

# Thrombocytopenia in Neonatal Intensive Care Unit and Role of Platelet Transfusion

Noshina Noreen, Samina T. Amanat, Sundas Ali  
Department of Pathology, PAEC General Hospital, Islamabad

## Abstract

**Background:** To determine frequency of thrombocytopenia in NICU and to find outcome of neonates receiving multiple platelet transfusion

**Methods:** In this cross sectional study, neonates with thrombocytopenia, admitted to neonatal intensive care unit (NICU) were included. Two milliliter of blood was collected in EDTA bottle and kept on a roller mixer for mixing until a platelet count done by automated haematology analyzer. Stained film was examined under light microscope to rule out platelet clumps and to ensure that platelets had been spread evenly before actual count was done. At least two platelet readings were taken during admission. Platelets were transfused to neonates at platelet count less than 50,000. Any mortality in neonates receiving platelet transfusion was recorded during hospital stay.

**Results:** The mean age of neonates was  $2.92 \pm 2.20$  days, 63.2% were male and 36.8% were females. Thrombocytopenia was present in 41.4%, percentage of neonates. Platelet transfusions were administered to 12.7% and recorded mortality was 4.5%.

**Conclusion:** Thrombocytopenia in neonates at NICU is higher while the outcome of neonates receiving platelet transfusion is appreciable.

**Key Word:** Thrombocytopenia, NICU, Platelet transfusion

## Introduction

Thrombocytopenia has been defined as a platelet count of less than  $150 \times 10^9/L$ . Almost 30% patients in the neonatal intensive care unit (NICU) can develop thrombocytopenia at some period during their hospital admission. Platelet transfusions are commonly given to NICU patients, which may be unwarranted in some cases.<sup>1</sup> Among term infants, only 2% are thrombocytopenic at the time of birth. The occurrence of thrombocytopenia in neonates is quite variable and depends upon the population studied. Various conditions relating to mother or fetus are

associated with thrombocytopenia like sepsis, birth asphyxia, low birth weight, prematurity, necrotizing colitis, exchange transfusion and some maternal conditions like hypertension, maternal idiopathic thrombocytopenic purpura. Sepsis is among the major causes of thrombocytopenia in neonatal age group and it rapidly aggravates within 24–48 hours after the start of infective process.<sup>2</sup> There has been a strong association between low platelet count and clinically important bleeding and according to transfusion guidelines, platelet count thresholds are still universally used as transfusion triggers. Apart from platelet count, there are also some other important determining factors for the bleeding risk in neonates.<sup>3</sup> Thrombocytopenia is regarded as a significant independent risk factor for sepsis-related mortality in neonates falling in the very low-birth weight category.<sup>4</sup> Many studies have described no major difference between the incidence and development of thrombocytopenia by either gram positive or gram negative bacterial sepsis but some studies have reported a higher rate of thrombocytopenia in neonates with gram negative sepsis.<sup>5-9</sup>

The frequency of severe thrombocytopenia in NICU is indirectly related to the birth weight and gestational age of the infant. Thrombocytopenia is a risk factor in cutaneous, pulmonary, gastrointestinal and CNS bleeding. Risk of thrombocytopenia in NICU is highest among preterm infants (baby born less than 36 weeks of gestation) and in low birth weight infants (having birth weight less than 2.5 kg) due to their restricted ability to compensate for the enhanced destruction of platelets.<sup>10</sup> Newborns who suffer from acidosis or hypoxia due to birth trauma developed thrombocytopenia.<sup>11</sup>

## Patients and Methods

This was a cross sectional study, done in Pakistan Atomic Energy Commission (PAEC) General Hospital, Islamabad from January to July 2015. Neonates of both gender admitted to NICU (neonatal intensive care unit) were included in study and neonates with congenital and chromosomal anomalies were excluded from study. Two milliliter of blood was collected in

EDTA bottle and kept on a roller mixer for mixing until a platelet count done by automated haematology analyzer. As a quality control measure a thin smear of each sample was made and stained with field stain. Stained film was examined under light microscope to rule out platelet clumps and to ensure that platelets had been spread evenly before actual count was done. Samples which were free of platelet clumps were catered. Hence any error which may be due to falsely low platelet count was eliminated. At least two platelet readings were taken during admission. Sample collection was done under aseptic technique. If platelet units were transfused to neonates, they were issued from blood bank of PAEC General Hospital with complete quality control of platelet unit. Platelets were transfused to neonates at platelet count of 50,000 or below. Any mortality in neonates receiving platelet transfusion was recorded during hospital stay. Qualitative variables like gender, thrombocytopenia, platelet transfusion and mortality were calculated as frequencies and percentages. Effect modifiers like age, gender, birth weight and gestational age were controlled by stratification. Post-stratification chi-square test was applied. P<0.05 was taken as level of significance.

### Results

Majority of neonates (78.9%) were between 1-3 days of life. (Table 1). Eighty four ( 63.2%) were males while 36.8% (n=49) were females. Seventeen (12.8%) neonates had platelet count of less than 50X10<sup>9</sup>/L (Table 2). Majority of neonates (79.7%) had birth weight between 3-4 kgs. Frequency of thrombocytopenia in NICU was 41.4%(Table 3). Majority (75.18%) had no bleeding manifestations (Table 4). The neonates who received platelet transfusion were 12.7% (n=17)(Table 5). Mortality was 4.5% (Table 6).

**Table 1:Age distribution of neonates(n=133)**

Age(days)	Number	Percentage
1-3	105	78.9
>3	28	21.1
Mean±SD	2.92±2.20	

**Table 2:Frequency and percentage of platelet count**

Platelet count (X10 <sup>9</sup> /L)	Number	Percentage
<50	17	12.8%
50-149	38	28.5%
150-250	30	22.5%
250-500	48	36.0%

**Table 3: Frequency and percentage of thrombocytopenia**

Thrombocytopenia	Number	Percentage
Yes	55	41.4
No	78	58.6

**Table 4: Bleeding manifestations-Frequency**

Bleeding manifestations	Number	Percentage
Yes	33	24.82
No	100	75.18

**Table 5: Frequency and percentage of neonates receiving platelet transfusion**

Transfusion	Number	Percentage
No	116	87.3
Yes	17	12.7

**Table 6: Outcome and mortality**

Mortality	Number	Percentage
Yes	6	4.5
No	127	98.5

### Discussion

Thrombocytopenia, defined as a platelet count of fewer than 150×10<sup>9</sup>/l, is a common abnormal hematological finding in neonatal period. Approximately 30% of patients admitted in NICU develop a low platelet count at certain stage during their hospital stay. Platelet transfusions are commonly given to NICU patients, but may not be necessary in each and every case. <sup>12</sup> Improvements in transfusion guidelines are required for defining the safe lower limit for platelet transfusion in both sick and stable neonates. In addition, there is a necessity for setting up effective platelet transfusion practices for sick neonates, and improving the therapy for conditions aggravating thrombocytopenia. It remains unclear whether platelet transfusions are beneficial in the majority of infants with no or minor bleeding symptoms. Bleeding manifestations in our study were related to skin in most of cases. Some showed gastrointestinal bleeding. In a study of 3652 neonates, 5 percent developed severe thrombocytopenia ( platelet count less than 60,000 x 10<sup>9</sup>/L) with 34, 39, and 28 percent of infants having platelet count nadirs of <20, 20 - 39 and >40 x 10<sup>9</sup>/L, respectively. <sup>13-15</sup>

There are conflicting reports regarding the connection between thrombocytopenia and intraventricular haemorrhage (IVH). Although no association was found by some researchers like Lupton et al, <sup>[16]</sup> Beiner et al in their study , they had noted a strong relationship between neonatal thrombocytopenia and IVH mainly between grades 3 and 4. <sup>16,17</sup> In our study, the incidence of IVH in severely thrombocytopenic infants was not increased.

Majority of the neonates with a low platelet count have a moderate degree of thrombocytopenia which resolves when the underlying cause is appropriately managed. We recorded 12.78% of the cases who received transfusion, which is lower than in a study which revealed about 25% received one or more transfusion.<sup>18</sup>In a current study, Stanworth et al showed that the transfusion of platelet concentrates has a more controversial role in neonates, because the neonatal thrombocytopenia is one of the usual findings in premature neonates.<sup>19</sup> The chief causative factors include intrauterine growth retardation or maternal hypertension in which the infant presents with a low count in the immediate post-natal period, and extreme sepsis or necrotizing enterocolitis, which are the common illnesses associated with thrombocytopenia in neonates greater than 72 hours of age.<sup>20</sup> No evident relationship was found between platelet count and major hemorrhagic manifestation. Cardiorespiratory morbidity is considered to be the main contributing factor in occurrence of periventricular and intraventricular hemorrhage in the neonatal age. Prophylactic platelet transfusions are given commonly in premature neonates having thrombocytopenia.<sup>21-23</sup> There is extensive difference in the pre-transfusion thresholds for platelet level and there has been a striking disparity in the practices of platelet transfusion between different hospitals in different countries.

Von Lindern et al. piloted a data analysis research in the Netherlands, concluding that the neonatal intensive care units with a higher platelet transfusion rate did not have inferior chances of clinically relevant bleeding.<sup>24</sup> Two large observational studies have shown that most neonates with severe thrombocytopenia receive platelet transfusions according to previously recommended neonatal intensive care unit (NICU) thresholds ( $<50 \times 10^9/L$ ).

Platelet transfusions can be a life-saving measure in patients with hemorrhagic symptoms due to thrombocytopenia. Nevertheless, more than 95% of platelet transfusions in the NICU are used prophylactically, issued without any clinical signs of bleeding, the aim in mind being that the transfusion will avert hemorrhagic propensity. The benefits of these transfusions remain unverified. However, the risks of transfusion are well recognized in literature, and multiple use of platelet transfusions can enhance these possibilities.<sup>25</sup>

## Conclusion

Frequency of thrombocytopenia in neonates at NICU

is higher while the outcome of neonates receiving platelet transfusion is appreciable in our population.

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**Contribution of Authors:** Noshina Noreen=A,B,C,D;Samina T.Amanat=A,C,F;Sundas Ali=A,C,E

**Key for Contribution of Authors :** A= Conception/ Study/ Designing /Planning; B= Experimentation/Study conduction;C=Analysis/Interpretation/ Discussion; D= Manuscript writing;E= Critical review;F= Facilitated for reagents/Material/Analysis