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Frequency distribution of blood components usage in neonatal intensive care unit in Shahid Sadoughi Hospital, Yazd, Iran, 2018

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Abstract

Background: Blood transfusion is a relatively common practice in neonatal intensive care units (NICUs). Regarding that few studies have been conducted on infants in neonatal intensive care unit (NICU), this study was investigated the frequency of blood components usage for preterm infants in NICU.

Materials and Methods: This study was a cross-sectional descriptive-analytical study and was conducted on all neonates admitted to NICU of Shahid Sadoughi hospital. Information such as gestational age, sex, birth weight, and cause of hospitalization, number of injections, transfusion information, newborn status and delivery type were extracted from medical records. Chi-square test was used for the analysis of data. Statistically, P-value< 0.05 was assumed significant.

Results: In study, 44.6 % of patients were hospitalized due to prematurity and 19.5% due to respiratory distress syndrome. Among 816 NICU admissions, 370 (45.3%) received one or more blood components during their hospital stay, 61.6% received one, 26.2% two and 12% received three or four types of blood components. In total, 1719 blood components were requested in NICU. Of these, 21.5% were not used. The most frequent blood components used for neonates were fresh frozen plasma (FFP) (60%), leukoreduced red blood cells (RBCs) (26.5%) and platelet units (9.2%). Moreover, there was significant difference between the frequency using of blood components in terms of gestational age (p=0.001), birth weight (p=0.001), type of delivery (p=0.04), ABO blood group (p=0.001) and mortality (p=0.001).

Conclusion: The demand for blood components in NICU was high and one-fifth of requested blood was not used. Considering the high blood component usage, it is necessary to investigate the appropriateness of demands and transfusion of blood components in NICU. In addition, parameters including gestational age, birth weight and, type of delivery were related to the frequency of using blood components in NICU.

Keywords: Birth weight, Blood component, Blood transfusion, Gestational age, Platelet

Introduction

Premature neonates and neonates with low birth weight (1-3) and very low birth weight (VLBW) are considered as a class of patients requiring high blood transfusion (16 look). About 40% of neonates with birth weight 1,000–1,500 g and 90% of neonates with birth weight 1,000 g may need transfusion (4). Majority of these transfusions occurs in neonatal intensive care units (NICU) (5). Blood transfusion is done according to clinical judgment and condition (6). Transfusions of red blood cells (RBCs), fresh frozen plasma (7), platelets, leukocyte and cryoprecipitate (6) are critical therapies for neonates in the NICU (8). Packed red blood cell transfusions account for 10% to 15% of all blood transfusions. More than 80% of these neonates need multiple transfusions. Discovering the frequency, risk factors, and reasons of transfusion in this population is significant for helping to these neonates (9, 10).

Risks of transfusion in neonates are metabolic complications including

hypoglycemia hyperkalemia, as well as hypocalcemia. In addition, immunologic complications, infectious complications, and transfusion-related adverse outcomes are considered as other risk factors (10). Studies reported that standard pattern of blood components transfusion varies in diverse regions and clinical conditions (6). Most of the demands for blood component are not used (11). In addition, a huge amount of blood component is often wasted because low amount of blood supply is required for the neonates (12).

Given that few studies have been done in this regard in our city, this study was investigated the distribution of blood components in NICU of Shahid Sadoughi Hospital, Yazd, Iran, during 2018.

Materials and Methods

This cross-sectional descriptive-analytical study was conducted on all neonates admitted to NICU of Shahid Sadoughi Hospital during 2018. Before initiating, the study was approved by ethical committee of Shahid Sadoughi University (IR.SSU.MEDICINE.REC.1395.358)..

First, information such as gestational age, sex, birth weight, cause of hospitalization, number of used components, transfusion information, and newborn status were extracted from medical records.

Statistical analysis

Data were entered to SPSS, version 19. Chi-square was used for statistical analysis. P-value <0.05 was statistically considered significant.

Results

This study was conducted to evaluate the frequency distribution of blood components in NICU of Shahid Sadoughi Hospital. Totally, 1719 blood components were requested and 1350 (78.5%) units were transfused in NICU during 2018.The total number of neonates admitted to intensive care unit was 816. Among them, 370 neonates (45.3%) received blood components. In addition, 290 patients (78.4%) were alive and 80 (21.6%) were dead. Furthermore, natural delivery and cesarean section were observed in 30.3 % and 69.7% of patients, respectively. Frequency distribution of the cause of hospitalization in NICU showed that prematurity, respiratory distress, surgery, sepsis, jaundice, anemia, congenital heart disease, and others diseases were observed in 165 (44.6%), 72 (19.5%), 44 (11.9%), 31 (8.4%), 17 (4.6%), 7 (1.9%), 6 (1.6%), and 28 (7.6%) patients, respectively.

Frequency distribution of blood components usage in hospitalized neonates in NICU is demonstrated in Table I. As demonstrated in Table 1, the most frequency distribution of blood component was FFP. Frequency of using blood components in terms of gestational age, type of delivery, mortality, and birth weight in intensive care unit is shown in Table II. As shown in Table II, there was significant difference in terms of type of delivery, mortality, gestational age, and birth weight ($p<0.05$). Most of blood components were used for neonates with the gestational age of less than 30 weeks ($p<0.001$). Most of neonates that received blood components were born through cesarean section ($p<0.05$). Table III shows frequency distribution of blood component usage in terms of blood group. Among 1350 transfused blood components, 398 (29.5%) had O + blood group, 354 (26.2%) had A + blood group, and 250 (18.5%) had B + blood group. Table IV shows frequency of using blood components. As shown in Table IV, the most used component was fresh frozen plasma (FFP) and leukoreduced red blood cells. Frequency distribution of neonates in terms of using blood components is shown in Table V. As shown in Table V, 309 (83.5%), 171(46.2%) and 44 (11.6%) neonates consumed fresh frozen plasma, leukoreduced red blood cell, and platelet, respectively.

Table I: Frequency of blood components component usage in hospitalized neonates in NICU

Blood Components	Number	Percent
Fresh frozen plasma (FFP)	814	60.3
Leukoreduced RBCs	358	26.5
Platelet	124	9.2
Red blood cell	51	3.8
Washed RBC	2	0.1
Plateletpheresis	1	0.1
Total	1350	100

Table II: Frequency distribution of blood components usage in terms of type of delivery, mortality, gestational age, and birth weight

Parameters		Leukoreduced RBC	RBC	FFP	Platelet	Washed RBC	Platelet pheresis	p-value
Delivery	Normal vaginal delivery	89 (24.9%)	23 (45.1%)	222 (27.3%)	39 (31.5%)	1 (50%)	0(0%)	0.04
	Cesarean section	269 (75.1%)	28 (54.9%)	592 (72.7%)	85 (68.5%)	1 (50%)	1 (100%)	
Gestational age	Less than 30 weeks	182 (50.8%)	7 (13.7%)	357 (43.9%)	23 (18.5%)	0 (0 %)	1 (100%)	0.001
	30-34 weeks	62(17.3%)	5 (9.8%)	179 (22%)	34 (27.4%)	0(0%)	0 (0%)	
	More than 35	114 (31.8%)	39 (76.5%)	278 (34.2%)	67 (54%)	2 (100%)	0 (0%)	
Birth weight	Less than 1000 g	91 (25.4%)	2 (3.9%)	164 (20.1%)	17 (13.7%)	0 (0%)	0 (0%)	0.001
	1000-1499 gr	92 (25.7%)	7 (13.7%)	218 (26.8%)	22 (17.7%)	0(0%)	0 (0%)	
	1500-2499 gr	75 (20.9%)	7 (13.7%)	184 (22.6%)	26 (21%)	2 (100%)	1 (100%)	
	2500-3999	100 (27.9%)	33 (64.7%)	230 (28.3%)	57 (46%)	2 (100%)	0 (0%)	
	More than 4000	0 (0%)	2 (3.9%)	1 8(2.2%)	2 (2.6%)	0 (0%)	0 (0%)	
Mortality	Alive	253 (70.7%)	33 (64.7%)	543 (66.7)	52 (41.9%)	0 (0%)	1 (100%)	0.001
	Dead	105 (29.3)	18 (35.3%)	271(33.3 %)	72 (58.1%)	2 (100%)	0 (0%)	

Table III: Frequency of blood component type in terms of blood group

Blood type	O+	O-	B+	B-	AB+	AB-	A+	A-	p-valu
Leukoreduced RBC	103 (28.8)	18 (5%)	62 (17.3%)	23 (6.4%)	30 (8.4%)	5 (1.4%)	106 (29.6%	106 (29.6%)	
Red blood cell	12 (23.5%)	6 (11.8%)	10 (19.6%)	3 (5.9%)	6 (11.8%)	0 (0%)	14 (27.5%	14 (27.5%)	0.001
Fresh frozen plasma	260 (31.9%)	62 (7.6%)	162 (19.9%)	55 (6.8%)	56 (6.9%)	7 (0.9%)	200 (24.6%	200 (24.6%)	
Platelet	23 (18.5%)	21 (16.9%)	15 (12.1%)	24 (19.4%)	6 (4.8%)	0 (0%)	33 (26.6%	33 (26.6%)	
Washed RBC	0 (0%)	0 (0%)	1 (50%)	0 (0%)	0 (0%)	0 (0%)	1 (50%)	1(50%)	
Plateletpheresi	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	
Total	398 (29.5%)	107 (7.9%)	250 (18.5%)	105 (7.8%)	99 (7.3%)	0 (0%)	26.2 354	354 (26.2%)	

RBC: red blood cells

Table IV: Frequency of blood components usage

Parameters	Used component	Not used component	Total requested components
Fresh frozen plasma	814(84.1%)	154 (15.9%)	968 (100%)
Leukoreduced RBC	358 70.9%)	147 (29.1%)	505 (100%)
Platelet	124 (87.3%)	18 (12.7%)	142 (100%)
Red blood cell	51 (52%)	47 (48%)	98 (100%)
Washed RBC	2 (66.7%)	1 (33.3%)	3 (100%)
Plateletpheresis	1 (100%)	0 (0%)	1(100%)
Cryo	0 (0%)	1 (100%)	1 (100%)
Whole Blood	0 (0%)	1 (100%)	1 (100%)
Total	1350 (78.5%)	369 (21.5%)	1719 (100%)

Table V: Frequency distribution of neonates in terms of using blood components

Blood component	Not used	Used	Total
Leukoreduced RBC	199 (%53.8)	171 (%46.2)	370(100%)
Red blood cell	330 (%89.2)	40 (% 10.80)	370(100%)
Fresh frozen plasma	61 (%16.5)	309(%83.5)	370(100%)
Platelet	327 (%88.4)	43 (%11.6)	370(100%)
Washed RBC	368 (%99.5)	2 (%0.5)	370(100%)
Plateletpheresis	369 (%99.7)	1 (%0.3)	370(100%)

Discussion

Transfusion therapy is a common procedure in NICU (5, 13). It is considered as one of the important principles in the treatment of neonates (7). This was the first epidemiologic study regarding blood component usage in NICU of Yazd that could be the basis for further evaluation of the conformity of blood consumption in the NICU with blood transfusion guidelines. The findings showed that 45 % of neonates received blood component which was higher in comparison to other studies. In Borna et al., study, among 1106 neonates admitted to NICU, 221 neonates (19.98%) received blood components (6).

Mosayebi et al., assessed the prevalence of blood transfusion in Kashan province and reported that the frequency of blood component transfusion to neonates was 21.8% (7). Many parameters, including length of hospital stay, requirement for dopamine support, birth weight and initial hematocrit, and necrotizing enterocolitis were correlated to the number of transfusions (14).

In the current study, there was a significant relationship between the number of blood transfusions and gestational age. Mohagheghi et al., assessed the number of blood component transfusions in premature neonates in Hazrat Rasoul hospital (15). Their findings showed similar results to our study. Borna et al., evaluated the prevalence of blood transfusions in newborns and reported a significant relationship between frequency of the use of blood transfusion and gestational age (6) that was consistent with the present study.

The most common cause of hospitalization in the current study was prematurity and respiratory distress syndrome. Lookzadeh et al., assessed the distribution of preterm complications in neonates and reported that the most common reason for hospitalization was prematurity complications, respiratory distress syndrome, and respiratory failure. The findings of this study were consistent with those detected in this study (16). Tajali et al., also reported that the most important reason for hospitalization was due to prematurity. Therefore, investigation of possible causes and prevention of prematurity birth can reduce the need for blood transfusion in neonates (17). Frequency distribution of the use of blood components in terms of birth weight in NICU showed that there was a significant difference between frequency distribution of blood components usage in terms of birth weight in NICU, so that neonates with birth weight less than 2500 g received 67% of blood components than other groups. Mohagheghi et al., reported a relation between blood components and birth weight which was consistent with findings of this study (15). Tajali et al., achieved the same results and reported that the number of blood transfusion was related to birth weight (17). Borna et al., reported an inverse relation between birth weight and the use of blood components (6). Strauss et al., also reported a significant relationship between the birth weight and the need for blood transfusion (18). According to the results of most studies, birth weight is the main parameter for determining the frequency of blood transfusion.

In the current study, no significant difference was seen between gender and the use of blood transfusion. Tajali et al., assessed RBC transfusion in premature neonates in Mofid hospital and reported no significant difference between gender and the use of blood components (17). Verma et al. achieved the same results. Therefore, it seems that gender did not affect blood component transfusion (19).

Frequency of the use of the blood components showed that the most commonly used components were FFP

(60%). In some studies in Iran, FFP was reported as the most frequent blood component used for neonates with a range of 47.9% to 49% (6, 7, 20). In the current study, 37.8% of admitted neonates received FFP transfusion. The rate of FFP transfusion in other studies was 2.8 to 12% (21, 22). They showed that 8% of admitted neonates received one or more FFP transfusion and high proportion (60%) of transfusions were not compliant with guidelines in their NICUs, and 63% of neonates received FFP prophylactically, without any evidence of bleeding (21). However, in the present study, the frequency of FFP usage was higher than that in other studies. Moreover, FFP transfusion continues to be a common practice in the NICUs but there is concern about the appropriateness of its use. Therefore, NICU should implement guidelines for the utilization of FFP to reduce the adverse reactions of transfusion and discard of components.

Conclusion

According to these findings, the demand for blood components in NICU was high and one-fifth of requested blood was not used. Approximately half of the admitted neonates received blood components in the NICU. Considering the high blood component usage, it is necessary to investigate the appropriateness of demands and transfusion of blood components and optimize the usage of blood components in the NICU. Moreover, it was revealed that parameters including gestational age, birth weight, and type of delivery affected the frequency of using blood components in the NICU.

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Conflict of interest

The authors declare no conflict of interest.

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