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Retinopathy of Prematurity (ROP) Screening of Newborn Babies at SNCU in BRIMS, Bidar

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ABSTRACT

Retinopathy of prematurity (ROP) is a disorder of retina is one of the leading causes of preventable blindness in children. Timely screening and early management is the key management of ROP. Present study was aimed to study retinopathy of prematurity (ROP) screening of newborn babies at a tertiary hospital. Present study was single-center, prospective, observational study, conducted in neonates admitted in SNCU with gestational age <37 weeks. All neonates were examined by Narayana Netralaya ophthalmologist (experience >10 years). During study period, 663 neonates satisfying study criteria were studied. In present study, incidence of retinopathy of prematurity (ROP) was 15.54%. Incidence of ROP was comparable in male (16.13 %) and female (14.91 %) neonates. Highest incidence of retinopathy of prematurity (ROP) was noted in birth weight <1000 GMS (34.38 %) followed by 1251-1500 GMS (28.13 %) and 1001-1250 GMS (23.88 %). In present study, neonates with Gestational Age <29 weeks had maximum incidence of retinopathy of prematurity (ROP) (59.38%) followed by 30 weeks (53.33%) and 31 weeks (50.57%). Among ROP cases, majority had stage 2 disease (52.43%) followed by stage 1 disease (52.43%). Neonates with oxygen treatment duration of >3 days, neonates received supplemental oxygen, blood culture positive, RDS present, Injection Dexamethasone to mother and received surfactant had statistically significant incidence of retinopathy of prematurity ($p<0.05$). Use of mechanical ventilator, hood oxygen and continuous positive airway pressure were risk factors noted for Retinopathy of prematurity, difference was statistically significant. Timely and careful retinal examination of at-risk infants by an experienced ophthalmologist is essential to prevent the development of advanced ROP and serious sequelae, leading to complete blindness.

INTRODUCTION

Retinopathy of prematurity (ROP) is a disorder of retina, predominantly in preterm and low birth weight neonates and is characterized by new vessel formation (neovascularization) and may progress to retinal detachment and blindness[1]. Retinopathy of prematurity (ROP) is one of the leading causes of preventable blindness in children, particularly in middle-income countries, where the 'third epidemic' of blindness from ROP is said to be occurring[2,3].

It is estimated that of about 15 million children born preterm worldwide, about 53,000 develop sight threatening ROP requiring treatment and 20,000 suffer blindness or severe visual impairment. India has the third highest incidence of LBW, with about 1.7 million weighing <2500 g and about 0.4 million <1500 g[4]. Crucially, premature birth and LBW predispose a newborn to develop ROP, for which India is evidently the hotbed[5].

An increase in the number of survival rates among premature babies is seen due to advances in the neonatal care. ROP is emerging as one of the major causes of preventable childhood blindness in India. Timely screening and early management is the key management of ROP. Present study was aimed to study retinopathy of prematurity (ROP) screening of newborn babies at a tertiary hospital.

MATERIAL AND METHODS

Present study was single-center, prospective, observational study, conducted in department of pediatrics, at Bidar Institute of Medical Science, Bidar, Karnataka, India. Study duration was of 1 year (July 2022 to july 2023). Study approval was obtained from institutional ethical committee.

Inclusion criteria:

- Neonates admitted in SNCU with gestational age <37 weeks (preterms), parents willing to participate in present study

Exclusion criteria:

- Neonates with >37 weeks of gestational age
- Neonates at risk for developing cortical blindness (like those with structural brain lesions)
- Parents not willing to enrol for study

Study was explained to patients in local language and written consent was taken for participation and study. A detailed history was recorded including the gender, gestational age, birth weight, postnatal date, duration of stay in the hospital, oxygen therapy, any H/O sepsis, I.V. antibiotics, blood transfusion, etc. All neonates were examined by Narayana netralaya ophthalmologist (experience >10 years). Under strict aseptic precautions, an initial ocular examination was done without dilating the pupil and anterior segment examined for congenital anomaly, corneal opacities, persistent tunica vasculosa lentis and neovascularization of the iris.

Mydriasis achieved for dilated fundus examination using diluted tropicamide and phenylephrine eye drops 2-3 times, 5 min a part, for 15-20 min. The fundus examination was done with an indirect ophthalmoscope using a 20D condensing lens. They are then examined for media clarity, posterior pole, i.e., optic disc, macula, retinal vessels near the disc. A scleral depressor with wire vectis is used to examine the periphery of the retina, first temporal retina followed by the nasal retina, to establish the proximity of retinal vascularisation at the ora Serrata. After a complete examination, removal of the speculum done gently and antibiotic eye drop instilled. If early signs of ROP present, then the infant is examined very week for progression or regression of the disease.

Data was collected and compiled using Microsoft Excel, analyzed using SPSS 23.0 version. Frequency, percentage, means and standard deviations (SD) was calculated for the continuous variables, while ratios and proportions were calculated for the categorical variables. Difference of proportions between qualitative variables were tested using chi- square test or Fisher exact test as applicable. $p<0.5$ was considered as statistically significant (Table 1-7).

RESULTS

During study period, 663 neonates satisfying study criteria were studied. In present study, incidence of retinopathy of prematurity (ROP) was 15.54%. Incidence of ROP was comparable in male (16.13%) and female (14.91%) neonates. Highest incidence of retinopathy of prematurity (ROP) was noted in birth weight less than 1000 gms (34.38%) followed by 1251-1500 GMS (28.13%) and 1001-1250 GMS (23.88%). In present study, neonates with Gestational Age <29 weeks had maximum incidence of retinopathy of prematurity (ROP) (59.38%) followed by 30 weeks (53.33%) and mn31 weeks (50.57%).

Among ROP cases, majority had stage 2 disease (52.43%) followed by stage 1 disease (52.43%). Neonates with oxygen treatment duration of more than 3 days, neonates received supplemental oxygen, blood culture positive, RDS present, Injection Dexamethasone to mother and received surfactant had statistically significant incidence of retinopathy of prematurity ($p<0.05$). While neonates with apnoea present at admission, received phototherapy had no statistically significant incidence of retinopathy of prematurity ($p>0.05$). Use of mechanical ventilator, hood oxygen and continuous positive airway pressure were risk factors noted for Retinopathy of prematurity, difference was statistically significant.

Table 1: General characteristics

Year	Screened	Percentage (n = 663)	Diagnosed	Percentage of ROP
2023	335	50.53	48	7.24
2022	328	49.47	55	8.3
Total	663		103	15.54

Table 2: Gender distribution

Gender	Total	ROP Present	ROP Absent	Percentage of ROP
Male	341	55	286	16.13
Female	322	48	274	14.91
Total	663	103	560	15.54

Table 3: Birth weight wise distribution

Birth Weight	Total	ROP Present	ROP Absent	Percentage of ROP
≥1000	32	11	21	34.38
1001-1250	67	16	51	23.88
1251-1500	96	27	69	28.13
1501-1750	134	16	118	11.94
1751-2000	154	17	137	11.04
2001-2500	102	9	93	8.82
>2500	78	7	71	8.97
Total	663	103	560	15.54

Table 4: Gestational age wise distribution

Gestational Age	Total	ROP Present	ROP Absent	Percentage of ROP
≤29	32	19	13	59.38
30	45	24	21	53.33
31	87	44	43	50.57
32	132	21	111	15.91
33	119	14	105	11.76
34	123	11	112	8.94
35	77	8	69	10.39
36	57	2	55	3.51
36-37	68	3	65	4.41
Total	663	103	560	15.54

Table 5: Incidence of ROP

Stage	No. of neonates	Percentage
1	38	36.89%
2	54	52.43%
Stage 2 pre plus disease	2	1.94%
Stage 2 plus disease	3	2.91%
APROP	6	5.83%

Table 6: Association Between Retinopathy of Prematurity and Treatment related Factors

Study variables	Total	ROP Present	ROP Absent	Percentage of ROP	p-value
Oxygen treatment duration					
≤3 Days	293	27	359	9.22	0.001
>3 Days	239	42	201	17.57	
Supplemental oxygen					
Oxygen given	532	69	463	12.97	0.001
Oxygen not given	131	34	97	25.95	
Apnoea					
Apnoea present	201	34	167	16.92	0.076
Apnoea absent	462	69	393	14.94	
Exchange transfusion					
Exchange transfusion given	83	18	65	21.69	0.032
Exchange transfusion not given	580	85	495	14.66	
Blood culture					
Blood culture +ve	155	34	121	21.94	0.031
Blood culture-ve	508	69	439	13.58	
Phototherapy					
Phototherapy given	433	67	366	15.47	0.63
Phototherapy not given	230	36	194	15.65	
RDS					
Present	453	78	375	17.22	0.001
Absent	210	25	185	11.9	
Injection dexamethasone to mother					
Injection dexa given	388	65	323	16.75	0.043
Injection dexa not given to mother	275	38	237	13.82	
Surfactant					
Surfactant given	254	48	206	18.9	0.01
Surfactant not given	409	55	354	13.45	

DISCUSSION

During the neonatal period, ROP is a silent disease and active screening by retinal examination is needed for detecting its presence, severity and need of treatment. Well-established tertiary care units have shown gradual decline in the incidence of ROP over the years with improvement in the quality of neonatal care and the establishment of robust screening and treatment programs[6]. ROP is unique in that vascular disease is found only in infants with incompletely

Table 7: Risk factors for ROP

Risk factors for ROP	No. of neonates (%)		p-value
	ROP	No ROP	
Mechanical ventilator	67	189	<0.0001
Hood oxygen	76	423	<0.0001
Continuous positive airway pressure	93	188	<0.0001

vascularized retina. The disease condition may range from mild without visual sequelae to advance disease-causing bilateral irreversible blindness. All premature babies are not born with ROP. The retina is immature at the time of birth. Its postnatal development within the retinal vessels, along with the predisposing factors that lead to ROP. The sequence of events takes 4-5 weeks for the development of ROP[7].

There are several reasons for the increase in ROP blindness in India, including the recent increase in the number of neonatal intensive care units (NICUs), which is increasing the survival of preterm infants. In some of these units, neonatal care may be of suboptimal quality, which can expose preterm infants to modifiable risk factors such as unregulated supplemental oxygen, sepsis and failure to gain weight[8,9].

In study by Sabherwal *et al*. 10 137 (18%) of the 751 infants eligible for screening were screened at least once, with no statistically significant difference by sex. The mean birth weight and gestational age of those screened were significantly lower than those not screened. Among those screened, 43% underwent first screening later than recommended and 44% had incomplete follow-up. 14 infants (11% of those screened) were diagnosed with ROP. Five were advised laser treatment and all complied.

Deshish Kumar Panda *et al*.[11] noted that incidence of ROP was 33.8%. Among maternal risk factors, multiple gestation and PROM/PPROM were found to be significant in the development of ROP, while mode of delivery and gestational hypertension, were found to be not significant in ROP. Among neonatal risk factors, low birth weight, lower gestational age, prolonged oxygen exposure, blood transfusion, mechanical ventilation, sepsis, phototherapy were found to be significant.

In study by Patel *et al*. incidence of ROP in 286 infants who were screened was 24.1%, 12 ROP positive cases were having birth weight >2000 gm. On multivariate analysis risk factors predisposing to ROP ($p<0.05$) were birth asphyxia, Sepsis, multiple blood transfusion, respiratory distress syndrome, multiple birth, antenatal steroid use and Phototherapy. Out of 69 infants who developed ROP, 6(8.7%) needed invasive management. Risk factors predisposing to ROP were gestational age and birth weight alone and along with the various risk factors like birth asphyxia, sepsis, multiple blood transfusion, respiratory distress syndrome, multiple birth, antenatal steroid use and phototherapy.

Selvakumar *et al*. screened 301 babies, 29 babies were diagnosed to have ROP. They noted that normal vaginal delivery, birth weight, respiratory distress syndrome (RDS), surfactant, apnea, sepsis and blood transfusion as the statistically significant risk factors ($p<0.05$). The mode of oxygen delivery also played an important role. Statistically significant relationship was present between RDS and ROP.

Strategies to control visual loss from ROP entail preventing preterm birth and improving the outcomes of preterm birth (e.g., a course of antenatal corticosteroids), high quality neonatal care from immediately after birth to reduce exposure to known modifiable factors (including hyperoxia, fluctuating hypo hyperoxia, sepsis and poor weight gain) and timely screening followed by urgent treatment of infants developing the sight threatening stages of ROP (ST ROP) (i.e., type 1 ROP)[14].

ROP services need to be integrated into neonatal care services and members of the neonatal team have a key role to play in ensuring that all eligible babies are screened and that engagement of families/parents is essential. Training ophthalmologists in ROP screening may require initial training in indirect ophthalmos copy and competencies beyond clinical skills are required, such as communication, leadership, keeping up to date with technical advances and management skills[15].

CONCLUSION

Retinopathy of prematurity (ROP) is emerging as one of the major causes of preventable childhood blindness in India. Timely and careful retinal examination of at-risk infants by an experienced ophthalmologist is essential to prevent the development of advanced ROP and serious sequelae, leading to complete blindness.

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