

# Epidemiology, Clinical Characteristics, and Risk Factors of Retinopathy of Prematurity at the Albert Royer University Hospital of Dakar: A Prospective Study

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## Abstract

**Introduction:** Retinopathy of prematurity (ROP) is a serious vasoproliferative disorder and one of the leading causes of preventable blindness in children. Often underestimated due to the lack of systematic screening, it can lead to severe visual impairment. **Objective:** To describe the epidemiological and clinical characteristics and risk factors associated with ROP in the neonatology department of the Albert Royer National Children's Hospital (CHNEAR). **Patients and Methods:** This was a prospective, descriptive, and analytical study conducted over 16 months (March 1, 2024 - July 31, 2025). It included premature infants (<34 weeks gestational age or <1500 g and/or oxygen-dependent) who underwent fundus examination with confirmation of ROP, regardless of the stage. **Results:** Of 756 neonatal admissions, 126 newborns were premature and eligible for screening. Among them, 72 underwent a fundus examination: 22 (a prevalence of 30.6% among the preterm infants screened) and 50 (69.4%) had a normal fundus. The mean gestational age was 27.8 weeks, and the birth weight was predominantly less than 1500 g. Recurrent ocular edema (ROE) was bilateral in 59.1% of cases, predominantly in zone 1 (45%) and stage 1 (31.8%). Management consisted of simple observation (50%), medication (9.1%), or surgery (31.8%). Associated risk factors were gestational age < 32 weeks, birth weight < 1500 g, and prolonged oxygen therapy, particularly with Optiflow. **Conclusion:** The high frequency of retinopathy of prematurity (ROP) observed at CHNEAR underscores the need for early and systematic screen-

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ing, as well as standardized oxygen therapy protocols, to improve the visual prognosis of premature infants.

## Keywords

Retinopathy of Prematurity, Screening, Prematurity, Oxygen Therapy, Senegal

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## 1. Introduction

Retinopathy of prematurity (ROP) is a multifactorial retinal disorder characterized by proliferative vasculopathy resulting from abnormal blood vessel development on the immature retina [1]-[3]. Pathophysiologically, it progresses from an initial phase of retinal ischemia to a neovascular proliferative phase stimulated by vascular endothelial growth factor (VEGF). It is a major cause of preventable childhood blindness worldwide [4] [5]. The main identified risk factors are prematurity, very low birth weight, and prolonged or uncontrolled exposure to oxygen. Diagnosis relies on systematic screening by indirect ophthalmoscopy or wide-field retinal photography [6] [7]. Therapeutic advances, particularly laser treatment and intravitreal injections of anti-VEGF, have improved the visual prognosis, although advanced forms still require major surgery with a guarded prognosis.

In Senegal, little data is available on this condition. The objective of this study is to investigate the epidemiological, clinical, and prognostic profile of retinopathy of prematurity (ROP) at the Albert Royer National Children's Hospital (CHNEAR).

## 2. Patients and Methods

**Study Type and Setting** This was a prospective, descriptive, and analytical study conducted over a 16-month period, from March 1, 2024, to July 31, 2025, in the Neonatology Department of CHNEAR.

**Study Population** The study included preterm newborns with a gestational age < 34 weeks, a birth weight < 1500 g, and/or who received prolonged oxygen therapy. Patients with multiple malformations were excluded. Of the 126 eligible preterm infants admitted during the study period, 72 underwent a complete fundus examination and constitute our final sample.

**Procedure and Data Collection:** Screening was performed after maximum pupillary dilation, starting from the 4th week of life, by an experienced ophthalmologist using indirect ophthalmoscopy (Schepens helmet) and a 20-diopter lens. Informed parental consent was obtained. The variables studied included sociodemographic, maternal, and perinatal data, oxygen therapy modalities (duration, type,  $FiO_2$ ), and the stage of retinopathy of prematurity (ROP) according to the International Classification of Retinopathy of Prematurity (ICROP).

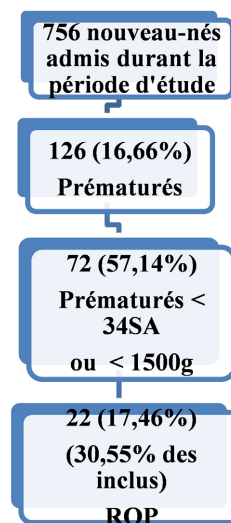
**Statistical Analysis:** Data were analyzed using R software. Qualitative variables

were described as counts and percentages, and quantitative variables as means and standard deviations. Univariate analysis was used to identify factors associated with the occurrence of ROP using Pearson's chi-squared test. The significance level was set at  $p < 0.05$ .

### 3. Results

#### 3.1. Epidemiological Data

During the study period, 756 newborns were admitted to the unit, of whom 126 (16.7%) were premature. Among them, 72 met the screening criteria and underwent a fundus examination. Twenty-two infants presented with retinal vein obstruction (RVO), representing a prevalence of 30.6% among the premature infants screened, while 50 infants had a normal fundus examination (**Figure 1**).



**Figure 1.** Flowchart of cases of retinopathy of prematurity (ROP).

The mean gestational age of ROP cases was  $27.8 \pm 1.9$  weeks, with a female predominance (sex ratio 0.69). Socioeconomic status was considered low in 45.5% of families.

#### 3.2. Maternal and Perinatal Factors

The mean maternal age was 24.5 years. A history of neonatal death (9%) and prematurity (5%) was frequent. Regarding newborns, 63.6% had a birth weight < 1000 g and 36.4% between 1000 and 1499 g. Morbidity was dominated by neonatal infection (77.3%) and respiratory distress syndrome (72.7%).

#### 3.3. Oxygen Therapy

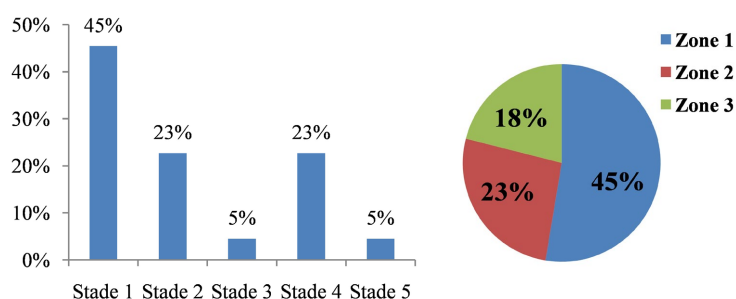
Non-invasive respiratory support using Optiflow was predominant (82%), with an average duration of use of 24.9 days (range: 5 - 72 days), compared to an average of 6 days for nasal cannulas (**Table 1**).

**Table 1.** Distribution according to the duration of oxygenation.

Statistic	Duration O <sub>2</sub> of via nasal cannula (days)	Duration optiflow (days)
Mean	6	24.9
Median	5	13
Standard deviation	4.58	22.84
Minimum	2	5
Maximum	11	72

### 3.4. Clinical Characteristics of ROP

The condition was bilateral in 13 patients (59.1%). The distribution according to the international classification showed a predominance of Stage 1 (31.8%) and Stage 4 (22.7%). Stage 5 was observed in 4.5% of cases. Regarding the affected areas: Zone 1 was the most frequently affected (45%), followed by Zone 2 (23%). Cataract-type complications were noted in 2 patients (9.1%) (Figure 2).

**Figure 2.** Distribution according to the stage of development and the affected area.

**Management:** The therapeutic strategy was distributed as follows: simple monitoring (abstention): 50% (n = 11), drug treatment (injection of Anti-VEGF/Bevacizumab): 9.1% (n = 2) and Surgery (Phaco-excision/Vitrectomy): 31.8% (n = 7) (Table 2).

**Table 2.** Distribution according to the type of PEC.

Type of management	Detailed treatment	Number	Percentage
<b>Observation</b>	Simple follow-up	11	50%
<b>Medical treatment</b>	Avastin/Bevacizumab	2	9.1%
<b>Surgical treatment</b>	Phacoextraction + vitrectomy	5	22.7%
	Vitrectomy + laser	2	9.1%
<b>Management not specified</b>	–	2	9.1%
<b>Total</b>	–	22	100%

**Risk factors:** Statistical analysis revealed a significant association between the occurrence of ROP and three main factors: gestational age < 32 weeks, birth weight < 1500 g and prolonged oxygen therapy with Optiflow with high FiO<sub>2</sub>. Nasal can-

nula oxygen therapy was not statistically linked to the disease (**Table 3**).

**Table 3.** Factors associated with the occurrence of retinopathy of prematurity.

Variables	Modalities	ROP no	ROP yes	p-value
Sex	F	26	13	0.38
	M	24	9	
Gestational age	<28 weeks	5	11	<0.0001
	28 - 31 weeks 6 days	24	10	
	32 - 34 weeks	21	1	
Birth weight (g)	<1000	9	14	<0.0001
	1000 - 1499	16	8	
	1500 - 2000	25	0	
IUGR	No	36	16	0.59
	Yes	14	6	
O <sub>2</sub> glasses	No	35	16	0.53
	Yes	15	6	
O <sub>2</sub> Optiflow	No	18	4	0.11
	Yes	32	18	
Maternal age (years)	Mean ± SD	28.17 ± 6	24.47 ± 3.87	0.03
O <sub>2</sub> duration on nasal cannula (h)	Mean ± SD	169 ± 123	144 ± 109	0.76
Max FiO <sub>2</sub> on nasal cannula (%)	Mean ± SD	40	42.5 ± 5	0.003
Duration optiflow (h)	Mean ± SD	124.4 ± 67.3	597.6 ± 548	0.01

#### 4. Discussion

Our study highlights a ROP prevalence of 30.6% among preterm infants screened at CHNEAR. This rate is comparable to regional data, particularly in Ethiopia (32% - 34%), but significantly higher than that of South Africa (6%) or Switzerland (9.3%). These disparities are explained by the variability in survival rates of very preterm infants and the quality of oxygen monitoring (the “ROP epidemic” in middle-income countries) [8]-[11]. We confirmed the predominant role of extreme prematurity (<32 weeks gestational age) and very low birth weight (<1500 g) as major risk factors, in accordance with international literature. Furthermore, our study underscores the impact of Optiflow oxygen therapy and fluctuations in FiO<sub>2</sub>. The lack of correlation with nasal cannula administration suggests that this method, often reserved for less severe cases, is less likely to cause retinal toxicity or is better controlled [8] [10] [12].

Clinically, although early forms (stages 1 and 2) predominate (68% combined), we observe a worrying proportion of severe forms (stages 4 and 5: 27.2%) and complications (cataracts). This contrasts with recent Ethiopian series reporting few stages 4 or 5 cases but is similar to Thai data describing aggressive forms. An

illustrative case from our series (30 weeks' gestation, 835 g), who developed stage 3 ROP requiring anti-VEGF therapy, illustrates the potential severity and complexity of local management [7] [13].

Management in Senegal is limited by access to the necessary equipment. Unlike developed countries or South Africa, where laser treatment is standard, our practice relies on anti-VEGF therapy or major surgery for late stages. The high rate of surgical procedures (phacoemulsification/vitreotomy) in our series indicates that the diagnosis is often made at a stage of late complications, reinforcing the need for earlier screening.

One limitation of our study lies in the use of B-mode ultrasound for certain late diagnoses (medial opacities), whereas the gold standard remains RetCam or ophthalmoscopy. The lack of wide-field imaging equipment limits the objective documentation of early stages.

## 5. Conclusion

Retinopathy of Prematurity (ROP) is a concerning reality at CHNEAR, affecting nearly one-third of very premature infants screened. The strong association between ROP and uncontrolled oxygen therapy and prematurity necessitates close collaboration between neonatologists and ophthalmologists. Improving visual prognosis will require the acquisition of modern screening equipment (RetCam), staff training in the proper use of oxygen, and the systematic performance of fundus examinations starting in the fourth week of life.

## Conflicts of Interest

The authors declare no conflicts of interest related to this study.

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