

Retinopathy of prematurity and its association with neonatal factors

Mohammad Shahidullah, Arjun Chandra Dey, Firoz Ahmed, Ismat Jahan, Sanjoy Kumer Dey, Nuzhat Choudhury and M. A. Mannan

Article Info

Department of Neonatology, Faculty of Medicine, Bangabandhu Sheikh Mujib Medical University, Shahbag, Dhaka, Bangladesh (MS, ACD, FA, IJ, SKD, MAM); Department of Ophthalmology, Faculty of Surgery, Bangabandhu Sheikh Mujib Medical University, Shahbag, Dhaka, Bangladesh (NC)

For Correspondence:

Mohammad Shahidullah
shahidullahdr@gmail.com

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Abstract

Retinopathy of prematurity is considered as an important cause of blindness. This prospective study was undertaken to document the frequency and the associated factors of retinopathy of prematurity among 97 preterm newborn weighing <2000 g and/or with a gestation of <35 weeks. The first eye examination was performed by an ophthalmologist at 4 weeks of postnatal age for the infants born at ≥ 30 weeks of gestation or birth weight ≥ 1200 g and at 3 weeks of postnatal age for the infants <30 weeks of gestation or birth weight <1200 g. The overall incidence of retinopathy of prematurity was 23.7%. Premature newborn with retinopathy was having significant low mean birth weight ($p=0.001$) and the mean gestational age ($p<0.001$) when compared with newborns without retinopathy of prematurity. Newborns with retinopathy of prematurity were requiring a longer duration of oxygen ($p=0.005$) than that of non-retinopathy of prematurity newborns. Logistic regression shows the duration of oxygen in the hospital and lower gestational age were independent risk factors of retinopathy of prematurity. Prematurity and longer duration of oxygen administration were the risk factors for the development of retinopathy of prematurity.

Introduction

Progressive improvement in the survival of preterm newborn subjects them to the risk of retinopathy of prematurity. It is considered an important cause of blindness in developed countries as well as developing countries.¹ The incidence and severity of retinopathy of prematurity are closely related to lower birth weight and earlier gestational age.² The prevalence has been surveyed in most of the countries and significant variations were observed ranging from 15.6 to 36.4%. Difference in prevalence among countries suggest that the race, geographic region, country, degree of social and economic development, and level of medical care are the factors influencing the incidence of retinopathy of prematurity.³⁻⁸ Wide variations of the retinopathy of prematurity incidence were also documented in studies done in Bangladesh.^{9,10} Therefore, it is crucial to document the frequency of retinopathy of prematurity to reveal the exact scenario among the Bangladeshi neonates.

Prematurity, low birth weight and oxygen therapy are the most common variables studied as risk factors for the development of retinopathy of prematurity by the most of the previous researchers.¹¹⁻¹³ Studies are now focusing more on the identification of potentially modifiable factors associated with the development of retinopathy of prematurity. Identification of these factors is largely helpful for the preven-

tion of retinopathy of prematurity. Moreover, the risk factors will also help to detect at risk babies to develop the retinopathy of prematurity so that appropriate, timely intervention can be initiated. With this context, the study was undertaken to document frequency of retinopathy of prematurity and to find out the factors associated with the development of retinopathy of prematurity among preterm newborn.

Materials and Methods

This prospective study enrolled 97 neonates weighing <2000 g and/or with a gestation <35 weeks admitted to the neonatal intensive care unit. They were routinely screened for retinopathy of prematurity from June 2013 to November 2014. Neonates with a birth weight of ≥ 2000 g or gestational age 35 weeks or more were also screened if they had an unstable clinical course at the unit. Exclusion criteria were fatal congenital anomaly, unilateral or bilateral retinal or choroidal disease (other than retinopathy of prematurity). Infants were also excluded if there was the refusal of initial consent or refusal of subsequent evaluation, or infants who died before the eye examination.

Initial eye examination was performed by one of the authors and ophthalmologist (NC) at 4 weeks of postnatal age for infants born at or more than 30 weeks of gestation or birth weight



≥1200 g and at 3 weeks of postnatal age for infants <30 weeks of gestation or birth weight <1200 g. The screening was done with a binocular indirect ophthalmoscope. The pupils were dilated with 0.5% tropicamide and 2.5% phenylephrine and the eyes were examined with an infant speculum and a scleral depressor. The follow-up eye examinations and reports depended on the severity of the disease. Retinopathy of prematurity was classified according to the International Classification of Retinopathy of Prematurity.

Data were also analyzed regarding demographic information, clinical diagnosis, treatment and findings of the eye examination, sepsis, respiratory distress syndrome, duration of oxygen in days, continuous positive airway pressure or mechanical ventilation, blood transfusion, and first eye examination findings. Patients were followed-up until 44 weeks of corrected gestational age to allow complete retinal vascularization.

Data analysis was performed using SPSS version 20.0. Univariate analysis was conducted using Chi-square test. Multiple logistic regression analysis was

performed to study the predictors of retinopathy of prematurity using independent variables as those variables which were significant in the univariate analysis.

Results

Newborn who developed retinopathy of prematurity had a lower birth weight (1175 ± 226 g) and gestational age (29.9 ± 1.8 weeks) than the non-retinopathy of prematurity counterpart. Retinopathy of prematurity was diagnosed in 23 infants and the overall incidence was 23.7%. Among them, 5 cases were in Stage 1, 2 in Stage 2, 9 in Stage 3, 1 in Stage 4 and 7 in aggressive posterior retinopathy of prematurity (APROP).

Newborns with retinopathy of prematurity were requiring a longer duration of oxygen ($p=0.005$) than that of non-retinopathy of prematurity newborns. However, gender, Apgar scores at 5 min, respiratory distress syndrome, the requirement of blood transfusion, sepsis, continuous positive airway pressure or ventilator treatment could not demonstrate a significant difference between both the groups (Table I).

The incidence of retinopathy of prematurity was more in lower gestational age group and a significant difference was found among these groups ($p=0.000$).

A multiple logistic regression analysis was performed with the statistically significant neonatal factors in which an association with retinopathy of prematurity was identified after controlling the potential risk factors. Mean duration of oxygen was significantly higher and gestational age was significantly lower in the retinopathy of prematurity group than that of non-retinopathy of prematurity group. Duration of oxygen in hospital days [odds ratio (OR)=0.937; 95% confidence interval (CI), 0.881-0.997, $p=0.04$] was independently associated with retinopathy of prematurity. Lower gestational age [odds ratio (OR)=1.903; 95% confidence interval (CI), 1.242-2.916, $p=0.003$] was also associated with retinopathy of prematurity. Birth weight was not independently associated with the retinopathy of prematurity.

Discussion

The data of the present study showed that infants with retinopathy of prematurity group were significantly more premature ($p<0.001$) and having low birth weight ($p=0.001$) than infants without retinopathy of prematurity. Findings are similar with that of most studies investigating risk factors of retino-

Table I

Characteristics of newborn with/without retinopathy of prematurity

	Non-ROP (n=74)	ROP (n=23)	p value
Gestational age (week)	32.3 ± 2.0	29.9 ± 1.8	<0.001
Body weight (g)	1400 ± 284	1175 ± 226	<0.001
Sex			
Male	48	12	
Female	26	11	
Age (week)			
<30	5	10	
30 - 32	34	11	
33 - <35	27	1	
≥35	8	1	
Distribution of body weight (g)			
<1000	7	8	
1000 - <1500	44	13	
1500 - <2000	19	2	
≥2000	4	0	
Respiratory distress syndrome (n)	14	6	0.45
APGAR at 5 min	7.6 ± 0.9	7.3 ± 0.9	0.16
Sepsis (n)	31	11	0.61
Ventilator treatment (n)	12	2	0.37
Duration of oxygen (day)	6.1 ± 8.5	11.8 ± 7.3	0.005
Blood transfusion (n)	21	11	0.08
CPAP treatment	20	8	0.47

ROP means retinopathy of prematurity

Table II

Logistic regression analysis of risk factors

Risk factors	Odds ratio	95% CI	p value
Birth weight	1.000	0.997-1.003	0.960
Gestational age	1.903	1.242-2.916	0.003
Oxygen uses (day)	0.937	0.881-0.997	0.040

pathy of prematurity.^{14,15} Apart from birth weight and gestational age, oxygen use— another important risk factor was found to be significantly more frequent among infants with retinopathy of prematurity when compared with non-retinopathy of prematurity infants. We could not demonstrate a significant association of retinopathy of prematurity with low Apgar, sepsis, respiratory distress syndrome. Univariate analysis was done between the retinopathy of prematurity and non-retinopathy of prematurity newborns. Few studies have documented significant association of the above-mentioned factors with retinopathy of prematurity in their studies and concluded that retinopathy of prematurity is more common among the sick infants.^{14,15}

In the present study, gestational age and duration of oxygen were found to be an independent risk factor for the development of retinopathy of prematurity (p value 0.009 and 0.04 respectively). The birth weight which was found to be significant in univariate analysis, revealed not significant when analyzed in logistic regression. Gestational age, birth weight, oxygen supplementation were significant risk factors of sepsis according to Liu et al study.¹⁵ Another study of Choi et al found the duration of oxygen use and intravenous steroid as the risk factors of retinopathy of prematurity.¹⁴ So, the study findings are variable probably because of the wide variation in study design, sample size as well as study settings.

The prevalence of retinopathy of prematurity varies among races, geographic areas, the survival rate of neonates and level of perinatal care. In the present study, the overall incidence of retinopathy of prematurity was 23.7% among hospitalized, sick, premature infants. The frequency is similar with that of studies conducted in developed and developing countries. Reported prevalence of retinopathy of prematurity in different countries was ranging from 15.6 to 36.4%.³⁻⁸ The explanation of higher incidence in some of the previous was most probably due to inclusion of hospitalized, sick and premature infants. According to earlier studies in Bangladesh, the incidence of retinopathy of prematurity was variable ranges from as low as 4.4 to as high as 40%.^{9,10} Lower incidence in the present study may reflect overall improvement in the neonatal care, optimization of oxygen therapy to sick premature infants and strict adherence to retinopathy of prematurity screening protocol.

Conclusion

Prematurity and longer duration of oxygen administration are the risk factors for the development of retinopathy of prematurity.

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