A Study of Prevalence and Risk Factors of Retinopathy of Prematurity in Tribal Area in Central India

[1]Pankaj Kataria, [2]Pranda Shukla, [3]Shoaib Arshad and [4]Pankaj Sharma
[1-4]Department of Ophthalmology, B.M. G. Medical College, Shahdol (M.P.), India

Corresponding Author
Shoaib Arshad,
Department of Ophthalmology, B.M. G. Medical College, Shahdol (M.P.), India
arshadshoaib123@gmail.com

Author Designation
[1]Ex-Senior Resident
[2]Professor and HOD
[3]Assistant Professor
[4]Senior Resident

ABSTRACT
Retinopathy of prematurity (ROP) is a leading cause of preventable childhood blindness. ROP is a Vaso proliferative retinal condition that is the leading cause of vision impairment and blindness in premature new-borns. Our objective of the study was to assess the prevalence and risk factors associated with the development of retinopathy of prematurity (ROP) and to determine the outcome on follow ups. This study was conducted in a tertiary care centre (Birsa munda Govt. Medical College) in shahdol district in Madhya Pradesh. Patients who presented at Shahdol Tertiary Care Centre for ROP screening were assessed in a sequential manner and recruited in this prospective cross-sectional observational study after receiving informed consent from the subjects' parents, after ethical clearance from the institutional ethical committee. A total of 442 eyes from 221 neonates were screened for Retinopathy of Prematurity, with inclusion criteria of preterm infants between 28 weeks and 36±6 weeks of gestational age, birth weight between 1-2.5 kg. Subjects with full term gestational age, previously diagnosed or treated patients were excluded from this study. Follow-up evaluations were performed on a weekly or biweekly basis if needed. 442 eyes of 221 participants were tested for ROP at a tertiary medical centre in Shahdol. The average gestational age was 33.46±2.37 weeks and the birth weight was 1.8±0.49 kilograms. A total of 43 (19.46%) individuals were diagnosed with ROP, with a mean gestational age of 31.4186±2.2597 weeks and a mean birth weight of 1.2816±0.304 grams. In our study we got a statistically significant link between ROP and risk variables, including gestational age (p=0.000), birth weight (p=0.015), respiratory distress (p=0.000) and oxygen therapy (p=0.000). Sex of the individual, mode of birth, sepsis, meconium aspiration and phototherapy all reveal insignificant statistics for developing ROP. ROP being a reversible cause of blindness in children; it is crucial to diagnose ROP at the appropriate time for interventional therapy because it can result in a patient's lifelong disability. Because it is a preventable cause of childhood blindness, we must do routine ROP screening in the targeted group.

INTRODUCTION

Retinopathy of prematurity (ROP) is a leading cause of preventable childhood blindness[1]. ROP is a Vaso proliferative retinal condition that is the leading cause of vision impairment and blindness in premature new-borns. ROP is a two-stage illness, with the first phase characterized by decreased retinal vascular growth and blood vessel loss due to a lack of growth factors and aberrant oxygenation. During this stage, the retina is only partially vascularized, resulting in the formation of a peripheral avascular zone that gets more hypoxic. This hypoxia causes the second phase of ROP, which is characterized by an increase in VEGF production, which can promote uncontrolled neovascularization and retinal detachment[18]. The most common treatment for severe ROP is retinal ablation, which involves utilizing laser photo coagulation to limit VEGF production in the hypoxic peripheral retina; however, this procedure destroys nearly two-thirds of the retina. Intravitreal anti-VEGF injections have emerged as a viable first-line treatment for severe ROP in recent years, with several authors reporting excellent outcomes. As a result, the goal of this study was to evaluate the prevalence of ROP and explore potential risk factors for its occurrence in a sizable cohort of extremely preterm infants receiving care in SNCUs and OPD.

MATERIALS AND METHODS

Patients who presented at Shahdol Tertiary Care Center for ROP screening were assessed in a sequential manner and recruited in this prospective cross-sectional observational study after receiving informed consent from the subjects' parents, after ethical clearance from the institutional ethical committee. A total of 442 eyes from 221 neonates were screened for Retinopathy of Prematurity, with inclusion criteria of preterm infants between 28 weeks and 36±6 weeks of gestational age, birth weight between 1-2.5 kg and the following information was collected: gestational age, weight, demographic data, socioeconomic data, personal and general history of the mother, type of delivery, patient's medical and surgical history, including respiratory distress, sepsis, phototherapy and history of oxygen supplementation including duration and method. Subjects with full term gestational age, previously diagnosed or treated patients were excluded from this study. After two to three weeks of life, the subjects underwent screening for ROP using an indirect ophthalmoscope, a+20D lens, a wire speculum and scleral depression after dilation of pupil by eye drop Tropicamide 0.5% and Phenylephrine 2.5% combination one hour before examination. According to AAO recommendations, ROP is characterized in Stages I, II, III, IV, V and Zones I, II, III

with Pre-Plus or Plus and APROP. Follow-up evaluations were performed on a weekly or biweekly basis if needed and cases that required any intervention were referred to higher centre for further management. The collected data was entered into a Microsoft 365 Excel sheet on a computer. To examine qualitative data, the chi-square test was utilized and the paired T-test was used to analyze quantitative variables. $P<0.05$ were considered statistically significantly.

RESULTS AND DISCUSSIONS

From December 2023-February 2024, 442 eyes of 221 participants were tested for ROP at a tertiary medical centre in Shahdol. The average gestational age was 33.46±2.37 weeks and the birth weight was 1.8±0.49 kilograms. 114 were male and 107 were female. 118 (53.39%) individuals were born vaginally, with 103 (46.6%) undergoing a lower segment caesarean section (Table 2). A total of 43 (19.46%) individuals were diagnosed with ROP, with a mean gestational age of 31.4186±2.2597 weeks and a mean birth weight of 1.2816±0.304 grams. Out of them, 18 (43.9%) were male and 25 (60.9%). 26 patients of ROP were born at gestational age of 28 weeks-31 days and 6 days while 10 patients were delivered at gestational age of 32 weeks-34 weeks and 6 days (Table 3).

As shown in Table 4 reveals a statistically significant link between ROP and risk variables, including gestational age (p=0.000), birth weight (p=0.015), respiratory distress (p=0.000) and oxygen therapy (p=0.000). Sex of the individual, mode of birth, sepsis, meconium aspiration and phototherapy all reveal insignificant statistics for developing ROP.

A total of 20 cases of Stage I ROP were identified, with twelve born between 28 and 31 weeks 6 days gestational age. Seven cases of Stage II ROP and two cases of Stage III ROP were discovered during screening. A total of fourteen cases of APROP were seen, with seven born between 28 and 31 weeks 6 days gestational age. As a result, the majority of ROP patients (20) were born between 28 and 31 weeks 6 days of gestation. While 24 ROP cases were born with birth weights ranging from 1000-1500 grams (Table 6). The majority of ROP patients (28) were recommended for further therapy at a higher level, with the remaining fifteen instances regressed without intervention.

Retinopathy of Prematurity, an avoidable cause of blindness, is one of Vision 2020's priorities for preventing childhood blindness. To meet this aim, we must do routine ROP screening in the targeted group. One of the significant deficiencies is a lack of experienced ophthalmologists and adequate facilities to treat patients as needed. With this goal in mind, we

Table 1 Demographic Data

Data		n (%) or Mean ± SD
Sex	Male	114(51.6%)
	Female	107(48.4%)
Gestational Age (weeks)	33.46 ±2.37	
Birth Weight (grams)	1.8 ± 0.49	

Table 2: Type of Delivery

Data	Male	Female
Vaginal n=118	61(51.7%)	57(48.3%)
Caesarean Section n=103	53(51.5%)	50(48.5%)

Table 3: Relationship between Study Groups

Data	ROP Cases (Mean ± SD)	NON-ROP Cases (Mean ± SD)
Gestational Age (weeks)	31.4186±2.2597	33.9607± 2.13
Birth Weight (grams)	1.2816 ± 0.304	1.93 ± 0.44

Table 4: Relationship between ROP and Risk Factors

Risk Factors	Data	ROP Cases	Non-ROP Cases	P-value
Sex	Male	18	96	0.176
	Female	25	82	
Mode of Delivery	Vaginal	24	94	0.73
	Caesarean Section	19	84	
Gestational Age	<28 weeks	0	2	0.000
	28-31 weeks 6 days	26	20	
	32-34 weeks6 days	10	68	
	35-36weeks 6 days	7	88	
Birth Weight	<1000 grams	4	7	0.015
	1000-1500 grams	18	43	
	1501-2000 grams	7	66	
	>2000 grams	14	62	
Respiratory Distress	n=146	39	107	0.000
Sepsis	n=23	6	17	0.41
Phototherapy	N=9	1	8	1
Meconium Aspiration	N=27	2	25	0.12
Oxygen Therapy	<3 days	0	49	0.000
	3-7 days	17	102	
	>7 days	26	27	

Table 5: Gestational Ages and ROP

Data		Stage I ROP	Stage II ROP	Stage III ROP	AP-ROP
Gestational Age (weeks)	<28 weeks	0	0	0	0
	28-31 weeks 6 days	12	3	2	7
	32-34 weeks6 days	5	2	0	4
	34-36weeks 6 days	3	2	0	3

Table 6: Birth Weight and ROP

Data		Stage I ROP	Stage II ROP	Stage III ROP	AP-ROP
Birth Weight	<1000 grams	0	0	0	0
	1000-1500 grams	8	4	2	5
	1501-2000 grams	5	2	0	4
	>2000 grams	7	1	0	5

Table 7: Follow-up Evaluation

ROP Stages	n	Outcome on Follow-ups
Stage I ROP	20	5 Referred, 14 regressed
Stage II ROP	7	4 Referred
Stage III ROP	2	All Referred
AP-ROP	14	All Referred

initiated a screening program in our institute to determine the prevalence and risk factors among the undernourished and destitute population of Shahdol, a tribal territory.

ROP was assessed in 442 eyes belonging to 221 participants at a tertiary medical facility located in Shahdol. The birth weight was 1.8±0.49 kilograms and the average gestational age was 33.46±2.37 weeks. The prevalence in our study is 19.457% which is comparable to study done by Abdel[1] (19.2%) and Mamta[13] (18.8%) where lower than the incidence rate found by Charan *et al* (47.27%)[12], Dwivedi[13].

In our study, we had taken various risk factors in consideration to determination the risk factors for higher cases retinopathy of prematurity including gestational age, birth weight, mode of delivery, respiratory distress syndrome, sepsis, phototherapy, meconium aspiration, oxygen therapy.

In our analysis, the mean gestational age was 33.46±2.37 weeks, with a lower gestational age of 31.4186±2.2597 weeks in ROP patients. The majority of kids were born between 28-34 weeks 6 days (36 babies), which is consistent with the location of study when compared to Dwivedi[13]. It also suggests that low

gestational age is a risk factor for developing ROP, comparable to Karna[7]. ROP patients had a mean birth weight of 1.2816±0.304 kg, which was similar to Dwivedi[13] (1.34±0.04 kg), Karna[7] (1.113±0.438 kg), and Sanghi[15], but lower than Abdel[1]. Our study also discovered that the difference in birth weight between ROP and non-ROP patients was statistically significant (p=0.015). In our study, we discovered that the mode of delivery, whether normal vaginal or lower caesarean section, was inconsequential, which is consistent with Abdel[1] findings for a risk factor for developing ROP. The importance of respiratory distress syndrome as a risk factor for ROP was clearly demonstrated, with 39 patients out of 43 developing ROP with p value 0.000, which was similar to Sanghi[15] but differed from Dwivedi[13], possibly due to the fact that they used mild ROP and severe cases as case controls.

Another factor that contributed to ROP in our study was greater oxygen duration, with all cases receiving oxygen for more than three days and the majority receiving oxygen for >seven days (p=0.000).

One independent risk factor for the development of ROP was oxygen therapy. There was no significant correlation identified between oxygen therapy and stages of ROP, although there was a significant correlation between the occurrence of ROP and the duration of oxygen therapy. Conversely, oxygen therapy was found to be a nonsignificant risk factor for ROP incidence by Palmer[16]. They stated that in circumstances when oxygen therapy was not administered, ROP may occur.

Other risk variables, including as phototherapy and meconium aspiration, are found to be statistically irrelevant (p = 1 and 0.12, respectively). Abdel[1] and Chaudhari[17] also concluded that phototherapy is insignificant. All the patients of ROP with the requirement of immediate attention were referred from our study for further management after making a diagnosis following ROP screening. Fourteen of the total Stage I cases were regressed, while the other ROP patients were transferred to a higher centre for further therapy.

CONCLUSION

ROP being a reversible cause of blindness in children; it is crucial to diagnose ROP at the appropriate time for interventional therapy because it can result in a patient's lifelong disability. Understanding the Retinopathy of Prematurity risk factors will aid in the development of screening recommendations. This study found a 19.457% prevalence of ROP, indicating that low gestational age, sepsis and oxygen therapy are independent risk factors for developing ROP. When monitoring preterm new-borns, practitioners should be aware of any additional risk factors. We recognize

the limitations of our investigation, such as the lack of appropriate photographic representation, the necessity for other risk variables to be included in the study, a long-term follow-up of referred patients and therapy modules to examine more complications of ROP.

REFERENCES

1. Hakeem, A.H., G.B. Mohamed and M.F. Othman, 2012. Retinopathy of prematurity: A study of prevalence and risk factors. Middle East Afr. J. Ophthalmol., 19: 289-294.
2. Dani, C., C. Coviello, F. Panin, S. Frosini and S. Costa et al., 2021. Incidence and risk factors of retinopathy of prematurity in an Italian cohort of preterm infants. Ital. J. Pediatr.s, 47: 1-6.
3. Akçakaya, A.A., S.A. Yaylali, H.H. Erbil, F. Sadigov and A. Aybar et al., 2012. Screening for retinopathy of prematurity in a tertiary hospital in Istanbul: Incidence and risk factors. J. Pediatr. Ophthalmol. Strabismus., 49: 21-25.
4. Azad, R. and P. Chandra, 2005. Retinopathy of prematurity. Jour Ind Med Ass., 103: 370-3720.
5. Kim, T., J. Sohn, S. Pi and Y.H. Yoon, 2004. Postnatal risk factors of retinopathy of prematurity. Paed Perin Epid., 18: 130-134.
6. Chawla, D., R. Agarwal, A.K. Deorari and V.K. Paul, 2008. Retinopathy of prematurity. Ind Jour Ped., 75: 73-76.
7. Karna, P., J. Muttineni, L. Angell and W. Karmaus, 2005. Retinopathy of prematurity and risk factors: A prospective cohort study. BMC Pediatr., Vol. 5, No. 1 .10.1186/1471-2431-5-18.
8. Akkoyun, I., S. Oto, G. Yilmaz, B. Gurakan and A. Tarcan et al., 2006. Risk factors in the development of mild and severe retinopathy of prematurity. J. Am. Assoc. Pediatr. Ophth. Strab., 10: 449-453.
9. Chen, Y., X.X. Li, H. Yin, C. Gilbert and J.H. Liang,et al., 2008. Risk factors for retinopathy of prematurity in six neonatal intensive care units in Beijing, China. Brit Jou Ophth., 92: 326-330.
10. Dogra, M.R., A. Vinekar, T. Sangtam, A. Narang and A. Gupta, 2007. Retinopathy of prematurity in asian Indian babies weighing greater than 1250 grams at birth: Ten year data from a tertiary care center in a developing country. Indian J. Ophthalmol., 55: 331-336.
11. Smith, L.E., 2002. Pathogenesis of retinopathy of prematurity. Acta Pæd., 91: 26-28.
12. Charan, R., M.R. Dogra, A. Gupta and A. Narang, 1995. The incidence of retinopathy of prematurity in a neonatal care unit. Indian J Ophth., 43: 123-126.

13. Dwivedi, A., D. Dwivedi, S. Lakhtakia, C. Chalisgaonkar and S. Jain, 2019. Prevalence, risk factors and pattern of severe retinopathy of prematurity in eastern madhya pradesh. Indian J. Ophthalmol., 67: 819-823.

14. Mamta, C., S. Janardan, D. Nisha, S. Meghna and D. Harish, 2023. Incidence and prevalence of retinopathy of prematurity in a tertiary care centre of north India. Maed A J. Clin. Med., 18: 232-237.

15. Sanghi, G., M.R. Dogra, P. Das, A. Vinekar and A. Gupta,et al., 2009. Aggressive posterior retinopathy of prematurity in asian Indian babies. Retina, 29: 1335-1339.

16. Palmer, A.E., R.J. Hardy and V. Dobson, 2005. 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 Ophth, Vol. 123.

17. Chaudhari, S., V. Patwardhan and U. Vaidya, 2009. Retinopathy of prematurity in a tertiary care center, incidence, risk factors and outcomes. Indian Pediatr, 46: 219-224.

18. Chiang, M.F., G.E. Quinn, A.R. Fielder, S.R. Ostmo. and R.V.P. Chan et al., 2005. International classification of retinopathy of prematurity, third edition. Arch Ophth, 123: 991-999.