Original Article

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Retinopathy in Preterm Low Birth Weight Babies and Special Management by Oxygen and Blood Transfusion

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ABSTRACT

Background: *More Occurrence of retinopathy of prematurity in preterm low birth weight babies exposed to different risk factors in Ad-din NICU is reported. The aim was to assess the Proportion of ROP development in different risk factor exposed group in a large cohort of very preterm infants who were assisted in Ad-din NICU. Aim of this study is to identify the most common risk factor and the severity of Retinopathy of Prematturity (RoP).*

Materials and methods: *This prospective study was carried out at the level-3 NICU of Ad-din Medical College Hospital Dhaka. 53 preterm low birth weight baby who are <36 weeks and low birth weight < 2.1 kg are screened from 1st January 2022 to 31st Deccember 2022 were screened for Retinopathy of Prematurity and data taken for risk factor like respiratory support and blood product transfusion and assessed need for Laser therapy or injection Avastin. Selected babies were screened conducted by special ROP instrument by ROP specialist professor of ophthalmology.*

Results: *Total 53 preterm LBW babies who were < 36 wks and <2.1kg were screened. Most (11.3%) were stage-1 and Zone-ii (52.8%). Respiratory support mainly given most of the babies (64.15%) by Nasal Intermittent Positive Pressure Ventilation (NIPPV). Out of which 11.7% needed inj Avastin. 22.6% babies needed no respiratory support, out of these 8.3% baby needed inj Avastin. 50% baby of 0_2 by HFNC needed inj Avastin. 16.6% baby without any respiratory support needed inj Avastin. 11.3% baby need PRBC transfusion, out of which 33.3% baby needed inj Avastin. 86.7% babies need no blood product transfusion, out of these 8.6% babies needed inj Avastin.*

Conclusion: *So from this study it is clear that though prematurity itself is a risk factor for ROP development .Oxygen therapy , blood product transfusion are major risk factor for ROP development. So causious oxygen therapy and avoid unnecessary blood product transfusion and respiratory support to prevent ROP.*

Key words: Preterm Low Birth Weight (PTLBW); Retinopathy of Prematurity (ROP); Risk factors.

Introduction

Retinopathy of Prematurity (ROP) is a complex disease of the developing retinal vasculature in premature infants. ROP includes all stages of the disease and its sequelae. Retinopathy of prematurity (ROP) is a vasoproliferative retinal disorder, which is the main cause of visual impairment and blindness in preterm infants.[1] It has been reported that some stages of ROP occur in 40–50% of infants born <30 weeks of gestational age, while severe ROP occurs in 7–8% and treatment is needed in 5–6%.[2] ROP is a two phase disease with a first phase of reduced retinal vascular growth and loss of blood vessels due to a lack of growth factors and abnormal oxygenation induces the second phase of ROP characterized by an increase in the expression of the Vascular Endothelial Growth Factor (VEGF) which promote uncontrolled neovascularization and retinal detachment.[3,4] The most common treatment of severe ROP is retinal ablation using laser photocoagulation to reduce VEGF production of the hypoxic peripheral retina but this treatment destroys approximately two-thirds of the retina.[3,5] Over the last few years, intravitreal injections of anti-VEGF have emerged as an effective first-line treatment for severe ROP and many authors have reported favourable outcomes using these drugs.[2,3,6] It is important to observe that risk factors have a significant etiopathogenetic effect in some units or countries while in other settings they do not.[9,10] This suggests that changes in neonatal assistance could contribute to the

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decreasing the occurrence of ROP and that evaluation of local risk factors is necessary for correction and possible prevention of this severe complication.[11,12] Thus, the purpose of this study was to assess the incidence of ROP and to investigate risk factors for its development in a large cohort of preterm infants who were assisted in Ad-din Neonatal Intensive Care Unit (NICU).[13,14]

Serial eye examinations were performed by ROP Specialist ophthalmologist; the first examination was made according to the recommendation of the American Academy of Pediatrics on ROP screening.[15] ROP staging was performed in agreement with international classification.[16] When examination was normal, subsequent controls were scheduled every two weeks until complete retinal vascularization. Eye examinations were performed through indirect ophthalmoscopy. The RetCam Imaging System II (Clarity Medical Systems, Pleasanton, CA) was used to confirm diagnosis, monitor disease and treatment, evaluate retinal neovascularization and to take fundus photography in any grade ROP. It is important to observe that risk factors have a significant etiopathogenetic effect. This suggests that improvements in neonatal assistance could contribute to the occurrence of ROP and that evaluation of local risk factors is necessary for correction and possible prevention of this severe complication.

Materials and methods

This prospective study was conducted at NICU of Ad-din Medical College Hospital, Dhaka during the period from January to December 2022.

Inclusion critaria

- Infants were included in the study if they were born between 27^{+6} and 35^{+6} weeks of gestation.

Exclusion critaria

- Major congenital malformations, chromosomal disorders, inherited metabolic diseases and death before ROP screening.

Ethical permission from the ethical committee of Ad-Din Medical College Hospital.

The data from infants enrolled in the study were described as rate and percentage. Normality of data distribution was assessed by Shapiro- Wilk's test. Parametric continuous variables were analyzed by the Student's "t" test or by Wilcoxon rank sum test in case of deviation from normality assumptions. Categorical variables were compared using the χ^2 test. A further multivariable stepwise logistic regression analysis was performed to evaluate the potential independent effect of the same variables on the ROP stage at discharge. Effect estimates were expressed as Odds Ratio (OR) with profile likelihood-based 95% confidence limits. Data analysis was performed using IBM SPSS Statistics version 20 (SPSS INC, Chicago, Illinois, USA).

Results

The study ran from 1st January2022 to 31st December 2022.

Table I Percentage of Male and Female required avastin (n=53)

Total pt	Male	Female
53(100%)	Total :30(56.6%)	Total : 23(43.3%)
	Need Avastin 02 (6.6%)	Need : 06 (26%)

We studied a total of 53 infants of which 30 (56.6%) were male and 23 (43.3%) were female. 02(6.6%) male and 06 (26%) female needed advanced treatment like inj Avastin.

Table II Stage of ROP at diagnosis and discharge among the infants (n=53)

Stage of ROP	At Diagnosis	At Discharge
Stage-1	06 (11.3%)	06 (11.3%)
Stage-2	03 (5.6%)	03 (5.6%)
Stage-3	03 (5.6%)	03 (5.6%)
Stage-4	0	0
Stage-5	0	0
No Stage	41 (77.3%)	41 (77.3%)
Total	53 (100%)	53 (100%)

Most of the babies,41(77.3%) were not in any stage, 06 (11.3%) were stage-1, 03(5.6%) Stage-2,03 (5.6% Stage-3.

Table III ROP / No Stage of ROP

ROP / NO ROP	At Diagnosis	At Discharge
ROP	12 (22.5%)	12 (22.5%)
No ROP	41(77.3%)	41(77.3%)
Total	53(100%)	53(100%)

Out of 53 babies 12(22.6%) developed ROP and 41 (77.3%) no stage of ROP.

Table IV Zones of ROP with percentage

Zone	At Diagnosis		At Discharge	
Zone-1	03 (5.6%)		03 (5.6 %)	
Zone-2	28 (52.8%)	Total :	28(52.8%)	Total :
Zone-3	16(30.2%)	47(88.6%)	16(30.2%)	47 (88.6%)
No zone	06 (11.3%)		06 (11.3%)	
Plus Disease	No Plus Disease		No Plus Disease	
Avascular Zone	13(24.5%)		13(24.5%)	

28 (52.8%) babies were in zone-ii, 16 (30.2%) were in zone-iii, 03 (5.6%) were in zone-i. 13(24.5%) had large avascular zone. There were no plus disease in any babies.

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Table V 0_2 Therapy by HFNC/LFNC/NIPPV/ VENTIL ATOR

Respiratory Support	No of Babies	ROP need supportive/Inj. A vastin/Laser	p-value
1. Low Flow Nasal Canula (LFNC)	03(5.6%)	Supportive	
2. High Flow Nasal Canula (HFNC)	02 (3.7%)	01 (Avastin) (50%)	0.0005
2. Nasal Intermittent Positive Pressutre Ventilation (NIPPV)	34(64.15%)	04 (Avastin)(11.7%)	<0.0001
3. Ventilator	03(5.6%)	Supportive	
4. No Support	12(22.6%)	01 (Avastin)(8.3%)	<0.0001

Respiratory support mainly given most of the babies, 34 (64.15%) by Nasal Intermittent Positive Pressure Ventilation (NIPPV), 03 (5.6%) by Low Flow Nasal Canula (LFNC), 02 (3.7%) by High Flow Nasal Canula, 03 (5.6%) by Ventilator support. 12 (22.6%) babies needed no respiratory support, out of these 02 baby needed inj Avastin(8.3%). Out of 34 NIPPV supported baby 04 (11.7%) needed inj Avastin, 01 baby of 02 by HFNC needed inj Avastin (50%). 02 (16.6%) of 12 baby without any respiratory support needed inj Avastin. p-values are statistically significant.

Table VI Blood Product Transfusion and ROP to received babies

Blood Product (PRBC, FFP)	No of baby	ROP in recipient Need avastin	p-value
1. PRBC	06(11.3%)	02(33.3%)	<0.0001
2. FFP	01	00	
3. No Transfusion	46(86.7%)	04(8.6%)	<0.0001

06 (11.3%) baby needed PRBC transfusion, out of which 02(33.3%) baby needed inj Avastin. 01 (1.8%) baby needed FFP, 46 (86.7%) babies required no blood product transfusion, out of these 04(8.6%) babies needed inj Avastin. p-values are statistically significant.

Discussion

This study evaluated the risk factors for ROP in a cohort of very preterm infants. It was found an occurrence of any stage ROP of 22.6% which is nearer to what has previously been reported.[7,14]

PRBC transfusions was found to be a risk factors for ROP at discharge but not at the screening visit. This is consistent with the fact that the majority of transfusions for anemia of prematurity were performed after first weeks of life and therefore, it can be speculated that they affect the progression of ROP rather than its onset.

This correlation between RBC transfusions and ROP confirm previous findings which have been explained by the pro-oxidant effect of transfusions due to the increase in oxygen delivery to the retina secondary to increased packed cell volume and lower oxygen affinity of adult haemoglobin in Packed Red Cells (PRCs) and secondary iron overload.[17-19] A retrospective study from an eye hospital in Iran also shows the incidence of ROP increase in Preterm LBW babies who received blood product transfusion which similar to this study but incidence increase with phototherapy which not performed in this study.[20] Study in viena shows more incidence of Zone-II like this study.[21]

Limitations

Small sample size, variable medical and nursing care over time and between care teams and units. It was not evaluate some maternal factors because their role is controversial (Pregnancy induced hypertension, premature rupture of membranes, chorioamnionitis, maternal diabetes, medications, age).

Conclusions

It was found that the occurrence of ROP was similar to what has previously been reported and that meticulous oxygen delivery to very preterm infants decreased the risk of its development, while RBC transfusions increased it. These results suggest that effective strategies for promoting the causious use of oxygen and standardizing the approach to RBC transfusions can contribute to decreasing the risk of ROP in very preterm infants.

Recommendation

It is key meassage to all to use oxygen causiously and avoid unnessary blood product transfusion and early screening will reduce incidence of ROP and blindness.

Disclosure

All the authors declared no competing in interests.

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