IJMA

International Journal of Medical Arts

Volume 7, Issue 4 (April 2025)

http://ijma.journals.ekb.eg/

P-ISSN: 2636-4174

E-ISSN: 2682-3780

Available online at Journal Website
https://ijma.journals.ekb.eg/
Main Subject [Ophthalmology**]**

Original Article

Incidence and risk factors of Retinopathy of Prematurity at Neonatal intensive care unit of Al-Azhar University Hospital Damietta

Mohab Ahmed Salama [1]; Ahmed Salah Abdelrehim [2]; Ehab Tharwat [1]

[1] Department of Ophthalmology, Damietta Faculty of Medicine, Al-Azhar University, Damietta, Egypt.

[2] Department of Ophthalmology, Faculty of Medicine, Al-Azhar University, Cairo, Egypt.

.

Article information

Received: 18-02-2025

Accepted: 11-03-2025

DOI: 10.21608/ijma.2025.361590.2132.

*Corresponding author

Email: mohabsalamasayoh@gmail.com

Citation: Salama MA, Abdelrehim AS, Tharwat E. Incidence and risk factors of Retinopathy of Prematurity at Neonatal intensive care unit of Al-Azhar University Hospital Damietta. IJMA 2025 Apr; 7 [4]: 5628-5634. doi: 10.21608/ijma.2025.361590.2132.

ABSTRACT

Background: Retinopathy of Prematurity [ROP] is a leading cause of blindness in preterm infants. This condition's incidence is rising due to advancements in neonatal care. Identifying the risk factors, such as low birth weight and oxygen therapy, is crucial for early detection and intervention to prevent long-term visual impairment.

Aim: his study aims to explore the incidence and risk factors ROP in preterm infants admitted to the Neonatal Intensive Care Unit [NICU] of Al-Azhar University Hospital, Damietta.

Patients and Methods: This Cross-sectional study included 100 babies selected from those admitted in neonatal care unit in Al-Azhar University hospital in Damietta from September 2023 to September 2024. Complete medical history and clinical examination was done for every baby at the time of recruitment. Complementary screening using indirect ophthalmoscope and wide field fundus imaging using Ret-cam were done for all eligible babies at 31-week post conception age or 3-4 weeks after birth.

Results: The prevalence of ROP was 66 babies [33%]. Thirty babies [45.5%] were stage 1, 32 babies were [48.5%] stage 2, and 4 babies [6%] were stage 3. Binary logistic regression analysis revealed that, Birth weight, Sepsis, anemia, and O2 therapy > 7 days were the only predictors for the development of ROP.

Conclusion: ROP screening in preterm infants is crucial to prevent blindness and long-term visual issues. Efforts should focus on reducing ROP incidence, avoiding risk factors, and enhancing screening guidelines.

Keywords: **Retinopathy of Prematurity; Preterm Infants; Ret-Cam.**

INTRODUCTION

Retinopathy of prematurity [ROP] is a retinal vascular disease affecting premature infants. Although neonatal care has improved, ROP remains a major cause of childhood blindness globally. Its incidence varies by region, depending on neonatal care quality. As infant mortality decreases with better care, ROP rates may rise due to early inadequate care and a shortage of trained ophthalmologists for screening [1].

Retinal vascularization initiates at the optic disc at the 16th week of gestation, extending outward and concluding by the 40th week. Preterm birth disrupts this process, resulting in a peripheral avascular zone that varies in size according on the neonate's maturity. ROP progresses through two stages: phase 1 [vaso-obliteration], characterized by the degeneration of retinal vessels due to hyperoxia, resulting in an avascular region; and phase 2 [vasoproliferation], in which hypoxia induces aberrant artery proliferation into the vitreous, driven by the secretion of growth factors [3].

The primary risk factors for the onset of ROP include gestational age [GA], birth weight [BW], oxygen therapy, infection, multiple births, and cesarean delivery [4]. In ROP examination, the retina is divided into three zones: Zone I, the most posterior region, is a circle with a radius twice the distance from the optic disc to the fovea. Zone II is a ring-shaped area extending from the outer limit of Zone I to the nasal ora-serrata, and similarly in other directions. Zone III is the remaining crescent of peripheral retina beyond Zone II [5].

ROP progresses through several stages: Stage 1 features a flat, white demarcation line that separates the vascularized posterior retina from the avascular anterior retina. In Stage 2, this line becomes more prominent and forms a ridge that rises above the retinal surface. Stage 3 involves the development of extraretinal fibrovascular tissue in 1–12 clock hours along with the ridge. In Stage 4, contraction of this tissue leads to partial retinal detachment, with Stage 4a not affecting the macula and Stage 4b involving it. Stage 5 marks complete retinal detachment, typically due to traction from the cicatricial process [6]. Plus disease is marked by significant retinal venous dilation, tortuous arterioles, iris vascular congestion, poor pupillary dilation, and vitreous haze. Aggressive posterior ROP is identified by extensive posterior vascularization, severe plus disease, and rapid progression [7]. The approach to treating ROP has evolved over time. Initially, cryotherapy was the standard treatment, but it was later replaced by laser therapy due to better anatomical and functional outcomes. More recently, intravitreal anti-vascular endothelial growth factor [VEGF] injections have become an important addition to the treatment options for ROP [8]. The prevention of ROP necessitates a multidisciplinary strategy initiated in early childhood and sustained throughout development [9].

The current study aimed to find out where we stand in terms of incidence, severity and the risk factors association of ROP in a tertiary referral intensive care unit [ICU] and to describe the obstacles faced during implementing the ROP screening protocol for the first time in Damietta governorate. This will help us preventing serious visual outcomes that may be encountered by those infants

PATIENTS AND METHODS

This Cross-sectional study included 100 babies selected from those admitted in neonatal care unit in Al-Azhar University hospital in Damietta from September 2023 to September 2024. We guided the Helsinki declaration principals. The Local Ethics Committee authorized the study protocol, and informed consent was acquired from the parents. The inclusion criteria comprised: birth weight below 1700 grams, gestational age less than 35 weeks, oxygen exposure exceeding 7 days, or high-risk newborns with illnesses such as sepsis or respiratory distress. Exclusion criteria included newborns who were lost before to adequate ocular examinations or those with congenital defects, chromosomal abnormalities, or metabolic diseases.

Data collection: All eligible infants underwent complementary screening with indirect ophthalmoscopy and wide-field Ret-cam imaging at 31 weeks post-conception or 3-4 weeks after birth, whichever was earlier. Data were collected via a semi-structured questionnaire covering: 1] perinatal history, including risk factors like prematurity, sepsis, and perinatal asphyxia, and 2] present history, noting symptoms such as respiratory distress, sepsis, phototherapy, congenital heart disease, and blood transfusion. Clinical exams included birth weight, length, skull circumference, gestational age [using the Ballard score], vital signs, and neurological, respiratory, and circulatory evaluations. All infants were regularly examined by the same ophthalmologist at 1-2 week intervals starting from the 4th postnatal week.

Fundus examination: Tropicamide 0.5% eye drops were used to dilate the pupils. Two to three drops, administered five minutes apart, achieved dilation within 15-20 minutes, lasting 30-45 minutes. Sterile cotton or tissue was used to wipe off any excess drops from the infant's cheeks to prevent absorption through the skin, which could increase heart rate. The examination was performed using a Keeler indirect ophthalmoscope, 20D and 28D condensing lenses, an infant speculum, and scleral indenters.

Ret-cam Examination: Digital images were obtained using the Ret-Cam Digital Retinal Camera with a 130° ROP lens, shortly before the indirect assessment. The goal of the Ret-Cam examination was to capture clear images of the posterior pole and all four quadrants. Imaging each eye typically took less than 1 minute, with a maximum of 2 minutes. The Ret-Cam exams were performed by either a study ophthalmologist or a skilled technician. A series of 1 to 10 images were captured and stored on the Ret-Cam device's hard drive.

Statistical analysis: Statistical analysis was conducted using SPSS software, version 26 [IBM, Chicago, Illinois, USA]. Data normality was assessed using the Kolmogorov-Smirnov test. Qualitative data were expressed as frequencies and percentages, with comparisons made using the Chi-square or Fisher's exact test. Quantitative data were presented as means and standard deviations, with comparisons made using the independent t-test. A p-value of <0.05 was considered statistically significant.

ESULTS

A total number of 100 babies were included in our study. The mean gestational age was 30.5 ± 2.2 weeks, with a range of 26 – 35 weeks. According to their gender, 54 babies [54%] were males, and 46 babies [46%] were females. The mean birth weight was 1410.5 ± 218.5 [gm] with a range of 880 – 1920 [gm] **[Table 1].** The prevalence of ROP was 66 babies [33%]. Thirty babies [45.5%] were stage 1, 32 babies were [48.5%] stage 2, and 4 babies [6%] were stage 3 **[Table 2].** The demographic data of the studied babies, revealed that, the mean gestational was significantly lower in ROP patients more than that of Non ROP [P=0.01]. However, the two groups were relatively similar in terms of their gender [P =0.12] **[Table 3].** In All studied babies the Caesarean section delivery was the commonest with no statistically significant difference between the ROP or Non ROP babies [P=0.7]. The mean birth weight was significantly lower in ROP patients more than Non ROP [1319.5 vs 1455.25 respectively] [P=0.003] **[Table 4].**

According to Neonatal risk factors for the development of retinopathy of prematurity, Sepsis, anemia, blood transfusion, and O2

therapy > 7 days were significantly higher in ROP babies than non ROP [P< 0.05 for all] **[Table 5].**

According to the maternal risk factors for the development of ROP, we found no statistically significant difference between the ROP and non ROP in terms of presence of DM, HTN, PROM, and Antepartum Hemorrhage [P> 0.05 for all] **[Table 6].** Binary logistic regression analysis revealed that, Birth weight, Sepsis, anemia, and O2 therapy > 7 days were the only predictors for the development of ROP. Increase birth weight, decrease the possibility of ROP occurrence [OR=1, 95% CI [1.002 – 1.012], p =0.002]. Anemic babies are at a risk of ROP 14 times more than those without anemia [OR=14.8, 95% CI [2.5 – 101.5], p =0.006]. Also, babies with sepsis are at a risk of ROP 14.6 times than those without sepsis [OR=14.6, 95% CI [2.5 – 79.5], p =0.002]. Babies who didn't receive O2 therapy are at a risk of ROP 21 times less than those who received [OR=21.5, 95% CI [0.2 – 30], p =0.1], and Those who received O2 < 7 days are at risk of ROP 13.8 less than who received O2> 7 days [OR=13.8, 95% CI [1.9 – 0.96], p =0.008] **[Table 7].**

Table [1]: Demographic data of the studied neonates.

Variables		Mean ± SD or N [%] [N=100]
Gestational Age	**Mean ± SD**	30.5 ± 2.2
	Min. – Max.	26 – 35
Gender	**Male**	54 [54%]
	Female	46 [46%]
Mode of delivery	**Normal**	40 [40%]
	Caesarean section	60 [60%]
Birth weight [gm]	**Mean ± SD**	1410.5 ± 218.5
	Min. – Max.	880 – 1920

Table [2]: Prevalence and stages of retinopathy of prematurity.

Variables	N [%]
Prevalence of ROP [N = 200 Eyes]	
Normal	134 [67%]
ROP	66 [33%]
Stages of ROP [N = 66 Eyes]	
Stage 1	30 [45.5%]
Stage 2	32 [48.5%]
Stage 3	4 [6%]

Table [3]: Demographic risk factors for the development of retinopathy of prematurity

Variables	Group 1 [ROP] [N=33]	GROUP 2 [Non ROP] [N=67]	P value
Gestational Age [weeks]			
Mean ± SD	30.5 ± 2	31.1 ± 2.1	0.01 [a] *
Min. - Max	26 – 34	26 – 35	
Gender			
Male	14 [42.4%]	40 [59.7%]	0.12 [b]
Female	19 [57.6%]	27 [40.3%]	

a: independent t test. b: Chi-square test. *: Significant P value

Table [4]: Mode of delivery and Birth weight of the studied neonates as a risk factor for the development of retinopathy of prematurity

Variables	Group 1 [ROP] [N=33]	GROUP 2 [Non ROP] [N=67]	P value
Mode of delivery			
Normal	14 [42.4%]	26 [38.8%]	0.7 [a]
Caesarean section	19 [57.6%]	41 [61.2%]	
Birth weight [gm]			
Mean ± SD	1319.5 ± 162.5	1455.25 ± 231.2	0.003 [b]*
Min. – Max.	880 – 1580	900 – 1920	

a: Chi-square test. b: Independent t test. *: Significant P value

Table [5]: Neonatal risk factors for the development of retinopathy of prematurity.

Variables	Total [N=100]	Group 1 [ROP] [N=33]	Group 2 [Non ROP] [N=67]	P value [a]
Sepsis	31 [31%]	23 [69.7%]	8 [12%]	0.001*
Anemia [HB<10 g%]	58 [58%]	31[94%]	27 [40.3%]	0.001*
Blood transfusion	58 [58%]	25 [75.8%]	33 [49.3%]	0.01*
RDS	75 [75%]	26 [78.8%]	49 [73.1%]	0.53
Intraventricular hemorrhage	31 [31%]	10 [30.3%]	21 [31.3%]	0.91
Necrotizing enterocolitis	11 [11%]	5 [15.2%]	6 [9%]	0.35
Apnea	59 [59%]	22 [66.7%]	37 [55.2%]	0.27
Bronchopulmonary dysplasia	4 [4%]	3 [9.1%]	1 [1.5%]	0.06
Oxygen therapy	72 [72%]	32 [97%]	40 [59.7%]	0.001*
Oxygen therapy duration				
< 7 days	19 [19%]	3 [9.1%]	16 [23.9%]	0.001*
>7 days	53 [53%]	29 [87.9%]	24 [35.8%]	
Multiple pregnancy				
Single	79 [79%]	23 [69.7%]	56 [83.6%]	0.19
Multiple	21 [21%]	10 [30.3%]	11 [16.4%]	

a: Chi-square test

Table [6]: Maternal risk factors for the development of retinopathy of prematurity.

Variables	Total [N=100]	Group 1 [ROP] [N=33]	Group 2 [Non ROP] [N=67]	P value [a]
DM	11 [11%]	3 [9.1%]	8 [11.9%]	0.65
HTN	59 [59%]	18 [54.5%]	41 [61.2%]	0.52
PROM	62 [62%]	21 [63.6%]	41 [61.2%]	0.81
Antepartum Hemorrhage	27 [27%]	9 [27.3%]	18 [26.9%]	0.96

a: Chi-square test

Table [7]: Binary logistic regression analysis for risk factors related to retinopathy of prematurity

Risk factors	Odds ratio	95% confidence Interval	P value
Gestational Age [weeks]	0.7	0.5 – 1.1	0.27
Birth weight [gm]	1	1.002 – 1.012	0.009*
Sepsis	14.6	2.5 – 79.5	0.002*
Anemia	14.8	2.5 – 101.5	0.006*
Blood transfusion	4.27	0.8 – 21.5	0.08
Oxygen therapy duration			
No oxygen therapy	21.5	0.2 – 30	0.1
< 7 days	13.8	1.9 – 0.96	0.008*

DISCUSSION

Identifying risk factors influencing ROP progression and understanding its etiology can aid ophthalmologists and neonatologists in improving screening, diagnosis, and prevention. This study aimed to estimate ROP incidence and assess its association with potential risk factors.

Incidence of ROP in Egypt:

Few studies show ROP's healthcare impact in Africa and the Middle East, especially Egypt. Our ROP incidence was 33%, similar to Gaber et al. [10], who examined risk variables in Egypt's largest NICU. The study comprised 240 neonates with a gestational age [GA] ≤34 weeks, birth weight [BW] ≤2000g, or unstable circumstances. ROP was 34.1% in their study. Another Egyptian study by Abdel examined this topic.

Abdel-Aziz *et al.* [11] investigated the incidence of ROP and its risk factors in preterm neonates at a neonatal ICU in a tertiary care hospital in Egypt. They included all preterm infants with a gestational age under 37 weeks and low birth weight under 2 kg. Their findings showed a 30.6% ROP incidence, which aligns with our results.

Hadi and Hamdy [12] indicated that 52 of the 152 screened newborns [34.4%] acquired retinopathy of prematurity [ROP] in a research done across three private hospitals in Alexandria, Egypt, from January 2010 to January 2012. **Bedda *et al.*** [13] also reported that 73 of 223 preterm newborns [33.74%] exhibited ROP in a research conducted at El-Shatby University Hospital, Alexandria University, from June 2012 to November 2013.

Nassar *et al.* [14] reported an incidence of ROP of 36.5% among 52 screened premature infants admitted to the NICU at Maternity and

Pediatrics University Hospital, Al-Minia, Egypt between January 2010 and March 2011.

In disagreement with our results, **Bassiouny *et al.*** reported, out of the 402 screened preterm babies, 237 [59%] cases having ROP in a study conducted at Mansoura City from March 2013 to March 2015.

In a prospective cohort research, **Elnahry *et al.*** [15] screened 300 preterm newborns from three Egyptian governorates [Gharbia, Kafr El-Shiekh, and Al-Buhaira] for ROP and risk factors. The study examined the demographics, epidemiology, and causes of ROP in at-risk newborns. ROP was 80% in their study.

Incidence of ROP in the Developing Arab countries.

Our results were also coinciding with the results of studies which published in the Neighboring Arab countries such as **Bassiouny *et al.*** [16] who reported an incidence of 34% for ROP in Oman, and **Maheshwari et al.** [17] who reported also reported an incidence of 27% in India, which relatively similar to our study percentage.

Binkhathlan *et al.* [18] reported an incidence of 56% for ROP in Saudi Arabia. **Amro *et al.*** [19] reported an incidence of 37.4% in the neo natal intensive care unit at King Khalid University Hospital in Riyadh in 2003. Another studies reported an incidence of [45.0%] in Iran [20], [19.28%] in India [21], and [18.2%] Brazil [22].

Incidence of ROP in the Developed countries

The international studies reported incidence of ROP in preterm babies ranging from 10 to 45.5%. The incidence was 36.1% in Germany [23], 36.4% in Sweden [24], 32.1% in Turkey [25], and 29.2% in Singapore [26].

Explanation of the difference in ROP incidence

In summary the incidence of ROP had been varied in different studies from 12.4 to 71%. These variations among different studies might be because of different GA, BW, survival rate of neonates, and level of perinatal care. It also varied among different races, geographical areas, and countries. In addition, late starting of retinal screening in developing countries may have missed the diagnosis of ROP [27].

Socioeconomic status and differences in resources might influence care protocols and the ability to screen patients, which in turn influence outcomes and reported incidences [28].

According to the stages of ROP, in our sample 30 patients [45.5%] were stage 1, 32 patients [48.5%] were stage 2, and only 4 cases [6%] were stage 3. The high percentage of stages 1 and 2 and the absence of stages 4 and 5 indicate that more cases of earlier ROP stags were documented by early screening.

Consistent with our findings, **Abdel-Aziz *et al.*** [11], indicated that 40.9% of newborns exhibited stage 1, 53% stage 2, and 6.1% stage 3 ROP, with no instances of stage 4 or 5.

Bassiouny *et al.* [29] identified a 42.6% prevalence of stage 1 and a 45.1% prevalence of stage 2 ROP, whereas **Babaei *et al.*** [30] documented a 45.5% incidence for both stages 1 and 2. Conversely, **Bas *et al.*** [31] documented reduced rates, with 25.9% for stage 1 and 11.06% for stage 2 in newborns with extremely low birth weight.

Elnahry *et al.* [15] found that 39 cases [16.25%] showed stage 0 ROP, 144 [60.1%] stage 1 ROP, 37 [15.3%] stage 2 ROP, and 14 [5.8%] stage 3 ROP. Stage 5 ROP was found in one patient [0.4%]. **Rasoulinejad *et al.*** [20], found that of 306 babies, 52 [16.99%] were in stage I of ROP, 193 [63.07%] were in stage II and 61 [19.93%] were in stage III or III.

Several risk factors were identified as predisposing to the develop of ROP. In our study the incidence of ROP increased statistically as GA decreased, which is in agreement with other studies [10,32–35]. This is explained by that, in the preterm babies, immaturity of the retinal blood vessels increases the retinal susceptibility to oxidative stress destruction and to perinatal factors such as hyperoxia and hypoxia, sepsis, and transfusions of blood.

In our study the incidence of ROP increased statistically as Birth weight decreased. This agrees with multiple studies [10,11,16,29,33–35]. However, in other studies no significant differences were found between infants born with low birth weight and those with a BW appropriate for their gestational age and the risk of developing ROP [36–39]. A possible explanation for these inconsistent results may be differences in the characteristics of the study populations and study designs.

The results of this study revealed a significant relation between sepsis and ROP. This finding may be attributed to the endotoxin effects on retinal blood vessels which lead to inflammation and leakage that lead to endotoxin-induced retinitis with enhanced active leukocyte adhesion to vascular endothelium [40].

This finding was in accordance with other studies [41–44]. Oxygen exposure is a primary and significant risk factor for the development of ROP. The rationale for the onset of ROP following oxygen exposure is that, in utero, the partial pressure of oxygen [PO_2] in the umbilical vein is below 50 mmHg. Consequently, retinal vasculature forms in a regulated, comparatively hypoxic milieu. Post-delivery, arterial PO_2 increases; newborns using supplemental oxygen may encounter elevated and more variable oxygen levels [45].

O_2 exposure fluctuations cause hypoxia [2–3 episodes] and hyperoxia [>3 episodes], which are linked to ROP [40]. Hyperoxia stops angiogenesis in the partly vascularized retina after birth. Late vascularization compared to neuronal development keeps the retina hypoxic, causing pathogenic neovascularization [46].

In our study, we found a statistically significant association between the oxygen exposure for long period [> 7 days] and the incidence of ROP. This is in agreement with multiple studies [10,15,29,33–35,40]. However, **Palmer *et al.*** [47] found that O_2 treatment was an insignificant risk factor for ROP.

While our study's small sample size is a limitation, it has key strengths that enhance its clinical relevance. These include a single trained examiner assessing the disease and the availability of intensive care resources at a tertiary hospital serving a large metropolitan population. Additionally, thorough statistical analysis was conducted to minimize bias. Various imaging tools were also used to assess premature neonates.

Conclusion: ROP screening in preterm infants is crucial to prevent blindness and long-term visual issues. Efforts should focus on reducing ROP incidence, avoiding risk factors, and enhancing screening guidelines. The study highlights gestational age, low birth weight, sepsis, and prolonged oxygen therapy as key risk factors. Timely screening, early diagnosis, and treatment are essential to prevent progression to blindness.

Financial and non-financial activities and relationships of interest: None

REFERENCES

1. Kim SJ, Port AD, Swan R, Campbell JP, Chan RVP, Chiang MF. Retinopathy of prematurity: a review of risk factors and their clinical significance. Surv Ophthalmol. 2018 Sep;63[5]:618–37.
2. Fielder A, Blencowe H, O'Connor A, Gilbert C. Impact of retinopathy of prematurity on ocular structures and visual functions. Arch Dis Child Fetal Neonatal Ed. 2015 Mar;100[2]:F179–84.
3. Wu PY, Fu YK, Lien RI, Chiang MC, Lee CC, Chen HC, et al. Systemic Cytokines in Retinopathy of Prematurity. J Pers Med. 2023 Feb 5;13[2]:291.
4. Bassiouny RaniaMR, Ellakkany R, Aboelkhair S, Mohsen T, Othman I. Incidence and risk factors of retinopathy of prematurity in neonatal intensive care units: Mansoura, Egypt. Journal of the Egyptian Ophthalmological Society. 2017;110[3]:71.
5. Chiang MF, Quinn GE, Fielder AR, Ostmo SR, Paul Chan RV, Berrocal A, et al. International Classification of Retinopathy of Prematurity, Third Edition. Ophthalmology. 2021 Oct;128[10]: e51–68.
6. Sen P, Jain S, Bhende P. Stage 5 retinopathy of prematurity: An update. Taiwan J Ophthalmol. 2018;8[4]:205.
7. Noor MS, Elbarbary M, Embabi SN, Zaki MA, Awad H, Al-Feky M. Screening and Risk Factors for Retinopathy of Prematurity in a Tertiary Care Hospital in Cairo, Egypt. Clinical Ophthalmology. 2022 Oct;Volume 16:3257–67.
8. Gupta MP, Chan RVP, Anzures R, Ostmo S, Jonas K, Chiang MF. Practice Patterns in Retinopathy of Prematurity Treatment for Disease Milder Than Recommended by Guidelines. Am J Ophthalmol. 2016 Mar; 163:1–10.
9. Brown AC, Nwanyanwu K. Retinopathy of Prematurity. StatPearls. 2024.
10. Gaber R, Sorour OA, Sharaf AF, Saad HA. Incidence and Risk Factors for Retinopathy of Prematurity [ROP] in Biggest Neonatal Intensive Care Unit in Itay Elbaroud City, Behera Province, Egypt. Clinical Ophthalmology. 2021 Aug;Volume 15:3467–71.
11. Abdel-Aziz SM, Hamed EA, Abdel-Radi M, Shalaby AM. Incidence and risk factors of retinopathy of prematurity in a tertiary neonatal intensive care unit. Delta Journal of Ophthalmology. 2021 Jan;22[1]:56–62.
12. Abdel Hadi AM, ShereenHamdy. Correlation between risk factors during the neonatal period and appearance of retinopathy of prematurity in preterm infants in neonatal intensive care units in Alexandria, Egypt. Clinical Ophthalmology. 2013 May;831.
13. Bedda A, Abd El-Monem Al-Shakankiry N, Abd-Elhady A, Hamdy Ahmad I. Evaluation of the treatment of retinopathy of prematurity in preterm infants in Alexandria University Hospital. Journal of the Egyptian Ophthalmological Society. 2014;107[2]:70.
14. Mahmoud M. Nassar. Screening for retinopathy of prematurity: a report from upper Egypt. Int J Ophthalmol. 2016 Feb 18;
15. GEHAD ELNAHRY, M.D.** MAAHMSc*;, DINA MS EL FAYOUMI, M.D.** GGMD**;, A. NOSSAIR, M.D.** A. Screening for Retinopathy of Prematurity in a Sample of Preterm Infants from Three Egyptian Governorates. Med J Cairo Univ. 2022;90[12]:2203–11.
16. Bassiouny M. Risk factors associated with retinopathy of prematurity: a study from Oman. J Trop Pediatr. 1996 Dec 1;42[6]:355–8.
17. Maheshwari R, Kumar H, Paul VK, Singh M, Deorari AK, Tiwari HK. Incidence and risk factors of retinopathy of prematurity in a tertiary care newborn unit in New Delhi. Natl Med J India. 1996;9[5]:211–4.
18. Binkhathlan AA, Almahmoud LA, Saleh MJ, Srungeri S. Retinopathy of prematurity in Saudi Arabia: incidence, risk factors, and the applicability of current screening criteria. British Journal of Ophthalmology. 2008 Feb 1;92[2]:167–9.
19. Al-Amro SA, Al-Kharfi TM, Thabit AA, Al-Mofada SM. Retinopathy of prematurity at a University Hospital in Riyadh, Saudi Arabia. Saudi Med J. 2003 Jul;24[7]:720–4.
20. Rasoulinejad SA, Montazeri M. Retinopathy of Prematurity in Neonates and its Risk Factors: A Seven Year Study in Northern Iran. Open Ophthalmol J. 2016 Feb 29;10[1]:17–21.
21. Vasavada D, Sengupta S, Prajapati VK, Patel S. Incidence and risk factors of retinopathy of prematurity in Western India – Report from A Regional Institute of Ophthalmology. Nepalese Journal of Ophthalmology. 2018 Feb 21;9[2]:112–20.
22. Fortes Filho JB, Eckert GU, Procianoy L, Barros CK, Procianoy RS. Incidence and risk factors for retinopathy of prematurity in very low and in extremely low birth weight infants in a unit-based approach in southern Brazil. Eye. 2009 Jan 6;23[1]:25–30.
23. Seiberth V, Linderkamp O. Risk Factors in Retinopathy of Prematurity. Ophthalmologica. 2000;214[2]:131–5.
24. Larsson E. Incidence of ROP in two consecutive Swedish population based studies. British Journal of Ophthalmology. 2002 Oct 1;86[10]:1122–6.
25. Alpay A, Uğurbaş SH. Incidence and risk factors for retinopathy of prematurity in the West Black Sea region, Turkey. Turk J Pediatr. 2012;54[2]:113–8.
26. Shah VA, Yeo CL, Ling YLF, Ho LY. Incidence, risk factors of retinopathy of prematurity among very low birth weight infants in Singapore. Ann Acad Med Singap. 2005 Mar;34[2]:169–78.
27. Pi LH. Incidence of Retinopathy of Prematurity in Southwestern China and Analysis of Risk Factors. Medical Science Monitor. 2014;20:1442–51.
28. Roohipoor R, Karkhaneh R, Farahani A, Ebrahimiadib N, Modjtahedi B, Fotouhi A, et al. Retinopathy of prematurity screening criteria in Iran: new screening guidelines. Arch Dis Child Fetal Neonatal Ed. 2016 Jul;101[4]:F288-93.
29. Bassiouny RaniaMR, Ellakkany R, Aboelkhair S, Mohsen T, Othman I. Incidence and risk factors of retinopathy of prematurity in neonatal intensive care units: Mansoura, Egypt. Journal of the Egyptian Ophthalmological Society. 2017;110[3]:71.
30. Babaei H, Ansari MR, Alipour AA, Ahmadipour S, Safari-Faramani R, Vakili J. Incidence and risk factors for retinopathy of prematurity in very low birth weight infants in Kermanshah, Iran. World Appl Sci J. 2012;18[5]:600–4.
31. Bas AY. The Incidence and Risk Factors of Severe Retinopathy of Prematurity in Extremely Low Birth Weight Infants in Turkey. Medical Science Monitor. 2014; 20:1647–53.
32. Sharma M, Dogra MR, Katoch D, Sharma M, Dutta S, Sharma M. Incidence and risk factors of retinopathy of prematurity in extremely low birth weight babies in a tertiary neonatal care unit in northern India. Indian Journal of Clinical and Experimental Ophthalmology. 2021;7[4]:614–8.
33. Gaber R, Sorour OA, Sharaf AF, Saad HA. Incidence and risk factors for retinopathy of prematurity [Rop] in biggest neonatal intensive care unit in itay elbaroud city, behera province, egypt. Clinical Ophthalmology. 2021; 15:3467–71.

34. Yucel OE, Eraydin B, Niyaz L, Terzi O. Incidence and risk factors for retinopathy of prematurity in premature, extremely low birth weight and extremely low gestational age infants. BMC Ophthalmol. 2022;22[1]:1–8.

35. Freitas AM, Mörschbächer R, Thorell MR, Rhoden EL. Incidence and risk factors for retinopathy of prematurity: a retrospective cohort study. Int J Retina Vitreous. 2018 Dec 31;4[1]:20.

36. Incidence of and risk factors for neonatal morbidity after active perinatal care: extremely preterm infants study in Sweden [EXPRESS]. Acta Paediatr. 2010 Jul;99[7]:978–92.

37. Allegaert K. Threshold retinopathy at threshold of viability: the EpiBel study. British Journal of Ophthalmology. 2004 Feb 1;88[2]:239–42.

38. Woo SJ, Park KH, Ahn J, Oh KJ, Lee SY, Jeong EH, et al. A co-twin study of the relative effect of birth weight and gestational age on retinopathy of prematurity. Eye. 2011 Nov 26;25[11]:1478–83.

39. Filho JBF, Valiatti FB, Eckert GU, Costa MC da, Silveira RC, Procianoy RS. Is being small for gestational age a risk factor for retinopathy of prematurity? A study with 345 very low birth weight preterm infants. J Pediatr [Rio J]. 2009 Feb 5;85[1]:48–54.

40. Singh P, Surana A, Shah A. Retinopathy of prematurity in neonatal care unit. Int J Contemp Pediatrics. 2016;234–9.

41. Khorshidifar M. Incidence and risk factors of retinopathy of prematurity and utility of the national screening criteria in a tertiary center in Iran. Int J Ophthalmol. 2019 Aug 18;12[8]:1330–6.

42. Hakeem AbdelHAA, Mohamed G, Othman M. Retinopathy of prematurity: A study of prevalence and risk factors. Middle East Afr J Ophthalmol. 2012;19[3]:289.

43. Kossambe S, Joglekar S, D'lima A, Silveira MP. Incidence and risk factors of retinopathy of prematurity in Goa, India: a report from tertiary care centre. Int J Contemp Pediatrics. 2019 Apr 30;6[3]:1228.

44. Bas AY. The Incidence and Risk Factors of Severe Retinopathy of Prematurity in Extremely Low Birth Weight Infants in Turkey. Medical Science Monitor. 2014; 20:1647–53.

45. Woods J, Biswas S. Retinopathy of prematurity: from oxygen management to molecular manipulation. Mol Cell Pediatr. 2023 Sep 15;10[1]:12.

46. Chan-Ling T, Gole GA, Quinn GE, Adamson SJ, Darlow BA. Pathophysiology, screening and treatment of ROP: A multi-disciplinary perspective. Prog Retin Eye Res. 2018 Jan;62:77–119.

47. Earl A Palmer 1, Robert J Hardy, Velma Dobson, Dale L Phelps, Graham E Quinn, C Gail Summers, Carol P Krom BTC for R of PCG. 15-Year Outcomes Following Threshold Retinopathy of Prematurity. Archives of Ophthalmology. 2005 Mar 1;123[3]:311.

IJMA

International Journal of Medical Arts

Volume 7, Issue 4 (April 2025)

http://ijma.journals.ekb.eg/

P-ISSN: 2636-4174

E-ISSN: 2682-3780