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Original Research Article

EVALUATION OF RISK FACTORS LEADING TO ROP IN SOUTHERN PUNJAB, A HOSPITAL BASED STUDY

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Abstract: *The study aimed to assess the risk factors associated with retinopathy of prematurity (ROP) in premature children. The study was conducted prospectively in the Neonatal Unit of Nishtar Medical Hospital from January 2022 to December 2022 located in southern Punjab. The study included premature children who had a birth weight of less than 1500 g, gestational age of 32 weeks or less, and infants who had low Apgar scores, respiratory distress syndrome, blood transfusion, sepsis, infection, hydrocephaly, microcephaly, and twin pregnancy. Children with ischemic zones and changes in blood vessels had ROP and were treated by ophthalmologists and surgeons. The study found that out of the total 70 premature children included, 4 (5.7%) had active ROP, and 66 (94.2%) showed spontaneous regression of ROP. The patients with active ROP had a mean gestational age of 27.4±1.4 weeks, and there was a significant association between early gestational age and ROP. Patients who developed active ROP had oxygen therapy for 21±3.5 days compared to 12.6±1.2 days in those without ROP (P<0.05). The most common retinal changes were the development of ischemic zones (61.4%), bleeding (24.2%), changes in blood vessels (15.7%), and changes in the optic nerve (1.4%). Of the 70 patients, 4 (5.7%) were in Zone I, 21 (30%) were in Zone II, and 45 (64.2%) were in Zone III. All patients in the zone I had active ROP, suggesting a significant association between zones and the development of ROP (P <.05). In conclusion, the study found that low birth weight, early gestational age, low Apgar score, and longer duration of oxygen therapy significantly increased the risk of ROP.*

Keywords: Retinopathy of prematurity, Infants, Gestational age, Birth weight

Introduction

Retinopathy of prematurity (ROP) is an eye disease affecting premature children's retina's blood vessels. Majorly, it's mild and regresses spontaneously; however, in a few cases, it can be severe and lead to blindness. The survival rate of pre-term infants has improved due to medical advancements in neonatal healthcare, but an increase in the incidence of ROP has been observed. Research has been conducted on risk factors and treatment of ROP (Wu and Lam, 2021). Premature birth increases the risk of ROP, but various interactive factors lead to its occurrence (Fevereiro-Martins et al., 2023; Siswanto, 2021). Low birth weight and early gestational age are the most common causes of ROP, but hypoxia, low weight gain, respiratory distress syndrome, reduced IGF increase, intraventricular hemorrhage, sepsis, fungal infections, blood transfusions, anemia, etc., also contribute to the development of ROP (Higgins, 2019; Mathias et al., 2021). According to the International Classification of Retinopathy of Prematurity (ICROP), other risk factors responsible for the progression of this disease are called "plus disease," which leads to the development of aggressive ROP (Chiang et al., 2021). ROP may lead to blindness or a visual impairment. Thus, it is essential to screen premature infants at early stages. According to guidelines, infants with gestational age under 31 weeks and birth weight under 1500g should be reviewed within 34 weeks(Singh et al., 2020). Premature infants with gestational age > 31 weeks should also be screened if clinical risk factors exist. The ophthalmologist may suggest further monitoring based on the condition of retinal blood vessels. Premature children should be monitored in the long term due to the increased risk of retinal detachment, glaucoma, myopia amblyopia, and strabismus (Bae et al., 2022; Ryu, 2022). Identifying risk factors for developing ROP is essential so that at-risk infants can be screened at early stages. This study was conducted to evaluate risk factors in premature children with retinopathy of prematurity.

Methodology

A prospective study was conducted in the Neonatal Unit of Nishtar Medical Hospital from January 2022 to December 2022. The study included premature children who had a birth weight less than 1500 g, gestational age of 32 weeks or less, and infants who had low Apgar scores, respiratory distress syndrome, blood transfusion, sepsis, infection, hydrocephaly, microcephaly, and twin pregnancy. Consent was taken from the neonates' guardians. An ethical review board of the hospital approved the study. All infants underwent their first ophthalmology examination in the neonatal ICU and later in the 1st, 2nd, 3rd, and 4th weeks based on complete development of retinal blood vessels and completion of screening. Changes in the fundus, including bleeding, changes in the optic nerve, tortuosity and dilation of blood vessels, signs of aggressive ROP, and ischemic zones were noted. Children were reviewed by cyclopentolate and 20 dioptres lens after complete mydriasis by Phenilneprin 2.5% Sol. Children with ischemic zones and changes in blood vessels had ROP and were treated by ophthalmologists and surgeons.
All the data were analyzed using SPSS version 23.0. Results were presented in charts and tables as frequency and mean. Students't-tests, chi-squares, Pearson's correlation

coefficient, and ANOVA were used to evaluate differences. A p-value less than 0.05 was considered statistically significant.

Results

A total of 70 premature children were selected for the study, including 33 (47.1%) males and 37 (52.8%) females (Figure 1). The mean gestational age was 28.7 ±2.8 weeks. Mean BW was 1421.1±516 g. 4 (5.7%) children had active ROP, and 66 (94.2%) showed spontaneous regression of ROP. 3 (8.1%) female and 2 (6%) male patients had active ROP; this difference was statistically insignificant (P >.05). Patients who had active ROP had a mean GA of 27.4±1.4 weeks, and there was a significant association between early GA and ROP. Moreover, patients with active ROP had significantly lower BW (875±182 g) in comparison with those who did not develop ROP (1457.9±510.5 g). Patients with ROP had significantly lower 1ST-minute Apgar scores (3.1±1.2) and 5-minute Apgar scores (5.10±1.2).

Patients who developed active ROP had oxygen therapy for 21±3.5 days compared to 12.6±1.2 days in those without ROP (P<0.05). Patients with active ROP had an oxygen saturation rate of 83.7±8.4% compared to 88.6±10.2% in those without ROP; this difference was statistically insignificant (Table I). 2 (14.2%) patients with intraventricular hemorrhage and 3 (5.3%) without intraventricular hemorrhage developed ROP (P>0.05). Active ROP was not significantly associated with infection, microcephaly, and hydrocephaly (Table II).

The most common retinal changes were the development of ischemic zones (61.4%), bleeding (24.2%), changes in blood vessels (15.7%), and changes in the optic nerve (1.4%).

Of 70 patients, 4 (5.7%) were Zone I, 21(30%) were zone II, and 45(64.2%) were zone III. All patients in zone I had active ROP, suggesting a significant association between zones and the development of ROP (P <0.05). Gestational age was significantly higher in patients with ischemic zones than those without zones (P<.05). The difference between 1-minute and 5-minute Apgar scores in patients without zones mean 1-minute Apgar scores in patients with and without ischemic zones was significant. Patients with ischemic zones had a significantly higher duration of oxygen therapy compared to those without zones. There was a significant association between hydrocephalus and ischemic zones (P<0.05).

Table I: Patients' baseline characteristics

	Active ROP (n=4)	Non-Active ROP (n=66)	P value
Gestation age	27.4 ± 1.4	29.08 ± 2.7	0.004
Birth weight	875 ± 182	1457.9±510.5	0.010
Apgar score			
At 1 minute	3.1±1.2	5.5 ± 1.5	0.001
At 5 minutes	5.10±1.2	6.8 ± 1.02	0.001
Duration of oxygen therapy	21±3.5 days	12.6±1.2 days	0.010
Oxygen saturation	83.7±8.4%	88.6±10.2%	

Table II: Analysis of the impact of variables on the development of active ROP

Variables	Active ROP (N=4)	Non Active ROP (N=66)	P value
Sepsis	1(25%)	15 (22.7%)	0.74
Blood transfusion	2 (50%)	29 (43.9%)	0.62
Respiratory distress syndrome	4 (100%)	61 (92.4%)	0.05
Infection	3 (75%)	24 (36.3%)	0.22
Microcephaly	1 (25%)	2 (3%)	0.23
Hydro reply	0	4 (6%)	0.82
intraventricular hemorrhage	2 (50%)	4 (6%)	0.23

Discussion

In this study, we analyzed risk factors for ROP in premature children. 47.1% of patients were male, and 52.8% were female. The mean gestational age was 29.7 ±2.8 weeks. Mean BW was 1421.1±516 g. 5.7% of children had active ROP and were treated with anti-VEGF factors and argon laser photocoagulation. Patients in Zone I had the earliest GA, while those in Zone III had the latest. BW was lowest in patients in Zone I and highest in Zone III. Apgar score was lowest in zone I and highest in zone III.

A study conducted on premature infants found that 12.6% of patients had severe ROP. Male sex, lower GA, patent ductus arteriosus, small for gestational age, late-onset sepsis, use of inotropes, and more than two blood transfusions were significantly associated with the risk of ROP (Du et al., 2024). In another study on infants with < 32 weeks, 21% of infants had severe while the remaining had non-severe ROP. Severe ROP was diagnosed with the development of plus disease; according to univariate analysis, GA, BW, directional positive air pressure, maximum fraction of inspiratory oxygen (FiO2), and duration of oxygen supplementation had a significant

association with severe ROP (Shemesh et al., 2023). A study was conducted to determine ROP incidence and risk factors in infants with BW > 1500g. 11.8% of infants had ROP, while 3.7% required treatment. The mean GA and BW were significantly lower in infants requiring treatments than those with mild ROP. Surfactant usage, duration of oxygen supplementation, respiratory distress syndrome, antibiotic use > 14 days, and bronchopulmonary dysplasia increased the risk of severe ROP (Na et al., 2020). Another retrospective study evaluated risk factors for ROP in preterm infants with low birth weight. The mean BW was 1285.8 ± 266.4 g, and the mean GA was 30.9 ± 2.5 weeks. 11.9% of infants had ROP, and 3.8% had Type 1 ROP. Univariate analysis showed that early GA, lower BW, inotropes use, postnatal hypotension, intraventricular hemorrhage, and bronchopulmonary disease were independent risk factors for ROP. According to multivariate analysis, early GA, mean higher oxygen concentration, surfactant use, thrombocytopenia, invasive mechanical ventilation, total parental nutrition, hypoglycemia, and intraventricular hemorrhage significantly increased the risk of ROP. There were no significant risk factors for Type 1 ROP (Khorshidifar et al., 2019).

A study was conducted on significant causes of childhood blindness and ROP. The retrospective comparative study included premature infants with and without ROP. Variables like BW, GA, phototherapy, oxygen saturation, and others were compared between the two groups. ROP was associated with lower gestational age, lower first-minute Apgar score, low birth weight, oxygen therapy, and phototherapy. Advanced gestational age and higher birth were protective factors. Multiple births and oxygen therapy were the predictors of ROP (Warad et al.) A study on the severity and incidence of ROP found that 5.9% of infants had ROP, and 8.6% were small for gestational age. Early gestational age and sepsis were found to be independent risk factors for severe ROP (Chu et al., 2020). This study has a small sample size. More extensive studies are recommended to confirm our findings.

Conclusion

Low birth weight, early gestational age, low Apgar score, and longer duration of oxygen therapy significantly increased the risk of ROP.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.
Ethics approval and consent to participate
Approved by the department Concerned.
Consent for publication
Approved
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Conflict of interest

The authors declared absence of conflict of interest.

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