Original Research Paper

Volume - 15 | Issue - 05 | May - 2025 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Opthalmology

A STUDY OF RISK FACTORS, PREVALENCE AND RETINA FINDINGS OF RETINOPATHY OF PREMATURITY IN BUNDELKHAND REGION

Dr. Amit Rao*	Dept. of Ophthalmology, MLB Medical College, Jhansi, Uttar Pradesh – 284001, India. *Corresponding Author
Dr. Jitendra Kumar	Dept. of Ophthalmology, MLB Medical College, Jhansi, Uttar Pradesh – 284001, India.
Dr. Laxmi Devi	Department of Pharmacy, Smt. Vidyawati Group of Institutions, Uttar Pradesh-284121, India.

ABSTRACT **Introduction:** Retinopathy of prematurity (ROP) is a Vaso-proliferative disorder of the retina. Blindness and Retinal detachment could be the next sequelae of ROP. **Objectives:** The aim of this research was to access the risk factors, prevalence, and retina findings of retinopathy of prematurity in Bundelkhand region. **Methods:** In a tertiary care facility,165 preterm newborns underwent screening. Every newborn underwent a thorough history, clinical examination, and fundus examination, with results recorded. **Results:** Out of the 165 neonates; 29(17.58%) newborns had retinopathy of prematurity in one or both eyes categorized as: 7 cases (24.45%) of stage 1 ROP, 6 cases (20.9%) of stage 2 ROP, 2 cases (7.2%) of stage 3 ROP, 1 case (3.5%) of stage 4 ROP ,2 cases (7.2%) of stage 5 ROP , 1 case (3.5%) of Pre-PLUS ROP and 10 ROP cases with PLUS disease (34.5%). A prevalence of 17.6%.was found in the study population. **Conclusion:** Our research concludes that shorter age of gestation, lower weight at birth, and O_2 treatment are determined to be significant risk variables whereas sepsis, phototherapy, mechanical ventilation, respiratory distress syndrome, blood transfusion is non-significant risk factors for development of ROP.

KEYWORDS : Retinopathy of prematurity (ROP), preterm, risk factors, prevalence, low birth weight

INTRODUCTION

Background Of The Study:

Retinopathy of Prematurity is a potentially blinding eye disease that mainly affects preterm newborns born prior to 31 weeks of gestation or weighing < 1500 grams at birth. The condition arises due to the immature formation of blood vessels in the retina, leading to abnormal growth and potential scarring, which ultimately leads to retinal detachment and everlasting blindness if untreated[1]. The Bundelkhand region, situated in central India, presents a unique context for studying ROP [2]. Factors contributing to the prevalence of ROP in this region include:

High Preterm Birth Rates:

Bundelkhand, like many regions in India, experiences relatively high rates of preterm births due to various socio-economic factors, including limited access to healthcare and nutrition[3].

Limited Access to Neonatal Intensive Care Units (NICUs):

Adequate NICU facilities and trained personnel for managing premature infants may be lacking in some areas of Bundelkhand, potentially impacting the early detection and management of ROP[3].

Environmental And Socio-economic Factors:

Factors such as poverty, maternal health, and inadequate prenatal care can contribute to higher rates of preterm births, which in turn increase the risk of ROP[4].

Healthcare Infrastructure:

Disparities in healthcare infrastructure and resources across different parts of Bundelkhand may affect the timely screening, diagnosis, and treatment of ROP[4].

Awareness And Education:

Awareness among healthcare providers, parents, and caregivers about the risk factors, symptoms, and importance of early detection of ROP is crucial but may vary in different communities within the region[4].

Need Of Study:

The need for a study focusing on risk factors, prevalence and retina findings of Retinopathy of Prematurity in the Bundelkhand region is multifaceted and crucial for several reasons.

Healthcare Planning And Resource Allocation:

Bundelkhand, like many regions in India, faces challenges in healthcare infrastructure and access, particularly in neonatal care. Understanding the prevalence of ROP and its correlated potential risk variables helps in planning and allocating resources effectively. This includes ensuring adequate NICU facilities, ophthalmic expertise, and equipment for early detection and management of ROP cases[5].

Impact On Childhood Blindness:

ROP is the principle cause of avoidable pediatric visual loss all over the world. Studying its prevalence in Bundelkhand provides insight into the regional burden of this condition and inform strategies to reduce visual impairment among premature infants. Early identification of ROP through screening programs can lead to timely interventions, potentially preventing severe visual outcomes such as retinal detachment[5].

Identification Of Localized Risk Factors:

Factors contributing to the evolution and progression of ROP may vary based on regional socio-economic, environmental, and healthcare factors. Investigating these factors in Bundelkhand helps in identifying local determinants such as prevalence of preterm births, oxygen therapy practices, maternal health status, and nutritional factors. Such insights are crucial for developing targeted interventions and guidelines specific to the region[5].

Enhancement Of Neonatal Care Practices:

Research on retina findings in ROP cases provides valuable data on disease progression and outcomes in Bundelkhand. This information supports the development of evidence-based protocols for ROP screening, diagnosis, and treatment, aiming to improve neonatal care practices and outcomes[5].

Health Equity and Access to Care:

By addressing the specific needs related to ROP in Bundelkhand, the study promotes health equity by ensuring that all infants, regardless of geographical location or socio-economic status, receive timely and appropriate eye care services. This aligns with global efforts to reduce health disparities and improve access to essential healthcare services for vulnerable populations[5].

Policy And Advocacy:

Findings from the study can inform policy-makers, healthcare providers, and stakeholders about the need for targeted interventions and investments in neonatal and ophthalmic care infrastructure. Advocacy based on research outcomes can lead to policy changes aimed at improving early detection, management, and long-term results for newborns at risk of retinopathy of prematurity in Bundelkhand[5].

Statement Of Problem:

Retinopathy of Prematurity is an important cause of avoidable

childhood blindness globally, particularly affecting premature infants. The Bundelkhand region in India, characterized by its socio-economic challenges and healthcare disparities, presents a unique context for understanding the prevalence, risk factors, and retina findings associated with ROP. Despite advancements in neonatal care, the incidence and severity of retinopathy of prematurity in Bundelkhand remain poorly documented and understood [6]. Therefore, this prospective study is aimed to determine the prevalence, risk factors and retina findings of retinopathy of prematurity in premature newborns receiving care in the Neonatal Intensive Care Unit at our Medical College.

MATERIALS & METHOD

This prospective non interventional study was carried out in collaboration with the departments of Ophthalmology and Neonatology at the Neonatal Intensive Care Unit (NICU) of Maharani Laxmi Bai Medical College, Jhansi, and affiliated Hospital, a tertiary referral hospital. This study included all premature babies who met the eligibility requirements and were admitted to the NICU between August 2022 and March 2024 (20 months), with a gestational age of < 34 weeks at delivery and a birth weight of < 2000 g.

Sample Selection:

I. Inclusion Criterion

- Consent: Written informed from parents/guardian of the infant to be included in the study.
- Willingness for follow up screening in the study.
- Premature neonates with low birth weight (<1.5 kg)
- Premature neonates with birth weight (>1.5 kg and < 2kg)[19-21]
- Premature neonates with low gestational age (<32 weeks)
- Premature neonates with low gestational age (>32 weeks and < 34 weeks) [19-21]
- Preterm neonates with sepsis, mechanical ventilation, oxygen therapy, intraventricular hemorrhage and blood transfusions

II. Exclusion Criterion

- Parents/guardian unwilling for giving written consent for ROP screening.
- ROP screening cases with loss to follow up.
- Neonates who are admitted to the NICU but do not meet the predetermined criteria.

165 premature babies who met the study's eligibility requirements underwent comprehensive perinatal histories and clinical tests for weight, length, and other systemic disorders. After that, a thorough fundus examination was performed locally using a direct and indirect ophthalmoscope. One hour prior to the inspection, cyclopentolate 0.2% and phenylephrine 1% eye drops were used to achieve full mydriasis. ROP was categorized by severity (stage 1-5) and localization on the retina (zone 1-3), of the International Committee for Classification of ROP.

Sex, birth weight, gestational age, and delivery method were the prenatal factors. RDS, oxygen delivery (via nasal catheter, mask, continuous positive airway pressure or mechanical ventilation), phototherapy for jaundice, number of blood transfusions and septicemia (by clinical diagnosis, with either blood culture positive results or CRP > 6.0 mg/dl) were the post birth factors.

Social Sciences Package for Windows (SPSS for Windows, version 27.0) was used to analyse the data. Simple proportion was used to characterize the prevalence rate of ROP. The chi-square test was used to compare groups of cases. After running a logistic regression model, the risk variables that had proved to be significant in the univariate analysis were given a modified OR (95% CI). A p-value < 0.05 was considered statistically significant.

RESULT

The study group is comprised of 165 neonates born between August 2022 and March 2024, all preterm babies with a gestational age of < 34 weeks and birth weight of < 2kg, either being stable or not**.** 85 (51.57%) of the 165 newborns were male and 80 (48.50%) were female. The mean age of gestation was 30.8±1.19 weeks (**Table1**), with 110 preterm babies falling below 32 weeks and 55 newborns were born at 32 weeks or more. Gestational age was found to be a significant risk factor for retinopathy of prematurity development (p-value=0.04). Babies born before 32 weeks had more severe Retinopathy of prematurity (**Table 2**). The birth weight varied between 890 g and 1950 g, with a mean of 1377.6 ± 158.1g. Of the 165 neonates, 60 babies (36.42%) were delivered vaginally, and 105 babies (63.65%) were delivered through lower segment caesarean section (**Table 1**).

Out of the 165 neonates; 29(17.58%) preterm neonates had retinopathy of prematurity in one or both eyes categorized as: 7 newborns (24.45%) in stage 1 ROP, 6 newborns (20.9%) in stage 2 ROP, 2 newborns (7.2%) in stage 3 ROP, 1 newborn (3.5%) in stage 4 ROP, 2 newborns (7.2%) in stage 5 ROP , 1 newborn (3.5%) of Pre-PLUS ROP and 10 ROP cases with PLUS disease (34.5%) (**Table 2**).

The study discovered that there were three significant risk variables for the development of Retinopathy of prematurity: birth weight (p-value=0.01**,Table 4)** , 100 % oxygen therapy(p-value of 0.02 ,**Table 3**), and gestational age(p-value=0.04,**Table 2**) While RDS (respiratory distress syndrome), septicemia, phototherapy, mechanical ventilation(MV), CPAP (continuous positive airway pressure) and blood transfusion were found to be insignificant risk variables (**Table 5**).

Table 1: Demographic Data Of Studied Cases.

Data	N (%) or mean±SD
Male	85
Female	80
Vaginal delivery	60
Cesarean delivery (LSCS)	105
Gestational age (weeks)	30.8±1.19
Birth weight (g)	1377.6 ±158.1

Table 2: **Relation Between Stages Of ROP& Gestational Age**

< 32 Weeks with ROP	24
≥ 32 Weeks with ROP	5
Stage 1 ROP	7 (24.45%)
Stage 2 ROP	6 (20.9%)
Stage 3 ROP	2 (7.2%)
Stage 4 ROP	1 (3.5%)
Stage 5 ROP	2 (7.2%)
Pre – PLUS ROP	1 (3.5%)
ROP with PLUS Disease	10 (34.5%)

Table 3: Relationship Of 100% Oxygen Therapy And Retinopathy Of Prematurity

Oxygen therapy	ROP	
	Present	Absent
Not given (n=34)	2	32
Given (n=131)	27	104

p- value = 0.02

Table 4 Relationship Of Birth Weight (in Grams) With Retinopathy Of Prematurity

Birth Weight (gram)	ROP	
	Present	Absent
<1500 (n=122)	27	95
>1500 (n=43)	2	41

p- value = 0.01

Table 5: Some Other Risk Factors And Their Relation With ROP.

Risk Factors	Cases without ROP	Cases with ROP	p-value
RDS (n=140)	112	28	0.06
Sepsis (n=56)	43	13	0.17
Phototherapy (n=86)	68	18	0.23
Mechanical			
Ventilation (n=35)	25	10	0.09
CPAP(n=7)	04	03	0.07
Blood Transfusion -			
ONCE (n=55)	41	14	0.06
>ONCE(n=7)	04	03	0.07
Gender (n=165) M =85 F=80	136	29	0.98
Mode of Delivery (n=165) VD =60 LSCS=105	136	29	0.06

Table 6: Univariate Regression Analysis

Risk Factors	OR	
1	Gestational age	>1

2	Birth weight	>1
3	100 % Oxygen therapy	>1

*Gestational age, birth weight and oxygen therapy were found to be independent risk factor for ROP during study.

DISCUSSION

In preterm neonates, retinal vascular development is affected, leading to a disorder known as retinopathy of prematurity. It remains a significant risk factor for premature neonates and the significant global cause of pediatric blindness despite advancements in neonatal care.[22]

Prevalence:

In this research, the prevalence of retinopathy of prematurity in study population was 17.6%, which was on lower side than in other previously published research articles. **Hakeem Abdel *et al*. (2012)** [5] reported 19.2% prevalence in Egypt. This could be explained by the fact that all premature newborns with a gestational age of < 32 weeks and a birth weight of < 1500 g were included in this research group. **Zarei M. *et al*. (2019)**[23] reported 27.28% prevalence in Iran explaining the fact by including only neonates with severe prematurity (age of gestation 28 weeks or less) and extremely low weight at birth (1000 g or less).On the other hand, it is greater than the Jakarta study conducted by **Badriah C *et al*. (2012)**[24], which included newborns with higher gestational ages up to 37 weeks and birth weights up to 2 kg and found a prevalence of 11.9%.

Risk factors:

Gestational Age:

In our study, we discovered a strong association (p value=0.04) between low gestational age and the development of retinopathy of prematurity. Of the 165 babies, 110 (66.7%) were born before the gestational age of 32 weeks and 55 (33.3%) beyond the gestational age of 32 weeks. 24 (83.5%) of the 29 newborns with retinopathy of prematurity were born at an age of gestation less than 32 weeks and 5 (17.5%) at gestational age more than 32 weeks. **Choudhary Mamta *et al*. (2023)** [18] studied that of the 130 neonates without retinopathy of prematurity, only twenty (15.4%) were delivered at an age of gestation of less than 32 weeks whereas the vast majority (84.6%) were delivered at an age of gestation more than 32 weeks. Out of the thirty newborns with ROP, ten (33.3%) were born before the age of gestation 32 weeks and twenty (66.7%) after the gestational age of 32 weeks. There is a significant connection (p=0.044) between the incidence of retinopathy of prematurity and an age of gestation < 32 weeks. The findings of our research are comparable with the above-mentioned study (p-value=0.04).

Birth weight:

A significant connection between lower birth weight and the development of retinopathy of prematurity was seen in our research with p value of 0.01. Out of 165 newborns, 122 (73.95%) newborns were found to have birth weight <1500 gram while 43 (26.05%) newborns had birth weight >1500 gram. Of the 29 neonates with ROP, 27 (93.25%) newborns were found to have birth weight <1500 gram while 2 (6.95%) newborns had birth weight >1500 gram. **Choudhary Mamta *et al*. (2023)**[18] research showed that out of the 160 newborns that were screened during this study period, 30 of them had ROP, representing a prevalence of 18.8% in the study population. Out of the 30 newborns with ROP, 24 (80%) weighed less than 1500 g and 6 (20%) weighed more than 1500 g. There was a statistically important association (p value <0.001) between the prevalence of ROP and birth weights under 1500 gram. **Princy Choudhary *et al.* (2023)** [17] the results of the study indicated that 168 (42%) and 232 (58%) of the 400 newborns were females and males respectively. Seventy (17.5%) of these four hundred newborns had ROP. Of these 70 neonates, stage-1 ROP seen in 42.8% of cases, 45.7% cases had stage- 2 ROP, stage- 3 ROP found in 5.71% of cases and 5.71% cases developed ROP stage 4. Birth weight less than 2 kg (p value <0.001) and gestational age not more than 34 weeks (p value=0.008) were determined to be statistically significant risk variables for the evolution of retinopathy of prematurity. The findings of our research are comparable with the above-mentioned studies (p value=0.01).

Oxygen Therapy:

During our research work, we found a strong association (p value=0.02) between 100% oxygen therapy and the development of ROP**.** Out of 165 newborns, 34 (20.65%) newborns were not given oxygen therapy while 131 (79.35%) newborns were supplemented with 100 % oxygen therapy. Of the 29 neonates with ROP, 2 (6.95%) newborns were not given oxygen therapy while 27 (93.05%) newborns were provided with 100% oxygen therapy. **Khairy *et al*. (2020)** [29] study was carried out on thirty extremely premature newborns who were hospitalized to the neonatal incubator unit at Menoufia University Hospital and Al Quds Hospital in Al Mahla Al Qubra, Egypt, between March 2019 and December 2019. The infants were born before 32 weeks of gestation. Fourteen candidates were male, with ROP present in 8 (44.4%) of them, while sixteen candidates were female, with ROP present in 10 (55.6%) of them. Regarding the relationship between oxygen administration and ROP, we found that 25 infants received oxygen, comprising 18 (72%) infants with ROP and seven (28%) infants without ROP. The 18 infants who received oxygen all had ROP and this represents 100% of infants (significant risk factor). **Bujoreanu Bezman, L. *et al*. (2022)**[15] found that although oxygen supplementation can cause pulmonary and neurological impairment, but it is crucial for the survival of very young preterm newborns. One major factor contributing to ROP is the free postnatal oxygen supply without close monitoring. Preterm neonates get subjected to increased supply of O_2 before birth, either from the air or from the supplemental O_2 delivery. These babies are born into a somewhat hypoxic environment within the uterus and have partially vascularized retinas, with oxygen saturation values ranging from 50% to 70%. A state of hyperoxia is caused by a sudden, sharp rise in oxygen saturation levels between 80% and 100% right after birth. This hyperoxia inhibits the release of VEGF and lowers levels of Hypoxia-Inducible Factor-1, which causes a phenomenon known as retinal vasoconstriction. The AAP revised their own guidelines for the O_2 saturation interval to reflect a target level higher than 85−89% following the release of the SUPPORT study, which sought to find the appropriate doses for oxygen in premature babies. This update was issued despite the fact that severe forms of ROP decreased in children with oxygen saturation between 85% and 89%; this was due to a higher mortality rate in comparison to premature infants with saturation level between 91% and 95%. Even under close observation, partial oxygen pressure (PaO_2) and level of oxygen saturation in patients with concomitant cardiac disease can shift outside the normal range. **Praveen S. *et al*. (2023)** [25] Conducted a prospective cross-sectional study between November 2019 and October 2021 in the neonatal intensive care unit for 64 premature newborns, adhering to norms of the Declaration of Helsinki guidelines, with an age of gestation< 36 weeks and were on oxygen therapy. The research was approved ethically. Written agreement with full disclosure was given with full knowledge. 26 (40.6%) and 38 (59.4%) of the 64 premature neonates were found to be female and male respectively, according to the study's findings. In terms of weight, the babies were born weighing an average of 1447.18 ± 288.38 g (660–2280 g) and gestating for an average of 223.27 ± 16.25 days (190–252 days). Of them, eighteen (28.12%) were delivered vaginally while forty-six (71.87%) underwent a lower segment caesarean section. Out of 64 babies, thirty-two babies were on 86 to 90 percent of O_2 supplementation where five babies had developed retinopathy of prematurity and the remaining thirty-two babies were on 91 to 94 percent of O_2 delivery where fourteen babies had developed ROP. The development of retinopathy of prematurity and supplemental O_2 delivery were identified to be significantly associated (P = 0.014). The findings of our study are comparable with the above-mentioned studies (p value=0.02).

Gender:

The study population included 165 neonates. In our study, we discovered no connection (p value=0.98) between gender and the development of ROP**.** Out of the 165 neonates; 85 (51.57%) were males and 80 (48.50%) were females. Of the 29 neonates with ROP, 15 (52%) were males and 14(48.0%) were females. There is a non-significant correlation between ROP and gender (p value=0.98). **Ibraheem Sameeh Awad *et al.* (2021)**[12] conducted a study including 100 preterm newborns and revealed that 22 of the cases had retinopathy of prematurity and 78 of the newborns were normal. It was determined that lower age of gestation, low weight at birth, sepsis, intraventricular haemorrhage, getting oxygen therapy and its time taken were all statistically important risk variables for the growth of retinopathy of prematurity. There were eleven newborns of ROP at stage I, eight newborns of ROP at stage II and three newborns of ROP at stage III. Gender, mode of delivery, phototherapy and PDA were found to be insignificant risk variables (p value 0.286). The above-mentioned study is consistent with our research findings.

Mode of Delivery:

The study population included 165 neonates. In our study, we

discovered no association between mode of delivery and the ROP's development with a p value of 0.06. Of the 165 babies, 60 (36.33%) were delivered via normal vaginal delivery and 105 (63.67%) were delivered via lower segment caesarean section (LSCS). 29 newborns with ROP were delivered; 23 (79.5%) via lower segment caesarean section (LSCS) and 6 (20.5%) were born vaginally. ROP and mode of delivery have shown a non-significant connection (p value=0.06) in this study.**Abdel H. A. A. Hakeem *et al.* (2012)**[5] study showed that out of the 172 newborns that were evaluated, thirty-three neonates (19.2%) had ROP in one or both eyes; there were Eighteen (54.5%) newborns at stage 1, Nine (27.3%) preterm babies at stage 2 and Six (18.2%) neonates at stage 3 ROP. ROP was not observed in any of the infants under study at stages 4 or 5. A significant connection was shown by univariate analysis among the incidence of retinopathy of prematurity and the age of gestation (p value = 0.000), sepsis (p value = 0.004), supplemental O_2 therapy (p value = 0.018) and the average number of blood transfusions (p value = 0.030). The incidence of retinopathy of prematurity did, however, not significantly associated with birth weight, respiratory distress syndrome, phototherapy, gender, mode of delivery, PDA, IVH, hypotension, period of O_2 delivery, MV or CPAP (all p values > 0.05). The findings of our study are comparable with the above-mentioned study (p value=0.06).

Sepsis:

The study population included 165 neonates. In our study, we discovered no connection (p value=0.17) between sepsis and the development of ROP. Out of the 165 neonates; 109 (66.12%) newborns showed no signs of sepsis and 56 (33.88%) newborns developed sepsis during course of study. Of the 29 neonates with ROP, 16 (55.5%) had no signs of sepsis and 13(45.5%) developed sepsis during course of study. There is a non-significant association (p=0.17) between ROP and sepsis. **Neeti R Sheth *et al.* (2023)**[16] carried out a hospital-based cross- sectional study at G.T. Seth hospital, P.D.U Government Medical College, Rajkot, involving 500 newborns who presented in OPD with age of gestation < 36 weeks and weight at birth < 2.5 kg and an eight percent incidence of retinopathy of prematurity was observed in any stage in the research they conducted, which is lower than the other previous researches carried out in India. Low weight at birth and preterm birth were the most potential risk variables for developing any retinopathy of prematurity. In our research, 2 patients were found to have septicemia (p=0.07) showing that there was an insignificant connection of sepsis with occurrence of ROP. **Ali Mohammed Abdulsahib *et al.* (2023)**[27] studied that a mean age of gestation 31.3 ± 2.2 weeks, 9.3% of cases being younger than twenty-eight weeks and a weight at birth of 1558.7 ± 476.8 grams were among the 269 newborns that were enrolled throughout the study period. Of the entire sample enrolled in the study, type 1 ROP (T1ROP) was present in Nineteen (7.1%), type 2 ROP (T2ROP) in forty-three (16%) and no ROP was present in seventy newborns (26%). RDS (20%), lower weight at birth (21.4% in patients with birth weight below 1051 g) and short gestational age (16% of preterm newborns aged than less 28 weeks) were all significantly correlated with T1ROP. There was an insignificant connection among septicemia and progression of ROP, as 2 (5.7%) had T1ROP and septicemia while 17 (7.3%) had T1ROP but no septicemia. **P. Senthil Kumar *et al.* (2023)**[28] 115 preterm newborns with an age of gestation<34 weeks and/or a weight at birth of < 2kg participated in this prospective research study. 27 newborns, out of 115 total, had ROP. In our study, 36 newborns did not develop ROP while 50 newborns had sepsis and 14 neonates had ROP. Based on this research finding, septicemia was revealed to be an insignificant risk variable for developing retinopathy of prematurity (p = 0.316). The above-mentioned studies are consistent with our research findings.

Phototherapy:

The study population included 165 neonates. In our study, we discovered no relation between phototherapy and the development of retinopathy of prematurity with p value=0.23**.** Out of 165 neonates; 86 (52.15%) newborns were given phototherapy and 79 (47.85%) newborns did not receive any phototherapy during course of study. Of the 29 neonates with ROP, 18 (55.5%) were given phototherapy and 11(45.5%) newborns did not receive any phototherapy during course of study. There is a non-significant association (p value=0.23) between of ROP and phototherapy. **P. Senthil Kumar *et al.* (2023)**[28] carried out a prospective study on 115 preterm infants who were born weighing 2kg or less and/or with age of gestation 34 weeks or less. Twenty-seven of the 115 newborns had ROP. The results of our investigation indicated a strong association between ROP and age of gestation, preterm birth weight, supplemental O_2 treatment, frequency of blood transfusion, apnea of prematurity and RDS. There was an insignificant correlation seen between the onset of ROP and phototherapy (p=0.688), maternal PIH, anemia, hypotension. The findings of our research are comparable with the above-mentioned study (p value=0.23).

Respiratory distress syndrome:

The study population included 165 neonates. In our study, we discovered no connection (p value=0.06) between the development of retinopathy of prematurity and respiratory distress syndrome. Out of the 165 neonates; 140 (84.85%) newborns showed signs of RDS and 25 (15.15%) newborns did not develop RDS during course of study. Of the 29 neonates with ROP, 1 (3.75%) had no signs of RDS and 28 (96.25%) developed RDS during course of study. There is a non-significant association (p value=0.06) between ROP and RDS. **Khairy *et al.* (2020)**[29] research was done on thirty extremely premature babies who were hospitalized to the neonatal incubator unit at Menoufia University Hospital and Al Quds Hospital in Al Mahla Al Qubra, Egypt, between March 2019 and December 2019 with newborns took birth at < 32 weeks of gestation. Among the candidates, there were 16 female candidates and 14 male candidates with ROP present in ten (55.6%) female and eight (44.4%) of the male candidates. Of 30 infants screened, six had RDS. Of 18 ROP cases present, four (22.2%) of them had RDS, whereas of 12 non-ROP cases, two (16.7%) of them had RDS. P-value was more than 0.001, with non-significant level. The above-mentioned study is consistent with our research findings.

Mechanical Ventilation & CPAP:

The study population included 165 neonates. Mechanical ventilation given in 35 (21.25%) newborns and not given in 130(78.75%) newborns out of 165 neonates and CPAP given in 7 (4.25%) newborns and not given in 158 (95.75%) newborns out of 165 neonates and discovered a non-significant association between Mechanical ventilation (p value=0.09), CPAP (p value=0.07) and the onset of ROP. **Gonçalves E. *et al*. (2014)** [30] carried out a prospective longitudinal incidence research work with a time-limited convenience sample. Preterm newborns admitted between May 2009 and April 2011 to the Unimontes University Hospital's neonatal intensive care unit were included in the research. The requirements for inclusion were that the age of gestation should be 32 weeks or less and/or the weight at birth should be 1.5kg or less. The number of days and the mode of delivery of supplemental oxygen therapy were assessed in this current research. No statistically important connection was seen between ROP and any of the oxygen administration methods used for longer than five days including MV (p=0.899) and CPAP (p=0.720). The above-mentioned study is consistent with our research findings.

Blood Transfusion:

Our research concluded that frequency of blood transfusion is an insignificant risk variable for development of retinopathy of prematurity (p value >0.05%) which is in agreement with research done by **Jitendra Kumar *et al*. (2018)** [2].However, it disagrees with research done by **Wang YC, Chan OW, Chiang MC, *et al*. (2017)**[31][32][33] which found a link between development of retinopathy of prematurity and Blood transfusion.

Table 6 shows that the development of Retinopathy of prematurity was independently associated with low gestational age, low birth weight, and 100% oxygen therapy, as confirmed by logistic regression analysis.

CONCLUSION

In summary, our research found that lower gestational age, lower birth weight and 100 % oxygen therapy are statistically significant risk variables for the development of retinopathy of prematurity. The prevalence of retinopathy of prematurity was 17.6%. While monitoring preterm newborns, the doctors should be conscious of the fact these additional risk factors do exist. Understanding and predicting ROP development in premature babies will be aided by the study of risk variables. Preventing the onset of progressive ROP in high-risk preterm newborns requires prompt examination by trained ophthalmologist. Every possible step must be taken to minimize the occurrence of advanced retinopathy of prematurity by identification of dangerous ROP signs and timely intervention. This is because ROP can cause catastrophic outcomes up to full blindness. In almost every nation with excellent perinatal care, neonatologists, ophthalmologists, and nursing professionals have worked together to significantly lower the prevalence of ROP.

In this context, neonatologists are essential because they make sure that every affected newborn receives the very best care possible based on the unique set of risk factors that they exhibit, and they also make sure that the NICU's oxygen supply and monitoring protocols remain adhered too. Spreading the awareness among clinicians and nursing personnel regarding the magnitude of the problem is of paramount importance.

The nursing professionals play a crucial role in successfully preventing ROP- induced blindness because additional to scheduling newborns at birth, they remain available during the entire exam procedure and actively engage in advising the patient's loved ones on the significance of follow-up after discharge. Neonatal assessment programmers, stringent monitoring of oxygen delivery from birth and appropriate management of maternal risk variables to lower the likelihood of preterm labor have all significantly decreased the incidence of retinopathy of prematurity related pediatric blindness globally as well as in the Bundelkhand region of Uttar Pradesh, India.

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