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Original Research Article

Is neonatal anemia a risk factor in developing retinopathy of prematurity in premature babies: A prospective observational study in rural central India

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Abstract

Background: Retinopathy of prematurity (ROP) in premature babies is mainly associated with lesser gestational age at birth and Low Birth weight. Anaemia in these babies is also known to be associated with higher risk of ROP.
Aim: Present study aims to study the incidence of ROP in a rural Sick – baby Neonatal Care Unit (SNCU) and to compare the incidence of ROP in the Anaemic and non-anaemic babies.
Materials and Methods: In this Prospective Observational Study, a total 100 consecutive preterm babies (with gestational age at birth less than 34 week or Birth weight less than 2000 grams, were studied for the ROP. The incidence of ROP was also studied in anaemic and non-anaemic babies.
Results: 100 babies with Gestational age gestational age at birth ranging from 28 weeks to 34 weeks and birth weight ranging from940 gram to 2000 gram were prospectively studied at SNCU. ROP was observed in 24 babies and remaining 76 babies had zone 3A vascularized retina. Stage 2 was the most commonly seen stage of ROP (12 babies). Stage 1 ROP was seen in 5 cases, stage 3 in 4 cases, stage 4 in 1 baby and Aggressive Posterior ROP (APROP) in 2 babies. Stage 5 was not seen in any baby in this study. Among the 24 babies with ROP, 6 babies (25%) needed treatment and other 18 babies (75%) had spontaneous regression. Out of 100 babies screened / included in study, 16 babies were anaemic. Out of these 16 babies 8 babies (50%) had ROP. Amongst the remaining 84 babies who did not have anaemia 16 babies (19%) had ROP.
Of the 100 babies included in the study, 11 babies had received blood transfusion, among which 6 babies (54.54%) had ROP. Among the remaining 89 babies who didn't have blood transfusion, 18 babies (20.22%) had ROP.
Conclusion: Anaemia is an important risk factor which affects the incidence of ROP. Anemia should therefore, be avoided and managed in premature babies from ROP management.

Keywords: Anaemia, Retinopathy of prematurity.

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1. Introduction

Retinopathy of prematurity (ROP) is a disease of the developing blood vessels of the retina in preterm infants. The key pathological feature is the ischemia of the avascular retina leading to retinal neovascularization. ROP is one of the important causes for preventable blindness in children.[1] Whereas the gestational age and birth weight are the two main recognized risk factors in causation of ROP,[2] Anaemia is yet to be established an independent risk factor.

Present prospective observational study aims to study the association of anaemia with occurrence of ROP.

2. Materials and Methods

This is a prospective observational study. This study was conducted babies screened for Sick Baby Neonatal Care Unit (SNCU) of a district hospital in Central India. Ethical approval for this study was obtained from the ethics review board of the hospital. Total of 100 consecutive babies

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meeting the inclusion criteria were studied in the period between November 2022 to October 2023. As per standard protocol of inclusion, all premature babies born at less than 34 weeks of gestation) and Low birth weight babies (with Birth weight of 2000 grams or less were included in this study. Those babies with gestational age 34 weeks or Birth weight more than 2.5 kgs or those with any congenital anomalies or not willing were excluded. The birth weight and gestational age at the time of birth were recorded. All the relevant risk factors were noted, including blood transfusion. Informed consent was taken from parents or guardians of the babies. Diluted tropicamide (0.5 percent) and phenylephrine (2.5 percent) eye drops were instilled into both eyes for 3 times about an hour before the examination for dilatation of pupil. To reduce discomfort during the test, paracaine topical anaesthetic eye drops (0.5%) is used once the pupil had been fully dilated. To keep eyelids apart, a sterile eye speculum was inserted. An indirect ophthalmoscope with a 20 D lens and a scleral depressor was utilised to examine the peripheral retina. Fundus findings were documented, including the vascularity of the retina and the zone, stage, and severity of ROP. ICROP guidelines were used to make the diagnosis.[3] Treatment was planned for babies with Type 1 ROP. The condition is explained in detail and counselling is given to parents regarding the importance of follow-up visits and treatment. The last follow-up visit is done at 41 weeks of post conception age.

The following variables were analysed in the results of this study: gender, twin pregnancy, gestational age, birth weight, anaemia, blood transfusion and exchange transfusion. Data was entered into the Microsoft Excel datasheet and was analysed using SPSS 22 version software. Categorical data was represented in the form of Frequencies and proportions. MS Excel and MS word were used to obtain various graphs such as bar diagrams. The results were subjected to chi square test to analyse if the association is significant or not. Significant association for ROP is considered at value less than 0.05.

3. Results

3.1. Demographic profile

In this study, 100 babies were screened. 54 were male and 46 were female. Their birth weight ranges from940 gram to 2000 gram and gestational age at birth ranges from 28 weeks to 34 weeks.

3.2. Prevalence and profile of ROP

In this study, ROP was seen in 24 babies among the total 100 babies taken into study. The remaining 76 babies had zone 3A vascularized retina upon 3 subsequent follow ups.

In this study, stage 2 was the most commonly seen stage of ROP (12 babies). Stage 1 ROP was seen in 5 cases, stage 3 in 4 cases, stage 4 in 1 baby and Aggressive Posterior ROP (APROP) in 2 babies. Stage 5 was not seen in any baby in this study.

Among the 24 babies with ROP, 6 babies (25%) needed treatment and other 18 babies (75%) had spontaneous regression.

3.3. Anemia and ROP

Out of 100 babies screened / included in study, 16 babies were anaemic. Out of these 16 babies 8 babies (50%) had ROP. Amongst the remaining 84 babies who did not have anaemia 16 babies (19%) had ROP.

The results were subjected to chi-square test. Significant association was found between anaemia and incidence of ROP in this study with a P-value of 0.007.(**Table 1**).

3.4. Blood transfusion and ROP

Of the 100 babies included in the study, 11 babies had received blood transfusion, among which 6 babies (54.54%) had ROP. Among the remaining 89 babies who didn't have blood transfusion, 18 babies (20.22%) had ROP. (**Table 2**)

The results were subjected to chi-square test. Significant association was found between blood transfusion and incidence of ROP in this study with a p-value of 0.01.

Table 1: Distribution of ROP and anaemia

Anemia	**ROP Positive**		**ROP Negative**		**Total**
	No. of cases	Percentage	No. of cases	Percentage	
Present	8	50	8	50	16
Absent	16	19.04	68	80.95	84
Total	24	24	76	76	100

Table 2: Blood transfusion and ROP

BT	**ROP Positive**		**ROP Negative**		**Total**
	No.	Percentage	No.	Percentage	
Given	6	54.54	5	45.45	11
Not Given	18	20.22	71	79.77	89
Total	24	24	76	76	100

4. Discussion

In this study, the incidence of Retinopathy of prematurity was reported to be 24%. This figure is lower than those found in studies by Gopal L (38%) and Rekha et al (46%).[4,5] Lower rates probably were due to the fact that the screening was done in basic NICU units (SNCU) in contrast to level 3 NICU that were screened in the cited literature. Since more critical babies in terms of very low gestational age, very low birth weight and associated co morbidities are admitted in level 3 SNCUs compared to SNCUs, the higher rates of ROP were seen in the previous studies.

In this study, the association between anaemia and incidence of ROP is found to be significant (p=0.007). Among the 24 babies who had ROP, 5 babies (20.83%) had anaemia. Rekha S et al. in 1996, concluded in their study that anaemia is a significant risk factor in the development of ROP.[5] LilLiu et al. concluded in their study that anaemia is a significant risk factor in the development of ROP.[6] Another risk factor for ROP is transfusion of packed RBCs. Adult RBCs are high in 2, 3 DPG, and adult haemoglobin binds to oxygen less tightly, allowing extra oxygen to reach the retina. Maheshwari et al. concluded in their study that blood transfusion is an independent risk factor for the development of ROP.[7] Pinheiro AM et al. concluded in their study conducted in Brazil that blood transfusion is an independent risk factor for the development of ROP.[8]

Replacement of fetal hemoglobin with the adult Hemoglobin in Blood transfusion increases the risk of developing ROP and maintaining high levels of fetal Hemoglobin may protect against ROP.[9,10] In this study, blood transfusion was found to be a significant risk factor for the development of ROP. (p=0.01).

Given that decreased platelet counts and increased RBC counts are associated with increased risk of ROP.[11,12] We propose this to be probably due to more anoxia in the anaemic cases which could trigger the Vascular Endothelial Growth Factor (VEGF) release resulting in higher neovascularization and hence higher incidence of ROP.

Thrombocytopenia is recently studied as a biomarker for development of Type I ROP requiring treatment.[13-15]

5. Conclusions

ROP is a blinding retinal disorder in babies especially when they are low birth weight or premature. Incidence of ROP is higher in premature babies with Anaemia and past blood transfusion is also a risk factor in development of ROP. Anaemia should be avoided and managed in premature babies from ROP management point of view, as anaemia can trigger the ischemia in the non-vascularized retina causing ROP. This study reveals the burden of ROP in a tertiary care hospital.

Low birth weight and prematurity are the two most important risk factors for ROP. The incidence of ROP was determined to be 24 percent in this study, which lasted 2 years. Low gestational age at birth, low birth weight, respiratory distress syndrome, oxygen therapy, anaemia, apnoea, sepsis, blood transfusion, birth asphyxia and exchange transfusion were all determined to be risk factors for ROP.

Thorough fundus examination using indirect ophthalmoscope with 20D lens is important in all preterm babies as a part of screening. ROP is a potentially blinding condition leading to visual impairment or blindness in preterm infants.

Hemoglobin status can provide important clues to the ROP.

6. Source of Funding

None.

7. Conflict of Interest

None.

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