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Original Article

Paediatrics Section

Thrombocytopenia in Paediatric ICU: Incidence, Transfusion Requirement and Role as Prognostic Indicator

AMARPREET KAUR[1], GURMEET KAUR SETHI[2], RAM KUMAR GOYAL[3], AVNEET KAUR[4], RUPINDERJEET KAUR[5], SHASHI KANT DHIR[6], HARSHVARDHAN GUPTA[7]

ABSTRACT

Introduction: Thrombocytopenia is defined as platelet count less than 150×10^9/L, it has a greater incidence in Intensive Care Units (ICUs) compared to wards and its most common cause is increased platelet consumption.

Aims: To investigate incidence of thrombocytopenia, platelet transfusions requirement, associated diseases and relationship between thrombocytopenia and mortality.

Materials and Methods: Eleven months hospital records between October 2013 and August 2014 of the PICU in a tertiary care teaching hospital was investigated retrospectively and 275 critically ill children formed the sample.

Statistical analysis: Odds ratio with 95% confidence interval was used. Probability value (p-value) of less than 0.05 was considered statistically significant. Results were confirmed using χ^2 test.

Results: Out of 275 patients {168 males (61.09%) and 107 females (38.91%)}, 89 patients had thrombocytopenia. Out of these 89 patients, 43 patients (48.31%) had severe, 24 patients (27.91%) had moderate and 22 patients (24.72%) had mild thrombocytopenia. The 43 patients having severe thrombocytopenia received platelet transfusion and out of these 43 patients 24 (55.81%) received more than one transfusion and 18 (41.86%) of the transfused patients expired. Among thrombocytopaenic patients, Sepsis (25.84%) was the most common diagnosis followed by Pneumonia (19.10%), Meningitis (13.48%), Diabetic Ketoacidosis (5.62%), Enteric fever (7.86%), Tubercular Meningitis (3.37%), Infantile Tremor Syndrome (2.25%), Congenital heart disease (5.62%), Burns (3.37%), Brain Haemorrhage (2.25%%), Hepatic abscess (1.12%), Chronic Renal Failure (3.37%), Malaria (2.25%) and Hepatitis (4.49%). There is a statistically significant association between thrombocytopenia and mortality. A significant association was established between mortality in thrombocytopenic patients of sepsis.

Conclusion: Thrombocytopenia is commonly associated with sepsis. Mortality rate is higher in thrombocytopenic patients.

Keywords: PICU, Platelet transfusion

INTRODUCTION

Thrombocytopaenia which is defined as platelet count less than 150×10^9/L, has a greater incidence in ICUs compared to wards. Thrombocytopaenia results from underproduction or overconsumption of platelets. Some common causes that might affect both platelet production and consumption i.e. sepsis and malignancy. Increased platelet consumption is the most common cause of thrombocytopaenia in PICU with Disseminated Intravascular Coagulation and Hemolytic Uremic Syndrome being the common diagnosis [1]. Prevalence of thrombocytopaenia varies in various ICUs ranging from 13% to 58% depending on clinical features of patients [2,3].

Nearly all studies analysing thrombocytopaenia as a prognostic marker in ICU patients found an inverse correlation of the platelet count with the risks for a prolonged ICU stay and mortality (mortality rate 31%–46% in thrombocytopaenic patients vs 16%–20% nonthrombocytopaenic patients) [4].

Prolonged and sustained thrombocytopaenia 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 [5].

Platelet transfusions are done to increase the platelet counts but the response to transfusions varies from patient to patient and severity of disease. Few studies have been done to know the prevalence of thrombocytopaenia in ICU and the need for transfusion and response to this transfusion [6]. There is not much data available from developing country like India and no such study has been done in Punjab region of the country.

Present study was conducted at a tertiary care teaching hospital in India to know about the incidence of thrombocytopaenia and relationship with mortality in PICU. Various disease conditions which were associated with thrombocytopaenia were found out and the number of transfusions and rise in platelet counts was calculated.

MATERIALS AND METHODS

Eleven months records, between October 2013 and August 2014, was screened retrospectively and 275 children (168 boys and 107 girls) in Paediatric Intensive Care Unit (PICU) were included in the study. Besides patient's demography, source of admission, primary diagnosis, presence or absence of sepsis, bleeding, use of central venous or arterial lines and mechanical ventilation were recorded. Laboratory data collected at admission i.e. Complete Blood Counts (CBC), C- Reactive Protein (CRP), Blood Urea Nitrogen (BUN), serum creatinine, serum bilirubin and coagulation profile was recorded. Daily platelet counts were also recorded in each patient.

Thrombocytopaenia was defined as platelet count below 150x10^9/L. The severity of thrombocytopaenia was classified as mild (platelet count 100 x 10^9 to 149 x 10^9 per L), moderate (platelet count 50 to 99 x 10^9 per L), severe (platelet count < 50 x 10^9 per L) and very severe (platelet count < 20 x 10^9 per L) [7]. Sepsis was defined in patients with documented infection in presence of positive acute phase reactants and raised Total Leukocyte Counts (TLC). Coagulopathy was defined when the Activated Partial Thromboplastin Time (aPTT) was 1.5 times the normal reference range for the laboratory with an associated increase in International Normalised Ratio (INR) more than 1.5. Bleeding was defined as an episode resulting from a drop in Haemoglobin of >2 g/dL within 24 hours, episodes requiring transfusions and any intracranial haemorrhage.

STATISTICAL ANALYSIS

The risk of thrombocytopaenia in a disease and mortality due to thrombocytopaenia was determined by calculating an odds

ratio with 95% confidence interval. Any independent risk factor with probability value (p-value) of less than 0.05 was considered statistically significant. Results were also confirmed using χ^2 test.

RESULTS

Out of 275 patients [Table/Fig-1], 89 patients had thrombocytopaenia incidence of 32.4%. Male to Female ratio was 1.57:1, {168 boys(61.09%) and 107 girls(38.91%)}, Age range of patients was 1 month to 13 years (156 months) with Mean ± SD (39.278± 44.125 months). The source of admission was mainly from Paediatric wards (46.54%), emergency department (45.45%) Surgical wards (4.36%) and Operation theatre (3.64%). Sepsis was the most common cause (20.36%) for admission while the other causes were Pneumonia (14.91%), Meningitis (10.54%), Diabetic Ketoacidosis (8.36%), Enteric fever (7.27%), Tubercular Meningitis (4%), Infantile Tremor Syndrome (3.27%), Congenital heart disease (4%), Burns (1.82%), Brain Haemorrhage (0.73%), Hepatic abscess (0.73%), Renal (3.27%), Malaria (3.27%), Hepatitis (3.64%), Others (13.82%).

Out of these 89 patients, 43 patients (48.31%) had platelet count of less than 50 x 10^9 per L, 24 had platelet count between 50 to 99 x 10^9 per L (27.91%), and 22 patients had platelet count between 100 to 149 x 10^9 per L (24.72%). Total of 43 patients having platelet count of less than 50 x 10^9 per L received platelet transfusion. These 43 patients were transfused 10^3 units of Platelets (median number of units per patient was 2, maximum being 10). Platelet dose was approximately 5.5 to 8.5 x 10^{10} per transfusion. Average rise in platelets was $30.581\times10^3\pm12.92\times10^3$.

Among thrombocytopaenic patients [Table/Fig-2], Sepsis (25.84% vs 17.74% non-thrombocytopaenic patients) was the most common diagnosis while other thrombocytopaenic patients had Pneumonia (19.10%), Meningitis (13.48%), DKA (5.62%), Enteric fever (7.86%), Tubercular Meningitis (3.37%), Infantile Tremor Syndrome (2.25%), Congenital heart disease (5.62%), Burns (3.37%), Brain Haemorrhage (2.25%%), Hepatic abscess (1.12%), Chronic Renal Failure (3.37%), Malaria (2.25%) and Hepatitis (4.49%). There is a statistically significant association between throm bocytopaenia and mortality [Table/Fig-3] {29.21% vs 15.05%in non- thrombocytopaenic patients Odd's Ratio 2.3288(1.2673-4.2795), χ^2 =7.65 p-value=0.0053}.

A significant association was established between mortality in thrombocytopaenic patients of sepsis {OR 4.1481(1.333- 12.9052) p-value 0.012} [Table/Fig-3,4].

No statistically significant association was found between thrombocytopaenia and mortality in Pneumonia, Meningitis, DKA, Enteric fever, Tubercular Meningitis, Infantile Tremor Syndrome, Congenital heart disease, Burns, Brain Haemorrhage, Hepatic abscess, Chronic Renal Failure, Malaria, Hepatitis as number of patients per each disease is very less.

DISCUSSION

The incidence of thrombocytopaenia and relationship between thrombocytopaenia on admission in PICU and mortality in critically ill patients was analysed in this study. The age range of our patients was 39.278±44.125 months which is comparable to other studies [2,3,8]. In our study the source of admission was from Paediatric wards (46.54%), Emergency department (45.45%), Surgical wards (4.36%), Operation theatre (3.64%) and which is comparable to the study by Yilmaz et al., where admissions were mainly from hospital wards (70.2%) [2], Emergency Department (26.6%) and Operation room (3.2%) while the study by Agarwal et al., had main source of admission from Emergency Room 79.7% [3].

The reason for difference in source of admission in our study may be because in our institution emergency patients are shifted to paediatric ward directly if the bed is not available in PICU.

Parameters	Total
Gender (M:F)	1.57:1,{168 boys (61.09%) and 107 girls(38.91%)}
Age	39.278±44.125 months
Admission	
Paediatric ward	128 (46.54%)
Surgical ward	10(4.36%)
Operation theatre	12(3.64%)
Emergency	125(45.45%)
Platelet count	
100 to 149 x 10^9 per L	22(24.72%)
50 to 99 x 10^9 per L	24(27.91%)
< 50 x 10^9 per L	43 (48.31%)
Diagnosis	
Sepsis	56(20.36%)
Pneumonia	41(14.91%)
Meningitis	29(10.54%)
DKA	23(8.36%)
Enteric fever	20(7.27%)
TBM	11(4%)
ITS	9(3.27%)
Congenital heart disease	11(4%)
Burns	5(1.82%)
Brain Haemorrhage	2(0.73%)
Hepatic abscess	2(0.73%)
Renal	9(3.27%)
Malaria	9(3.27%)
Hepatitis	10(3.64%)
Others	38(13.82%)
Platelet transfusion	43(15.64%)
Mortality	54(19.64%)

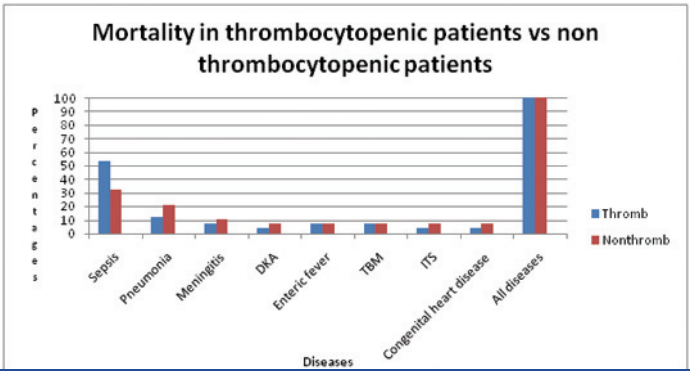
[Table/Fig-1]: Clinical features of patients in Paediatric Intensive Care Unit (n=275)

Disease	Thrombocytopaenic (n=89)	Percentage (%)	Non-thrombocytopaenic (n=186)	Percentage (%)	ODD Ratio (95% CI)	p-value
Sepsis	23	25.84	33	17.74	1.6157(0.8818-2.9605)	0.08
Pneumonia	17	19.10	24	12.90	1.5938(0.807-3.1475)	0.122
Meningitis	12	13.48	17	9.14	1.5493(0.7055-3.4021)	0.186
DKA(Diabetic ketoacidosis)	5	5.62	18	9.67	0.5556(0.1994-1.5482)	0.184
Enteric fever	7	7.86	13	6.99	1.136(0.4368-2.9542)	0.4844
TBM(Tubercular Meningitis)	3	3.37	08	4.30	0.7762(0.2009-2.999)	0.499
ITS(Infantile tremor syndrome)	2	2.25	07	3.76	0.5878(0.1196-2.8891)	0.3986
Congenital heart disease	5	5.62	06	3.22	1.7857(0.53-6.017)	0.2616
Burns	3	3.37	02	1.07	3.2093(0.5266-19.5604)	0.1938
Brain Haemorrhage	2	2.25	0	0	∞	0.1039
Hepatic abscess	1	1.12	01	0.53	2.1023(0.13-34.033)	0.5433
Renal	3	3.37	06	3.22	1.0465(0.2556-4.2845)	0.6014
Malaria	2	2.25	07	3.76	0.5878(0.1196-2.8891)	0.3986
Hepatitis	4	4.49	06	3.22	1.4118(0.3882-5.1348)	0.4138
Others	0	0	38	14.51	0	0.0001

[Table/Fig-2]: Diseases in thrombocytopaenic vs nonthrombocytopaenic

Disease	Thrombocytopaenic	Percentage (%)	Non-thrombocytopaenic	Percentage (%)	OR with 95%CI	p-value
Sepsis	14(23)	53.85	09(33)	32.143	4.1481(1.333-12.9052)	0.012
Pneumonia	03(17)	11.53	06(24)	21.428	0.6429(0.1362-3.0348)	0.435
Meningitis	02(12)	7.69	03(17)	10.714	0.9333(0.1309-6.657)	0.67
DKA	01(15)	3.85	02(18)	7.143	2 (0.1429-27.99)	0.539
Enteric fever	02(07)	7.69	02(13)	7.143	2.2(0.2373-20.3967)	0.439
TBM	02(03)	7.69	02(08)	7.143	6.0(0.3351-107.4259)	0.2787
ITS	01(02)	3.85	02(07)	7.143	2.5 (0.0998-62.6084)	0.583
Congenital heart disease	01(05)	3.85	02(06)	7.143	0.5 (0.0313-7.9942)	0.5757
All diseases	26	100	28	100	2.3288(1.2673-4.2795)	0.0053

[Table/Fig-3]: Mortality in various diseases thrombocytopaenic (26) vs non thrombocytopaenic (28)
* The no. of patients in bracket is the total number of patients suffering from the disease mentioned in column 1



[Table/Fig-4]: Mortality in thrombocytopaenic patients vs non thrombocytopaenic patients

In our study incidence of thrombocytopaenia was 32.4% (89) which is lower than study by Mussa et al., and Yilmaz et al., where it was 44.61% and 59.57% respectively while it was slightly higher than study by Agarwal et al., where incidence was 25% [2,3,8]. This difference in incidence may be because other studies were prospective and patients were monitored for longer duration of time.

Incidence of moderate thrombocytopaenia (platelet count 50 to 99 x 10^9 per L) in our study was 27.91% which is comparable to other studies [2,3,8].

Mortality in thrombocytopaenic patients was higher (29.21% vs 15.05%) and statistically significant {OR 2.3288 (1.2673-4.2795), χ^2 =7.65 p-value=0.0053} which is in consonance with other studies [2,9].

Mortality was significantly higher in thrombocytopaenic septic patients {(53.85% vs 32.143% in non thrombocytopaenic patients OR 4.1481(1.333-12.9052) p-value 0.012} which is comparable to other studies [2,3,8].

The reason for more mortality in Septic patients may be because of Multiple Organ Dysfunction (MODS) as MODS criteria for hematologic dysfunction is thrombocytopaenia i.e. platelet count < 80,000/mm^3 or decline of 50% in the platelet count from the highest value recorded over the last 3 days. We could not find any statistically significant relation between mortality and thrombocytopaenic patients with Pneumonia, Meningitis, DKA, Enteric fever, Congenital heart disease, TBM and ITS as number of patients in these groups is very less. From this study it can be inferred that thrombocytopaenia can be used as an independent predictor of overall mortality in PICU especially in cases of thrombocytopaenic septic patients. Only one study in PICU and few studies in NICU have been done in India but none has been done in this region of the country [3,9,10].

LIMITATION

The limitations of this study are that it includes small number of patients in certain groups and it does not allow great precision in the estimation of odds ratio and we may have missed some important risk factors. So the results need to be validated in a larger cohort.

CONCLUSION

From this study it can be concluded that mortality rate is higher in thrombocytopaenic patients and among the thrombocytopaenic patients, Sepsis is the most common diagnosis.

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PARTICULARS OF CONTRIBUTORS:
1. Assistant Professor, Department of Pediatrics, Guru Gobind Singh Medical College and Hospital, Faridkot, Punjab, India.
2. Professor and Head, Department of Pediatrics, Guru Gobind Singh Medical College and Hospital, Faridkot, Punjab, India.
3. Professor, Department of Pediatrics, Guru Gobind Singh Medical College and Hospital, Faridkot, Punjab, India.
4. Post Graduate Student, Department of Pediatrics, Guru Gobind Singh Medical College and Hospital, Faridkot, Punjab, India.
5. Assistant Professor, Department of Medicine, Guru Gobind Singh Medical College and Hospital, Faridkot, Punjab, India.
6. Assistant Professor, Department of Pediatrics, Guru Gobind Singh Medical College and Hospital, Faridkot, Punjab, India.
7. Assistant Professor, Department of Pediatrics, Guru Gobind Singh Medical College and Hospital, Faridkot, Punjab, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Amarpreet Kaur,
Assistant Professor, Department of Pediatrics, Guru Gobind Singh Medical College and Hospital, Faridkot, Punjab, India.
E-mail: dr.amarpreet12@gmail.com

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