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Original Research Article

Retinopathy of Prematurity: Analysis of Demographic and Clinical Profiles, Incidence, Risk Factors and Treatment Outcome

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Abstract

This study was carried out in 388 premature babies for incidence of retinopathy of prematurity, foetal and maternal risk factors to design an effective screening program for ROP. Further, the efficacy of mode of treatment was evaluated. Preterm neonates with birth weight ≤ 1500 grams and/or gestation age ≤ 32 weeks; and selected patients with birth weight between 1500 to 2000 grams or gestational age > 32 weeks but ≤ 35 weeks with unstable clinical course were included in the study. The incidence of any stage of ROP in this study was 23.70%. Majority of patients (88.64%) developed mild forms of ROP (stage 1 and 2). On univariate analysis, the significant risk factors predisposing to ROP were low gestation age, low birth weight, respiratory distress, unmonitored oxygen supplementation, sepsis, blood transfusion, surfactant use and metabolic acidosis. Significant maternal risk factor was pregnancy-induced hypertension. On multivariate logistic regression, low gestational age, unmonitored oxygen supplementation, use of surfactant and pregnancy induced hypertension were found to be independent risk factors. The majority of cases (70.65%) of ROP of stage 1 and 2 without plus disease regressed without any treatment. Rest 29.35% cases needed treatment, and were treated with Diode laser photocoagulation to avascular retina. Regression occurred in all the cases.

Keywords: Diode laser, Low birth weight, Low gestation age, Oxygen supplementation, Respiratory distress, Sepsis, Pregnancy induced hypertension.

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INTRODUCTION

Retinopathy of prematurity (ROP) is a serious complication of prematurity and/or low birth weight neonates and can lead to childhood blindness unless recognized and treated early**.** In India, of the 26 million neonates born every year, 8 million (30.76%) are low birth weight (LBW) and low gestational age (GA) infants i.e. around 40% of the global burden of LBW infants. Nearly three fourth of all neonatal deaths and half of infant deaths occur among LBW infants [1]. The LBW baby is at higher risk of both mortality and morbidity compared to the normal birth weight infants. Recent advances in neonatal care in the last decade have improved the survival rates of premature infants. Consequently, the incidence of ROP has increased in parallel. Retinopathy of prematurity is an important cause of childhood blindness in both developed and developing countries. Worldwide around 50,000 children are blind due to ROP every year and majority of them belong to India and Latin America [2]. Retinopathy of prematurity (ROP) is a multi-factorial vasoproliferative retinal disorder. Prematurity and LBW are important consistent risk factors for the development of ROP, along with other risk factors like unmonitored oxygen therapy, respiratory distress, use of surfactant, sepsis, blood transfusion, metabolic acidosis pregnancy induced hypertension, low APGAR score etc [3-10].

Retinopathy of prematurity is responsible for approximately 3-10% of all new cases of childhood blindness in high-income countries, while in middle-income countries ROP accounts for up to 20-30 % of such cases. Therefore, it is now considered a major health problem and has been included in the World Health Organization (WHO) program for prevention of childhood blindness. Since, ROP is essentially asymptomatic in early stages without clinical signs or symptoms, the present recommendation is to screen all LBW and low GA infants and specially those exposed to other risk factors [2]. The screening for ROP has dramatically increased as clinical studies have shown improved visual outcomes in infants with ROP treated well in time with either Laser photocoagulation, cryotherapy and occasionally with anti- VEGF agents.

This study was conducted to screen the premature and LBW neonates and determine the incidence of Retinopathy of Prematurity and to determine the significance of risk factors associated with development of ROP by comparing the demographic and clinical profiles between two groups**:** the group in which infants developed ROP and the other in which infants did not develop ROP.

MATERIALS AND METHODS

This prospective, unmasked and interventional study was conducted in a tertiary eye care hospital in northern India in 388 premature neonates admitted in Neonatal Intensive Care Units (NICU), and those referred from other hospitals during May, 2018 to April, 2019. Patients with birth weight ≤ 1500 grams (g) and/or Gestational age ≤ 32 weeks (wk); and selected patients with birth weight between 1500 and 2000 grams or gestational age > 32 weeks but ≤ 35 weeks with unstable clinical course or neonatologist's concern over exposure to high risk factors, were included in the study. Infants with major congenital malformations, chromosomal anomalies, ocular anomalies and patients who died or lost to follow up were excluded from the study. All subjects underwent thorough history taking from parents and data recording from available records. Complete ophthalmologic examination including fundus examination was done with binocular indirect ophthalmoscope using +30 D lens and scleral indentation using a small muscle hook. Standard procedure and precautions described in literature were employed for fundus dilatation, topical anesthesia and examination.

For each infant with ROP, the age at which it was first detected, the location (zones), severity (stage), extent of ROP (in clock hours) and exposure to any risk factor were recorded on a prescribe format. Data was compiled on a Google spread sheet and analysed statistically regarding incidence of ROP, putative risk factors such as gestation age, birth weight and gender. The duration of supplemental oxygenation, respiratory distress, use of surfactant, blood transfusion and its frequency, documented sepsis, metabolic acidosis, total parenteral nutrition, seizures, neonatal jaundice, intracranial haemorrhage, apneic attacks, necrotizing enterocolitis, APGAR score, and some prenatal maternal factors such as mother's age at the time of conception, diabetes, smoking, preeclampsia and maternal bleeding, multiple gestation etc.

The data was entered in Microsoft excel spreadsheet and statistical analysis was performed using SPSS (Statistical Package for the Social Sciences) software version 21.0 (SPSS Inc., Chicago, IL). Clinical data were expressed as mean ± standard deviation (SD) and percentage (%). Univariate analysis for putative risk factors was performed. Student's 't' test was used to compare normally distributed numerical variables, Mann-Whitney 'U' test for numerically variables with skewed distribution and Pearson's Chi Square test for categorical variables. The difference was considered significant when the p value was < 0.05 (two sided). Multivariate binary logistical regression analysis was performed to identify independent risk factors of ROP.

Early treatment of retinopathy of prematurity (ETROP) study recommendations were adhered to whenever treatment was necessary.

RESULTS AND ANALYSIS

The demographical details of the study were as shown in Table-1.

Table-1: Demographic details of the study group

Demographic details	
Total number of patients: n (%)	388 (100%)
Number of males: n (%)	184 (47.42%)
Number of females: n (%)	204 (52.58%)
Mean birth weight (grams): mean ± SD	1337± 193.84
Mean gestational age (weeks): mean ± SD	31.61 ± 1.68
Multiple gestation	74 (19.07%)
Apgar score at 1 minute (out of 10)	5.32 ± 1.01
Apgar score at 5 minutes (out of 10)	7.23 ± 0.09

In total, 388 surviving preterm neonates who met inclusion criteria were screened. At the completion of the study, out of 388 preterm babies, 92 (23.70%) were diagnosed to have developed some degree of ROP

in at least one eye on at least one occasion. The remaining 296 (76.30%) babies did not develop any stage of ROP. Hence, the incidence of ROP in this study was 23.70%.

Table-2: Showing incidence of ROP

	Frequency	%
Total cases screened	388	
ROP detected	92	23.7

For statistical analysis and comparison babies were divided in two groups.
Group I (no evidence of ROP): 296 babies
Group II (ROP was present): 92 babies

The sex distribution in the two groups was as shown in Table-3.

Table-3: Sex ratio in groups I and II

Sex	Group I		Group II		p value
	Frequency	%	Frequency	%	
Males	132	44.6	52	56.5	0 .045
Females	164	55.4	40	43.5	
Total	296	100	92	100	

The sex ratio was comparable in the two groups, and thus statistically insignificant using Pearson's Chi Squared test.

The difference in the mean gestational age (GA) between the two groups was statistically significant (Table-4).

Table-4: Retinopathy of prematurity in relation to GA

	Group I	Group II	p value
	Mean ± SD	Mean ± SD	
GA (wk)	32.22 ± 1.55	31.00 ± 1.81	<0.001

wk=weeks

The incidence of ROP was statistically significantly more in neonates with a gestational age of ≤ 32 wk (83.7%) compared to neonates with gestational age > 32 wk (16.3%) as shown in Table-5.

Table-5: Retinopathy of prematurity in relation to different GA categories

GA (wk)	Group I		Group II		p value
	Frequency	%	Frequency	%	
< 28	6	2.0	10	10.9	<0.001
28 - 32	171	57.8	67	72.8	
>32	119	40.2	15	16.3	
Total infants	296	100	92	100	

The mean birth weight (BW) of babies in group II was significantly less compared to group I (Table-6).

Table-6: Effect of BW on development of ROP

	Group I	Group II	p value
	Mean ± SD	Mean ± SD	
BW (g)	1392.60 ±184.35	1281.63 ± 203.33	<0.001

g=grams

The incidence of ROP in neonates with a BW of ≤1500 g was significantly more (93.5%) compared to those with a BW of >1500 g (6.5%), as shown in Table-7.

Table-7: Incidence of ROP in relation to different BW categories

BW (gms)	Group I		Group II		p value
	Frequency	%	Frequency	%	
≤1000	6	2.02	8	8.69	<0.001
1001 - 1250	60	20.27	38	41.30	
1251 - 1500	172	58.11	40	43.49	
>1500	58	19.59	6	6.52	
Total cases	296	100.0%	92	100	

In total, 256 babies (66%) developed respiratory distress syndrome (RDS). Of these, 85.9% developed ROP and 59.8% did not develop. This difference was statistically significant (Table-8).

Table-8: Incidence of RDS in babies with and without ROP

RDS	Group I		Group II		p value
	Frequency	%	Frequency	%	
Absent	119	40.20	13	14.13	<0.001
Present	177	59.80	79	85.87	
Total cases	296	100	92	100	

Total 48.5% of all neonates needed surfactant out of which 52 (56.5%) babies developed ROP. It was found to be significant in comparison with 32.4% babies who did not have ROP (Table-9).

Table-9: Effect of surfactant on development of ROP

Surfactant given	Group I		Group II		p value
	Frequency	%	Frequency	%	
No	200	67.57	40	43.48	<0.001
Yes	96	32.43	52	56.52	
Total cases	296	100	92	100	

The mean duration of monitored Oxygen supplementation in group II was significantly more than in group (Table-10).

Table-10: Exposure of Oxygen in babies with and without ROP

Oxygen	Group I			Group II			p value
	Mean ± SD	Min - Max	Median (IQR)	Mean ± SD	Min - Max	Median (IQR)	
Number of days	7.33 ± 5.01	0-22	7 (3-10)	13.55± 6.16	3-28	15 (8-18)	<0.001

Overall, the blood transfusion (BT) was given to 10.31% of babies. Of these 19.57 % babies developed ROP and 7.43% did not develop ROP. The difference was statistically significant (Table-11).

Table-11: Incidence of BT in babies with and without ROP

BT	Group I		Group II		p value
	Frequency	%	Frequency	%	
No	274	92.57	74	80.43	0.001
Yes	22	7.43	18	19.57	
Total cases	296	100	92	100	

In all neonates 22.68% were detected to have sepsis. Of these, 38.04% developed ROP and 17.9% did not. The difference was statistically significant (Table-12).

Table-12: Effect of sepsis (positive on screen/ culture) on development of ROP

Sepsis	Group I		Group II		p value
	Frequency	%	Frequency	%	
No	243	82.09	57	61.96	<0.001
Yes	53	17.91	35	38.04	
Total	296	100	92	100	

In the present study, 53.3% babies with metabolic acidosis developed ROP, while 22.3% babies without ROP also had metabolic acidosis. This difference was significant (Table-13).

Table-13: Influence of metabolic acidosis on development of ROP

Metabolic Acidosis	Group I		Group II		p value
	Frequency	%	Frequency	%	
Absent	230	77.70	43	46.74	<0.001
Present	66	22.30	49	53.26	
Total cases	296	100%	92	100	

The 17.90% babies in group I had apneic attacks, while, in group II, 27.13% developed apneic attacks. The difference was not statistically significant (Table-14).

Table-14: Incidence of apnoea in babies with and without ROP

Apnoea	Group I		Group II		p value
	Frequency	%	Frequency	%	
No	243	82.10	67	72.83	0.053
Yes	53	17.90	25	27.13	

Overall, 51 mothers (13.14%) suffered from pregnancy-induced hypertension (PIH). Of these, 9.8% in group I, and 23.91% in group II developed PIH. This difference was highly significant (Table-15).

Table-15: Incidence of PIH in mothers of babies with and without ROP

PIH	Group I		Group II		p value
	Frequency	%	Frequency	%	
Absent	267	90.20	70	76.09	<0.001
Present	29	9.80	22	23.91	
Total	296	100	92	100	

The overall incidence of neonatal seizures was 7.22%. In group I, 6.42% babies and in group II, 9.78% babies had seizures. This difference was insignificant (Table-16).

Table-16: Effect of neonatal seizures on development of ROP

Seizures	Group I		Group II		p value
	Frequency	%	Frequency	%	
No	277	93.58	83	90.22	0.276
Yes	19	6.42	9	9.78	
Total	296	100	92	100	

Overall, 164 babies (42.27%) developed neonatal jaundice (NNJ). Of these, 42.23% infants were in group I and 42.39% were in group II. This difference was not significant (Table-17).

Table-17: Incidence of neonatal jaundice in babies with and without ROP

NNJ	Group I		Group II		p value
	Frequency	%	Frequency	%	
No	171	57.77	53	57.61	0.978
Yes	125	42.23	39	42.39	
Total	296	100	92	100	

In total, 50 mothers (12.89%) suffered from bleeding. Of these, 11.15% mothers in group I and 18.48% mothers in group II had bleeding. This difference was insignificant (Table-18).

Table-18: Effect of maternal bleed on development of ROP

Maternal bleed	Group I		Group II		p value
	Frequency	%	Frequency	%	
No	263	88.85	75	81.52	0.067
Yes	33	11.15	17	18.48	
Total no of cases	296	100	92	100	

Overall, 19.07% mothers had multiple gestations. Of these, 17.57% babies in Group I and 23.91% in group II were from multiple gestation. This difference was statistically insignificant (Table-19).

Table-19: Incidence of ROP in babies with mother having multiple gestations.

Multiple gestation	Group I		Group II		p value
	Frequency	%	Frequency	%	
Single	244	82.43	70	76.18	0.176
Duplet	52	17.57	22	23.91	

Total cases	296	100	92	100	

The mean Apgar score at 1 minute and at 5 minutes was significantly different in the two groups (Table-20).

Table-20: Apgar Score of babies with and without ROP

Apgar score	Group I	Group II	p value
	Mean ± SD	Mean ± SD	
at 1 min	5.79 ± 1.03	5.32 ± 1.01	<0.001
at 5 min	7.69 ± 0.84	7.23 ± 0.90	<0.001

Of 92 cases of ROP, majority of cases (70.65%) were of stage 1 and 2 without plus disease (mild forms of ROP), and rest were of severe forms (≥ stage 3 with/without plus disease), as shown in Table-21.

Table-21: Showing severity of ROP

Severity of ROP (stage)	No. of cases n (%)
Stage 1 and 2 without plus disease (mild forms)	65 (70.65)
Stage ≥ 3 with/without plus disease (severe forms)	27 (29.35)

The maximum number of cases of ROP belonged to mild forms (70.65%). And regressed without any treatment. Rest, 29.35% cases needed treatment. Eighteen cases (19.57%) of prethreshold ROP and 9.78% of aggressive posterior ROP needed treatment. All these cases were treated with Diode laser retinal ablation of avascular areas starting anterior to the ridge upto ora. Regression occurred in all the cases. We did not use anti-VEGF agents because of safety concerns.

On univariate analysis, 11 risk factors predisposing to ROP were found (Table-22).

Table-22: Significant infantile risk factors on univariate analysis

Risk factor	Non-ROP group (I)	ROP- group (II)	P value
Birth weight (g)	1392.60 ±184.35	1281.63 ±203.33	<0.001
GA (weeks)	32.22 ±1.55	31.00 ±1.81	<0.001
Apgar score at 1 min	5.79 ±1.03	5.32 ±1.01	<0.001
Apgar score at 5 min	7.69 ±0.84	7.23 ±0.90	<0.001
Oxygen exposure	7.33 ±5.01	13.55 ±6.16	<0.001
RDS	59.80%	85.87%	<0.001
Surfactant	32.43%	56.52%	<0.001
Blood transfusion	7.43%	19.57%	0.001
Sepsis	17.91%	38.04%	<0.001
Metabolic acidosis	22.30%	53.26%	<0.001

The significant maternal risk factor for development of ROP was PIH (Table-23).

Table-23: Significant maternal risk factors on univariate analysis

Risk factor	Non- ROP group (I)	ROP-group (II)	P value
PIH	9.80%	23.91%	<0.001

We performed stepwise multiple logistic regression analysis on all risk factors that were significant on univariate analysis, to find out independent risk factors predisposing to ROP in premature babies. Gestational age, oxygen supplementation, use of surfactant and PIH were found to be independent risk factors predisposing to development of ROP (Table-24)

Table-24: Independent risk factors on multivariate analysis

Parameters					
Gestational age	-0.266	0.096	7.616	1	0.006
Surfactant	-0.717	0.368	3.795	1	0.050
Oxygen	0.191	0.03	41.884	1	<0.001
PIH	0.901	0.359	6.288	1	0.012

In this study, none of the babies had intraventicular haemorrhage, necrotizing enterocolitis and none of the mothers were smokers, diabetic or substance abuser. So, the statistical analysis could not be done.

The ROP continues to remain an important cause of childhood blindness all over the world. The incidence and severity of ROP correlates strongly with low birth weight and low gestation period and other risk factors as noted above.

DISCUSSION

Retinopathy of prematurity (ROP) is one of the leading causes of blindness and marked visual impairment among premature and low birth weight neonates, the world over. The rate of blindness caused by ROP varies greatly among countries and different regions within the same country, depending on their level of development, standard of neonatal care, neonatal survival rate in preterm infants, and whether effective screening and treatment programs exist. That is why, screening guidelines must 'not be generalized' and must take into account 'regional differences'.

The incidence saw an increase in developed and developing countries as more and more LBW, VLBW, ELBW and low GA babies are surviving due to better neonatal care. The initial low incidence of ROP has risen with better screening protocols, availability of assisted ventilation services and survival of sicker, smaller neonates. This period is followed by gradual decline in incidence of ROP especially of more severe variety because of availability of better screening criteria and effective treatment programs.

The present work comprised of one year prospective, unmasked and interventional study conducted in a tertiary care eye hospital in northern India. Of the 388 preterm babies screened, 23.71% developed some stage of ROP in at least one eye on at least one occasion during the study. Hence, the incidence of ROP in the present study was 23.71%. Incidence of ROP in various Indian studies published in chronological order are 38%, 47.2%, 46.0%, 52.0%, 32.0%, 21.7% and 22.3% respectively [5, 11-16]. As screening criteria differ across different ROP units and time-periods in the country, the overall incidence of ROP varies from 20% to 52%, with more recent studies reporting lower rates of ROP ranging from 20% to 30 % [4, 11-14]. The incidence of ROP in the present study was similar to that reported in the recent studies.

Of 92 babies who developed ROP, the various stages observed during study period were stage 1 in 47.8%, stage 2 in 33.7%, stage 3 in 9.8%, stage 4a in 3.3% and stage 5 in 2.2%. Thus, the maximum numbers of ROP patients (81.5%) were having mild forms (stage 1 and 2) of the disease without plus disease.

There was no influence of gender of babies on incidence of ROP in the present study. Darlow et al. noted a predilection of ROP for male gender [6]. Yang et al. reported male gender and non-black race to be predictors for ROP. In their study, this bias towards male gender could not be explained [7].

Similarly, the mother's age also did not significantly influence the incidence of ROP. No study in the available literature was found in this regard.

In this study, the incidence of ROP in BW category of ≤ 1250 g was 8.69%. The incidence of ROP was 43.49% in BW category 1251-1500 g, and the incidence was 6.62% in BW >1500 g. Our incidence of 50.11% in BW category ≥1251 g is higher than a report from USA, in which Yanovitch et al found 4.2 % babies weighing between 1250-1800 g developed ROP [4]. The later study was however retrospective in nature. No baby greater than 1500 g required treatment in either study. Keith et al. found an incidence of 6.40% of ROP in the 'heavy cohort' (>1500 g) [17], which is comparable to an incidence of 6.62% in the present study. The mean BW in severe forms of ROP was not significantly lower than mild forms of ROP.

The mean gestational age (GA) of babies in group II was significantly less than that in group I. The incidence of ROP was significantly more in neonates with a GA of ≤ 32 weeks compared to neonates with GA>32 weeks. The GA in those with severe forms of ROP was significantly lower than in those with mild forms of ROP. No study in the literature compared these parameters.

Several studies have found that LBW and short GA were the most significant factors for development and progression of ROP [6, 7.] Gilbert et al. in their recent study have shown that mean BW of infants with severe forms of ROP in highly developed countries was < 800 gms and mean GA < 26 weeks, whereas, in moderately developed countries these values were > 1000 gms and > 26.3-33.5 weeks respectively [18]. Accordingly, the mean BW and mean GA in severe forms of ROP in this study were comparable to results of moderately or poorly developed countries. Recently, Yanovitch et al. suggested that BW > 1500 gms and presence of ≥ 2 risk factors could be used as a screening score and the benefit would be $ 587.75 per infant screened [4].

This study has revealed 11 significant risk factors on univariate analysis that portend the development of ROP in preterm babies in our region.

These include low GA, LBW, and longer duration of oxygen exposure, RDS, surfactant therapy, blood transfusion, metabolic acidosis, sepsis, PIH and low Apgar score.

The role of prolonged oxygen is a well-established risk factor in the development of ROP including severe ROP, in VLBW and LBW babies. The link between ROP and supplemental oxygen has been confirmed by controlled trials and clinical studies [15, 17-20].

The relationship between ROP and blood transfusion was reported previously [5-7, 17]. This study found it to be a significant risk factor though, not independent.

Sepsis has also been found to be a significant risk factor in a study by other investigator [5] as in our study.

Respiratory distress syndrome (RDS) was noted to be a significant risk factor in our study. Postnatal surfactant therapy, oxygen supplementation is still the mainstay of prevention and treatment of RDS [21, 22], as noted in this study.

In the present study, surfactant therapy, used for prophylaxis, showed a significant influence on ROP incidence. The influence of surfactant therapy seems to be controversial. Although, one study showed no significant association between prophylactic surfactant therapy and the incidence of ROP, other studies reported that the use of surfactant increased the risk of developing ROP [21, 22].

The role of maternal pregnancy induced hypertension that we found to be a significant risk factor requires elaboration. Purohit et al. in his study on babies weighing < 1500 grams found that toxemia in pregnancy was a risk factor. In the same study additional risk factors such as maternal diabetes and antihistaminic use in the late pregnancy were also found significant [8]. Similarly, in a cohort of VLBW babies, Shah et al. found preeclampsia and prenatal betamethasone to be a risk factor on univariate analysis [9]. Maternal PIH and toxemia has been known to cause placental infarcts and compromised fetal blood flow, hence compromising fetal nutrition and growth and resulting in intrauterine growth retardation (IUGR). Weather, PIH is a surrogate risk factor for prematurity and low birth weight or an independent risk factor causing ROP requires further studies.

We did not find any other maternal disease or drug intake to be significant in our study and so; statistical correlation could not be performed.

The findings of this study were comparable to those reported by various investigators (Table-25).

Table-25: Significant risk factors on univariate analysis: Comparative analysis with other studies

STUDY	SIGNIFICANT RISK FACTORS	COMMON WITH PRESENT STUDY
Maheshwari [3]	Blood transfusion, Sepsis	Blood transfusion, Sepsis
Yanovitch [4]	Sepsis, Antibiotic, Ventilation, Blood transfusion	Sepsis, Blood transfusion
Rekha [5]	Anaemia, Blood transfusion Apnoea	Blood transfusion
Purohit [8]	Apnoea, BDP, Sepsis	Sepsis
Charles [10]	IVH, RDS, Sepsis, Hispanic	RDS, Sepsis
Fang PC [19]	Oxygen, Blood transfusion	Oxygen, Blood transfusion

The significant maternal risk factors found on univariate analysis were compared with other studies published in the literature (Table-26)

Table-26: Significant maternal risk factors on univariate analysis: Comparative analysis with other studies

STUDY	SIGNIFICANT RISK FACTORS	COMMON WITH PRESENT STUDY
Purohit [8]	Diabetes, PIH, Antihistamine	PIH
Shah [9]	PIH, Betamethasone	PIH

The number of ROP patients requiring treatment in the present study was 29.4%. Eighteen cases (19.6%) of prethreshold ROP and 9.8% of aggressive posterior ROP needed treatment. The BW of neonates requiring treatment in the present study were between 800-1500 g in babies with prethreshold disease and 680- 800 g in infants of AP-ROP. A recent study in India with similar screening criteria and similar overall incidence (22.3%) found that 33.6 % babies with ROP required treatment [4]. This was slightly higher, but not significantly different than that found in our study. This difference could be explained by better NICU facilities and screening strategy in our institute.

All these cases were treated with Diode laser retinal ablation of avascular areas starting anterior to the ridge upto ora. Regression occurred in all the cases.

Though the incidence of ROP is significantly greater in BW < 1500 g, but the fact that 8.1% of high risk babies weighing >1500 grams have ROP cannot be ignored. So, the need of the hour is to establish 'sickness criteria' so that those with significant risk factors in the heavy cohort are also screened.

Our study had some limitations. First, the sample size is small. Second, our final study population was 60% of of all neonates intended for study. The loss of cases due to death, transfer to other hospitals, lost to follow-up and incomplete chart retrieval was unavoidable. And the high ratio of excluded group may affect the results of the analysis. Third, this study was from a single institute with a limited number of neonates and the data provided may not be representive of other regions in our country. Therefore, the multicentric trials with large sample size and of longer duration may be helpful for determination of screening criteria, risk factors and treatment outcome of ROP in India.

CONCLUSION

This prospective, unmasked and interventional study was conducted in 388 premature neonates to find out the incidence of ROP, foetal and maternal risk factors and the efficacy of mode of treatment. Neonates with birth weight ≤ 1500 grams (g) and/or Gestational age ≤ 32 weeks (wk); and selected patients with birth weight between 1500 and 2000 grams or gestational age > 32 weeks but ≤ 35 weeks with unstable clinical course or neonatologist's concern over exposure to high risk factors, were included in the study. The incidence of any stage of ROP in this study was 23.70%. Majority of patients developed mild forms of ROP (stage 1 and 2). On univariate analysis, the significant risk factors predisposing to ROP were low gestation age, low birth weight, respiratory distress, unmonitored oxygen supplementation, sepsis, blood transfusion, surfactant use and metabolic acidosis. Significant maternal risk factor was pregnancy-induced hypertension. On multivariate logistic regression, low gestational age, unmonitored oxygen supplementation, use of surfactant and pregnancy induced hypertension were found to be independent risk factors. The majority of cases (70.65%) of ROP of stage 1 and 2 without plus disease regressed without any treatment. Rest 29.35% cases needed treatment, and were treated with Diode laser photocoagulation to avascular retina. Regression occurred in all the cases.

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