International Journal of Research in Medical Sciences
Kaur H et al. Int J Res Med Sci. 2023 Jan;11(1):113-117
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20223301

Original Research Article

Prevalence of retinopathy of prematurity among premature babies in a tertiary care hospital

Happy Kaur*, Sanjay Kai

Department of Ophthalmology, GMC Jammu, Jammu and Kashmir, India

Received: 17 November 2022
Revised: 07 December 2022
Accepted: 08 December 2022

***Correspondence:**
Dr. Happy Kaur,
E-mail: haps02@yahoo.com

ABSTRACT

Background: Retinopathy of prematurity (ROP) is a Vaso-proliferative retinal disease affecting low birth weight (BW) and premature infants which leads to blindness unless recognized and treated early. Aim was to study prevalence of ROP in babies <1500 gm and <32 weeks of gestation and stress the importance of examination of premature babies at four weeks after birth and regular follow up till the vascularization is complete. The aim was to determine the prevalence of ROP in premature babies in a tertiary care hospital.
Methods: It is a prospective study carried out in premature babies referred for ophthalmological examination in eye OPD of govt. medical college Jammu over a period of one year. Babies with gestational age (GA) of <32 weeks at birth and BW<1500 gm, babies with gest age >32 weeks or BW>1500 gm were included if they were exposed to oxygen therapy for more than >7 days. Neonates with a BW<1500 g and GA<32 weeks who were referred for a ROP eye examination as an outpatient, were included in the study. Neonates with major congenital malformations, syndromes or congenital cataracts or tumors of the eyes, and those that died before the eye examination or did not attend the out-patient's department for an eye examination, were excluded. More than 100 premature babies were examined by indirect ophthalmoscope with 20 D lens, scleral depressor and eye speculum. First examination was done at 4th post-natal week then weekly and biweekly until retinal vascularization has reached zone 3.
Results: Out of 100 neonates, ROP was identified in nine neonates (10%) at the first eye examination. ROP was significantly associated with BW (p=0.0165), GA (p=0.0176).
Conclusions: We identified ROP in 10% of neonates at first eye examination. Significant associations between ROP and a GA<32 weeks and a BW<1500 g was also observed. We also stress that serial follow-up of neonates at risk for ROP is important when making a final diagnosis.

Keywords: Premature, Low BW, ROP

INTRODUCTION

Retinopathy of prematurity (ROP) is an important cause of preventable blindness in children.[1] Recent advances in neonatal care in the last decade, have improved the survival rates for premature infants.[3] Consequently, the incidence of ROP has increased in parallel.

ROP is under constant epidemiological study around the world.[4] The condition was first described by Terry in 1942 as retrolentalfibroplasia.[2] As developing countries began to adopt modern neonatology techniques in the1980s and 1990s, increasing the survival of preterm neonates, ROP began to emerge in middle-income countries (the 'third epidemic'), where it can account for as much as 60% of childhood blindness.[3] The 'first epidemic' of ROP took place in the 1940s and 1950s, affected larger premature infants, and was associated with unmonitored oxygen supplementation.[3,4] In India, with the development of neonatal intensive care

units, premature infants with extremely low birth weights are surviving and are at highest risk of developing ROP.[5] Over 22% of childhood blindness in India is attributable to retinal etiologies and "Retinopathy of prematurity-ROP" is the commonest, and more preventable of these causes. The incidence of ROP in India estimated to be 47.27% according to Charan et al.[6]

Early identification of retinal damage and the institution of appropriate treatment prevent blindness and offer child better overall development.[5]

ROP is characterized by abnormal neovascular development in the retina of premature infants. These abnormal blood vessels are fragile and can leak or bleed, scarring the retina and pulling it out of position. This causes a tractional retinal detachment, which is the main cause of visual impairment and blindness in ROP.[6]

The stages of ROP describe the ophthalmoscopic findings at the junction between the vascularized and avascular retina; stage 1 is a faint demarcation line, stage 2 is an elevated ridge, stage 3 is an extraretinal fibrovascular 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.[7] Plus disease refers to presence of engorged veins and tortuous arteries in at least two quadrants at posterior pole with any stage of ROP.

Associated with it is the engorgment and dilatation of iris vessels, which result in poor pharmacological dilatation of pupil. Plus diseases signifies a tendency to progression and is notated by adding plus sign (+) after the number of stage of ROP (e.g., stage 2+). Pre-plus disease is labelled when venous dilation and arterial tortuosity is more than normal but insufficient to be defined as plus disease.

Aggressive posterior ROP (AP-ROP), also called Rush-disease, refers to the ROP located in zone I with plus disease out of proportion to the peripheral retinopathy or ROP in posterior zone II with severe, plus disease. APROP requires immediate treatment. It may progress rapidly to stage 5 ROP without passing through the other stages.

Threshold disease refers to stage 3 +ROP with plus disease located in zone I or II and involving 5 continuous or 8 discontinuous clock hours. This stage needs laser therapy in less than 72 hours.

In 1942, Terry first described retrolental fibroplasia with implication of oxygen therapy as the causative agent.[8] However, reports have found ROP in cases without oxygen therapy and even after oxygen therapy, not all premature infants develop ROP.[9] Three factors have shown consistent and significant association with ROP: low GA, low BW and prolonged exposure to supplementary oxygen following delivery.[10]

Aim

Aim of the study was to determine the prevalence of (ROP) among premature babies in tertiary care hospital.

METHODS

It is a prospective study carried out in premature babies referred for ophthalmological examination in eye OPD of govt. medical college Jammu over a period of one year. Babies with GA of <32 weeks at birth and birth weight <1500 gm, babies with gest age>32 weeks or birth weight >1500 gm were included if they were exposed to oxygen therapy for more than >7 days.

Inclusion criteria

babies with GA<32 weeks and birth weight <1500 gm, babies with GA >32 weeks and birth weight >1500 gm if exposed to oxygen therapy for more than 7 days were included in the study.

Exclusion criteria

Neonates with congenital anomalies, chromosomal abnormalities and inborn error of metabolism will be excluded from study.

More than 100 premature babies were examined by indirect ophthalmoscope with 20 D lens and scleral depressor demographic history and risk factors, like respiratory distress, sepsis, multiple blood transfusion, multiple birth,apneic episode and oxygen documented.

First examination was done at 4th post-natal week then weekly and biweekly until retinal vascularization has reached zone 3.

The pupils were dilated using 2.5% phenylephrine and 1% tropicamide eye drops instilled into each eye three times at intervals of 15 minutes one hour before examination. The examination was done under all aspectic condition. One drop of topical paracaine eyedrops were used and paediatric wire speculum was used to keep eyelids apart. Indirect ophthalmoscopy was done by same ophthalmologist using 20 D lens and scleral depressor If no ROP was detected at initial examination. the infants were re-evaluated once every two weeks. Until vascularization was complete. If ROP was detected the examination was performed weekly for stage 1 and 2 more frequently for stage 3 till the disease start resolving.

ROP was defined as the incomplete or abnormal vascular proliferation of the retina, The ROP classified by location on retina (zone 1-3), and severity (stage 1-5), according to criteria established by the international committee for

classification of ROP.[7] All patients diagnosed with stage 3 ROP treated with laser photocoagulation.

The ophthalmological examinations were initiated at the 4th week of life and were repeated weekly or biweekly, until full vascularization of the retina reached zone 3 (the most peripheral temporal retinal zone), or until full remission of ROP after treatment.

Our study was carried out after approval by the ethical committee of college. Informed consents were obtained from the parents of the subjects.

The prevalence rate of ROP was described in simple proportion. Group comparisons were done by the Chi-squared ($\chi 2$) test or Fisher's exact test for categorical variables. A probability (P) of less than 0.05 was considered significant.

RESULTS

The study population included 100 neonates; all pre-terms with a GA of 32 weeks or less at birth and a BW of 1500 g or less. This study also included infants whose GA was >32 weeks or BW was >1500 g with unstable condition.

Out of the 100 neonates; 47 (47%) were males and 53 (53%) were females. The mean GA was 30.95 weeks; 53 were <32 weeks; and 46 were > or equal to 32 weeks. The BW ranged from 9500 to 1500 gm.

Table 1: Demographic data of studied patient, (n=100).

Demographic characters	N	Percentages (%)
Gender		
Male	47	47
Female	53	53
GA (Weeks)		
<32	53	53
>32	47	47
BW (Gm)		
<1500	52	52
>1500	48	48

Table 2: Relationship between ROP and risk factors.

Variables	ROP present	ROP absent	P value
Gender			
Male	3	44	0.3275
Female	7	46	
GA (Week)			
<32	9	44	0.0176
>32	1	46	
BW (Gm)			
<1500	9	43	0.0165
>1500	1	47	

In our study out of 100 babies, 47% were male and 53% were females. ROP developed in three males and seven females. Applying fisher test (p>0.05) so gender was insignificant in development of ROP.

Out of 100 babies 53 babies were of <32 weeks gestation and 47 were of >32 weeks gestation 10 developed ROP out of which 9 were of GA <32 weeks and 1 was of GA>32 weeks. Applying fisher test p=0.0176 which was statistically significant (p<0.05), thereby implying gestation age is significantly associated with occurrence of ROP.

Out of 100 babies, 52 had birth weight of <1500 gm and 48 had birth weight of>1500 gm. Out of 10 babies who developed ROP, 9 had birth weight <1500 gm and 1 had birth weight of >1500 gm. Applying fisher test p=0.0165 which is statistically significant. So, birth weight is significantally associated with occurrence of ROP.

Intervention with laser was necessary for the 1 case diagnosed as stage 3, and patients showed improvement on follow-up. The other 9 cases regressed spontaneously without intervention.

Table 3: Outcome of ROP in studied cases, (n=10).

Variables	N (%)	Outcome
ROP stage 1	7	Spontaneous regression
ROP stage 2	2	Spontaneous regression
ROP stage 3	1	Needed laser treatment

Out of the 100 neonates; 10 (10%) cases developed ROP in one or both eyes classified as 7 (7%) cases stage 1, 2 (2%) cases stage 2, and 1 (1%) case stage 3. None of the studied neonates presented ROP at stages 4 or 5.

Table 2 shows the relationship between ROP and risk factors. There was a significant relationship between the occurrence of ROP and GA (p=0.0176), BW (p=0.0165), On the other hand, there was no significant relationship between the occurrence of ROP and sex,

Table 3 shows the outcome of ROP in studied cases. Intervention with laser was necessary for the1 cases diagnosed as stage 3, and patients showed improvement on follow-up. The other 9 cases regressed spontaneously without intervention.

DISCUSSION

ROP is a disorder of retinal vascular development in preterm infants. It continues to be a significant complication in preterm neonates despite advances in neonatal care and remains a major cause of childhood blindness worldwide.[16]

The prevalence of ROP in this study was 10% and this was less than that reported in many other studies; 24% in India, 29.2% in Singapore, and 32.4% in Pakistan.[11,17,18]

This can be explained by the fact that these studies involved only very low BW infants. However, it is higher than the study done in Beijing which involved infants with higher GA and BW (up to 2 kg and /or 34 weeks GA) and reported a prevalence of 10.8%.[19]

ROP is a multifactorial disease involving many factors. Low-GA, low-BW, sepsis, oxygen therapy, respiratory distress syndrome, and blood transfusion have been suspected to influence the incidence of ROP.20 The most significant risk factors for development of ROP were low-GA and low-BW, as shown in many studies.10,15,21 In our study, low- GA, and low BW were found to be risk factors for development of ROP independently. Gender was an insignificant factor in development of ROP

As regard the effect of low- GA on occurrence of ROP, 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.[11,13,22] 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 that birth was a significant factor for the development of ROP as in many studies which reported that lower BW was significantly associated with development of ROP, and explained that by more susceptibility for oxygen therapy, prolonged ventilation, sepsis, and blood transfusion in very low BW infants.[11,22,24]

Some studies reported that a duration of oxygen therapy more than 7 days was a significant risk factor for development of ROP.[11,30] Meanwhile, in our study we found it insignificant which was in agreement with the results of Dutta et al.[31]

Our study revealed insignificant relationship between sex and occurrence of ROP, in contrast to Darlow et al who found that male sex is a significant risk factor.[34] In agreement with Seiberth and Lindarkomp, we found insignificant relationship between the mode of delivery and occurrence of ROP.[35] But this was in disagreement with Shah et al who found that cesarean section delivery was significantly associated with occurrence of ROP.[11]

Laser photocoagulation was found to be very effective in regressing ROP. In agreement with Coats et al we found that the one case that required laser intervention improved and ROP regressed with regular follow-up.[1] Laser is now the preferred mode since the most severe forms of the disease are more easily treated with laser than with cryotherapy.[36]

We are aware of limitation of this study in terms of small number of patients. Our study was conducted on small sample and made a limited number of observations.

CONCLUSION

We are aware that a limitation of this study is the small number of patients. In conclusion, the prevalence of ROP in this study was 10%, the data of this study suggest that low GA and, low BW are independent risk factors in the development of ROP. Clinicians should be aware of the presence of the additional risk factors when monitoring preterm infants. The analysis of risk factors for ROP development will help to understand and predict it in severe preterm infants. The timely retinal screening of high-risk preterm infants is important to prevent the development of advanced ROP. We diagnosed ROP in 10% of cases at the time of the first eye examination. We conclude that serial monitoring (eye examinations) of neonates at risk for ROP is important for making a final diagnosis. Although the present study was conducted on a small sample and made a limited number of observations, the results show a significant association between ROP and a BW<1500 g and a GA<32 weeks Since ROP may produce serious sequelae up to complete blindness, all efforts must be made to prevent the development of advanced ROP through elimination of preterm births, changes in the neonatal care, and improvement in detection of threatening ROP markers.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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.
2. Fleck BW, Dangata Y. Causes of visual handicap in the Royal Blind School, Edinburgh, 1991-2. Br J Ophthalmol. 1994;78:421.
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.
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.
5. Fanaroff AA, Martin RJ, editors. Neonatal perinatal medicine. 7th ed. Louis: Mosby. 2002;676-745.
6. Azad R, Chandra P. Retinopathy of prematurity. J Indian Med Assoc. 2005;103:370-2.
7. International Committee for the Classification of Retinopathy of Prematurity. The International Classification of Retinopathy of Prematurity revisited. Arch Ophthalmol. 2005;123:991-9.
8. Terry TL. Extreme prematurity and fibroblastic overgrowth of persistent vascular sheath behind each crystalline lens. Am J Ophthalmol. 1942;25:203-4.

9. Chawla D, Agarwal R, Deorari A. Retinopathy of prematurity. Indian J Pediatr Paul VK. Indian J Pediatr. 2008;75:73-6.
10. Kim T, Sohn J, Yoon YH. Postnatal risk factors of retinopathy of prematurity. Paediatr Perinat Epidemiol. 2004;18:130-4.
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.
12. Gupta VP, Dhaliwal U, Sharma R. Retinopathy of prematurity-risk factors. Indian J Pediatr. 2004;71:887-92.
13. Karna P, Muttineni J, Angell L. Retinopathy of prematurity and risk factors: A prospective cohort study. BMC Pediatr. 2005;5:18.
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.
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.
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.
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.
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.
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.
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.
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.
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.
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.
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.
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.
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.
27. Smith LE. Pathogenesis of retinopathy of prematurity. Acta Paediatr Suppl. 2002;91:26-8.
28. Weinberger B, Laskin DL, Heck DE. Oxygen toxicity in premature infants. Toxicol Appl Pharmacol. 2002;181:60-7.
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.
30. Ikeda H, Kuriyama S. Risk factors for retinopathy of prematurity requiring photocoagulation. Jpn J Ophthalmol. 2004;48:68-71.
31. Dutta S, Alaraop S, Narang A. Risk factors of threshold retinopathy of prematurity. Indian Pediatr. 2004;41:665-71.
32. Deepak C, Ramesh A, Ashok KD. Retinopathy of prematurity. Indian J Pediatr. 2008;75:73-6.
33. Hirano K, Morinobu T, Kirn H. Blood transfusion increases radical promoting non-transferrin bound iron in preterm infants. Arch Dis Child Fetal Neonatal Ed. 2001;84:188-93.
34. Darlow A, Hutchinson JL, Henderson S. Prenatal risk factors for severe retinopathy of prematurity among very preterm infants of the Australian and New Zealand Neonatal Network. Pediatrics. 2005;115:990-6.
35. Seiberth V, Lindarkomp O. Risk factors in retinopathy of prematurity: A multivariate statistical analysis. Ophthalmologica. 2000;214:131-5.
36. Cordelia C, Alistair F, Edmund A. Management of retinopathy of prematurity. Current Paediatr. 2005;15:99-105.

Cite this article as: Kaur H, Kai S. Prevalence of retinopathy of prematurity among premature babies in a tertiary care hospital. Int J Res Med Sci 2023;11:113-7.