ISSN No:-2456-2165

To Evaluate the Occurrence and to Analyse Risk Factors for the Development of ROP in a Tertiary Care Hospital

Dr. Venugopal Reddy. I, Medical Director and Consultant Pediatrician,
Ovum Hospital, Bangalore.
Dr. Kasi Viswanath Reddy , Consultant Pediatrician , Hyderabad.

Abstract:- ROP is a significant contributor to infant blindness that could be avoided by early detection of retinal damage and the implementation of suitable treatment. It is thought to be responsible for 6-18% of childhood blindness in industrialised nations, and up to 10% at the Royal Blind School of Edinburgh. In the past ten years, improvements in neonatal care have increased the survival statistics for premature infants, and the prevalence of ROP has risen concurrently. Five stages of ROP are subtotal retinal detachment, total retinal detachment in stage 5, a faint demarcation line in stage 1, an elevated ridge in stage 2, extraretinal fibro vascular tissue in stage 3, and plus disease in stage 2.

This study evaluated the occurrence and risk factors for the development of Retinopathy of prematurity (ROP) in a tertiary care hospital located in Hyderabad, India. The Hyderabad Neonatal Intensive Care Unit (NICU) served as the site of this retrospective and prospective observational research. Neonates were included if they were born at or below 34 weeks' gestation and weighed no more than 1750 g. ROP was observed 47% of the time overall in the research, and type I ROP was 25% common. The outborn nature of the unit, the small sample size, the late arrival of sick preterm neonates, and the loss of the usual golden first hour of management of these small neonates may be responsible for the higher incidence of ROP in our research. Another significant factor might be the cohort's almost total absence of antenatal steroids.

Keywords:- *ROP Incidence, Childhood Blindness, Oxygen, Retina, Born.*

I. INTRODUCTION

ROP is a significant contributor to infant blindness that could be avoided. It is thought to be responsible for 6–18% of childhood blindness in industrialised nations, and it accounts for up to 10% of childhood blindness at the Royal Blind School of Edinburgh1.1 In the past ten years, improvements in neonatal care have increased the survival statistics for premature infants.3 As a result, the prevalence of ROP has risen concurrently. Worldwide, statistical research on ROP is ongoing.4

The prevention of blindness and improved overall development for children are made possible by early detection of retinal damage and the implementation of suitable treatment.5

Premature babies' retinas exhibit abnormal neovascular development, which is what defines ROP. The retina can become scarred and displaced by these abnormal blood vessels because they are brittle and can leak or haemorrhage. The primary factor in ROP-related vision impairment and blindness is a tractional retinal detachment, which is caused by this.6

The five stages of ROP are a subtotal retinal detachment in stage 4, a total retinal detachment in stage 5, a faint demarcation line in stage 1, an elevated ridge in stage 2, extraretinal fibrovascular tissue in stage 3, and a faint demarcation line in stage 2. 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.7

Terry8 first identified Retinopathy of prematurity in 1942 and suggested oxygen treatment was the likely cause. ROP has been documented in cases without oxygen treatment, though not all premature infants who receive oxygen therapy go on to develop ROP.9 Three factors—low gestational age, low birth weight, and prolonged exposure to supplemental oxygen after delivery—have demonstrated a consistent and substantial association with ROP.10 Other potential risk factors include apnea, surfactant treatment, anemia, numerous blood transfusions, sepsis, intraventricular hemorrhage, and mechanical ventilation.11 These factors' exact contributions to the development of the disease are still unknown.15.

The aim of present study is to evaluate the occurrence and to analyse risk factors for the development of ROP in a tertiary care hospital located in Hyderabad, India.

II. MATERIALS AND METHODS

The Hyderabad Neonatal Intensive Care Unit (NICU) served as the site of this retrospective and prospective observational research. If an infant received oxygen treatment for more than seven days, they were included if they were born at or below 34 weeks' gestation and weighed no more than 1750 g. Infants who were born between 34 and 36 weeks gestation were checked to see if they had an

ISSN No:-2456-2165

unstable course. Infants who passed away prior to the initial ophthalmologic evaluation were not included. All of the neonates in this research underwent the following:

History: Perinatal history; identify risk factors such as prematurity, sepsis (offensive liquor, premature separation of membranes >18 hours, maternal uTI, and intrapartum temperature >38°C), and perinatal asphyxia.

Patint History: The most frequent respiratory distress symptoms needing oxygen treatment, sepsis, phototherapy, congenital heart disease, and blood transfusions are all included in the patient's current history.

- *Clinical Assessment*

Weight, height, the circumference of the cranium, the gestational age calculated using the new Ballard score, the neonatal reflexes, the neurological symptoms, the respiratory manifestations, and the circulatory manifestations.

- *Local Eye Examination*

From the fourth postnatal week onward, the ophthalmologist routinely examined all newborns at intervals of 1-2 weeks. One hour prior to the test, eye drops containing cyclopentolate 0.1% and phenylephrine 0.1% were used to dilate the pupils.

With a speculum and scleral depression, indirect ophthalmoscopy was carried out using a 28-diopter lens. When necessary, an optometrist examined the retina and performed a retinal drawing and RetCam 2 fundus imaging.

According to the criteria set by the International Committee for Classification of ROP, ROP was defined as the incomplete or abnormal vascular proliferation of the retina. ROP was categorised by location on the retina (zone 1-3) and severity (stage 1-5).7 Laser photocoagulation was used to treat each patient who had been identified with stage 3 ROP.

The ophthalmological examinations were started at the fourth week of life and were repeated weekly or biweekly, following the follow-up schedule advised by the AAP, AAO, and AAPO16, until full retinal vascularization reached zone 3 (the most peripheral temporal retinal zone), or until full ROP remission following treatment. In this research, we looked at a number of prenatal and postnatal risk factors that were thought to be connected to the development of both mild and severe ROP in our NICU settings. Gestational age, birth weight, sex, and delivery method made up the prenatal factors. Respiratory distress syndrome, oxygen therapy, phototherapy for jaundice, frequency of blood transfusions, sepsis (by clinical diagnosis, with either C-reactive protein greater than 6.0 mg/dl or blood culture positive cases), hypotension (as determined by the standard mean for age and weight), intraventricular haemorrhage (as determined by cranial ultrasound), and patent ductus arteriosus were the post-natal variables. (as identified by echocardiography).

An indirect binocular ophthalmoscope with a +20 dioptre lens was used for the screening, which was carried out by a retina specialist in the NICU under aseptic circumstances. Every 15 minutes, until the pupil was fully expanded, 1% tropicamide + 2.5% phenylephrine was used to dilate the pupils. According to the International Classification for Retinopathy of Prematurity, retinal disease was divided into phases and zones.

The first scan was performed four weeks after delivery. The results of the original visit were used to guide the repeat exams.

- *Data analysis*

SPSS v20 was used to examine the data. The chi square test and univariate analysis were used for the data analysis. P values of 0.05 or lower were considered statistically significant.

III. RESULTS

Overall 47% of screened eligible neonates (n = 59) had ROP. Among the cases diagnosed as ROP 53.5% were males and 46.5% were females. Mean birth weight of cases (ROP) and controls (NO ROP) were 1.13 ± 0.23 kg and 1.35 ± 0.23 kg respectively, and mean gestational age of cases and controls were 29.64 ± 2.46 weeks and 32.32 ± 1.9 weeks respectively. Distribution of birth weight and gestational age in the study population in relation to ROP were analysed in the Table 1.

Table 1: Correlation of birth weight and gestational age between ROP and with NO ROP

variable	ROP(n=28)	NO ROP(n=31)	P VALUE
Birth weight			
<1000gm	8	0	0.006
1001-1500gm	17	25	
>1500gm	3	6	
Mean birth weight	1.13±0.23kg	1.35±o.23kg	
Gestational age			
≤28weeks	12	1	0.000
29-31weeks	11	8	
32-34weeks	15	12	
Mean gestational age	29.64± 2.46weeks	32.32±1.9weeks	

ISSN No:-2456-2165

The most prevalent risk factors among patients with ROP were use of oxygen therapy followed by RDS. 96.4% of patients with ROP experienced need for oxygen therapy as compared to 64.5% among NO ROP group (P= 0.002). 60.7% of patients with ROP have RDS when compared to 19.3% among NO ROP group(P=0.000). Other significant postnatal risk factors noted were presence of sepsis (57%), patent ductus arteriosus (53.5%), IVH (42.8%), respiratory support via ventilation (35.7%) and packed red blood cells transfusion (35.7%). Multiple gestation was not statistically significant between the groups. (Table 2)

Table 2: Risk factors in relation to ROP

factors	ROP(n=28)	WITH OUT ROP(n=31)	P VALUE
OXYGEN THERAPY	27	20	0.002(S)
MECHANICAL VENTILATION	10	4	0.000(S)
PDA	15	6	0.006(S)
RDS	17	6	0.001(S)
IVH	12	2	0.001(S)
SEPSIS	16	7	0.007(S)
PRBC TRANSFUSION	10	1	0.001(S)
MULTIPLE GESTATION	6	7	0.915(NS)

S- significant, NS-Not significant

All infants who developed ROP in our study weighed <1,750 g at birth. The majority of the infants had a birth weight between 1001 and 1500 g (60.7%). The second most common range was ≤1000 g (28.5%). Seven infants were diagnosed with vision-threatening ROP (any Zone I disease or Stage 2/3 disease in Zone II with plus disease), a prevalence of 25% among ROP group. All of these underwent laser treatment. Table 3 shows occurrence of ROP and Laser treatment required according to gestaional age and birth weight.

TABLE 3: Occurrence and treatment outcome among study population

variable	ROP(n=28)	Required Laser Rx(n=7)
Birth weight		
<1000gm	8(28.6%)	3(42.8%)
1001-1500gm	17(60.7%)	4(57.2%)
>1500gm	3(10.7%)	0
Gestational age		
≤28weeks	12(42.9%)	4(57.2%)
29-31weeks	11(39.3%)	2(28.5%)
32-34weeks	5(17.8%)	1(14.3%)
Stage		
1	16(57.2%)	0
2	7(25%)	2(28.6%)
3	5(17.8%)	5(71.4%)
Zone		
1	1(3.5%)	1(14.2%)
2	7(25%)	6(85.8%)
3	20(71.5%)	0
Plus disease	6(21.4%)	6(85.7%)

IV. DISCUSSION

ROP was observed 47% of the time overall in our research. Among newborns with any ROP, type I ROP was 25% common. In a study done in Bhuvaneswar Orrisa, India, ROP incidence was found to be 33%. At AIIMS New Delhi, serious ROP occurred 4.6% and 20% of the time, respectively. The outborn nature of our unit, the small sample size, the late arrival of sick preterm neonates, and the loss of the usual golden first hour of management of these small neonates may be responsible for the higher incidence of ROP in our research. Another significant factor might be the cohort's almost total absence of antenatal steroids. The incidence of ROP at different center in our country ranges from 38 to 56% which closely mimics our incidence.

Compared to AIIMS data, our research found a higher incidence of type I ROP (11%) likely because more ELBW babies (50%) were included among those who underwent LASER.

In a study from Hyderabad, the prevalence of ROP was found to be 2.3% (n = 66), with Stage I ROP accounting for the bulk of cases (71%). One-seventh of the babies had weights under 1000 grammes. Multiple pregnancy (17%) was the most common gestational risk factor. Oxygen therapy and respiratory distress syndrome were the two most common perinatal risk factors (71% and 58%, respectively). Similar risk factor patterns were found in our research, with the need for oxygen topping the list. Despite being higher in the ROP group, multiple gestation was not statistically relevant.

Another research from Tamilnadu that included five NICUs found a significant correlation between the incidence of ROP and both oxygen therapy and RDS. The other risk variables, such as intrauterine growth restriction (IVH), surfactant therapy, blood transfusion, sepsis, multiple pregnancies, gestational diabetes, maternal hypertension, and antepartum hemorrhage, did not demonstrate any meaningful correlation. On the basis of univariate analysis, we did discover a significant correlation between IVH, surfactant treatment, blood transfusion, and sepsis. The association between prenatal risk factors and the ROP was not investigated.

In our research, neonates that were ELBW and younger than 28 weeks had a high incidence of both type I and other ROPs. The prevalence in the Tamilnadu study of these small babies was comparable to our analysis (26 vs. 28% any ROP). Low birth weight and low gestation are recognised risk factors for type I ROP as well as other ROPs.

Prematurity-related apnea was discovered to be an independent risk factor in a study from Sikkim; this risk factor was not assessed in our analysis.

V. CONCLUSION

We are conscious that the small number of patients in this study is one of its limitations. The results from this research indicate that low gestational age, sepsis, oxygen therapy, and frequent blood transfusions are independent risk factors in the development of ROP. In conclusion, the prevalence of Type 1 ROP in this study was 11%. When monitoring preterm infants, clinicians should be aware of the presence of the extra risk factors. Understanding and predicting ROP development in severely preterm infants will be made possible by a study of risk factors. For high-risk preterm babies to avoid developing advanced ROP, prompt retinal screening is crucial. All efforts must be made to prevent the development of advanced ROP through the elimination of preterm births, modifications to neonatal care, and enhancements in the detection of threatening ROP markers because ROP may result in severe sequelae up to complete blindness.

REFERENCES

[1]. Coats DK, Aaron MM, Mohamed AH. Involution of retinopathy of prematurity after laser treatment: Factors associated with development of retinal detachment. Am J Ophthalmol. 2005;140:214–22. [PubMed] [Google Scholar]
[2]. Fleck BW, Dangata Y. Causes of visual handicap in the Royal Blind School, Edinburgh, 1991-2. Br J Ophthalmol. 1994;78:421. [PMC free article] [PubMed] [Google Scholar]
[3]. Dominico R, Davis K, Davis O. Documenting the NICU design dilemma: Comparative patient progress in open-ward and single family room units. J Perinatol. 2011;31:281–8. [PMC free article] [PubMed] [Google Scholar]
[4]. Akçakaya A, Yaylali S, Akçay G. Screening for retinopathy of prematurity in a tertiary hospital in istanbul: Incidence and risk factors. J Pediatr Ophthalmol Strabismus. 2011;15:1–5. [PubMed] [Google Scholar]
[5]. Fanaroff AA, Martin RJ, editors. Neonatal perinatal medicine. 7th ed. Louis: Mosby; 2002. pp. 676–745. [Google Scholar]
[6]. Azad R, Chandra P. Retinopathy of prematurity. J Indian Med Assoc. 2005;103:370–2. [PubMed] [Google Scholar]
[7]. International Committee for the Classification of Retinopathy of Prematurity. The International Classification of Retinopathy of Prematurity revisited. Arch Ophthalmol. 2005;123:991–9. [PubMed] [Google Scholar]
[8]. Terry TL. Extreme prematurity and fibroblastic overgrowth of persistent vascular sheath behind each crystalline lens. Am J Ophthalmol. 1942;25:203–4. [PubMed] [Google Scholar]
[9]. Chawla D, Agarwal R, Deorari A. Retinopathy of prematurity. Indian J Pediatr Paul VK. Indian J Pediatr. 2008;75:73–6. [PubMed] [Google Scholar]
[10]. Kim T, Sohn J, Yoon YH. Postnatal risk factors of retinopathy of prematurity. Paediatr Perinat Epidemiol. 2004;18:130–4. [PubMed] [Google Scholar]
[11]. Shah VA, Yeo CL, Ling YL. Incidence, risk factors of retinopathy of prematurity among very low birth weight infants in Singapore. Ann Acad Med Singapore. 2005;34:169–78. [PubMed] [Google Scholar]
[12]. Gupta VP, Dhaliwal U, Sharma R. Retinopathy of prematurity-risk factors. Indian J Pediatr. 2004;71:887–92. [PubMed] [Google Scholar]
[13]. Karna P, Muttineni J, Angell L. Retinopathy of prematurity and risk factors: A prospective cohort study. BMC Pediatr. 2005;5:18. [PMC free article] [PubMed] [Google Scholar]
[14]. Englert A, Saunders A, Purohit D. The effect of anemia on retinopathy of prematurity in extremely low birth weight infants. J Perinatol. 2001;21:21–6. [PubMed] [Google Scholar]
[15]. Imren A, Sibel O, Gursel Y. Risk Factors in the development of mild and severe retinopathy of prematurity. J AAPOS. 2006;10:449–53. [PubMed] [Google Scholar]
[16]. American Academy of Pediatrics Section on Ophthalmology; American Academy of Ophthalmology; American Association for Pediatric Ophthalmology and Strabismus. Screening examination of premature infants for retinopathy of prematurity. Pediatr. 2006;117:572–6. [PubMed] [Google Scholar]
[17]. Murthy KR, Nagendra BK. Analysis of risk factors for the development of ROP in preterm infants at a tertiary referral hospital in South India. Acta Medica Lituanica. 2006;13:147–51. [Google Scholar]
[18]. Taqui AM, Syed R, Chadry TA. Retinopathy of prematurity: Frequency and risk factors in a tertiary care hospital in Karachi, Pakistan. J Pak Med Assoc. 2008;58:186–90. [PubMed] [Google Scholar]
[19]. Chen Y, Li X-x, Yin H, Gilbert C, Liang JH, Jiang YR, et al. Risk factors for retinopathy of prematurity in six neonatal intensive care units in Beijing, China. Br J Ophthalmol. 2008;92:326–30. [PubMed] [Google Scholar]
[20]. Fortes JB, Barros CK, Lermann VL. Prevention of blindness due to retinopathy of prematurity at hospital de clinicas de porto alegre, Brazil: Incidence, risk factors, laser treatment and outcomes from 2002 to 2006. Acta medica Lituanica. 2006;13:130–6. [Google Scholar]
[21]. Dammann O, Brinkhaus MJ, Bartels DB. Immaturity, perinatal inflammation, and retinopathy of prematurity: A multi-hit hypothesis. Early Hum Dev. 2009;1016:1–5. [PubMed] [Google Scholar]
[22]. Fortes JB, Eckert GU, Procianoy L. Incidence and risk factors for retinopathy of prematurity in very low and in extremely low birth weight infants in a unit-based approach in southern Brazil. Eye (Lond) 2009;23:25–30. [PubMed] [Google Scholar]

[23]. Arroe M, Peitersen B. Retinopathy of prematurity: Review of a seven year period in a Danish neonatal intensive care unit. Acta Paediatr. 1994;83:501–5. [PubMed] [Google Scholar]
[24]. Roberto F, Miguel AH, Ricardo JH. Screening for retinopathy of prematurity: Results of a 7-year Study of underweight newborns. Arch Med Res. 2007;38:440–3. [PubMed] [Google Scholar]
[25]. Vinekar A, Dogra M, Sangtam T. Retinopathy of prematurity in Asian Indian babies weighting greater than 1250 gram at birth; ten years data from tertiary care center in a developing country. Indian J Ophthalmol. 2007;55:331–6. [PMC free article] [PubMed] [Google Scholar]
[26]. Chaudhari S, Patwardhan V, Vaidya U. Retinopathy of prematurity in a tertiary care center, incidence, risk factors and outcomes. Indian Pediatr. 2009;46:219–24. [PubMed] [Google Scholar]
[27]. Smith LE. Pathogenesis of retinopathy of prematurity. Acta Paediatr Suppl. 2002;91:26–8. [PubMed] [Google Scholar]
[28]. Weinberger B, Laskin DL, Heck DE. Oxygen toxicity in premature infants. Toxicol Appl Pharmacol. 2002;181:60–7. [PubMed] [Google Scholar]
[29]. Palmer AE, Hardy RJ, Dobson V Cryotherapy for Retinopathy of Prematurity Cooperative Group. Outcomes following Threshold Retinopathy of Prematurity. Final results from the multicenter trial of cryotherapy for retinopathy of prematurity. Arch Ophthalmol. 2005;123:311–8. [PubMed] [Google Scholar]
[30]. Ikeda H, Kuriyama S. Risk factors for retinopathy of prematurity requiring photocoagulation. Jpn J Ophthalmol. 2004;48:68–71. [PubMed] [Google Scholar]