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ORIGINAL ARTICLE

Frequency of Thrombocytopenia and Associated Mortality in Neonates with Neonatal Sepsis

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ABSTRACT

Aim: To assess the frequency of thrombocytopenia and associated mortality in neonates with neonatal sepsis.
Methodology: This descriptive study was designed to identify the frequency of thrombocytopenia in neonates and conducted at Nazir Hussain Medical Complex KKF Hospital Hyderabad from 1st September 2022 to 28th February 2023 after ethical clearance through the institutional review committee. This study enrolled 190 neonates which were admitted in NICU with the diagnosis of neonatal sepsis. All those neonates under 28 days of age and having a positive blood culture reports were included. A 3cc whole blood was drawn from each neonate by a nursing staff in a single pick and blood test including haematological markers (haemoglobin, platelet count) and infection markers (white blood cells, neutrophil%, Lymphocyte%, C-reactive proteins and Erythrocyte sedimentation rate) were analyzed.
Results: There were 60% male neonates while rest 40% were females. About 44.78% had a weight between 2.5-3.5kg. The mean platelet count was 182.95±156 x10^9/L whereas lymphocytes% mean value was 41.81±11.0% with a very high ESR reported as 21.08±14.2mm/hour. The frequency of thrombocytopenia was observed in 129(67.89%) neonates wherein it was observed as severe in 35(18.4%) neonates and the frequency of mortality was observed as fourfold increased in the cases of thrombocytopenia.
Practical Implication: Factors like age, low birth weight, platelet count and severity of thrombocytopenia are related with outcomes of neonatal sepsis among neonates.
Conclusion: There is a high frequency of thrombocytopenia within the cases of neonatal sepsis. The mortality is higher in cases with severe thrombocytopenia.
Keywords: Frequency, Thrombocytopenia, Associated mortality, neonate, neonatal sepsis

INTRODUCTION

Neonatal sepsis is a multivariate disease carrying conditions like septicaemia, urinary tract infections as well as meningitis and pneumonia.[1] In developing world, the prevalence of cases with neonatal sepsis resulting into death is more than 50%[2,3]. Every 20% infants developing neonatal sepsis almost 1% have mortality as their fate with a reported incidence of sepsis as 1-10/1000 live births[4].

There are various reasons for this huge neonatal sepsis cases in developing countries. One out of such reason is the very low birth weight of newborns as well as premature deliveries.[5] Depending on the sepsis onset time it is divided into categories like early-onset sepsis with an age as 0-3 days, late-onset sepsis within the age of 3-28 days and late late-onset sepsis lasting between 29-120 days of age. One of the early indicators of neonatal sepsis is the formation of thrombocytopenia in newborns[6].

Thrombocytopenia has been reported as a most frequent haematological disorder presented in the NICU departments of tertiary care hospitals[7]. The global frequency of thrombocytopenia is reported as 20-35% among the NICU admissions with highest reported among premature deliverers[8,9]. The range of thrombocytopenia had been reported from mild to severe. The severe cases have the highest risk of profuse bleeding, infection and neonatal sepsis formation[10-12].

The present study was designed to estimate the frequency of thrombocytopenia among the neonatal sepsis cases admitted in NICU department and the association of mortality among these cases. The interpretation of the current research assisted in generating a basic idea of how many cases are reported in Pakistan. This study results also assisted in generating a standard mechanisms of identification of these cases on early onset for reducing severity and mortality involved.

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MATERIALS AND METHODS

This descriptive study was designed for identifying the frequency of thrombocytopenia in neonates and conducted at Nazir Hussain Medical Complex KKF Hospital Hyderabad from 1st September 2022 to 28th February 2023 after ethical clearance through the institutional review committee. This study enrolled 190 cases of neonates which were admitted in NICU with the provisional diagnosis of neonatal sepsis. The enrolment was based on the clinical features of the neonates with neonatal sepsis. An informed consent was taken from the mothers of the newborns for their participation in the study through a written consent document. The sample size was generated through sample size calculator software using a prevalence of thrombocytopenia as 20-35%[8,9]. A margin of error as 5% and 95% CI was taken in these cases. All those neonates under 28 days of age and having a positive blood culture reports were included in this study. Neonates belonging to mothers having a clinical history of Immune thrombocytopenic purpura, Systemic lupus erythematosus, or any other autoimmune relateddisorders were excluded from the study. Neonates whose mothers were on sulfonamides, thiazides, quinine, tolbutamide, quinidine, vancomycin, heparin or hydralazine were also excluded from study. The exclusion criteria also included neonates with family history of bleeding disorders. A 3cc whole blood was withdrawn from each neonate by a highly professional nurse and blood test including haematological markers (haemoglobin, platelet count) and infection markers (white blood cells, neutrophil %, Lymphocyte %, C-reactive proteins and Erythrocyte sedimentation rate) were analyzed using quality assurances and SOPs under observation using Auto analyzer (Abbott, USA). All demographic data, clinical history and characteristics as well as biomarkers analysis data was entered in a well-structured questionnaire. Data was analyzed using SPSS version 26.0 where data was interpreted in terms of frequency, percentages, mean and standard deviations. For comparative analysis of data ANOVA test was applied with a pvalue <0.05 as significant.

RESULTS

There were 60% male neonates while rest 40% was females. Most of the infants belonged to the age group of 07 days followed by 22-28 days. About 44.78% had a body weight between 2.5-3.5kg with a very less proportion having a body weight >4.5kg. Among various modes of deliveries 43.1% were born through vaginal delivery while almost equal percentages neonates were born through C section of NVD with episiotomy. Around 63.6% were breast fed (Table 1).

All neonates mean value of haematological as well as infection markers were assessed and it was analyzed that the mean haemoglobin of neonates was estimated as 13.12±2.09 g/dl while the mean platelet count were 182.95±156x10^9/L. Although the mean value of platelet count was within normal range but towards lower side where as lymphocytes% was at higher mean value as 41.81±11.0% with a very high ESR reported as 21.08±14.2 mm/hour (Table 2).

The frequency of thrombocytopenia was observed in 129(67.89%) neonates wherein it was observed as severe in 35(18.4%) neonates while moderate in 50(26.31%) neonates and mild in 43(22.6%) neonates. There were 32.1% of neonates where no thrombocytopenia was identified (Fig. 1). The frequency of mortality was observed as four fold in the cases of thrombocytopenia in comparison with cases with no thrombocytopenia (Fig. 2).

The comparative analysis of 129 neonates having thrombocytopenia with the socio-demographic factors presented data where there was a strong association of thrombocytopenia with age and fetal risk factors involved. The mode of delivery had also some influence in increasing risk of thrombocytopenia in neonates however the association was insignificantly related (Table 3).

Table 1: Demographic characteristics of neonates (n=190)

Variable	No.	%
Gender		
Male	114	60.0
Female	76	40.0
Age (days)		
0–7	78	41.0
8–14	38	20.0
15–21	33	17.3
22–28	41	21.6
Weight (kg)		
2.5–3.5	91	47.8
3.6–4.5	84	44.2
>4.5	15	7.89
Mode of delivery		
Normal vaginal delivery	82	43.1
Caesarean section	55	28.9
NVD with episiotomy	53	27.9
Feeding		
Mother breastfeed	121	63.6
Formula milk	31	16.3
Both/mix	38	20.0

Table 2: Haematological and infection markers in neonates

Parameters	Haemoglobin (g/dL)	White blood cell (10^9/L)	Platelet count (10^9/L)	Neutrophils (%)	Lymphocytes (%)	CRP (mg/dL)	ESR (mm/hour)
Mean	13.12±2.09	10.71±15.6	182.95±156	43.3±11.0	41.81±11.0	4.58±7.1	21.08±14.2
Minimum & Maximum	7.8-21.2	4.40-21.7	2-590	13.5-78.1	8.2-81	0-46	9-99
Normal Range	9.5 to 13 g/dL	5.0-21.0	150-450	40-60	20-40	2-5	0-2

Table 3: Comparative analysis of thrombocytopenia with socio-demographic features

Socio-demographic features	Sum of squares	Degree of freedom	Mean-square	Variation	P value
Age	885.56	3	295.187	3.932	0.011
Gender	0.511	3	0.171	0.710	0.549
Weight	1.942	3	0.648	1.113	0.346
Mode of delivery	3.590	3	1.201	1.745	0.161
Maternal risk factor	3.510	3	1.171	0.397	0.758
Fetal risk factor	13.358	3	4.455	2.154	0.098
Feeding	1.016	3	0.336	0.542	0.655

Fig. 1: Frequency of thrombocytopenia within cases

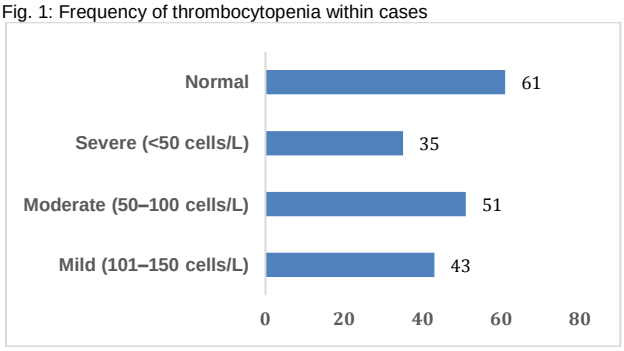
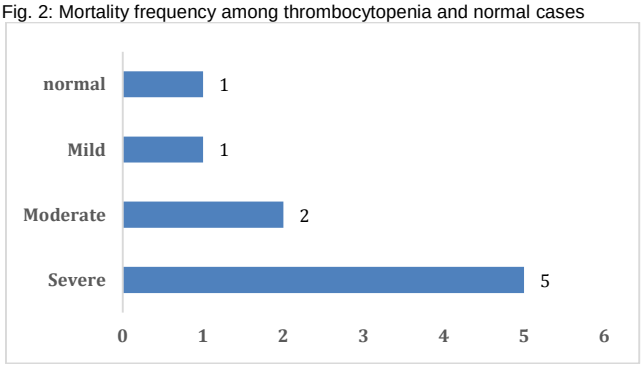


Fig. 2: Mortality frequency among thrombocytopenia and normal cases



DISCUSSION

Thrombocytopenia is a serious complication of newborns which is related with neonatal sepsis and mortality. Each year more than 1.9 million infants globally suffer from thrombocytopenia with more than 40% belonging to the developing countries. In the present study thrombocytopenia was observed in 67.89% of the cases. Arabdin et al[13] in 2022 estimated the prevalence of thrombocytopenia in neonatal sepsis cases upto 66% in the same region as addressed in the current research. This provides the accuracy in the results of the present research as with the previously reported data.

The study also focused on the association of thrombocytopenia with the clinical and socio-demographic features wherein it was identified that age and other fetal risk factors had a strong association of thrombocytopenia. Charoo et al[14] assessed two hundred cases of very low birth weight infants and within 61.5% of them the sepsis formation as well as thrombocytopenia was detected. The augmented incidence of thrombocytopenia in very low birth weight infants was due to a partial-response to thrombocytopenia in relations to platelet and thrombopoietin formations specifically during the sepsis with reduced reserved of energy in the infants.[15]The low platelet levels in the present study evidently provide the similar interpretations as observed by Charoo et al[14].

The mortality rate was identified as fourfold higher in neonatal sepsis cases with thrombocytopenia than in cases of neonatal sepsis with no thrombocytopenia. Previous studies have also found a higher increase rate of mortality in the neonatal cases suffering from thrombocytopenia, especially with severe forms of

thrombocytopenia.[12]Increasing platelet count has been reported as method for reduction of mortality in such neonates. Applications of vascular catheter have been linked with thrombosis by damaging the mechanical blood flow and also resulting in the injection of toxic thrombogenic-agents in the vascular system resulting into sepsis formation[16].

There were more males reported in this study as have also been reported by other studies like of Fanaroff and his colleague[17] who reported higher incidence of neonatal sepsis in male infants than female infants. The severity of thrombocytopenia is also related with the presence of invading bacteria as gram negative causes higher severity and mortality risks than gram positive[18,19]. Medical resources, diagnosis, and treatment must improve in developing countries. There are limited resources: access to medical and health resources; knowledge about disease; awareness, trainings and awareness about health[20,21,22,23,24,25].

CONCLUSION

There is a high frequency of thrombocytopenia within the cases of neonatal sepsis. The mortality is higher in cases of severe thrombocytopenia. Factors like age, low birth weight, platelet count and severity of thrombocytopenia are related with outcomes of neonatal sepsis among neonates.

Conflict of interest: Nil

Ethical consideration: Permission was granted by hospital ethical committee.

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