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ORIGINAL ARTICLE

An Observational Descriptive Study Regarding the Outcome of Retinopathy of Prematurity Screening in Tertiary Care

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Abstract

Background: Low birth weight, prematurity, and prolonged oxygen therapy are some of the variables that contribute to Retinopathy of Prematurity (ROP), a disorder that affects premature infants and can cause blindness owing to undeveloped retinal blood vessels. With rising neonatal survival rates, ROP incidence has increased. This Observation descriptive study aimed to identify risk factors, assess their relationship with ROP, and estimate its incidence in preterm newborns at our tertiary care center, considering both genetic and environmental influences. **Materials and Methods:** For two years, from May 2022 to May 2024, the Department of Ophthalmology at Chengalpattu Medical College & Hospital carried out this observation descriptive study. Sample size of around 1500- Low birth weight newborns (less than 2,500g) and preterm infants (less than 37 weeks) who were checked for ROP were included. Indirect ophthalmoscopy, a 20D lens, a portable fundus camera, Vectis, and a wire speculum were among the tools utilized. Inclusion criteria covered all intramural infants meeting gestational age or weight criteria, while exclusions included those with ocular media opacities or inadequate follow-up (<3 visits). Point estimates and 95% CI were computed using IBM SPSS Statistics 26.0 for data analysis. **Results**: Of the patients in our study, the majority (98.9%) had no ROP, whereas 0.5% had stage 1, 0.5% had stage 2, and 0.1% had stage 3. 52.1% of the 1500 newborns were male, and 47.9% were female. The following risk factors were shown to be significant by univariate analysis: low gestational age, low birth weight, RDS, PDA, sepsis, NEC, and blood transfusion; there were also substantial correlations between PDA and blood transfusion. Low birth weight was validated by multivariate logistic regression as an independent risk factor for ROP. **Conclusion**: This study emphasizes low birth weight and PDA as key independent risk factors for ROP, highlighting the need for targeted neonatal care, PDA prevention, and cautious blood transfusion practices. The findings align with existing research, reinforcing the importance of comprehensive neonatal management. Future studies should explore early biomarkers and intervention strategies to further reduce ROP incidence and improve outcomes for preterm infants.

Keywords: ROP, Risk Factors, Low Birth, Neonatal Care

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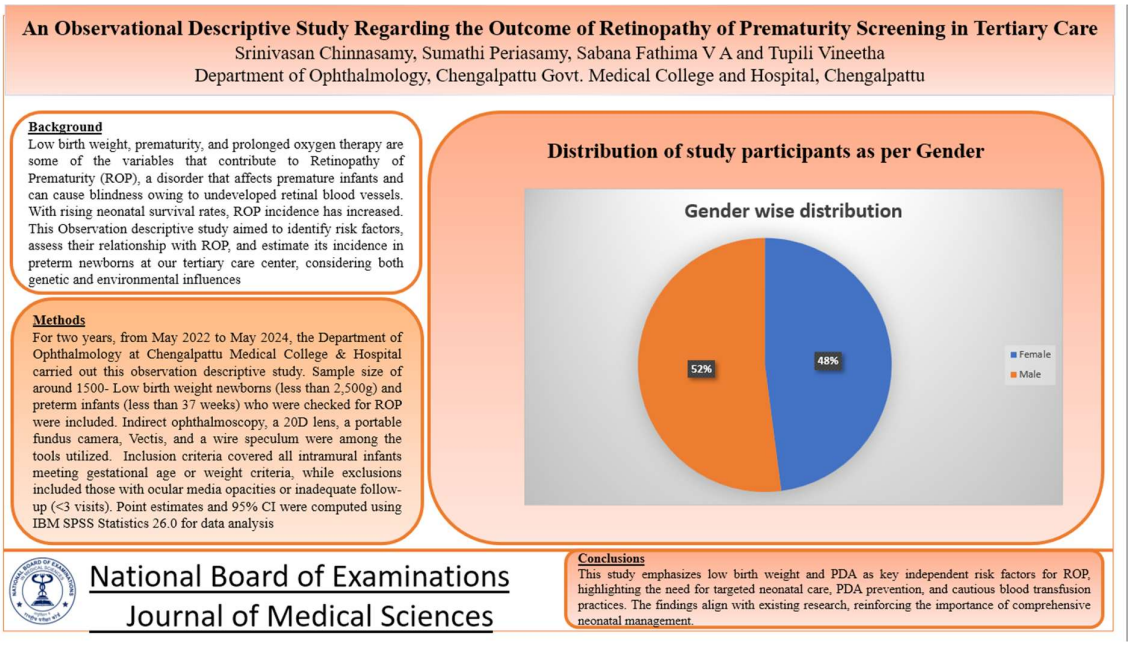
Graphical Abstract



Introduction

Retinopathy of prematurity (ROP) is a significant cause of preventable blindness worldwide, particularly affecting premature infants. The World Health Organization (WHO) has highlighted ROP as an emerging cause of childhood blindness, especially in middle-income countries such as Latin America, Eastern Europe, India, and China [1]. Geographical disparities play a crucial role in the prevalence and severity of ROP, with low-resource settings experiencing higher rates due to limited access to adequate neonatal care [2]. ROP primarily affects the developing retinal vasculature of preterm infants. The disease spectrum ranges from mild forms, which often resolve spontaneously without causing significant visual impairment, to severe forms characterized by pathological neovascularization. Blindness and retinal detachment may result from these severe cases if treatment is not received. Extremely preterm infants, especially those delivered before 25 weeks of gestation, now have higher survival rates thanks to advancements in neonatal care [3]. However, because these infants are more likely to acquire ROP, the increased prevalence of the ailment has coincided with this improved survival [4].

Premature babies are the main victims of the multifactorial condition known as retinalopathy of prematurity (ROP). Low birth weight (BW), low gestational age (GA), and concomitant diseases including intraventricular hemorrhage (IVH), necrotizing enterocolitis (NEC), and patent ductus arteriosus (PDA) are among the risk factors that have been found. Long-term exposure to more oxygen has also been linked to the development of ROP. Extremely low birth weight (ELBW) and extreme prematurity further elevate the risk of severe ROP [5]. Early detection and timely intervention are critical to prevent the progression of ROP and its associated complications. Historically, transscleral cryotherapy was

employed to ablate the avascular retina, significantly reducing adverse anatomical and visual outcomes in threshold and pre-threshold ROP, as demonstrated by the Cryotherapy for Retinopathy of Prematurity (CRYO-ROP) trial. However, cryotherapy was associated with considerable postoperative inflammation and discomfort [6]. Subsequently, transpupillary laser photocoagulation emerged as a preferred treatment modality, offering better visual outcomes, a reduced likelihood of inducing myopia, and faster disease regression compared to cryotherapy. Laser therapy also presented advantages such as decreased postoperative morbidity, less stress to ocular tissues, easier access to the posterior pole, and a reduced need for general anesthesia [7].

Anti-vascular endothelial growth factor (VEGF) medicines, like bevacizumab, have been investigated as possible therapies for ROP in more recent years using intravitreal injections. These agents target pathological neovascularization and have shown promise in managing severe cases of ROP. However, concerns regarding potential systemic side effects and the long-term safety profile of anti-VEGF therapy necessitate further investigation [8]. Long-term and consistent follow-up is essential to monitor disease regression or progression and to identify and manage associated morbidities, including myopia, anisometropia, amblyopia, and strabismus. Despite efforts to emphasize timely ROP screening and educate families on the necessity of follow-up, reports evaluating the effectiveness of ROP screening programs remain limited [8]. This observation descriptive study aimed to quantify the frequency of ROP in preterm neonates at our tertiary care center, identify the risk factors that predispose to ROP, and assess the association between ROP and its risk variables.

Material and Methods

This study is an Observation descriptive study, conducted in our Department of Ophthalmology, Chengalpattu Medical College & Hospital. The study period 2 year from May 2022-May 2024. All preterm <37 week and low birth weight <2500g infants who were screened for ROP. Sample size =1500The materials used in this study was wire speculum and Vectis, indirect ophthalmoscopy and 20 D Lens portable fundus camera. The inclusion criteria in our study we include all intramural baby who were less than 37 weeks of Gestational age and /or had a birth weight less than 2500g were examined. Infants were excluded from the study if they had ocular media opacities that interfered with fundus examination. Patient who did not complete the follow up less than minimum of 3 visits examination was excluded from the analysis. In our study all patients who were enrolled in the study were examined. Pupils were dilated using plain tropicamide eye drops diluted with lubricant at least 30 min prior to examination. Topical anesthetic agent applied and eye speculum inserted. Fundus were examined using indirect ophthalmoscopy with 20D LENS. A lubricant was used during examination.

If ROP is detected, to verify the zone, stage, and extent of ROP, detected fundus photography was taken. The Revised International Classification of ROP was used to categorize retinalopathy of prematurity. Both the presence and absence of plus disease and ROP were noted. GA, BW, maternal and newborn risk factors, such as sepsis, apnea, necrotizing

enterocolitis, intravenous hemorrhage, and outcome, were among the data that were documented. Until retinal vascularization was finished, screening tests were conducted. if any ROP stages were found. Until retinal vascularization was finished, screening tests were conducted. if any ROP stages were found. In order to enter and evaluate data, IBM SPSS Statistics version 26.0 was utilized. 95% CI and a point estimate were computed. Multivariate logistic regression analysis (Table 1).

Results

Table 1. Distribution of study participants as per ROP stage wise

STAGES	Frequency	Percent
STAGE 1	7	0.5
STAGE 2	7	0.5
STAGE 3	2	0.1
No ROP	1484	98.9
Total	1500	100.0

The above table shows the distribution of study participants as per ROP stage wise. Among our study participants about 0.5% were belong to stage 1, 0.5% were also belong to stage 2. About 0.1% were belong to stage 3. Majority of about 98.9% does not have any ROP (Figure 1).

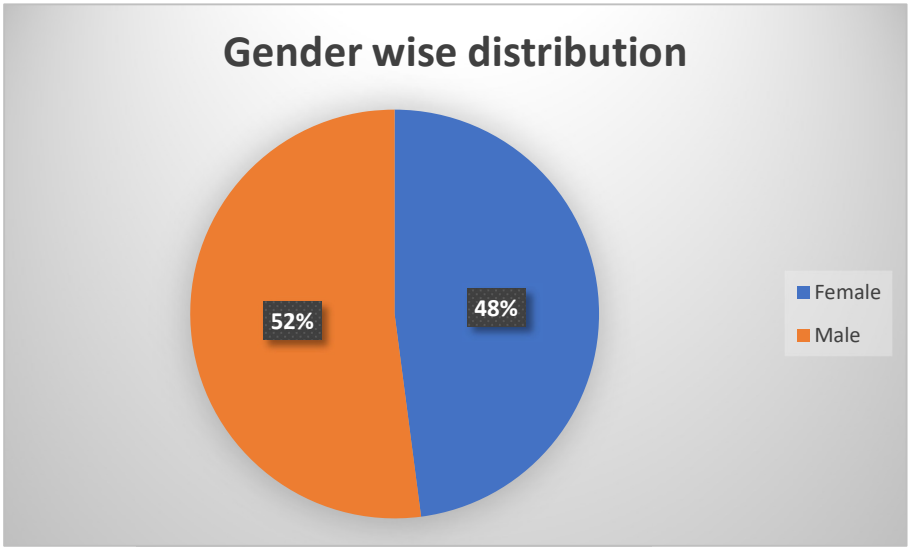


Figure 1. Distribution of study participants as per Gender.

The distribution of study participants by gender is depicted in the above figure. 781 (52.1%) and 719 (47.0%) of the 1500 newborns were male and female, respectively (Table 2).

Out of 1500 babies 233(15.53%) were ≤32 weeks of gestational age and 1267 (78%) were between 32 and 37 weeks (Table 3).

Table 2. Distribution of study participants as per Gestation age

Age at Gestation (WKS)	Frequency	Percent
≤32WKS	233	15.53
32-37WKS	1,267	84.47
Total	1,500	100.00

Table 3. Univariate risk factors for the onset of any severity of retinopathy of prematurity in 1500 screened newborns

Risk Factors	Odds ratio	95% confidence interval	P value
Age of low gestation (days)	1.325	1.124 -1.942	0.032
low weight at birth (g)	1.674	1.0485-1.198	0.045
RDS	6.485	1.003-24.684	0.002
PDA	10.716	4.742-48.127	0.001
SEPSIS	5.781	0.671-10.853	0.004
NEC	4.125	0.942-12.412	0.012
IVH	2.378	0.438-5.813	0.945
BLOOD TRANSFUSION	10.831	3.279-45.687	0.002

The retinopathy of prematurity (ROP) development risk variables for 1,500 examined newborns are displayed in the above table. Low birth weight, respiratory distress syndrome (RDS), patent ductus arteriosus (PDA), sepsis, necrotizing enterocolitis (NEC), low gestational age, and blood transfusion were all found to be significant risk factors by univariate analysis. The associations between PDA (OR: 10.716, p = 0.001) and blood transfusion (OR: 10.831, p = 0.002) were especially strong. Nevertheless, there was no significant correlation between intraventricular hemorrhage (IVH) and ROP (p = 0.945) (Table 4).

Table 4. Multivariate logistic regression studies of risk factors for the occurrence of any severity of retinopathy of prematurity in 1500 screened newborns

Risk factors			
Age of low gestation (days)		Multivariate logistic modalities were excluded.	
low weight at birth (g)	1.0043	1.002-1.0092	0.0051
RDS		Multivariate logistic modalities were excluded.	
PDA	4.894	1.039-25.784	0.0472
SEPSIS		Multivariate logistic modalities were excluded.	
BLOOD TRANSFUSION		Multivariate logistic modalities were excluded.	

Table 4 demonstrates that only low birth weight (OR: 1.0043, p = 0.0051) and PDA (OR: 4.894, p = 0.0472) remained independently significant risk factors for ROP after confounding factors were adjusted for using the multivariate logistic regression model. Other variables such as low gestational age, RDS, sepsis, and blood transfusion were excluded from the final model, suggesting their effects may be confounded by other factors rather than acting as direct independent predictors. This indicates that while multiple factors contribute to ROP, low birth weight and PDA play the most critical independent roles. Identifying and addressing these factors, particularly through improved neonatal care and management of PDA, could be essential in reducing the risk of ROP in preterm infants.

Discussion

From our study it had been found that the majority of the infants (98.9%) did not develop retinopathy of prematurity (ROP), with only a small percentage classified into various stages of ROP: Stage 1 (0.5%), Stage 2 (0.5%), and Stage 3 (0.1%). This low incidence of ROP contrasts with findings from other studies, such as Kocabeyoğlu et al. [9], who reported an ROP prevalence of 21.72% in preterm infants. The variation in ROP prevalence could be due to differences in neonatal care, oxygen therapy practices, and screening protocols across different healthcare settings. With regarding to the gender distribution of the study participants was nearly equal, with 52.1% male and 47.9% female infants. Previous studies have shown conflicting evidence regarding the role of gender in ROP development. Some reports suggest a slight male predisposition due to differences in fetal lung maturity and oxidative stress responses, but many studies, including this one, found no statistically significant association between gender and ROP risk by Fleck et al. [10]. From our study, it had observed that 15.53% of infants were born at or before 32 weeks, while 84.47% were born between 32 and 37 weeks. Prematurity

remains one of the strongest risk factors for ROP due to incomplete retinal vascularization at birth. Studies by Sundar et al. [11] support this finding, emphasizing that earlier gestational age significantly increases ROP risk due to prolonged exposure to supplementary oxygen and immature vascular development.

A number of significant risk factors were found by the univariate analysis, including blood transfusion, respiratory distress syndrome (RDS), patent ductus arteriosus (PDA), sepsis, necrotizing enterocolitis (NEC), low birth weight, and short gestational age. The strongest associations were found with PDA (OR: 10.716, p = 0.001) and blood transfusion (OR: 10.831, p = 0.002). These findings align with research conducted by Shah et al., which identified PDA and blood transfusion as major contributors to ROP due to increased exposure to oxidative stress and hemodynamic instability by Shah et al. [13]. The Multivariate Logistic Regression Analysis of Risk Factors for ROP Development shows after adjusting for confounding factors, only low birth weight (OR: 1.0043, p = 0.0051) and PDA (OR: 4.894, p = 0.0472) remained independently significant risk factors for ROP. Other factors such as low gestational age, RDS, sepsis, and blood transfusion were excluded, suggesting their effects were mediated through other variables. These results are supported by studies from the Early Treatment for Retinopathy of Prematurity Cooperative Group, which also found that low birth weight was the most robust predictor of ROP progression a per Titawattanakul et al. [14].

Conclusion

This study underscores the importance of low birth weight and PDA as independent risk factors for ROP. The findings highlight the need for targeted interventions, including optimizing neonatal care, preventing PDA-related complications, and minimizing unnecessary blood transfusions. Future research should focus on early biomarkers and intervention strategies to further reduce ROP incidence and improve outcomes for preterm infants. These conclusions align with existing literature and reinforce the critical role of comprehensive neonatal care in mitigating ROP risk.

Statements and Declarations

Conflicts of interest

The authors declare that they do not have conflict of interest.

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