## **Original Research Article**

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# Study of retinopathy of prematurity in high risk infants

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#### **ABSTRACT**

**Background:** Retinopathy of prematurity is a vaso-proliferative disorder of retina in premature babies. The objective of this study was to study retinopathy of prematurity in premature babies and to study associated risk factors.

**Methods:** Study was a prospective study was conducted among infants in high risk follow up clinic of our department KT Children Hospital, tertiary teaching hospital attached to Government medical college, Rajkot. Sample size of study was conducted on 100 high risk neonates who were brought to high risk follow up clinic at K T children hospital, Rajkot.

Results: Out of studied 100 infant, 40% developed ROP, 12% developed stage 1 ROP, 13% developed stage 2 ROP,15% developed stage 3 ROP. Out of 100 cases 40% were ROP positive.15% occurred between 28-30 weeks of gestation. In 31-33 weeks of gestation 82.5%. In 34-36 weeks of gestation 2.5%. 15% of cases between 740-1000 gm of birth weight developed ROP.67.5% between 1000-1500 gm of birth weight developed ROP.15% between 1500-2000 gm of birth weight developed ROP. 2.5% between 2000-2500 gm of birth weight developed ROP. 70 newborns received oxygen, 95% of newborns developed ROP. 5% newborns who have not received oxygen developed ROP. In present study there is association of ROP with oxygen therapy. 40 cases had apnea. Out of 40 cases 55% had ROP. Association between apnea and ROP. 21 received blood products.57% of them had ROP. Association between blood transfusion and ROP. 20 received ventilation. 75% of them had ROP. Association between ventilation and ROP. Out of 40 positive newborns there 17 were male and 23 were female. No difference in distribution of ROP in male and female sex. Significant relationship between gestational age, O2 therapy, mechanical ventilation, apnea and blood products. Insignificant relationship between sexes.

**Conclusions:** This study has identified ROP is found to be associated with gestational age, o2 therapy, mechanical ventilation, apnea and blood products.

**Keywords:** Associations, Prevalence, Retinopathy of prematurity, Risk factors

### INTRODUCTION

Retinopathy of prematurity is a vaso-proliferative disorder of retina in premature babies. It begins to develop between 32 to 34 weeks after conception, regardless of gestational age at delivery.

During acute first phase, the normal vascular genesis of retina is disturbed by relative hyperoxia of extra uterine environment. This causes vaso-obliteration and non-vascularization of some areas of anterior retina. The subsequent hypoxia causes 2<sup>nd</sup> chronic phase, characterized by proliferation of vascular and glial cells, AV shunt formation, occasionally leading to involution or permanent cicatricial changes and visual impairment.

The stages of ROP describe the ophthalmoscopic findings at the junction between the vascularised and avascular

retina; stage 1 is a faint demarcation line, stage 2 is an elevated ridge, stage 3 is an extra retinal fibro vascular tissue, stage 4 is a subtotal retinal detachment, while stage 5 is a total retinal detachment. In addition, Plus disease, which indicates significant vascular dilation and tortuosity observed at the posterior retinal vessels, may be present at any stage and reflects the increased blood flow through the retina. In 1942, Terry first described retrolental fibroplasia with implication of oxygen therapy as the causative agent. However, reports have found ROP in cases without oxygen therapy and even after oxygen therapy, not all premature infants develop ROP.

Three factors have shown consistent and significant association with ROP: low gestational age, low birth weight and prolonged exposure to supplementary oxygen following delivery.<sup>3</sup> Other risk factors include mechanical ventilation, sepsis, intraventricular hemorrhage, surfactant therapy, anemia, frequent blood transfusions, and apnea.<sup>4,5,3,6,7</sup>

The precise roles of these factors individually in the progression of the disease have not yet been determined.<sup>8</sup> ROP began to emerge in middle income countries, where it can account for as much as 60% of childhood blindness. The incidence of ROP in India is estimated to be 47.27% according to Charan et al.<sup>9</sup> The control of blindness in children is considered a high priority within the World Health Organizations (WHO'S) VISION 2020-The Right to Sight Programme. Retinopathy of prematurity is most preventable cause of blindness, so early diagnosis and intervention can prevent this type of disability.

The aim of this study is to study retinopathy of prematurity in premature babies and to study associated risk factors, to calculate prevalence of retinopathy of prematurity in high risk infants as early as possible to take preventive measures, to calculate odds ratio and other parameters to establish significance of variables associated with good or bad early outcomes in term of retinopathy of prematurity.

### **METHODS**

Study was a prospective study was conducted among infants in the high risk follow up clinic of our department KT Children Hospital, tertiary teaching hospital attached to Government medical college, Rajkot.

Study was conducted on 100 high risk neonates who were brought to high risk follow up clinic at K T children hospital, Rajkot.

### Inclusion criteria

All high-risk newborns with following criteria were included:

Severe respiratory distress syndrome

- Low gestational age
- Low birth weight
- Prolonged o2 exposure
- Mechanical ventilation
- Blood transfusion
- Intraventricular hemorrhage
- Poor postnatal weight gain
- Hypotension requiring vasopressor support
- Surgery in first week of life

#### Exclusion criteria

Babies lost to follow up.

#### Examination

The neonates admitted in NICU were selected for study and were followed up in high risk clinic at K T children hospital, Rajkot. Patients were called on 1,3,6,9 and 12 months for high risk follow up and it was done under JSSK (Government scheme) funding.

ROP is diagnosed by retinal examination with indirect ophthalmoscopy. It was performed by ophthalmologist with expertise in ROP screening. Infants born >28 weeks or >1200gm, had first ROP screening at 4 weeks of chronological age. Infants born <28 weeks of gestation or <1200gm, had ROP screening at 3 weeks of chronological age. Follow up was decided by ophthalmologist. Retinopathy was graded into stages and zones as ICROP classification. Infants with normal vascularization up to periphery were not examined again. Those with ROP were examined every week till regression occurred or till they reached threshold for laser treatment.

### RESULTS

Out of 100 cases 40% were ROP positive and majority of cases of ROP 6 (15%) occurred between 28-30 weeks of gestation. In 31-33 weeks of gestation 33 (82.5%) cases were seen. In 34-36 weeks of gestation 1 (2.5%) cases of ROP were seen.

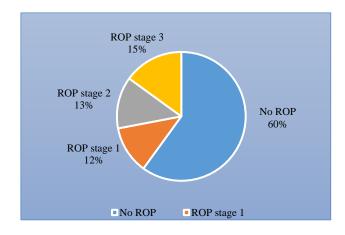


Figure 1: Incidence of ROP.

6 (15%) of cases between 740-1000 gm of birth weight developed ROP. 27 (67.5%) of newborns between 1000-1500 gm of birth weight developed ROP. 6 (15%) of newborns between 1500-2000 gm of birth weight developed ROP. 1 (2.5%) of newborns between 1500-2000 gm of birth weight developed ROP. The chi-square value is p=0.001. Out of 70 newborns who received oxygen, 38 (95%) of newborns developed ROP. 2 (5%) newborns who have not received oxygen developed ROP.

Table 1: Correlation between Gestational age and ROP.

	Positi	ive	Nega	tive	Total	
Gestational age (week)	No.	%	No.	%	No.	%
28-30	6	15	3	5	9	9
31-33	33	82.5	53	88.4	86	86
34-36	1	2.5	4	6.6	5	5
Total	40	100	60	100	100	100

In the present study there is significant association of ROP with oxygen therapy.

Table 2: Correlation between birth weight and ROP.

	Positi	ve	Negat	tive	Total	
Birth wt.(gm)	No.	%	No.	%	No.	%
740-1000	6	15	3	5	9	9
1000-1500	27	67.5	23	38.3	50	50
1500-2000	6	15	30	50	36	36
2000-2500	1	2.5	4	6.6	5	5
Total	40	100	60	100	100	100

The odds ratio is 16.62 and chi-square value is 0.000.40 cases out of 100 cases had apnea. Out of 40 cases 22 (55%) had ROP.

Table 3: Correlation between oxygen therapy and ROP.

Overson	Positive		Negative		Total	
Oxygen	No.	<b>%</b>	No.	%	No.	%
Given	38	95	32	53.3	70	70
Not given	2	5	28	46.6	30	30
Total	40	100	60	100	100	100

Table 4: Correlation between Apnea and Blood products associated with ROP.

ROP	Apnea				Blood tran	Blood transfusion			
	Present	%	Absent	%	Present	%	Absent	%	
Positive	22	55	18	45	12	57	9	11.4	
Negative	18	45	22	55	9	43	70	88.6	
Total	40	100	40	100	21	100	79	100	

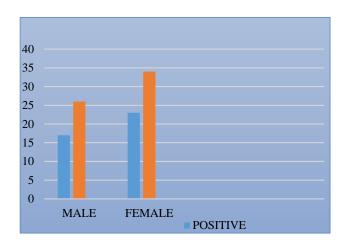


Figure 2: Correlation between sex and ROP.

Table 5: Correlation between ventilation and ROP.

ROP	Ventilation	l	Non-vent	Non-ventilated		
	present	%	Absent	%		
Positive	15	75	5	6.25		
Negative	5	25	75	93.75		
Total	20	100	80	100		

In this study highly, significant association between apnea and ROP is seen. chi-square p=0.000. 21 out of 100 newborns received blood products.

12 (57%) of them had ROP. In this study highly, significant association between blood transfusion and ROP is seen. Chi-square p=0.001. 20 out of 100 newborns received ventilation. 15(75%) of them had ROP. In this study highly, significant association between ventilation and ROP is seen. chi-square p=0.000.

### **DISCUSSION**

Out of studied 100 infant, 40% developed ROP, 12% developed stage 1 ROP, 13% developed stage 2 ROP, 15% developed stage 3 ROP. Out of 100 cases 40% were ROP positive and majority of cases of ROP 6(15%) occurred between 28-30 weeks of gestation. In 31-33 weeks of gestation 33 (82.5%) cases were seen. In 34-36 weeks of gestation 1(2.5%) cases of ROP were seen.

Infants born with lower gestational age were having a significant increase in incidence of retinopathy of prematurity, we found it the most important risk factor in ROP. This was in agreement with the results of studies

done by Shah et al, Karna et al and Fortes et al. 4.6.10 This was explained by immaturity of vascularization that induces an increased susceptibility of the retina to oxidative damage and to a number of perinatal factors which include hyper and hypoxia, blood transfusions, and sepsis. We found significant relationship between gestational age and the severity of ROP, but this was in agreement with other studies showing that lower gestational age was significantly associated with severe ROP. 4.11

6(15%) of cases between 740-1000 gm of birth weight developed ROP.27(67.5%) of newborns between 1000-1500 gm of birth weight developed ROP.6(15%) of newborns between 1500-2000 gm of birth weight developed ROP. 1(2.5%) of newborns between 2000-2500 gm of birth weight developed ROP. The chi-square value is p=0.001.

Out of 70 newborns who received oxygen, 38(95%) of newborns developed ROP. 2(5%) newborns who have not received oxygen developed ROP. In the present study there is significant association of ROP with oxygen therapy. The odds ratio is 16.62 and chi-square value is 0.000. 40 cases out of 100 cases had apnea. Out of 40 cases 22(55%) had ROP.In this study highly significant association between apnea and ROP is seen. chi-square p=0.000.

21 out of 100 newborns received blood products. 12 (57%) of them had ROP. In this study highly, significant association between blood transfusion and ROP is seen. Chi-square p=0.001. 20 out of 100 newborns received ventilation. 15(75%) of them had ROP. In this study highly, significant association between ventilation and ROP is seen. chi-square p=0.000.

In the study out 40 positive newborns there 17 were male and 23 were female. There is no significant difference in distribution of ROP in male and female sex. Prevalence is 40%. Significant relationship between gestational age, O2 therapy, mechanical ventilation, apnea and blood products. Insignificant relationship between sexes.

Despite current treatments, ROP remains a major cause of blindness in premature infants, and the incidence is increasing with increased survival of infants born at very early GAs. 12 The incidence of ROP in this study was 40% which falls within the range of 15.6%–47.3% reported from previous studies in India. 9,13-16 ROP is a multifactorial disease with risk factors such as low GA, LBW, sepsis, oxygen therapy, RDS, and blood transfusion shown to influence its incidence. 17 Of these LBW, low GA and oxygen therapy are considered the most important risk factors for ROP with LBW being the greatest predictor of severity. 17,18

The incidence and severity of ROP show an inverse relationship with BW and GA, with few cases diagnosed in babies weighing over 1500 g or babies whose GA is

>32 weeks at birth.<sup>9,11</sup> There have, however, been several reports of ROP in bigger and more mature babies in India.<sup>16,19-22</sup> The lower GA, lower BW as well as the lower proportion of babies weighing >1500 g with ROP in this series are a reflection of improved neonatal care.

Studies have demonstrated a significant reduction in severe ROP and ROP requiring laser treatment with changes in clinical practice such as the introduction of specific target values of arterial oxygen saturation, the introduction of new technology using pulse oximeters, and education of staff on the potential risks due to exposure to oxygen.<sup>23</sup>

#### **CONCLUSION**

ROP is a disorder of developing retinal blood vessels in the premature infant retina. ROP is the commonest and most preventable form of blindness. In the present era of advanced neonatal care and management where the incidence of ROP is on rise, identifying risk predictors helps in better understanding of the disease. Active intervention has been done to tackle the menace of ROP that is on rise. This study has identified ROP is found to be associated with gestational age, O<sub>2</sub> therapy, mechanical ventilation, apnea and blood products.

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