

Original Research Article

Risk factor and outcome of retinopathy of prematurity among premature babies admitted to tertiary care hospital: a prospective observational study

Vijaykumar Shegji¹, Sharanabasappa S. Dhanwadkar^{1*}, S. S. Kalyanshettar²,
S. V. Patil², Ashwini Kumara N. B.¹

¹Department of Pediatrics, ESIC Medical College, Gulbarga, Karnataka, India

²Department of Pediatrics, Shri B. M. Patil Medical College, Bijapur, Karnataka, India

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*Correspondence:

Dr. Sharanabasappa S. Dhanwadkar,

E-mail: drsharan77@gmail.com

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ABSTRACT

Background: Retinopathy of prematurity is a multifactorial vaso-proliferative 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 in the developed world despite current treatment and is becoming increasingly prevalent in the developing world. The purpose of this study was to determine risk factor and outcome of ROP among premature infants admitted to NICU of Shri B M Patil Medical College Hospital and Research Centre-Vijayapur.

Methods: Preterm babies less than 35 weeks of gestation or less than 2000grams of birth weight delivered in or referred to Department of Paediatrics at B. L. D. E. U's Shri B M Patil Medical College Hospital and Research Centre, Vijayapur.

Results: Of 153 neonates screened 49 infants had ROP. The incidence of ROP in this study was found to be 32.02% among the babies screened. 25 babies were in stage 1(51.0%) 19 babies were in stage 2(38.8%) two babies from stage 2 progressed to plus disease and 5 babies with APROP (10.2%).

Conclusions: The present study reflects the problem of ROP in a tertiary care centre. The incidence of ROP in our study was 32.02 % for any stage. The percentage of neonates who had ROP in the gestational age group ≤ 32 weeks 36.5%, 24.1% in the 32-36 weeks gestational age group and 40 % in >35 weeks of gestational age group. A statistically significant correlation between birth weight and ROP was also shown in our study. Our study showed greater risk of developing ROP with birth weights less than 1750g. There exists a statistically very high significant correlation between ROP and supplemental oxygen. Also, there is a statistically significant correlation between RDS and ROP.

Keywords: Birth weight, Gestational age, Risk factors, ROP

INTRODUCTION

Retinopathy of prematurity (ROP), or retrolental fibroplasia as it was originally named, has had a most curious life span as a twentieth century disease. The enigmatic findings of the disease, with scar tissue behind the neonate lens associated with retinal detachment, have

been responsible for the two largest "epidemics" of blindness in neonates in modern times. These outbreaks of the disease occurred approximately 25 years apart in the mid-1950s and late 1970s.¹ Over the last 59 years since this disease was first correlated with prematurity by Terry in 1942, a plethora of literature has emerged on retrolental fibroplasia (RLF) and retinopathy of

prematurity (ROP).¹ 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%. It is estimated that there are about 1.4 million blind children, millions of whom live in Asia. India shares 20% of the world's childhood blindness.² ROP afflicts over 3,00,000 infants worldwide.³ 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. There appears to have been an oxygen epidemic from the late 1940s through the mid-1950s. During this period ROP was the leading cause of blindness in neonates. Although the percentage of arterial oxygen delivered per se could not be incriminated, the duration of oxygen administration was found to be of significance.^{4,5} Over the next 25 years a number of factors, including phototoxicity, ischemia, elevated oxygen levels, low oxygen levels, adrenocortical deficiency, elevated and low carbon dioxide levels, vitamin E or A deficiency, iron deficiency, maternal factors, multiple gestation, poor nutrition, cyanotic congenital heart disease, anencephaly, exchange and replacement transfusion, complications of pregnancy, congenital anomalies, intraventricular hemorrhage, septicemia and prematurity itself, were advanced as possible causes of the diseases. Despite meticulous attention to oxygen use, however, the disease is increasingly prevalent. In fact, it has occurred in term infants who have never been given supplemental oxygen as well as in the hypoxic infant. Therefore, this disease of fibrovascular proliferation in the neonatal retina, largely, remains an enigma.^{4,6} The purpose of this study is to know the incidence of ROP and to correlate it with maternal and neonatal risk factor.

METHODS

Preterm babies less than 35 weeks of GA and/or less than 2000grams of birth weight delivered in or referred to Department of Pediatrics at B. L. D. E. U's Shri. B. M. Patil Medical College Hospital and Research Centre, Vijaypur. The premature babies admitted or referred to NICU in BLDEU'S Shri. B. M. Patil Medical College, Hospital and Research Centre Bijapur who undergoes ROP screening. It was a prospective observational study, duration was November 2013 to April 2015.

47%³ at 95% confidence interval and 20% allowable error the sample size is 108.

$$n = \frac{(Z\alpha)^2 \times p \times q}{L^2}$$

$$n = \frac{(1.96)^2 \times 47 \times (100 - 47)}{(47 \times 0.2)^2}$$

Hence 108 cases were included for present ROP.

p=prevalence

q=100-p

L=20% of p

Z_a=1.96

Data was analysed using mean±SD, diagrams, chi-square test and regression analysis (if necessary)

Inclusion criteria

- All preterm babies less than 35 weeks of GA and/or less than 2000g of birth weight delivered in or referred to Department of Pediatrics at B. L. D. E. U's Shri. B.M. Patil Medical College Hospital and Research Centre, Vijaypur.

Exclusion criteria

- Babies having congenital anomalies of eye/ cornea.
- Babies with suspected chromosomal anomalies.

Informed/ written consent of parents was taken after explaining in detail about the methods and procedures involved in the study in their own vernacular language. Ethical clearance was obtained from Institutional Ethical Committee.

All eligible babies were screened at Neonatal Intensive Care Unit.

RESULTS

Incidence

153 babies fulfilled the inclusion criteria were screened and 49 babies were found to have ROP. The incidence of ROP in this study is 32.02 % among the babies screened.

Out of 153 neonates screened-32 was found to have ROP which corresponds to 32% (Figure 1).

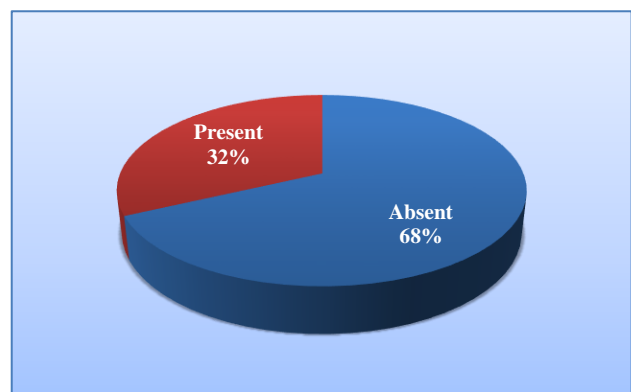


Figure 1: Percent distribution of ROP.

Table 1: Percent distribution of birth weight (g).

BW (g)	N	Percent
750-1500	79	51.6
1501-1750	42	27.5
1751-2000	32	20.9
Total	153	100.0

Out of 153 neonates screened: 51.6% were VLBW and ELBW babies which are more prone to develop ROP as complication of prematurity (Table 1).

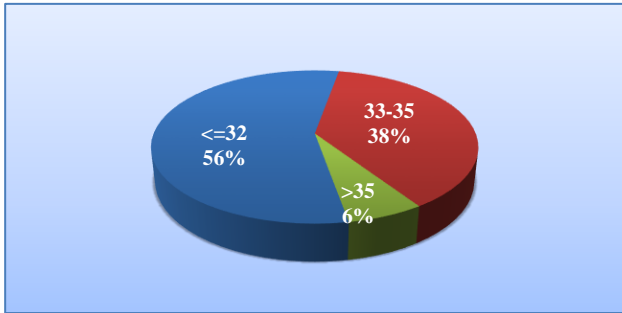


Figure 2: Percent distribution of GA (weeks).

About 56% of neonates were below 32 weeks (extreme preterm) which are high risk neonates to develop RDS and its complication like ROP (Figure 2).

Table 2: Percent distribution of stages of ROP.

Stages of ROP	N	Percent
1	25	51.0
2	19	38.8
APROP	5	10.2
Total	49	100.0

51% of neonates were stage 1 ROP, 39% were suffering from stage 2 and 10% APROP (Table 2).

Table 3: Association of gestational age (weeks) and ROP.

ROP	Present		Absent		Total	P value
	N	Percent	N	Percent		
GA (weeks)						
<=32	31	36.5	54	63.5	85	0.180
33-35	14	24.1	44	75.9	58	0.103
>35	4	40	6	60	10	0.575

Table 4: Association of birth weight (g) and ROP.

ROP	Present		Absent		Total	p value
	N	Percent	N	Percent		
BW (g)						
750-1500	32	40.5	47	59.5	79	0.020
1501-1750	8	19.0	34	81.0	42	0.034
1751-2000	9	28.1	23	71.9	32	0.596

Out of 153 babies screened, 85 babies were ≤ 32 weeks, 58 babies were in between 33-35, 10 babies were > 35 weeks with p value of 0.180, 0.130 and 0.575. Gestational week was not found to be a significantly associated with ROP in the present study (Table 3).

Out of 153 babies screened 79 babies birth weight ranged between 750-1500g 32 babies developed ROP with $p=0.020$, 42 babies birth weight ranged between 1501-1750g, 8 babies developed ROP with $p=0.034$ and 32 babies ranged between 1751-2000g, 9 babies developed ROP with $p=0.596$.

Birth weight was found to be a significantly associated with developed of ROP between birth weight of 750-1500g and 1501-1750g (Table 4).

Out of 153 babies screened 77 were given O_2 and 32(41.6%) babies developed ROP. Oxygen administration was a significant risk factor for the development of ROP ($p=0.011$) (Figure 3).

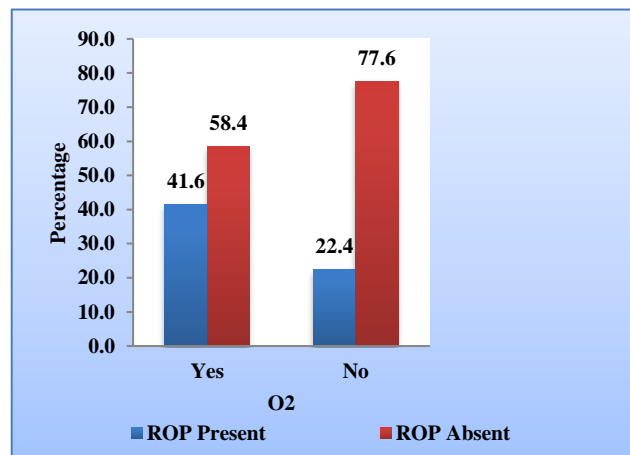


Figure 3: Association of oxygen and ROP.

Out of 153 babies screened 34 had RDS and 21(61.8%) babies developed ROP. RDS was a significant risk factor for development of ROP ($p=0.000$) (Table 5).

Table 5: Association of respiratory distress syndrome and ROP.

ROP	Present		Absent		Total	p value
	N	Percent	N	Percent		
Yes	21	61.8	13	38.2	34	0.000
No	28	23.5	91	76.5	119	

Out of 153 babies screened 85 had sepsis and 21(24.7) babies developed ROP.

Table 6: Association of sepsis and ROP.

ROP	Present		Absent		Total	p value
	N	Percent	N	Percent		
Yes	21	24.7	64	75.3	85	0.030
No	28	41.2	40	58.8	68	

Sepsis was a significant risk factor for development of ROP (p=0.030) (Table 6).

Table 7: Mean comparison of variables between ROP present and absent.

Variables	Absent (N=104)		Present (N=49)		P value
	Mean	SD	Mean	SD	
BWT	1519.3	264.5	1410.0	308.9	0.025
GA	32.1	2.6	31.5	2.8	0.172
PCAFE	34.7	3.4	33.6	5.5	0.113

DISCUSSION

Of the 153 neonates screened, 64 were males (53.33%) and 56 were females (46.67%). Among the neonates who developed ROP, 28 were males (32.6%) and 21 were females (31.3%), 25 neonates were in stage 1(51.02%), 19 in stage 2 (38.8%) and 5 in APROP (10.20%) of the disease. Total incidence of ROP in this study was found to be 32.02 %.

Table 8: Comparison of incidence of ROP.

Studies	Incidence
Chaudari S et al ⁷	22.3 %
Shah VA et al ⁸	29.2%
Present study	32.02%

The incidence of ROP showed a significant statistical correlation with prematurity on performing the chi square test. Interestingly, of the 85 neonates who fell in the <32 weeks GA group, 31(36.5%) had ROP while 18 out of the remaining 68 neonates (26.47%) who had ROP fell in the 32-36 weeks GA group.

This showed that the percentage of neonates who had ROP was higher in the younger age group while the majority who did not have ROP was in the older age group. All the neonates with APROP disease were of 28-

32 weeks GA showing a more severe form of disease in lower age groups.

One of the major ROP risk factors is birth weight. The lesser the birth weight, greater are the chances of developing ROP. Our study showed statistically significant correlation between birth weight and ROP by Redit analysis.

Table 9: Comparison of oxygen as a risk factor of ROP in different studies.

Study	p-value
Chaudhari S et al ⁷	0.005
Gupta et al ⁹	0.002
Present study	0.011

In present study there is very highly significant correlation between oxygen supplementation and ROP. This has been supported by studies done Chaudhari S et al and Gupta et al.^{7,9}

Table 10: Comparison of respiratory distress syndrome as a risk factor indifferent studies.

Study	P value
Gupta et al ⁹	0.02
Vinekar et al ¹⁰	0.007
Akkoyunn et al ¹¹	0.029
Present study	0.000

In present study there is very highly significant correlation between RDS and ROP. This has been supported by studies done Gupta et al, Vinekar et al and Akkoyunn et al.⁹⁻¹¹

Table 11: Comparison of sepsis as a risk factor of ROP in different studies.

Study	P value
Chaudhari S et al ⁷	0.003
Chawla D et al ¹²	0.030
Present study	0.030

In present study there is very highly significant correlation between sepsis and ROP. This has been supported by studies done by Chaudhari S et al and Chawla D et al.^{7,12}

The present study reflects the problem of ROP in a tertiary care centre. The incidence of ROP in our study was 32.02 % for any stage. Out of 19 babies in stage 2 ,2 babies progressed to higher stage, rest all resolved spontaneously. This shows a decreased trend of the disease to progress to higher stages that is stage 3 or above.

Most of the cases resolved spontaneously. The incidence of ROP showed a significant statistical correlation with

prematurity on performing the chi square test. The percentage of neonates who had ROP in the gestational age group ≤ 32 weeks 36.5%, 24.1% in the 32-36 weeks gestational age group and 40 % in >35 weeks of gestational age group. A statistically significant correlation between birth weight and ROP was also shown in our study by Ridit analysis. Our study showed greater risk of developing ROP with birth weights less than 1750g. There exists a statistically very high significant correlation between ROP and supplemental oxygen. Also, there is a statistically significant correlation between RDS and ROP. This indicates that patients with RDS are at increased risk of developing ROP. There exists a statistically significant correlation between sepsis and ROP. This indicates patient with sepsis are at increased risk of developing ROP. Several other factors associated with ROP like cyanosis, apnoea, exchange transfusions, anemia, patent ductus arteriosus and other malformations, hyperbilirubinemia, phototherapy, dopamine administration, maternal risk factors like hypertension were also considered in this study. None of the above factors showed any statistically significant correlation with the development of ROP.

Table 12: Present study in brief.

Significant correlation towards	Insignificant correlation towards
Prematurity	Apnoea
Low birth weight	Exchange transfusion
Supplemental oxygen	Anemia
RDS	PDA/ other malformation
Sepsis	Phototherapy
	Maternal hypertension
	Metabolic acidosis

Neonates after giving laser photocoagulation may need to be followed up for a prolonged period as these children are likely to have complications like refractive errors, especially high myopia, glaucoma, strabismus and retinal detachments in the future.

CONCLUSION

The rate of ROP in moderately premature infants has decreased dramatically with better care in the neonatal intensive care unit. Early examination was significantly associated with chance of early detection or ROP and hence all babies should have their first screening within the first four weeks after birth. In our opinion, the effective management of retinopathy of prematurity requires a team effort of the neonatologist and ophthalmologist staff for better out come.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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