IJABR

International Journal of Advanced Biotechnology and Research (IJABR)
ISSN 0976-2612, Online ISSN 2278–599X,
Vol-9, Issue-4, 2018, pp250-255
http://www.bipublication.com

Research Article

A cross sectional on necrotizing enterocolitis in low birth weight neonates

[1]Umair Mustafa, [2]Adeela Saif

and [3]Hafiza MubashraTayyaba

[1]Medical Officer, DHQ Hospital, Sheikhupura
[2]Woman Medical Officer, DHQ Hospital, South City Okara
[3]Woman Medical Officer, DHQ Hospital, South City Okara

Received: 04/11/2018 Accepted: 22/11/2018 Published: 24/11/2018

ABSTRACT

Objective: To assess the necrotizing enterocolitis in low birth weight neonates presenting at DHQ Hospital, Sheikhupura

Material and methods: This cross sectional was conducted at Department of Pediatrics DHQ Hospital, Sheikhupura from March 2017 to September 2017. A total of 290 neonates were taken after taking informed consent. Babies receiving RBC transfusion was enrolled and shall be monitored till 48 hours post transfusion for developing of NEC. Standard and intensive care was ensured in all cases. I collected the data on predesigned proforma.

Results: In this study 74(25.5%) neonates had NEC. Among these neonates frequency of NEC was highest in the age group 2-10 days (52.7%) followed by 11-20 days (28.4%) and >20 days (18.9%) respectively. Birth weight was also significantly associated with frequency of NEC. Preterm neonates also had higher frequency of NEC as that of neonates who had term birth. However no statistically significant association was seen between number of transfusions and NEC.

Conclusion: A high frequency of NEC among neonates with RBC transfusion. So it is important to adopt and implement such strategies for minimizing incidence of NEC.

Keywords: Necrotizing Enterocolitis, Very low birth weight, Neonates, Red blood cell

INTRODUCTION

In neonatal age, Necrotizing Enterocolitis (NEC) is one of the life threatening disease followed by bowel necrosis and other multisystem organ failure.[1, 2] Infants having very low birth weight (VLBW: <1500 g) or very preterm with incidence of approximately 5% and infants having extremely low birth weight (ELBW: <1000 g) or extremely preterm with incidence of approximately 10% by this NEC disease.[3] On comparison, extremely preterm or VLBW infants associated with NEC leading cause of morbidity than infants who do t have NEC.[1]

It is well established to know that no of cases of NEC are commonly occuring in premature infants with low birth weight.[3, 4] Among most common and highly risk features for developing of NEC are manufacturing milk and aggressive feeding.[5] According to literature review, about 80% preterm or VLBW infants when transfused with packed red blood cell atleast once a time, enough to maintain their anemia.[6] Historically, there is contraindicted study about transfusion associated NEC(TA-NEC) or transfusion-related acute gut injury, infants after transfusion of packed red

blood cell (pRBC) have greater chances to develop NEC within 48 hours of transfusion. [7]

Similar report is published about risks and advantages of blood transfusion in extremely preterm infants (extremely low birth weight [ELBW], <1000 g) but the result of this study are not satisfactory.[8] One group of reseacherhypothesized,very low birth weight (VLBW) infants have highly susceptible for development of retinopathy of prematurity (ROP) or for chronic lung disease (CLD) and NEC after packed red blood cell (PRBC) transfusions .[9, 10] According to this study, about 25% infants suffered from Necrotizing Enterocolitis after packed red blood cells (PRBC) transfusion.[10]

In 2014 a study was conducted in which about 5.8% cases of NEC after packed red blood cells (PRBC) transfusion was reported.[6]

Clinical trials was performed for studies assessing the rate of occurance of Necrotizing Enterocolitis in very low birth weight neonates after 48 hours of packed red blood cell transfusion. Internationally there was inadequate research that Necrotizing Enterocolitis develop after transfusion or not i.e. its frequency varies from 5.8%[6]-25% but a local study is reported about this tranfusion association NEC.[10]

By this research work we observe the higher rate of occurance of NEC after blood transfusion in these neonates so that we can minimize the incidence of NEC hereafter by applying different preventing method. By reducing frequency of NEC we can ultimately minimize NEC related complications such as nosocomial infections, lower levels of nutrient intake, delayed growth, and have longer duration of intensive care and hospital stay.

MATERIALS & METHODS

This cross sectional was conducted at Department of Pediatrics DHQ Hospital, Sheikhupura from March 2017 to September 2017. Total 290 neonates aged 0-28 days of either gender who have VLBW (as per operational definition) were included in this studyNeonates received at least 1 pack of RBC transfusion during their hospital stay were selected.

Patients diagnosed with NEC at an outside hospital prior to transfer, neonates with birth Asphyxia (APGAR score >7) and PDA and umbilical catheter was excluded as they risk factor for NEC were excluded.

After taking informed consent form parents or attendants a detailed history was taken along with their age (days), gestational age, weight, gender and address. Very Low Birth Weight Baby was defined when a neonate has birth weight <1500 g and preterm birth was defined as birth <37Ayeeks of gestation (according to dating scan from antenatal record). Babies receiving red blood cell transfusion was enrolled and shall be monitored till 48 hours post transfusion for developing of NEC. NEC wasdiagnosis of according to Bell's stage >II. All the data collected was entered and analyzed using SPSS version 22. Quantitative variables like age, weight of neonates (g) and gestational age (weeks) was presented inform of mean ± S.D. Qualitative variables like gender, preterm, no. of transfusion, NEC was presented in form frequency and percentage. Data was stratified for age, gestational age, gender, birth weight, prematurity, and no. of transfusions to address effect modifiers. Post stratification Chi-square test was applied and p-value < 0.05 was considered as significant.

RESULTS

Mean age of neonates was 14.60±7.82 days. Minimum and maximum age of neonates was 2 and 28 days. There were 143(49.31%) male and 147(50.69%) female neonates included in the study.Mean birth weight of neonates was 12255.42±148.421 gm.Mean gestational age of neonates was 35.97±2.625 weeks. There were 167(57.6%) neonates who had preterm birth and 123(42.4%) neonates birth was term.There were 86(29.7%) neonates who were transfused once, 100(34.5%) neonates were transfused twice and 104(35.95%) neonates were transfused thrice. NEC was positive in 74(25.5%) neonates.

Neonates who were diagnosed with NEC among them the highest frequency of NEC was seen in the age group 2-10 days (52.7%) neonates followed by neonates who were 11-20 days (28.4%) and last in neonates who were >20 days of age. (18.9%). Statistically significant association was seen between age groups of neonates with frequency of NEC. i.e. (p-value=0.003)Gender of neonates was not significantly associated with NEC. i.e. (p-value=0.891). Gestational age of neonates was significantly associated with NEC. Neonates with less gestational age had high frequency of NEC. 32-35 weeks: 62.2% & 36-40 weeks: 37.8% i.e. (p-value=0.002). Highest frequency of NEC was seen in neonates who were in the weight category 1000-1150 (29.7%) followed by 1151-1250 weight category (28.4%), 1251-1400 weight category (28.4%) and lastly neonates who were >1400 gm in weight (13.5%) among them frequency of NEC was lowest. Frequency of NEC was significantly associated with weight of neonates. i.e. (p-value=0.007). Frequency of NEC was significantly higher in neonates who had preterm birth as that of neonates who had term birth. NEC: (Preterm Birth) 73% vs. (Term Birth):27%, (p-value=0.002). Frequency of NEC was not significantly associated with number of transfusion a neonate had. Neonates with a single transfusion had the highest frequency of NEC (36.5%) followed by 2 transfusions (32.4%) and neonates who had 3 transfusions among them frequency of NEC was the lowest (31.1%), (p-value=0.314).

Table-1: Age distribution of neonates

	Age of neonates (days)	**Weight of neonates (kg)**	**Gestational age (weeks)**
Mean	14.60	1255.42	35.97
SD	7.827	148.421	2.625
Min	2	1000	32
Max	28	1500	40

Table-2: Association of NEC with different parameters

Parameters		**NEC**		**p-value**
		Yes	**No**	
Age groups (days)	**2-10**	39(52.7%)	67(31%)	**0.003**
	11-20	21(28.4%)	78(36.1%)	
	20-28	41(18.9%)	71(32.9%)	
Gender	**Male**	37(50%)	106(49.1%)	**0.891**
	Female	37(50%)	110(50.9%)	
Gestational age (weeks)	**32-35**	46(62.2%)	89(41.2%)	**0.002**
	36-40	28(37.8%)	127(58.8%)	
Birth weight (kg)	**1000-1150**	22(29.7%)	64(29.6%)	**0.007**
	1151-1250	21(28.4%)	27(12.5%)	
	1251-1400	21(28.4%)	71(32.9%)	
	>1400	10(13.5%)	54(25%)	
Gestational age (week)	**Preterm Birth**	54(73%)	113(52.3%)	**0.002**
	Term Birth	20(27%)	103(47.7%)	
Blood Transfusions	**1**	27(36.5%)	59(27.3%)	**0.314**
	2	24(32.4%)	76(35.2%)	
	3	23(31.1%)	71(37.5%)	

DISCUSSION

Case-fatality rates of NEC associated acute mortality is reported as 20% to 30% among preterm infants.[11, 12] With reference to 2 risk factors, RBC transfusion and anemia, despite decade of contraindicated research, The pathogenesis of developing NEC in preterm infant

is not clear. A subset analysis of different multiple retrospective observational studies determined an association between RBC transfused and NEC, exposed transfusion-RBC had increased risk of NEC (adjusted odds ratio, 2.0 [95% CI, 1.6-2.5]).[13] Recently, another observational studies determined no association between RBC transfusion and NEC or knowing this transfused risk factor further prevention can be made.[6, 14]

In this research work 74(25.5%) neonates developing NEC was observed.With increase in age of neonates the chances of NEC decreases. The rate of occurance of NEC was greater with age group of 2-10 days (52.7%) than 11-20 days (28.4%) and >20 days (18.9%) respectively. On comparison within of gestational age, rate of occurance of NEC was greater neonates with less gestational age i.e. 32-35 weeks (62.2%) vs neonates having gestational age 36-40 weeks (37.8%).

The rate of NEC associated birth weight is generally reported to be greater among lower birth weight neonate than high birth weight neonates.so as birth weight increases NEC incidence decreases. With respect to birth weight highly significant data is recorded as 1000-1150 gm: 29.7%, 1151-1250 gm: 28.4%, 1251-1400 gm: 28.4% &>1400 gm: 13.5% . On comparison of Preterm neonates with term neonates. The rate of incidence of NEC increases in preterm than term birth. i.e. Preterm: 73% vs. Term Birth: 27%. A decrease change was reportd in the incidence of NEC with the increase in number of transfusion to the neonates. However no drastically change was recorded between NEC association number of transfusions .

Recently multiple studies was conducted between transfusion and transfusion associated NEC. A subset of qualitative and quantitative studied data from multiple selected studies resulted, highly significant relation between PRBC transfusion and transfused developing NEC.[15] Another current trial data was reportd similar result of transfusion and transfused developing NEC for prevention of its risk factor and complications.[13]

However recently 2 conflicted studies was conducted which determined PRBC transfusion was not a risk factor for developing NEC.[7, 16] Some researcher said on holding of enteral feedings during and after PRBC transfusion can be minimize the developing of NEC.[6]

Currently a study was conduted by Ravi M. Patel, according to this study reported that RBC transfused infants of week 8 had greater degreee of incidence of NEC than non-transfused infants i.e transfused infants 9.9% (95% CI, 6.9%-14.2%) vs non-transfused infants 4.6% (95% CI, 2.6%-8.0%).[17] Sharma et al, a study reported no association of RBC transfusion and degree of incidence of NEC.[16]

In this study rate of occurance of NEC was entirelly with RBC transfused neonates moreover NEC was remarkably concorded with number of blood transfusion, age of neonates, gestational age, birth weight, and preterm birth.

Elabiad MT studied infants with lower BW (924 vs 1042 g) after PRBC transfusion developed NEC about 5.7%. Infants with BW≤750 , 751–1000 , 1001–1250 g and 1251–1500 g (n=52, 51, 46 and 25, respectively) had a relative risk of 0.14, 0.46, 1.83 and 1.78 ($p<0.01$, 0.02, 0.07 and 0.17), respectively, to develop NEC after an exposure.

Infants having BW (1001–1500) have greater risk for developing NEC after transfusion while transfused neonates less likely to be associated with NEC in≤1000 infants.[18]

In this research low birth weight infants was highly risk features for developing of NEC. In this study 25.5% neonates reported after PRBC transfusion. This is much significant than result of Elabiad MT. However the distinction from other study may be due to the difference in sample size in both the studies.

A study was reported by Brazilian, the incidence of NEC in VLBW preterm neonates association RBC transfusion was about 7.2% . RBC transfusions were highly concerned with gestational age (OR: -1.098; 95%CI: -1.12 to -1.04) &necrotising enterocolitis (3.80; 2.26-6.41).[19] Frequency of NEC in this study was much

greater than previous one. The difference in result can be explained by difference in sample size. However less gestational age also risk factor for significantly development of NEC. The result about gestational age matched to result of Brazilian study. A report is published by Parveshm Garg, in his study all admitted patient in NICU was observed and studied in which infants ≤34 weeks gestation was about 3.67% and incidence of developing NEC during the study period was 1.45% . Infants significantly developed transfusion-associated NEC with risk factor of lower gestational age at birth, had lower birth weight.[20]

The result of Parveshm Garg study is same as result of this study regarding to developing of NEC higher association with small gestational age at birth and lower birth weight. Development of NEC significantly greater in neonates with risk features of small gestational age and low birth weight. During hospital stay period more than half infants with very low-birth-weight (VLBW, ≤1500 g) require transfusion of PRBC once or more than once a time so there should be significantly study regarding to role of RBC transfusion and anemia in the development of NEC.[21]Previously studies regarding to associations between transfusion, anemia, and NEC were significantly restricted due to having small sample size, case-control design, or short time of exposures. As conclusion of all researchers was limited and not well defined so the need for prospective study design in which exposure RBC, episode of anemia, and of NEC can be uniformly and efficiently analyzed.[13]

The explanation regarding to association between NEC and transfusion is highly significant because neonates are heavily and frequently transfused. During hospitalization because of multiple laboratory testing and immature hematopoietic system, infants with VLBW require at least 1 transfusion are within range of 50% - 94%.[6] In the NICU an evidence based study about risks associated with pRBC transfusion is extremely important for making better decision clinically. Furthermore practitioner know the risk features characterized by transfused NEC and also commonly know the risks of blood products, such as infection or graft-vs-host disease.

CONCLUSION

Results of this study showed a high frequency of NEC among neonates with RBC transfusion. So it is important to adopt and implement such strategies for minimizing incidence of NEC. While doing so we can ultimately reduce NEC and its related complications such as nosocomial infections, lower levels of nutrient intake, delayed growth, and have longer duration of intensive care and hospital stay.

REFERENCES

1. McGuire W, Young L, Morgan J. Preventing necrotising enterocolitis in very preterm infants: current evidence. Paediatrics and Child Health 2015;25(6):265-70.
2. Yee WH, Soraisham AS, Shah VS, Aziz K, Yoon W, Lee SK. Incidence and timing of presentation of necrotizing enterocolitis in preterm infants. Pediatrics 2012;129(2):e298-e304.
3. Patel BK, Shah JS. Necrotizing enterocolitis in very low birth weight infants: a systemic review. ISRN gastroenterology 2012;2012.
4. Gephart MSM, McGrath JM, Effken JA, Halpern MD. Necrotizing enterocolitis risk: state of the science. Advances in Neonatal Care 2012;12(2):77.
5. McCallie K, Lee H, Mayer O, Cohen R, Hintz S, Rhine W. Improved outcomes with a standardized feeding protocol for very low birth weight infants. Journal of Perinatology 2011;31:S61-S7.
6. Wallenstein MB, Arain YH, Birnie KL, Andrews J, Palma JP, Benitz WE, et al. Red blood cell transfusion is not associated with necrotizing enterocolitis: a review of consecutive transfusions in a tertiary neonatal intensive care unit. The Journal of pediatrics 2014;165(4):678-82.

7. Kirpalani H, Zupancic JA, editors. Do transfusions cause necrotizing enterocolitis? The complementary role of randomized trials and observational studies. Seminars in perinatology; 2012: Elsevier.
8. Ghavam S, Batra D, Mercer J, Kugelman A, Hosono S, Oh W, et al. Effects of placental transfusion in extremely low birthweight infants: meta-analysis of long-and short-term outcomes. Transfusion 2014;54(4):1192-8.
9. Chen H-L, Tseng H-I, Lu C-C, Yang S-N, Fan H-C, Yang R-C. Effect of blood transfusions on the outcome of very low body weight preterm infants under two different transfusion criteria. Pediatrics & Neonatology 2009;50(3):110-6.
10. Blau J, Calo JM, Dozor D, Sutton M, Alpan G, La Gamma EF. Transfusion-related acute gut injury: necrotizing enterocolitis in very low birth weight neonates after packed red blood cell transfusion. The Journal of pediatrics 2011;158(3):403-9.
11. Patel RM, Kandefer S, Walsh MC, Bell EF, Carlo WA, Laptook AR, et al. Causes and timing of death in extremely premature infants from 2000 through 2011. New England Journal of Medicine 2015;372(4):331-40.
12. Neu J, Walker WA. Necrotizing enterocolitis. New England Journal of Medicine 2011;364(3):255-64.
13. Mohamed A, Shah PS. Transfusion associated necrotizing enterocolitis: a meta-analysis of observational data. Pediatrics 2012:peds. 2011-872.
14. Sood BG, Rambhatla A, Thomas R, Chen X. Decreased hazard of necrotizing enterocolitis in preterm neonates receiving red cell transfusions. The Journal of Maternal-Fetal & Neonatal Medicine 2016;29(5):737-44.
15. Gephart SM, Spitzer AR, Effken JA, Dodd E, Halpern M, McGrath JM. Discrimination of GutCheckNEC, a clinical risk index for necrotizing enterocolitis. Journal of perinatology: official journal of the California Perinatal Association 2014;34(6):468.
16. Sharma R, Kraemer D, Torrazza R, Mai V, Neu J, Shuster J, et al. Packed red blood cell transfusion is not associated with increased risk of necrotizing enterocolitis in premature infants. Journal of Perinatology 2014;34(11):858-62.
17. Patel RM, Knezevic A, Shenvi N, Hinkes M, Keene S, Roback JD, et al. Association of Red Blood Cell Transfusion, Anemia, and Necrotizing Enterocolitis in Very Low-Birth-Weight Infants. JAMA 2016;315(9):889-97.
18. Elabiad MT, Harsono M, Talati AJ, Dhanireddy R. Effect of birth weight on the association between necrotising enterocolitis and red blood cell transfusions in≤ 1500 g infants. BMJ open 2013;3(11):e003823.
19. dos Santos AMN, Guinsburg R, de Almeida MFB, Procianoy RS, Marba STM, Ferri WAG, et al. Factors associated with red blood cell transfusions in very-low-birth-weight preterm infants in Brazilian neonatal units. BMC pediatrics 2015;15(1):1.
20. Garg PM, Ravisankar S, Bian H, Macgilvray S, Shekhawat PS. Relationship between packed red blood cell transfusion and severe form of necrotizing enterocolitis: A case control study. Indian pediatrics 2015;52(12):1041-5.
21. Strauss RG. Practical issues in neonatal transfusion practice. American journal of clinical pathology 1997;107(4 Suppl 1):S57-63.