ISSN: 2581 – 3633
PubMed - National Library of Medicine - ID: 101745081

International Journal of Medical Science and Advanced Clinical Research (IJMACR)

Available Online at: www.ijmacr.com

Volume – 5, Issue – 2, March - April - 2022, Page No. : 202 – 205

Thrombocytopenia as a marker in paediatric sepsis patients in picu with vasopressor usage and their outcome

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How to citation this article: Dr. Kartik R, Dr. Adarsh E, Dr. Rakshitha P, "Thrombocytopenia as a marker in paediatric sepsis patients in picu with vasopressor usage and their outcome", IJMACR- March - April - 2022, Vol – 5, Issue - 2, P. No. 202 – 205.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Introduction

Sepsis is the most common cause of mortality in children worldwide. Mortality ranges from 5% in developed countries to up to 35% in developing countries [1].

According to IPSCC, sepsis is defined by the presence of two or more signs of SIRS, one of which being a change in temperature or in leukocytes counts, with confirmed or suspected infection. Severe sepsis in children is characterized by the presence of sepsis and cardiovascular or respiratory dysfunction, or two or more organ dysfunctions (neurological, hepatic, hematologic, renal). Septic shock is defined as sepsis and cardiovascular dysfunction [2].

Assessment of severity of illness at admission is important for effective patient management, prog nostication, and optimum utilization of resources [3].

The most commonly used laboratory biomarker in sepsis have proven poor sensitivity and specificity for bacterial infection.

The important role of platelets in the inflammatory process, microbial host defense, wound healing, angiogenesis, and remodelling in addition to their contribution to haemostasis and thrombosis [4]. Thrombocytopenia which is defined as platelet count less than 150000cell/cumm. Prolonged and sustained thrombocytopenia over more than 4 days after ICU admission or a drop in platelet count of >50% during ICU stay is related to a 4-to-6-fold increase in mortality [19]. Furthermore, thrombocytopenia is a key component of the Pediatric Risk of Mortality -III (PRISM III) score, the only validated predictor of outcome in the Pediatric Intensive Care Unit (PICU) [5-7]. The current study is undertaken to determine the prognostic value of thrombocytopenia in critically ill infants and children with severe sepsis.

Keyword: PICU, CRP, PRIMS – III,

Methods

Children with a diagnosis of sepsis, septic shock between the age group 1 month to 15 years of age

admitted to PICU of RRMCH, Bengaluru were included in the study. Study participants were included in the study by Purposive Sampling. A pre-tested, semistructured questionnaire was used to record information on history, clinical examination and PRISM III score was evaluated within 24 hours after arrival to the PICU of children with sepsis, septic shock. Details regarding treatment, Vasopressors, Outcomes were recorded. Blood samples were drawn for: arterial blood gases, random blood glucose, complete blood count, C-reactive protein (CRP), serum electrolytes, liver function tests, kidney function tests, prothrombin time, partial thromboplastin time, and blood culture.

These were used in calculation of PRISM III score. The Descriptive statistics has been used to present the data. To analyse the data SPSS (Version 26.0) was used. Significance level was fixed as 5% ($\alpha = 0.05$). Qualitative variables are expressed as frequency and percentages and Quantitative variables are expressed as Mean and Standard Deviation. The Normality tests Kolmogorov-Smirnov and Shapiro-Wilks tests results reveal that QOL variables follow Normal distribution. Therefore to analyse the data, parametric tests were applied. To compare proportions between two groups Chi-Square test is applied and if any expected cell frequency is less than five then Fisher's exact test is used.

Results

Table 1: Distribution of the study participants according to their prism 3 score

Prism 3 score	Frequency (n)	Percentage (%)
1-24	15	75
25-49	5	25
50-74	0	0

In the present study, none of the study participants had their PRISM3 score in the range of 50-74 which indicates worse prognosis. 25% of the study participants had their PRISM3 score in the range of 25-49. The mean PRISM3 score of the study participants was found to be 21.70 + 7.449.

Table 2: Distribution of the study participants according to the severity of thrombocytopenia

Throbocytopeni a	Frequency (n)	Percentage (%)
Mild	16	80
Moderate	2	10
Severe	2	10

80% of the study participants had mild thrombocytopenia with 10% of the deceased study participants having severe thrombocytopenia. The mean platelets level among the study participants is found to be 114825 + 29604.97.

Table 3: Distribution of the study participants according to their need for vasopressor

Need for vasopressor	Frequency(n)	Percentage (%)
Yes	17	85
No	3	15

In the present study, 85% of the study participants were in need of vasopressor.

Table 4: Distribution of the study participants according to their outcome on treatment

Outcome on treatment	Frequency (n)	Percentage (%)
Recovered	18	90
Dead	2	10

In the present study, 90% of the study participants recovered on treatment. The mortality rate of the present study was found to be 10%.

Table 5: Association between outcome on treatment and thrombocytopenia of the study participants

Outcome on treatment	Thrombocytopenia	X2	P Value		
	Mild	Moderate	Severe		
Recovered	16	2	0	10.47	0.011
Dead	0	0	2		

In the present study, when outcome on treatment was associated with thrombocytopenia, the association was found to be statistically significant between outcome on treatment and thrombocytopenia.

Discussion

In the present study, 25% of the study participants had their PRISM 3 score in the range of 25-49 and a mean PRISM 3 score of 21.70 + 7.449.

In the study done by Coronado Munoz AJ et al [9], the mean PRISM-III score was found to be 11.3 ± 5, which is lower than the present study. PRISM III scoring system provides an outlook regarding patient's prognosis. The predicted mortality with the PRISM score correlated well with the actual observed mortality.

80% of the study participants had mild thrombocytopenia with 10% of the deceased study participants having severe thrombocytopenia. In the study done by Kaur A et al [6], 48.31% had severe, 27.91% had moderate and 24.72% had mild thrombocytopenia respectively. In the study done by Agrawal S et al [10]. Thrombocytopenia is mostly multifactorial and is recognised as an early warning sign of sepsis. Furthermore, thrombocytopenia is a key component of the PRISM III score. Increased platelets destruction, an impaired platelet production or a combination may be the underlying mechanism of thrombocytopenia. Thrombocytopenia has been reported as an independent risk factor for sepsis related death among paediatric sepsis [6].

Fluid refractory shock warrants use of vasoactive drugs. In the present study, 85% of the study participants were in need of vasopressor. In the study done by Coronado Munoz AJ et al [9], 38% of the study participants required vasopressor support. A study done by Claushuis TAM et al [8], found that thrombocytopenia is associated with enhanced mortality and a more disturbed host response during sepsis, independent of disease severity.

A study done by Yilmaz S et al [11] concluded that low platelet count could be a good indicator to estimate the mortality during ICU stay. They added that thrombocytopenia-associated risk factors should be closely followed up by physicians in critically ill children.

Various studies compared mortality rates among patients with and without thrombocytopenia [5,9]. The present study has demonstrated an association of a drop in platelet counts during PICU stay with the outcome. Mortality was higher in severe thrombocytopenic patients.

Conclusion

Sepsis is the leading cause of death worldwide for children. Overall incidence continues to increase; however, mortality has dramatically decreased in recent years.

There is an increasing focus on platelets as key regulators of the immune system. Thrombocytopenia is an ominous sign that should be taken seriously in paediatric sepsis. Serial platelet counts are easily available markers of disease progression. A drop in platelet counts irrespective of thrombocytopenia is associated independently with the mortality. The present study supported these recent suggestions.

So, we recommend platelet count should be assessed in all sepsis patients upon admission to the PICU to guide the clinical decision along with the PRISM 3 score. Similar studies are required with larger number of patients in the paediatric age group to further consolidate the present study's findings.

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