

## Original Article

# Analysis on Retinopathy of Prematurity Screening at Combined Military Hospital Rangpur, Bangladesh

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**Abstract:**

**Background:** A potentially lethal but preventable proliferative disease of the retinal vasculature in preterm newborns is called Retinopathy of prematurity (ROP). Significant vision loss and an increased risk of neonatal blindness might result from improper evaluation and treatment of the kid, which would significantly impair a person's quality of life and put a financial burden on the community as well as the individual. **Objective:** The purpose of this study is to screen for premature births and ascertain if GA and BW are linked to the onset of ROP. **Material and method:** In our study, infants with a GA  $\leq 34$  weeks and BW  $\leq 2000$  grams were selected for ROP screening. Premature newborns were first evaluated four weeks after birth. The subjects' eye exams were repeated one to two weeks later, depending on the findings. If no ROP was seen, eye exams were conducted every two weeks until vascularization completed. **Result:** We analyzed 50 babies with GA between 27 and 34 weeks and a BW of less than 2000 grams between August 2022 and February 2025. We discovered that, of the 50 infants, 36% (18/50) were female and 64% (32/50) were male. Of these, 52% (26/50) did not develop ROP, while 48% (24/50) did. It is clear from our research that the risk of acquiring ROP sharply declines with increasing BW and GA. **Conclusion:** The identification of risk factors that interfere with the evolution of ROP, as well as knowledge of its origin, may assist ophthalmologists and neonatologists in performing diligent screening, making correct diagnoses, and preventing the disease from developing.

**Keywords:** Retinopathy of prematurity, Gestational Age, Low birth weight

**Introduction:**

Retinopathy of prematurity (ROP) is a potentially fatal but avoidable proliferative illness of the retinal vasculature in preterm infants. If the child is not appropriately evaluated and treated, it can cause significant visual loss and increase the chance of blindness in newborns,<sup>1</sup> which was first described as retrolental fibroplasia in the 1940s. Due to the use of unmonitored supplementary oxygen for preterm infants, the condition quickly spread throughout industrialized nations in the 1950s. The higher survival rate of very low birth weight (VLBW) newborns led to the second epidemic in the 1970s and 1980s. It appears that

the third outbreak of the disease, with a higher rate of ROP and more mature infants involved, is currently occurring in developing nations.<sup>2</sup>

Low birth weight (LBW) babies are susceptible to ROP, a condition in which the retinal blood vessels do not grow normally. This could lead to macular folds, refractive or strabismic amblyopia, retinal detachment, or other quickly progressing structural eye malformations that cause blindness.<sup>3</sup> Severe ROP is a debilitating disease that, if ignored, can cause irreversible vision loss, which would lower a person's quality of life and place a heavy financial strain on both the individual and the community.<sup>4</sup>

Prior research has shown that the incidence of ROP varies by country's level of development, socioeconomic status, and geographic location.<sup>5</sup> The following screenings are advised by US national screening guidelines: The attending pediatrics team believes that newborns who weight more than 1500 g but less than 2000 g, infants who weight 1500 g or less, or postmenstrual age of 32 weeks or less are at high risk for ROP.<sup>1</sup>

A new group of extremely preterm infants has shown higher survival rates due to advancements in neonatal care. Such infants are at high risk for ROP, according to the current national population-based study, and the risk decreases by 50% for every week that the infant's Gestational Age (GA) increases at birth.<sup>6</sup> Thus, it is critical to keep an eye on the prevalence of ROP and its risk factors.<sup>7</sup>

Blindness can be avoided and the child's general development can be improved by early detection of retinal injury and the implementation of suitable treatment.<sup>8</sup> Therefore, this study aims to screen out premature babies and determine if GA and BW are associated with the development of ROP.

#### **Pathogenesis:**

When preterm newborns' retinal arteries fail to develop normally, they develop ROP, a vasoproliferative condition of the retina.<sup>9</sup> Although the pathophysiology is complex, the preterm infant's elevated oxygen saturation levels are crucial.

Vascular Endothelial Growth Factor (VEGF) is downregulated and endothelial cells die in preterm infants with abnormal retinal vessels as a result of incomplete vascularization of the retinal tissue caused by relative hyperoxia compared to intrauterine relative hypoxia. This alters the normal vascularization of the retina by vasoconstriction and vasoobliteration of the existing immature vessels. The developing retinal tissue becomes ischemic and hypoxic once the expanding arteries close. The resulting ischaemia raises VEGF production, leading to neovascularization.<sup>10</sup>

#### **Definitions:**

**Gestational Age (GA):** During pregnancy, this phrase is frequently used to indicate the stage of the pregnancy. From the first day of the woman's

most recent menstrual cycle to the present, it is expressed in weeks.

**Post-Conceptional Age (PCA):** A baby's growth and development up until about the due date are estimated using post-concational age, which is the sum of the baby's gestational and chronological ages.

Five consecutive, or eight total, clock hours of stage 3 ROP in zones 1 or 2 with plus diseases are considered threshold ROP. Plus disease in zone1 is included in pre-threshold ROP; in zone1, it is included in stage3 ROP; and in zone2, it is included in stage 2 or 3 ROP with plus disease.<sup>10</sup>

Severe ROP was defined as ROP that required therapy or stage 4 or 5 of ROP, whereas mild ROP was described as ROP that did not fulfill the requirements for treatment. Any stage of ROP with plus disease or zone I stage 3 without plus, and zone II stage II or III with plus disease were the treatment criteria. Individuals with stage 5 ROP who did not receive therapy were classified as advanced untreatable.<sup>2</sup>

#### **Risk Factors:**

LBW and GA have a substantial correlation with ROP development, with LBW being a better indicator of severity. More kids are at risk of developing ROP if they are born at earlier gestations and with lower birth weights.<sup>10</sup>

ROP is attributed to a number of risk factors such as LBW, preterm, oxygen therapy, blood transfusions, apnea, postnatal steroid treatment, and hypercapnia.<sup>11</sup>

Previously, it was believed that the main cause of ROP development was a high dosage of oxygen therapy. ROP has been observed in situations without oxygen therapy, nevertheless. Not all premature children develop ROP, even after receiving oxygen therapy.<sup>12</sup> Therefore, oxygen treatment is no longer the sole and most crucial element in the development of ROP. Oxygen therapy is merely one component of the complex cause of ROP.<sup>13</sup>

#### **Materials and Methods:**

The PCA showed a stronger correlation with the time of ROP's retinal vascular events than with the chronological age.<sup>14</sup>

According to the most recent statement from the American Academy of Ophthalmology, the American Academy of Pediatrics, and the American Association for Pediatric

Ophthalmology and Strabismus, all infants under 1500 g at birth or those who have had GA for more than 32 weeks must be screened for ROP; additionally, infants who have some risk factors for ROP formation and have birth weights between 1500 and 2000 g or who have GA for more than 32 weeks should also be screened.<sup>15</sup>

In the Le et al. trial, an infant was evaluated for ROP upon arrival to the NICU if they met the following criteria: (a) weighted less than 1750 g at birth, (b) appeared at less than 34 weeks of gestation, or (c) had additional serious risk factors such as sepsis, respiratory distress syndrome (RDS), or chronic oxygen use.<sup>16</sup>

Infants delivered at  $\geq 32$  weeks gestation are not at risk of having ROP, according to studies done in industrialized nations.<sup>17</sup> The best time for the first screening exam is still up for debate. While later screening may miss the opportunity for therapy and fail to diagnose the threshold ROP, earlier screening would lead to several needless fundus evaluations. For the Shah et al. trial, screening was done four to six weeks after birth.<sup>13</sup>

The first screening examination should be conducted between 4 and 6 weeks of chronological age, or 31 and 33 weeks after conception, according to a joint statement issued by the American Academy of Pediatrics, the American Association of Pediatric Ophthalmologist and Strabismus, and the American Academy of Ophthalmology.<sup>18</sup>

Infants with a BW  $\leq 2000$  grams and/or a GA  $\leq 34$  weeks were chosen for ROP screening in our study. In order to determine if children weighting more than 2000 grams are at risk of developing ROP, we selected six newborns whose BW was greater than 2000 grams and whose GA was less than 34 weeks. To be eligible for screening, a baby must live for 32 postmenstrual weeks, or 4 weeks after birth. Four weeks after birth, premature babies were first assessed.

Depending on the results, the subjects' eye exams were conducted again after a period of one to two weeks. Eye exams were performed every two weeks until vascularization reached zone 3 if no ROP was observed.

The International Classification of Retinopathy of Prematurity was used to categorize the stages of ROP:

1. Stage 1: Abnormal branching of tiny arteries directly posterior to the demarcation line that divides the vascularized retina posteriorly from the avascular retina anteriorly.
2. Stage 2: Retinal ridge: this proliferative tissue is still intraretinal, but the demarcation line has enlarged in volume.
3. Stage 3: Extraretinal fibrovascular growth on the ridge.
4. Stage 4: Partial detachment of the retina.
5. Stage 5: Complete detachment of the retina.<sup>19,20</sup>

#### Ophthalmological examination:

Three drops of 1% tropicamide and 2.5% phenylephrine, spaced 15 minutes apart, were used to dilate the patients' pupils one hour prior to the test. Using a pediatric speculum, a sclera depressor, and a +20 diopter lens, a fundus examination was carried out with a binocular indirect ophthalmoscope. The International Classification of Retinopathy of Prematurity (ICROP), which is based on the degree of vascularization stage, the circumferential extent of the illness based on the clock hours, and the disease's position in zones, was followed when recording the results.<sup>21</sup>

#### Results:

50 newborns with GA ranging from 27 to 34 weeks and a BW of less than 2000 grams were evaluated for our study between January 2025 and February 2025.

**Table-I: Gender Distribution with ROP Status**

Ser No	ROP Status	Male	Percentage	Female	Percentage	Total	Percentage
1.	ROP Positive	15	30	9	18	24	48
2.	ROP Negative	17	34	9	18	26	52
	Total	32	64	18	36	50	100

**Table-II: Relationship between ROP with GA**

Ser No	GA (Weeks)	Total Babies	ROP Positive	Percentage	ROP Negative	Percentage
1.	≤ 28	1	1	100	0	0
2.	>28-30	15	12	80	3	20
3.	>30-32	15	7	46.67	8	53.33
4.	>32-34	19	4	21.05	15	78.95
	Total	50	24	48	26	52

**Table-III: Relationship between ROP with BW**

Ser No	BW (in Grams)	Total Babies	ROP Positive	Percentage	ROP Negative	Percentage
1.	<1000	4	4	100	0	0
2.	1000- 1499	23	13	56.52	10	43.48
3.	1500- 2000	17	6	35.30	11	64.70
4.	>2000	6	1	16.67	5	83.33
	Total	50	24	48	26	52

**Discussion:**

In our study, we have found that, out of 50 babies, 64 % (32/50) were male and 36% (18/50) were female babies. Among them, 48% (24/50) were having ROP and 52% (26/50) did not develop ROP. Among positive cases 30% (15/50) were male and 18% (9/50) were female babies. Among negative cases 34% (17/50) were male and 18% (9/50) were female babies.

Therefore, it is clear that male kids are more likely than female babies to be born preterm and to suffer ROP. Gebesce et al. found that ROP was found in 44 out of 219 neonates, 110 (50.2%) of them were male and 109 (49.8%) of whom were female.<sup>21</sup> According to statistics from Le et al. there is a 41% female prevalence and a 59% male preponderance in ROP overall.<sup>16</sup>

Severe ROP may develop in up to 34-week preterm babies in developing countries, despite the fact that in developed countries, ROP is primarily recorded in infants under 28 weeks of gestation and weighing 1000 g at birth.<sup>4,5</sup> It has been established that the two main risk factors for the development of ROP are LBW and short GA.<sup>22,23</sup>

For every week that the gestational age at birth increased the chance of ROP decreased by 50%. Severe ROP was independently linked to both GA at birth and infant BW, whereas GA at birth

was a better indicator of severe ROP than infant BW.<sup>6</sup> However, a rise in GA at birth was associated with a progressive decrease in the risk of severe ROP, according to the Austrian study.<sup>24</sup>

In our study, 1 kid was below 28 weeks and has developed ROP. 15 babies were between 28 to 30 weeks, among them 80% (12/15) has developed ROP, while 20% (3/15) did not. 15 babies were between 30 to 32 weeks, among them 46.67% (7/15) has developed ROP, whereas 53.33% (8/15) did not. Of the 19 infants born between 32 to 34 weeks, 21.05% (4/15) had ROP and 78.95% (15/19) did not. As a result, it is obvious that the likelihood of developing ROP decreases dramatically as GA increases.

Lad et al. demonstrated a substantial correlation between the onset of ROP and LBW. [1] BW was shown to be a more significant risk factor for the development of ROP than GA by Gebesce et al. and other Turkish research.<sup>21,25,26</sup>

In our study, 4 infants were below 1000 grams and have developed ROP. 23 babies were between 1000 to 1499 grams, among them 56.52% (13/23) has developed ROP and 43.48% (10/23) did not. 17 babies were between 1500 to 2000 grams, among them 35.30% (6/17) has developed ROP and 64.70% (11/17) did not. 6 babies were above 2000 grams, among them 16.67% (1/6) has developed ROP and 83.33% (5/6) did not. Thus, it

is evident that the likelihood of developing ROP decreases dramatically as BW rises.

### Conclusion:

The significant increase in the recorded incidence of ROP can be attributed to a number of factors, including increasing knowledge of ROP, increased newborn survival, and the distribution of guidelines for ROP screening and treatment.

Smaller, sicker, and immature babies are highly linked to ROP. The only hopeful factors that may lessen the incidence and severity of ROP in the high-risk infant are prevention of preterm, management of pre-eclampsia, and prudent use of ventilation and oxygen therapy. In order to reduce blindness and long-term visual morbidity in VLBW infants with ROP who require surgical treatment, follow-up is crucial and advised.

It is necessary to better identify the population at risk, identify risk factors, and implement suitable screening criteria in order to prevent irreversible visual loss. Despite the potential for significant visual abnormalities, ROP fortunately has a fair prognosis when detected and treated early. Therefore, prompt detection and treatment of this preventable disease depend on an efficient screening protocol.

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