Original Research Article

Study of incidence and risk factors for retinopathy of prematurity in RIMS SNCU

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Abstract

Background: Retinopathy of prematurity (ROP) is a multifactorial vasoproliferative retinal disorder that increases in incidence with decreasing gestational age. Most of the risk factors associated with ROP arise in the neonatal intensive care unit (NICU) itself and most of them are avoidable. In view of paucity of Indian studies on the incidence and risk factors of ROP from Government tertiary care centers especially from the southern parts of India, the present study is undertaken. **Material and Methods:** Present study was single-center, descriptive and observational study conducted in neonates less than 34 weeks of GA or less than 1750 gms of birth weight diagnosed with retinopathy of prematurity. **Results:** During study period 230 neonates satisfying study criteria were evaluated. Incidence of ROP was 21.3% (49 neonates). In present study average gestational age was 31.4 ± 2.4 weeks. Most of patients were of 28-32 weeks gestational age (46.9 %), were male (59 2 %), with birth weight < 1000 gms (51 %), delivered by caesarean section (57.1 %). Singleton pregnancies were 63.3 % while Multiple gestation neonates were 36.7 %. In present study most of patients were Zone 2 stage 3 (30.6 %) followed by Zone 3 stage 1 (18.4 %) and Zone 2 stage 1 (16.3 %). Oxygen therapy (100 %), sepsis (83.7 %), mechanical ventilation (79.6 %), anemia of prematurity (77.6 %), maternal use of antenatal corticosteroids (65.3 %), history of blood transfusion (63.3 %), RDS (63.3 %), use of surfactants (55.1 %), thrombocytopenia (53.1 %), apnea of prematurity (53.1 %) were common risk factors noted in neonates with ROP. **Conclusion:** Early screening is recommended in VLBW and ELBW newborns with gestational age < 34 weeks along with judicious use of oxygen, blood products, sepsis prevention and timely intervention can halt the progression of ROP to end stages.

Keywords: Low birth weight, Oxygen therapy, Prematurity, Retinopathy

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INTRODUCTION

Retinopathy of prematurity (ROP) is a multifactorial vasoproliferative retinal disorder that increases in incidence with decreasing gestational age.[1] The possible mechanism of injury suggested is vasoconstriction, increase in level of vasogenic factors like vasculo-endothelial growth factor and compensatory neovascularization leading to severe extraretinal fibrovascular proliferation and retinal detachment.[1] ROP is mostly limited to preterm babies with birth weight (BW) of less than 1500 gms or GA of less than 32 weeks, with an incidence varying between 35 to 60%.[2] ROP is emerging as one of the leading causes of preventable childhood blindness in India.[2] Initial low incidence of ROP had been increasing with better screening protocols, more availability of assisted ventilation services and increased survival of preterms.[3] Infants with significant ROP have increased risk of high myopia, refractive errors, strabismus, amblyopia, astigmatism, retinal detachment and glaucoma.[1,3,4] The percentage of pediatric blindness contributed by ROP ranges from 3% to 11% in high developed countries and as high as 60% in middle developed countries.[5,6,7] Currently no definitive methods are available for the prevention of ROP. Since most of the

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risk factors associated with ROP arise in the neonatal intensive care unit (NICU) itself and most of them are avoidable, cautious monitoring of the risk factors, early screening, follow up and surgical intervention have been shown to reduce the incidence and improve the outcome of ROP.[2] In view of paucity of Indian studies on the incidence and risk factors of ROP from Government tertiary care centers especially from the southern parts of India, the present study is undertaken.

MATERIAL AND METHODS

Present study was single-center, descriptive and observational study conducted in department of paediatrics, at Raichur Institute of Medical Sciences, Raichur, Karnataka, India. Study duration was of 1 year (July 2019 to June 2020). Study was approved by institutional ethical committee. A minimum sample size calculation of 138 preterm neonates was done with the incidence of ROP as 10% amongst the total births.

Inclusion Criteria:

All preterm babies less than 34 weeks of GA or less than 1750 gms of birth weight delivered in or referred to RIMS SNCU were included.

Exclusion Criteria

Neonates more than 34 weeks of GA, or more than or equal to 1750 gms of birth weight.

Children with major congenital malformations, suspected chromosomal anomalies.

Informed Consent was obtained from parents for participation in study. As soon as neonate fulfilling study criteria is admitted to SNCU, baseline data collected regarding date of birth, sex, single or multiple pregnancy, intrauterine growth retardation and other antenatal insults. routine blood investigations, urine analysis, chest x-ray ,USG Abdomen and indirect ophthalmoscopy were done in all patients. Other details were entered in a predesigned proforma which includes assessment of risk factors like GA (either by maternal history or as assessed by Expanded New Ballard's Scoring System[8]), birth weight, oxygen exposure (number of hours on oxygen, flow rate of oxygen and mode of oxygen delivery), hypoxia and hyperoxemia (as per arterial blood gas analysis and Continuous pulse oximetry), hyperglycemia (whole blood glucose level > 125 mg%, by daily RBS monitoring thrice a day by glucometer) , thrombocytopenia (platelet count <1.5 lakhs cells/mm^3), severe respiratory illness requiring mechanical ventilation (duration of mechanical ventilation in hours, FiO2, proximal inspiratory pressure, peek end expiratory pressure), severity of illness/hyaline membrane disease (surfactant administration, necrotizing enterocolitis, intraventricular hemorrhage, apnoea of prematurity, pulmonary hemorrhage, patent ductus arteriosus), septicemia, anemia, amount of blood transfusion, duration of stay in the hospital. During the stay, heart rate, blood pressure, apnoea monitoring and oxygen saturation are done by continuous pulse oximetry. Clinical assessments and lab investigations for identifying the risk factors are carried out as mentioned above. Screening for ROP:[9] Hand washings shall be done and asepsis maintained while screening. Discomfort to the baby during ophthalmic examination was minimized by pre-treatment of the eyes with a topical Proparacaine and swaddling the baby. Pupils were dilated with Tropicamide 0.5% (1 drop instilled every 10-15 minutes for 4 times starting 1 hour before the scheduled examination) followed by Phenylephrine 2.5% (1 drop just before examination). Screening of ROP was done by indirect ophthalmoscopy by an experienced ophthalmologist in our NICU. Ophthalmological notes are made after each ROP examination, detailing zone, stage and extent in terms of clock hours of any ROP and the presence of any pre-plus or plus disease. These notes include a recommendation for the timing of next examination and are kept with medical record. After screening, the cases are classified as per International Classification of Retinopathy of Prematurity (ICROP).[10] ICROP describes vascularization of the retina and characterizes ROP by its position (zone), severity (stage), and extent (clock hours). Follow-up examinations were done as per recommendation by the examining ophthalmologist on the basis of retinal findings.

Data was collected and analysed by descriptive statistics in Microsoft excel.

RESULTS

During study period 230 neonates satisfying study criteria were evaluated. Incidence of ROP was 21.3% (49 neonates). In present study average gestational age was 31.4 ± 2.4 weeks. Most of patients were of 28-32 weeks gestational age (46.9 %), were male (59 2 %), with birth weight < 1000 gms (51 %), delivered by caesarean section (57.1 %). Singleton pregnancies were 63.3 % while Multiple gestation neonates were 36.7 %.

Table 1: General characteristics

Characteristics	No. of cases (n=49)	Percentage
Gestational age (weeks)		
<28 weeks	18	36.7
28-32 weeks	23	46.9

33-34 weeks	8	16.3
Average gestational age (weeks)	31.4 ± 2.4	
Gender		
Male 39 59 2	29	59.2
Female 27 41 6	20	40.8
Birth weight (gms)		
< 1000	25	51.0
1000-1499	13	26.5
1500-1750	11	22.4
Mode of delivery		
Vaginal	21	42.9
Caesarean	28	57.1
Gestation		
Singleton	31	63.3
Multiple	18	36.7

In present study most of patients were Zone 2 stage 3 (30.6 %) followed by Zone 3 stage 1 (18.4 %) and Zone 2 stage 1 (16.3 %).

Table 2: Stages of retinopathy of prematurity

ROP stage		
Zone 2 stage 1	8	16.3
Zone 2 stage 2	5	10.2
Zone 2 stage 3	15	30.6
Zone 3 stage 1	9	18.4
Zone 3 stage 2	8	16.3
Zone 3 stage 3	4	8.2

Oxygen therapy (100 %), sepsis (83.7 %), mechanical ventilation (79.6 %), anemia of prematurity (77.6 %), maternal use of antenatal corticosteroids (65.3 %), history of blood transfusion (63.3 %), RDS (63.3 %), use of surfactants (55.1 %), thrombocytopenia (53.1 %), apnea of prematurity (53.1 %) were common risk factors noted in neonates with ROP.

Table 3: Risk factors noted in neonates with ROP

Risk factors	No. of cases (n=49)	Percentage
Oxygen therapy	49	100
Sepsis	41	83.7
Mechanical ventilation	39	79.6
Anemia of prematurity	38	77.6
Maternal use of antenatal corticosteroids	32	65.3
History of blood transfusion	31	63.3
RDS	31	63.3
Use of surfactants	27	55.1
Thrombocytopenia	26	53.1
Apnea of prematurity	26	53.1
Intraventricular hemorrhage	21	42.9
TTN	21	42.9
Pulmonary diseases	19	38.8
Cardiac diseases	13	26.5
Respiratory support	42	85.7
Neonatal seizures	39	79.6
Hypoglycemia	31	63.3
Apgar score at 1 min	6.4 ± 2.2	
Apgar score at 5 min	5.8 ± 1.7	
Days on oxygen therapy	18.4 ± 6.7	
Days on CPAP	16.7 ± 8.9	
Days on mechanical ventilation	21.4 ± 8.4	
Number of blood transfusions	6.3 ± 2.1	

DISCUSSION

In low- and middle-income countries (LMICs), ROP is becoming an important cause of childhood blindness due to increasing survival associated with access to neonatal intensive care services.[11] The most widely used classification for ROP is the International Classification of Retinopathy of Prematurity (ICROP) which classifies ROP into stage 1 to 5, plus disease, extend, threshold and pre-threshold disease.[10] The incidence of ROP according to a study by Chaudhari S at Pune was overall 22.3%. 33.6% of the infants with ROP required laser photocoagulation and 9% had blindness due to retinal detachment.[12] The incidence of ROP according to a study at Bangalore by Rekha S was overall 46%, 73.3% in less than 1000 gms and 47.3% in less than 1500 gms birth weight babies.[13] Many risk factors are associated with ROP like low GA, low birth weight, prolonged oxygen exposure, severity of neonatal illnesses, severe respiratory distress requiring mechanical ventilation, shock, sepsis, hypoxia, prolonged ventilatory support, need for blood transfusion, intraventricular hemorrhage, acidosis, anemia, high ambient light, vitamin E deficiency whereas breast feeding and history of maternal preeclampsia are protective.[14,15] Le C *et al.*[16], noted that most prevalent postnatal risk factors among patients with ROP were RDS (58%) and use of oxygen therapy (71%). 36% infants with ROP were diagnosed with anemia of prematurity, with 26% of these infants requiring transfusion of packed red blood cells. Other significant postnatal risk factors were presence of sepsis (33%), transient tachypnea of the newborn (20%), apnea of prematurity (20%), patent ductus arteriosus (17%), hypoglycemia (15%), and neonatal seizures (6%).

In study by Zarei M *et al.*,[17] prevalence of ROP was 27.28% (n = 543) among all screened infants, 74.4% for extremely preterm (EP) infants, 77.5% for extremely low birth weight (ELBW) babies, and 27.25% for infants from multiple gestation pregnancies. Gestational age, birth weight, and history of transfusion were found to be significantly associated with ROP. More advanced stages of ROP were observed in EP and ELBW infants. Birth weight, history of transfusion and intubation were not associated with increased risk of ROP in EP infants, while gestational age and history of transfusion (P = 0.040) were significant risk factors for ROP in ELBW infants. Anuja Sathar[18] studied 203 cases with ROP against a control group of 609 babies. On multivariate analysis apart from low birth weight and low gestational age, risk factors found statistically significant were apnea, blood transfusion, hyaline membrane disease, phototherapy, ventilator support and oxygen use more than seven days. Factors significantly associated with severity of ROP were oxygen by continuous positive airway pressure, congenital pneumonia, shock, hyaline membrane disease and surfactant use. Compromised pulmonary function along with oxygen, surfactant therapy and shock are important risk factors for severe ROP. Chen ML *et al.*,[19] published a systematic review and meta-analysis to report the association between severe ROP and the incidence of premature infants with high or low target oxygen saturation measured by pulse oximetry. Low oxygen saturation (70%-96%) in the first several postnatal weeks was associated with a lesser risk of severe ROP and high oxygen saturation (94%-99%) at more than or equal to 32 weeks of GA was associated with a lesser risk for progression to severe ROP. They concluded that in preterm infants with a GA of less than or equal to 32 weeks, early low and late high oxygen saturation were associated with a reduced risk for severe ROP. Presence of ROP on the first examination, posterior location, increasing severity of stage, circumferential involvement, plus disease and rapid progression are the risk factors which necessitates treatment.[1] In certain neonates with ROP intervention with laser photocoagulation is required. Laser photocoagulated eyes showed regression of the disease, and the results were extremely satisfactory.[20,21]

CONCLUSION

Early screening is recommended in VLBW and ELBW newborns with gestational age < 34 weeks along with judicious use of oxygen, blood products, sepsis prevention and timely intervention can halt the progression of ROP to end stages.

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