



Original article

Incidence and risk factors of retinopathy of prematurity among very-low-birth-weight neonates

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ABSTRACT

Background: Retinopathy of prematurity (ROP) is a serious morbidity in neonates, which could lead to poor visual outcomes. Data from high-income countries suggest a high incidence of this disease among very preterm neonates.

Aims and objectives: The objective of this study was to evaluate incidence and risk factors of ROP in very-low-birth-weight (VLBW) neonates.

Material and methods: VLBW neonates born between January 2015 and July 2018 at Sir Ganga Ram Hospital, New Delhi, were prospectively screened for ROP. The risk factors for ROP were analyzed.

Results: Of 461 VLBW infants born during the study period, 361 survived beyond 4 weeks and were evaluated for ROP. Of these, 43 (11.9%) neonates had ROP (any stage) and 8 (2.2%) required treatment with either laser ablation or intraocular anti-vascular endothelial growth factor (anti-VEGF) injections. On multiple logistic regression analysis, lower gestational age, apnea of prematurity, and red cell transfusion were independent risk factors for retinopathy of prematurity.

Conclusion: We observed a low incidence of ROP requiring treatment in VLBW neonates. Lower gestation, apnea of prematurity, and red cell transfusions were independent risk factors for ROP.

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1. Introduction

Retinopathy of prematurity (ROP) is a common cause of preventable blindness in preterm neonates.^{1,2} The incidence of ROP has been reported to vary from 28 to 68% in neonates younger than 30 weeks of gestation.^{3–5} The common risk factors for ROP are prematurity, need for mechanical ventilation, supplemental oxygen, sepsis, hypotension, anemia, blood transfusions, intraventricular hemorrhage, necrotizing enterocolitis, and poor weight gain.^{6,7}

With advancements in neonatal care and resultant increased survival of very-low-birth-weight (VLBW) infants over the last few decades, the incidence of ROP is increasing.^{8–10} There are few studies from India, reporting burden of ROP among VLBW neonates. The aim of this study was to evaluate the incidence and risk factors of ROP among VLBW neonates at a tertiary care hospital in north India.

2. Methods

This study was conducted in the departments of neonatology and ophthalmology, Sir Ganga Ram Hospital, New Delhi. VLBW neonates born between January 2015 and July 2018 were enrolled. Demographic and clinical details of study subjects were collected prospectively. Eye examinations were performed by a single ophthalmologist as per standard guidelines. The first examination was performed at 4 weeks of postnatal age and then subsequently as needed till 44 weeks of corrected gestational age. Findings of ROP screening were classified as per International Classification of Retinopathy of Prematurity (ICROP) and were recorded on a pre-designed proforma.¹¹ Gestational age was calculated based on best estimates: first trimester ultrasound, last menstrual period, or clinical examination by Ballard scoring. Data for antenatal steroids, gestational hypertension, premature rupture of membranes, apnea of prematurity, need for respiratory support, bronchopulmonary dysplasia, culture-proven sepsis, shock, necrotizing enterocolitis, and blood transfusion were recorded as per standard definitions. The Fenton charts were used to calculate small for gestational age status.¹² The study was approved by the institutional review board.

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Data were analyzed using SPSS, version 17.0. Possible risk factors for ROP were analyzed in univariate analysis. The significant factors were further analyzed in the multiple logistic regression model.

3. Results

Of 461 VLBW infants admitted in the neonatal intensive care unit during the study period, 361 survived beyond 4 weeks and were evaluated for ROP (Fig. 1). The characteristics of enrolled neonates with or without ROP are displayed in Table 1. Mean (standard deviation) gestational ages and birth weights of infants with or without ROP (any stage) were 27.2 ± 1.7 weeks, 842 ± 208 g, and 30.1 ± 2.4 weeks, 1154 ± 232 g, respectively.

Among VLBW neonates, 43 (11.9%) neonates had ROP (Fig. 1). Incidence of ROP across all gestational age among survivors is displayed in Table 2. No infant at gestation 33 weeks or more developed ROP. Of 43 neonates with ROP, 8 (18.6%) required treatment by laser ablation or anti-VEGF injections. All neonates diagnosed with ROP survived till discharge.

The findings of univariate analysis of possible risk factors for ROP are displayed in Table 3. On multiple logistic regression analysis, lower gestational age, apnea of prematurity, and red cell transfusion were found to be independent risk factors for ROP (Table 3).

4. Discussion

ROP is a vasoproliferative disease of developing retina and is a serious morbidity among very preterm neonates. With increasing survival of these neonates in low-resource settings, the burden of ROP is increasing. The incidence of ROP among VLBW neonates in our study was 11.9%. Eight (2.2%) neonates required treatment with either laser ablation or intraocular anti-VEGF injections. Burden of

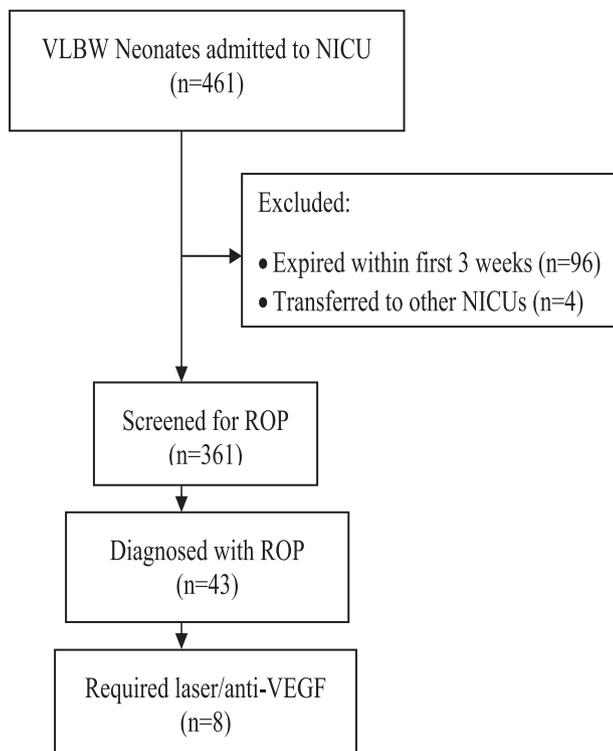


Fig. 1. Study flow chart. NICU, neonatal intensive care unit; ROP, retinopathy of prematurity; VLBW, very-low-birth-weight; anti-VEGF, anti-vascular endothelial growth factor.

Table 1
Characteristics of VLBW neonates with or without ROP.

Characteristics	No ROP (n = 318)	ROP (n = 43)	P value
Gestation at birth, wks*	30.1 (2.4)	27.2 (1.7)	0.000
Birth weight, grams*	1154 (232)	842 (208)	0.000
Male gender	166 (52.2)	26 (60.4)	0.308
Small for gestation	96 (30.1)	4 (9.3)	0.004
Antenatal steroids	207 (65.0)	20 (46.5)	0.018
Gestational hypertension	69 (21.6)	4 (9.3)	0.068
PPROM	79 (24.8)	13 (30.2)	0.440
Apnea of prematurity	118 (37.1)	24 (55.8)	0.018
Need for respiratory support	227 (71.3)	37 (86.0)	0.042
Bronchopulmonary dysplasia	16 (5.0)	22 (51.1)	0.000
Culture-proven sepsis	46 (14.4)	13 (30.2)	0.009
Septic shock	42 (13.2)	12 (27.9)	0.011
Necrotizing enterocolitis	9 (2.8)	3 (6.9)	0.155
Red cell transfusion	57 (17.9)	24 (55.8)	0.000

Data are expressed as n (%), unless specified.

*, mean (standard deviation); ROP, retinopathy of prematurity; PPRM, preterm premature rupture of membranes; VLBW, very-low-birth-weight.

Table 2
Incidence of retinopathy of prematurity among surviving VLBW neonates.

Gestation at birth (wks)	Survival	ROP among survivors
24–25	7/23 (34.7)	6/7 (85.7)
26–27	54/87 (62.0)	22/54 (40.7)
28–29	86/115 (74.7)	12/86 (13.9)
30–32	147/165 (89.0)	3/147 (2.0)
33 or more	67/73 (91.7)	0/67 (0)

Data are expressed as n (%)

ROP, retinopathy of prematurity; VLBW, very-low-birth-weight.

ROP in our study is lower than reports from high-income countries, possibly due to higher mortality at lower gestation in our cohort.^{3–5} Survival for less than 30 weeks of age was 65% in the study infants compared with more than 90% among reports from Western countries. The reported incidence of ROP in studies from India ranges from 19% to 47%.^{13–18} Variation in these observations could be due to differences in clinical settings, population characteristics, and screening methods. Vinekar et al.¹³ used a telemedicine-based, technician-dependent wide-field retinoscopy model for ROP screening in underserved rural areas in Karnataka, India. In the study by Vasavada et al.,¹⁵ incidence of ROP was 19% in neonates who weighed <1250 g. They observed higher sepsis rates in their cohort (48%), compared with 27.8% in our study. The cohort investigated by Charan et al.¹⁷ is older than 15 years, and care practices might have changed a lot since then.

Several authors have evaluated risk factors for ROP and have found fluctuating/high oxygen concentrations, hyperglycemia, corticosteroid treatment, sepsis, poor nutritional intake, and poor postnatal growth to be associated with occurrence of ROP.^{19–26} In the present study, we observed lower gestational age, apnea, and

Table 3
Independent risk factors for ROP.

Variable	Adjusted OR	95% CI	P value
Gestation at birth	0.737	0.636–0.855	0.000
Small for gestational age	0.648	0.218–1.924	0.434
Antenatal steroids	0.505	0.247–1.032	0.061
Apnea	2.422	1.189–4.934	0.015
Need for respiratory support	1.139	0.420–3.092	0.798
Red cell transfusion	3.991	1.952–8.159	0.000
Culture-proven sepsis	1.299	0.556–3.037	0.546
Septic shock	0.982	0.408–2.368	0.969

OR, odds ratio; CI, confidence interval ROP, retinopathy of prematurity.

red cell transfusion to be significant risk factors associated with ROP. These findings are consistent with earlier reports.^{15,26,27}

To summarize, we observed a low incidence of ROP requiring treatment in VLBW neonates. Lower gestation, apnea of prematurity, and red cell transfusions were independent risk factors for ROP. The strength of our study is its prospective design with long-term follow-up. All eligible neonates were serially screened for ROP by the same ophthalmologist as per guidelines. Limitations of our study are its small sample size and a high mortality among extremely preterm neonates, making our finding less generalizable.

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None.

Declaration of competing interest

None.

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