Research Article

Assessing the prevalence and risk factors of retinopathy of prematurity in preterm babies

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Abstract: ***Background:*** Retinopathy of prematurity (ROP) is a leading cause of visual impairment in preterm infants worldwide, particularly in low and middle-income countries. Identifying the prevalence and associated risk factors is essential for effective screening and early intervention. ***Methods:*** This retrospective study was conducted in the Department of Obstetrics and Gynecology at Islami Bank Hospital, Dhaka, Bangladesh, from January 2012 to June 2013. A total of 150 preterm infants were enrolled and the prevalence of ROP and its risk factors were assessed. Data on gestational age, birth weight, oxygen therapy, sepsis and apnea were collected. ROP was classified based on the International Classification of Retinopathy of Prematurity. ***Results:*** The overall prevalence of ROP was 30% (45/150), with 77.8% of cases being mild (Stage 1-2) and 22.2% being severe (Stage 3-5). Significant risk factors for ROP included gestational age <32 weeks, birth weight <1500 g, oxygen therapy, sepsis and apnea ($p < 0.05$). Logistic regression analysis revealed that gestational age <32 weeks, low birth weight, oxygen therapy and sepsis were significantly associated with ROP ($p < 0.001$). ***Conclusion:*** ROP remains a significant concern in preterm infants, with gestational age, birth weight and oxygen therapy identified as major risk factors. Early screening and timely intervention are essential to prevent visual impairment.
Keywords: Retinopathy of Prematurity, Preterm Infants, Risk Factors, Gestational Age, Birth Weight, Oxygen Therapy.

INTRODUCTION

Retinopathy of Prematurity (ROP) is a potentially blinding eye disorder that primarily affects premature infants.[1] It results from the abnormal development of retinal blood vessels, which can progress to retinal detachment and permanent vision loss if untreated.[2] With advancements in neonatal care, the survival rates of preterm infants have improved significantly; however, this has led to a higher incidence of ROP, particularly in low- and middle-income countries where resources for early detection and management are limited.[3]

Globally, ROP is a leading cause of childhood blindness, particularly in regions with underdeveloped healthcare systems.[4] The prevalence of ROP varies widely, influenced by factors such as gestational age, birth weight and the quality of neonatal care.[5] Infants born at earlier gestational ages or with lower birth weights are at significantly higher risk of developing the condition.[6] In addition to these intrinsic factors, external risk factors such as supplemental oxygen therapy, mechanical ventilation, sepsis and blood transfusions play critical roles in the pathogenesis of ROP.[7] Despite this, the interplay of these risk factors remains complex and context-specific, necessitating localized research to guide effective preventive and therapeutic strategies.[8]

In low income countries, where preterm birth rates and neonatal mortality remain high, ROP is emerging as a significant public health concern.[5] Although advancements in neonatal intensive care units (NICUs) have improved survival rates, there is limited research on the burden of ROP and its associated risk factors in the country.[9] Early identification and intervention are crucial, as timely treatment can prevent progression to severe stages of the disease.[10] Screening programs, guided by evidence from population-specific studies, are essential to reduce the long-term burden of blindness and visual impairment among affected neonates.[11]

This study aimed to assess the prevalence of ROP among preterm infants admitted to the NICU of Islami Bank Hospital, Dhaka and to identify the associated risk factors. By evaluating the demographic and clinical characteristics of affected neonates, this research seeks to contribute to the growing body of evidence needed to improve ROP screening and

management practices in resource-limited settings. Understanding the local burden of ROP and its risk profile will help inform targeted interventions and policies to reduce its impact on preterm infants in Bangladesh.

METHODOLOGY AND MATERIALS

This retrospective observational study was conducted to assess the prevalence and risk factors of Retinopathy of Prematurity (ROP) in preterm neonates admitted to the neonatal intensive care unit (NICU) of Islami Bank Hospital, Dhaka, Bangladesh, over 1.5 years from 1 January 2012 to 30 June 2013. The study included 150 preterm neonates with a gestational age of <37 weeks and birth weight <2500 grams. Neonates with congenital ocular abnormalities, incomplete medical records, or those lost to follow-up before ROP screening were excluded. Data were collected retrospectively from medical records, including demographic information, clinical characteristics and neonatal history. Fundoscopic examinations were performed by an experienced ophthalmologist using an indirect ophthalmoscope after pupil dilation with 0.5% tropicamide. The severity of ROP was graded following the International Classification of Retinopathy of Prematurity (ICROP) guidelines, categorizing the disease into mild (Stages 1–2) and severe (Stages 3–5). Risk factors such as gestational age, birth weight, oxygen therapy, sepsis and mechanical ventilation were recorded for analysis.

The prevalence of ROP was determined as the proportion of neonates diagnosed with any stage of ROP in at least one eye. Statistical analysis was performed using SPSS version 22. Descriptive statistics summarized baseline characteristics and prevalence rates, while categorical variables were compared using chi-square tests and continuous variables using t-tests. Logistic regression analysis identified independent risk factors for ROP, with a p-value <0.05 considered statistically significant.

RESULTS

Table 1: Baseline Characteristics of Study Population (N = 150)

Characteristics	Frequency	Percentage (%)
Gender		
- Male	81	54.0
- Female	69	46.0
Gestational Age (weeks)		
- <28 weeks	25	16.7
- 28–32 weeks	59	39.3
- >32 weeks	66	44.0
Birth Weight (grams)		
- <1000 g	11	7.3
- 1000–1499 g	62	41.3
- 1500–2499 g	77	51.3

Table 1 summarizes the baseline characteristics of the study population (N = 150). Among the neonates, 54.0% were male and 46.0% were female. Most were born at a gestational age >32 weeks (44.0%), followed by 28–32 weeks (39.3%) and <28 weeks (16.7%). Regarding birth weight, the majority weighed 1500–2499 g (51.3%), with 41.3% weighing 1000–1499 g and 7.3% weighing <1000 g.

Table 2: Prevalence of ROP (N = 150)

Variable	Frequency	Percentage (%)
Retinopathy of Prematurity	45	30.0
- Mild (Stage 1–2)	35	77.8
- Severe (Stage 3–5)	10	22.2

Table 2 presents the prevalence of Retinopathy of Prematurity (ROP) among the study population (N = 150). ROP was observed in 30.0% of neonates. Among these, the majority had mild ROP (Stages 1–2, 77.8%), while severe ROP (Stages 3–5) accounted for 22.2%.

Table 3: Risk Factors Associated with ROP

Risk Factor	ROP Present (n = 45)	ROP Absent (n = 105)	p-value
Gestational Age <32 weeks	40	45	<0.001
Birth Weight <1500 g	35	40	0.002
Oxygen Therapy	30	20	<0.001
Sepsis	25	10	<0.001
Apnea	15	5	0.005

Table 3 highlights the risk factors associated with Retinopathy of Prematurity (ROP). Gestational age <32 weeks and birth weight <1500 g were significantly more common in neonates with ROP (p-values <0.001 and 0.002, respectively). Oxygen therapy (66.7% vs. 19.0%), sepsis (55.6% vs. 9.5%) and apnea (33.3% vs. 4.8%) were also strongly associated with ROP, with p-values indicating statistical significance (<0.001 for oxygen therapy and sepsis and 0.005 for apnea).

Table 4: Logistic Regression Analysis of Risk Factors

Risk Factor	Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Gestational Age <32 weeks	3.5	2.1–5.9	<0.001
Birth Weight <1500 g	2.8	1.5–4.2	0.002
Oxygen Therapy	4.0	2.3–7.5	<0.001
Sepsis	5.1	3.2–8.9	<0.001

Table 4 presents the logistic regression analysis of risk factors for Retinopathy of Prematurity (ROP). Gestational age <32 weeks (OR: 3.5, 95% CI: 2.1–5.9) and birth weight <1500 g (OR: 2.8, 95% CI: 1.5–4.2) were significant predictors of ROP. Neonates requiring oxygen therapy (OR: 4.0, 95% CI: 2.3–7.5) and those with sepsis (OR: 5.1, 95% CI: 3.2–8.9) were at substantially higher risk. All associations were statistically significant with p-values <0.001, except birth weight (p = 0.002).

DISCUSSION

Retinopathy of Prematurity (ROP) is a significant cause of visual impairment in preterm infants, especially in low- and middle-income countries. In this study, we investigated the prevalence and risk factors associated with ROP in a cohort of 150 preterm neonates admitted to Islami Bank Hospital in Dhaka, Bangladesh. The results provide valuable insight into the epidemiology of ROP in this region and highlight the importance of identifying and managing high-risk infants.

Our study found that ROP was present in 30.0% of preterm infants, with mild forms (Stages 1 and 2) accounting for 77.8% of cases and severe forms (Stages 3–5) making up 22.2%. These findings are consistent with previous studies that report varying prevalences of ROP in preterm neonates. For instance, Blencowe et al., estimated the global prevalence of ROP in preterm infants to be 15–25% in high-income countries, while it can reach up to 60% in some middle-income countries like Bangladesh, due to inadequate screening and lack of timely intervention.[12] The higher prevalence observed in our study highlights the need for improved surveillance and management strategies in these settings.

Several factors have been identified in the literature as significant risk factors for ROP and our study corroborated these findings. Gestational age less than 32 weeks and birth weight under 1500 grams were found to be strongly associated with ROP in our cohort. The association between lower gestational age and higher ROP prevalence is well-documented, as more premature infants are at a higher risk of retinal immaturity and subsequent ROP development.[13,14] In line with our results, studies such as those by Quinn et al. and Hakeem et al., have demonstrated that the risk of ROP increases significantly in infants born before 32 weeks of gestation and those with low birth weights.[15,16]

Oxygen therapy, another key risk factor in our study, was associated with a higher incidence of ROP. This is in agreement with earlier studies that indicate a strong link between the use of supplemental oxygen and the development of ROP, especially when oxygen is administered in high concentrations for prolonged periods.[17] Oxygen-induced retinopathy occurs due to the dysregulation of retinal vasculature, leading to abnormal growth and development of blood vessels, which is the hallmark of ROP.[18] The use of oxygen therapy is essential for managing respiratory distress syndrome in preterm infants, but it must be closely monitored to prevent the complications associated with ROP.

Sepsis was another significant risk factor identified in our study. Sepsis in preterm infants is a known contributor to the development of ROP, likely due to the inflammatory response it triggers. Inflammatory cytokines can induce vascular endothelial growth factor (VEGF) production, which plays a critical role in the pathogenesis of ROP.[19] The association between sepsis and ROP found in our study aligns with findings from other research, such as that of Hakeem et al., who reported that infections increase the likelihood of severe ROP.[16]

Apnea, which was significantly more common in the ROP group in our study, has also been implicated as a risk factor. Apnea of prematurity occurs due to the immaturity of the respiratory control centers in the brainstem and is often managed with respiratory support, which may increase the risk of ROP due to the same mechanisms involved in oxygen therapy.[20] Although the pathophysiological relationship between apnea and ROP is not as well-established, our findings suggest that preterm infants with apnea may be more vulnerable to developing ROP, particularly when combined with other risk factors.

The logistic regression analysis further reinforced the strength of these associations, with

gestational age <32 weeks, birth weight <1500 g, oxygen therapy and sepsis all showing statistically significant odds ratios. These findings support the need for focused screening programs for preterm infants, especially those at high risk due to their gestational age, birth weight and the use of oxygen therapy. Screening for ROP, as recommended by the American Academy of Pediatrics, is crucial for early diagnosis and timely intervention, which can significantly reduce the incidence of vision impairment in these infants.[21]

In our study, the implementation of effective screening and management protocols could have a substantial impact on reducing the incidence of severe ROP. This is particularly important in middle-income countries, where the burden of ROP is increasing due to advancements in neonatal care that have led to improved survival rates among extremely premature infants.[22] Studies from other regions, such as India and Africa, have shown that early identification and treatment of ROP can reduce the risk of blindness significantly.[23]

Limitations of the study
The limitations of this study include its retrospective design, which may have led to incomplete or inaccurate data collection. The study was conducted in a single hospital, which may limit the generalizability of the findings to other regions or settings. Additionally, factors such as long-term outcomes of retinopathy of prematurity were not assessed, which could provide further insights into the disease progression.

CONCLUSION
In conclusion, our study confirms that ROP remains a significant public health issue in preterm infants, particularly those born with low gestational age, low birth weight and those receiving oxygen therapy. Sepsis and apnea also emerge as important risk factors. Given these findings, it is essential to strengthen ROP screening programs in Bangladesh and similar settings to ensure early detection and timely intervention. Further research and implementation of preventive measures, including optimal oxygen management and infection control, are crucial in reducing the burden of ROP in preterm infants.

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