up and also determine commonly involved bacteria. This study is also addressing common confounders like the association of age, gender and weight with thrombocytopenia in neonatal sepsis.

The objectives of this study were to determine the frequency of thrombocytopenia in neonatal sepsis and bacterial pattern of neonatal sepsis.

MATERIALS AND METHODS

This descriptive cross sectional study was carried out on 119 neonates in Neonatology unit, Ayub Teaching hospital, Abbottabad from 20th December 2017 to 20th May 2018 using consecutive nonprobability sampling technique. Ethical approval was obtained from hospital ethical committee. Informed verbal consent was obtained from parents after complete explanation of the study. The sample size was calculated by WHO calculator at 95% confidence level and 9% absolute precision using frequency of thrombocytopenia in neonatal sepsis of 49% from previous study (Brown RE, *et al.*, 2008). Children of both genders having less than one month age, positive blood culture and birth weight of 1-4 kg were included in the study. Infants with birth asphyxia, blood transfusion, premature birth (<28 weeks gestation), maternal history of placental insufficiency, and familial bleeding disorders were excluded.

Neonatal sepsis was diagnosed having one of the features; fever (temperature ≥ 38°C), hypothermia (temperature <3.6°C), poor capillary refill (capillary refill time of more than 3

seconds), vomiting, grunting, excessive cry and bulging fontanel and growth of microorganism on blood culture. Thrombocytopenia was defined as a platelet count below 150 × 10^9/L in complete blood count.

All data were collected by a fellow of CPSP. Demographics like age and gender were recorded. Blood were obtained from neonate having feature of neonatal sepsis and sent to laboratory for evaluation of thrombocytopenia. Laboratory findings were reported by expert pathologist.

Bias and confounder in the study were control by strictly following the inclusion criteria and stratification of data.

SPSS version 22.0 was used for data analysis. Mean and standard deviation was computed for continuous variables like age, and weight. Categorical variables like gender, type of bacteria and thrombocytopenia was computed in term of frequencies and percentages. Frequency of thrombocytopenia was stratified by age groups, gender and weight to see effect modifiers using chi-square test at 5% level of significance.

RESULTS

The mean age was 9.87 ± 7.68 days with range from 1 to 28 days. The mean weight was 2.11 ± 1.14 kg with range from 1 to 4 Kg. The frequency of thrombocytopenia was 82 (68.9%). The males (n=71, 59.7%) were more than female (n=48, 40.3%). The most common age weight was <2 kg (n=60, 50.4%). Most of ages were in range of 7-30 days (n=64, 53.8%) *(Table 1)*.

The most common bacteria involved in neonatal sepsis were *Staph. aureus* present in 26(21.85%) followed by *E. coli* found in 22(18.49%) and *Klebseilla Pneumonae* found in 16(13.45%). Rest of details for pattern of bacteria in neonatal sepsis is given in *Figure 1*.

The frequency of thrombocytopenia was higher in 7-30 days neonates (61.8%) than <7 days (75.0%) but the difference was not statistically significant (P=0.121). Similarly thrombocytopenia has no statistically significant association with weight (P=0.891) and gender (P=0.402). The detailed statistics are given in *Table 2*.

Table 1: Frequency of thrombocytopenia, gender, weight and age

Characteristics		Frequency	Percent
Thrombocytopenia	Yes	82	68.9
	No	37	31.1
Gender	Male	71	59.7
	Female	48	40.3
Weight groups	<2 Kg	60	50.4
	2-4 Kg	59	49.6
Age groups	<7 days	55	46.2
	7-30 days	64	53.8

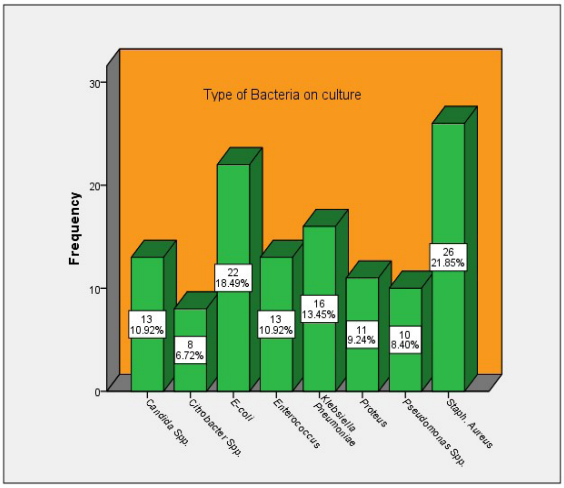

Figure 1: Pattern of bacteria in neonatal sepsis

Table 2: Frequency of thrombocytopenia stratified by age, weight and gender

		Thrombocytopenia				P-Value*
		Yes		No		
		N	%	n	%	
Age group	<7 days	34	61.8	21	38.2	0.121
	7-30 days	48	75	16	25	
Weight group	<2 kg	41	68.3	19	31.7	0.891
	2-4 kg	41	69.5	18	30.5	
Gender	Male	51	71.8	20	28.2	0.402
	Female	31	64.6	17	35.4	
*chi-square test						

DISCUSSION

This study was aimed to determine the frequency of thrombocytopenia in neonatal sepsis. Our main findings were thrombocytopenia was found in 68.9% and more common in females and less than 2 kg weighted neonates. The most common bacteria involved in neonatal sepsis were *Staph. aureus* followed by *E. coli* and *Klebseilla pneumonae*. Thrombocytopenia has no statistically significant association with age, weight and gender. Thrombocytopenia is the frequent hematological disorder found in the newborns predominantly in the sick neonates, preterm births and those admitted in ICUs (Kebede ZT, *et al.*, 2020). The mortality rate is from 20 to 40% in these neonates. Virtually any pathogen causing sepsis can induce thrombocytopenia (Arif S, *et al.*, 2012).

Our findings showed that the frequency of thrombocytopenia in neonatal sepsis was 68.9%. A study conducted in India on thrombocytopenia in neonatal sepsis on under 28 days neonates reported 82.6% thrombocytopenia (Sindhura Y and Reddy R, 2017). This frequency is higher than our study. The difference can be due to genetic and environmental factors. A study conducted in Islamabad reported that thrombocytopenia in neonatal sepsis was 68.24% (Kausar M, *et al.*, 2020). These results are similar to our study. However another study reported frequency of thrombocytopenia in neonatal sepsis to be 49% (Brown RE, *et al.*, 2008). These results show that frequency of thrombocytopenia in neonatal sepsis varies across various populations. Many factors like genetic of neonates and environmental factors like adequate care of neonates can be responsible for this variability.

In our study the most common bacteria involved in neonatal sepsis were *Staph. aureus* followed by *E. coli* and *Klebseilla Pneumonae*. *Staph. aureus* is normal comensal of skin so that's why commonly encountered in neonatal sepsis. Klebsiella is one of important bacteria grows in neonates admitted to intensive care units. Klebsiella can cause of outbreak of infection in ICUs due to its potential to make colonies and its survival on inanimate surfaces, and acquiring high antibiotic resistance (Polin RA and Saiman L, 2003).

A study conducted in Peshawar on neonatal sepsis reported that most common bacteria were *Staphylococcus aureus*, *Escherichia coli* and Klebseilla species (Najeeb S, *et al.*, 2012). Another study on neonatal sepsis in Abbottabad reported that most common bacteria were *Staphylococcus aureus* and *Escherichia coli* (Muhammad Z, *et al.*, 2010). These results are similar to current study. Other studies also reported that *Staphylococcus aureus* is most common pathogen encountered in neonatal sepsis (Arif S, *et al.*, 2012; Sharma P, *et al.*, 2013). Our study showed that late onset (7-30 days) thrombocytopenia was higher than early onset (<7 days age) but results were not significant. Previous studies also reported that late onset thrombocytopenia is more prevalence that early onset (Muhammad Z, *et al.*, 2010; Ribeiro RP, *et al.*, 2019).

CONCLUSION

The frequency of thrombocytopenia in neonatal sepsis is quiet higher so the clinicians while attending neonatal sepsis should be vigilant in prompt diagnosis and management of thrombocytopenia to avoid serious complications.

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