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Risk factor and Outcome of Retinopathy of Prematurity among Premature Babies admitted to Tertiary Care Hospital: A Retrospective Observational Study

Dr Gaurav Paranjpe[1], Dr Renuka Sarwate[2], Dr Neha Shetty[*,†,3]

[1]*Department of Ophthalmology, Krishna Institute of Medical Sciences, Karad, Maharashtra, India*
[2]*Department of Ophthalmology, Krishna Institute of Medical Sciences, Karad, Maharashtra, India*
[3]*Department of Ophthalmology, Krishna Institute of Medical Sciences, Karad, Maharashtra, India*

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ABSTRACT

Background:
Retinopathy of Prematurity (ROP) is a multifactorial vasoproliferative retinal disorder that increases in incidence with gestational age. ROP is a vascular retinal disease that can cause low vision or blindness. ROP is a common blinding disease in children which is becoming increasingly prevalent in the developing world.

Aim:
The aim of this study is to evaluate the incidence of Retinopathy of prematurity (ROP) and its association with risk factors such as low birth weight, gestational age, oxygen therapy, respiratory distress syndrome and sepsis among premature infants admitted to the Neonatal Intensive Care Unit (NICU) of Krishna Institute of Medical Sciences, Karad.

Methods:
Retrospective chart review of all infants admitted to the NICU between July 2017 and July 2019, who met the criteria for ROP screening: (a) ≤32 weeks of gestation, (b) ≤1.500 kg of birth weight, (c) infants with significant risk factors including sepsis, respiratory distress syndrome, or long-term oxygen use. Treatment was offered to infants with Stage III ROP disease or Stage II in Zone II with plus disease. Qualified infants were treated with argon laser photocoagulation within 48 h of diagnosis.

Results :
A total of 233 neonates who met the criteria were screened for ROP. Incidence of ROP was found to be 35.62% among the babies screened (n=83) majority of whom had stage 1 ROP (83.13%). Maximum incidence was seen in neonates of gestational age between 32-35 weeks (54.22%) and neonates of birth weight between 0.750 and 1.500 kg (85.54%).
Other prevalent risk factors for development of ROP include Respiratory Distress Syndrome (59%) and Oxygen therapy (65%). Four neonates were found with plus disease and six neonates required laser treatment.

Conclusion:
The present study reflects the problem of ROP in a tertiary care centre. Prematurity, Low Birth Weight (LBW), high oxygen supplementation, respiratory distress syndrome were found to be independent risk factors in the development of ROP in neonates. Because of advancements in neonatal intensive care in developing countries and higher survival rate of premature infants, the incidence of ROP has increased. Unrecognized and untreated ROP will cause potential blindness in children. Hence, to prevent the adverse visual outcome and possible blindness; timely screening, recognition, and treatment of ROP is essential.

Key words: Birth weight–Gestational age–Risk factors–ROP

1 INTRODUCTION:

Retinopathy of Prematurity (ROP), a vasoproliferative disease in the developing retina of premature babies, described by Terry in 1942. [1] (with implication of oxygen therapy due to the premature development of the lung, as the causative agent) is the main cause of visual impairment in preterm infants. The first case of the epidemic was seen on St. Valentine's Day in 1941, when a premature baby in Boston was diagnosed. The first epidemic of ROP occurred during 1940s and 1950s, mainly in developed countries due to unmonitored use of oxygen in premature babies. With advances in neonatal intensive care more and more low Birth Weight (BW) and low Gestational Age (GA) infants surviving, 'Second Epidemic' of ROP began in 1970s and 1980s. From a global perspective, 'third epidemic' of ROP started mostly in the middle income countries [2].There are approximately 45 million blind people in the world today out of which, 30% are in Asia. Of the total blindness, childhood blindness accounts for 4%. India shares 20% of the world's childhood blindn [2]s$_s$ .ROP afflicts over 3,00,000 infants worldw [3]de$. In developing countries like India, the incidence of ROP has been reported at 24-47 % among high risk preterm infants. It is important not only in terms of economic burden, but in its severe social implication, which is very long in terms of blind years. Prematurity has been regarded to be the most important risk factor of ROP, however, other factors such as low birth weight (LBW), high oxygen supplementation and its duration, respiratory distress syndrome (RDS), anemia, sepsis, and blood transfusion were also found to have significant associat [2]on$ The aim of this is to find out the incidence of ROP in a tertiary care centre in a developing country and to identify the risk factors which predispose to ROP in a large population of Neonatal Intensive Care Unit (NICU) graduat [4, 5]s.$

2 METHODS:

This retrospective study of all infants admitted to the NICU screened for ROP if they met

the following criteria:

(a) Presented at ≤32 weeks of gestation,

(b) Weighed ≤1.500 kg at birth, or

(c) Possessed other significant risk factors such as sepsis, respiratory distress syndrome

(RDS), or long-term oxygen use.

Screening was performed by a single retina specialist in the NICU under aseptic conditions, using an indirect binocular ophthalmoscope with a + 20 diopter lens. Our treatment threshold was Stage III ROP disease or Stage II in Zone II with plus disease. All infants who qualified were treated with laser photocoagulation within 48 h of diagnosis. This is a retrospective study of all NICU admissions between July 2017 and July 2019 at Krishna Institute of Medical Sciences. Infants diagnosed with ROP were identified and any information that increased their risk of ROP development was recorded including low birth weight, gestational age, history of sepsis, history of oxygen therapy, and respiratory support.

3 RESULTS:

A total of 233 infants were screened at the NICU between July 2017 and July 2019.

83 infants admitted were diagnosed with ROP, demonstrating an incidence of 35.63%.

Patients with ROP showed a male predominance (59% male, 41% female).

Birth weight and retinopathy of prematurity:

In neonates with birth weight ≤ 1.500 kg, 71 were found to have ROP (85.54%), birth weight between 1.501 and 1.750 kg, 10 were found to have ROP (12.05%) and birth weight between 1.751 and 2.000 kg, 2 were found to have ROP (2.41%)

Gestational age and retinopathy of prematurity:

Amongst the infants with 18.07% neonates had a gestational age <32 weeks, 54.22% of infants were between 32-35 weeks and 27.71% were >35 weeks.

ROP was most commonly seen in Zone III (82%) and Zone II was the second most common (16.87%). Only one case was noted to occur in Zone I.

Associated Risk factors with retinopathy of prematurity:

The most prevalent risk factors among patients with ROP were RDS and use of oxygen therapy. 59.04% of babies (49) with ROP experienced RDS and (54) needed oxygen therapy (65.06%). Mean duration of oxygen therapy required was 5 days (range: 1-42 days) and average duration of respiratory support via ventilation was 3.5 days (range:1h-7days) Only 14 babies had history of sepsis (16.87%)Of the 83 infants who developed ROP, only six presented with severe enough disease warranting laser photocoagulation in both eyes (4 females, 2 males).

The average gestation age of these patients was 28 weeks (range: 26–30 weeks). All infants were born under 1.500 kg and all the six infants required oxygen therapy for an average of 10 days (range 4-28 days)

Tables 1, 2, 3, 4, 5, 6 and 7

4 DISCUSSION:

ROP is regarded as one of the important cause of preventable blindness in children [11]Vision 2020 – right to sight gives special importance in preventing blindness in children. ROP has a typical progression pattern, however, early stages of the disease may regress spontaneously at any

* Corresponding author.
† Email: nehashetty94@gmail.com

Table 1. International classification ofretinopathy of prematurity

Stage	Features
I	Demarcation line (between vascular and avascular retina)
II	Ridge (elevated demarcation line)
III	Ridge with extra retinal fibrovascular proliferation
IV	Subtotal retinal detachment
	A-not involving fovea
	-involving fovea
V	Total retinal detachment
PLUS disease, dilatation of posterior pole vessels. Threshold disease, stage 3 plus disease in zone 1 or zone 2, 5 contiguous clock hours or 8 non-contiguous clock hour involvement	

Table 2. Correlation between birth weight and retinopathy of prematurity stages

Table - 2	Number of Babies From July, 2017 to July, 2019				
Birth Weight	STAGE - 1	STAGE - 2	STAGE - 3	Total ROP	%
(A) 0.750 to 1.500 KG	57	10	4	71	85.54
(B) 1.501 to 1.750 KG	10	0	0	10	12.05
(C) 1.751 to 2.000 KG	2	0	0	2	2.41
Total :	69	10	4	83	100

Table 3. Correlation between gestational age and retinopathy of prematurity stages

Table – 3	Number of Babies From July, 2017 to July, 2019				
Weeks of Distribution	STAGE – 1	STAGE – 2	STAGE – 3	Total ROP	%
(A) < 32 Weeks	10	4	1	15	18.07
(B) 32 to 35 Weeks	39	4	2	45	54.22
(C) > 35 Weeks	20	2	1	23	27.71
Total :	69	10	4	83	100

Table 4. Correlation between other risk factors and retinopathy of prematurity stages

Table - 4	Number of Babies From July, 2017 to July, 2019				
RDS	STAGE - 1	STAGE - 2	STAGE - 3	Total ROP	%
YES	42	5	2	49	59.04
NO	27	5	2	34	40.96
Total :	69	10	4	83	100

Table 5. Correlation between other risk factors and retinopathy of prematurity stages

Table - 5	Number of Babies From July, 2017 to July, 2019				
SEPSIS	STAGE - 1	STAGE - 2	STAGE - 3	Total ROP	%
YES	13	1	0	14	16.87
NO	56	9	4	69	83.13
Total :	69	10	4	83	100

Table 6.

Table - 6	Number of Babies From July, 2017 to July, 2019				
O2	STAGE - 1	STAGE - 2	STAGE - 3	Total ROP	%
YES	44	7	3	54	65.06
NO	25	3	1	29	34.94
Total :	69	10	4	83	100

Table 7.

Table - 7				
Author	Sample Size	Incidence of ROP (%)		
		Overall	<32 weeks	<1500g
Charan et al. [6]	165	47.27	-	-
Varughese et al. [7]	79	51.89	-	-
Chaudari S et al [8]	552	22.3	146	128
Shah VA et al [9]	564	29.2	-	-
Clark et al. [10]	204	51	51.5	60.5
Our study	233	35.63	18.07	85.54

time [12]. As the disease progresses, vitreous haemorrhage and tractional retinal detachment can occur. The end stage of untreated ROP is the development of a dense, white fibrovascular plaque behind the lens with complete retinal detachment, where the child goes completely blind. Retinal vascularization normally proceeds from the optic disc to the periphery and is completed nasally by 36 weeks of gestation and on the temporal side by 40 weeks of gestation [13]. We screened all babies admitted to the NICU with birth weight $\leq$1.500 kg and gestation $\leq$ 32 weeks. Infants with birth weight $>$ 1.500 kg and gestation $>$ 32 weeks were screened only if they had additional risk factors. Among the risk factors, low gestational age and LBW are the most important factors that determine the development of ROP [14]. Incidence of ROP was found to be 35.62% which is comparable to previous studies Table 6. A total of 71 (85.54%) of babies of less than 1.501 kg and 45 (54.22%) babies with gestational age group 32-35 weeks had ROP. All infants who developed ROP in our study weighed <1.501 kg. All the 8 infants who required laser photocoagulation had a birth weight under 1.500 kg. The average gestation age of these patients was 28 weeks (range: 26–30 weeks). Our data suggests an overall ROP male predominance of 59%, and a female predominance, 4 out of 6 among infants with severe ROP requiring laser photocoagulation. No gender predominance in ROP has been documented before. [15, 16]

The most prevalent postnatal risk factors among patients with ROP are RDS (59%) and use of Oxygen therapy (65.06%). All the six infants who presented with severe ROP necessitating laser photocoagulation intervention required oxygen therapy and half required respiratory support.

5 CONCLUSION:

Prematurity and LBW are independent risk factors in the development of ROP in neonates. Prematurity was a more important factor. At a given age group, those with LBW had more chance of developing ROP. Screening of the babies at 4 weeks of their birth and follow-up will allow us to detect significant ROP at their early stages, which will prevent further progression and blindness with appropriate treatment.

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