

# ASSESSMENT OF RETINOPATHY OF PREMATURITY AMONG 150 PREMATURE NEONATES IN FARABI EYE HOSPITAL

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**Abstract** - the aim of this study was to estimate the incidence of retinopathy of prematurity (ROP) and to evaluate possible neonatal risk factors for ROP. The main study was a cross-sectional study including 150 high risk neonates born at teaching hospitals of Tehran universities referring to Farabi Eye Hospital. The choosing criteria were birth weight less than 2500 g or gestational age younger than 37 weeks. ROP was present in 9(6%) newborns, all of whom aged less than 32 weeks at birth. There was also strong association between ROP and birth weight, oxygen administration, respiratory distress syndrome and intraventricular hemorrhage. There also seems to be a higher risk for developing ROP in female neonates, those who were born by multiple gestational pregnancies or were treated by phototherapy or transfusion and those who had suffered from bronchopulmonary dysplasia or sepsis. Prematurity per se remains the strongest risk factor for ROP. Suitable criteria for screening of ROP seem to be gestational age younger than 32 weeks or birth weight less than 1500 g. *Acta Medica Iranica* 39 (1): 35-38; 2001

**Key Words:** Retinopathy of prematurity, risk factors, gestational age, birthweight, oxygen administration

## INTRODUCTION

Retinopathy of prematurity (ROP) is a vasoproliferative disorder of the developing retina characterized by arteriovenous shunting at the border of vascularized and nonvascularized immature retina. After decades of decrease, the incidence of this disease is now rising as advances in neonatology have allowed for the survival of very low birth weight infants (1); low birth weight and young gestational age are directly correlated with the most severe retinopathy (2). Other reported risk factors include oxygen administration (2,3), hypoxia (4), sepsis (5) blood transfusion (5,6) bronchopulmonary dysplasia (BPD) (6), intraventricular hemorrhage (IVH) (6), phototherapy (7) and multiple pregnancy (8).

Because there was no similar study performed previously in Iran, we tried to evaluate the positive cases of ROP and to assess the correlation of aforementioned risk factors with ROP.

## MATERIALS AND METHODS

We included each neonate referring to Farabi Eye Hospital who was born at university hospitals and met the criteria of gestational age younger than 37 weeks or birth weight of less than 2500 g. Data on possible risk factors including sex, birth weight, gestational age, oxygen administration, single versus multiple pregnancy, phototherapy, blood transfusion and perinatal disorders (respiratory distress syndrome [RDS], IVH, BPD and sepsis) were recorded. Each patient was examined at vitreous and retina service of Farbi Eye Hospital with an indirect ophthalmoscope using a +30D lens, after full dilation of pupils by tropicamide 0.5% and phenylephrine 1%. The first eye examination was to be done at 4-6 weeks after birth. If the first examination showed no ROP, next visit was performed after another 4-6 weeks. If ROP was detected at any time, the examinations were repeated weekly up to the point that regression occurred or treatment became necessary. Afterward the follow-up was done according to the case. There was no major complication during ophthalmologic examination.

During a 2 year study (1997-1999), 150 neonates who fully participated in the primary and follow-up examinations, were chosen for statistical analysis. Categorical variables were analyzed by chi square test and continuous variables with T-test. All statistical tests were performed by SPSS using a univariate analysis with ROP as the dependent variable.

## RESULTS

From 150 neonates included in this study by meeting the mentioned criteria, 74 (49.3%) were boys

and 76 (50.7%) were girls (Fig. 1). These newborns were grouped by their gestational age into 3 groups (<32 weeks, 32-34 weeks and > 34 weeks), and by their birth weight also into 3 groups (<=1250g, 1251-1500g and >1501g), the mean gestational age was 33.46±2.63 weeks and the mean birthweight was 1814.46±491g.

Ninety-nine (66%) neonates were born as single pregnancies and the other 51 (34%) by multiple pregnancies. Phototherapy was done in 91 (60.7%) because of prophylactic or therapeutic reasons. Supplementary oxygen was administrated to 110 (73.8%) of the babies (Table 1).

Table 1. FIO<sub>2</sub> of supplementary oxygen

FIO <sub>2</sub>	No.	%
35%	42	28.2
36-60%	40	26.8
> 60%	28	18.8
Total	110	(= SUM (ABOVE))

During ophthalmologic examination, 9 cases of ROP were detected, 8 (88.9%) cases were bilateral and 1 (11.1%) case was unilateral. In 6 (66.7%) cases, at the first examination, the stage of ROP was 1 (demarcation line) at zone III (temporal periphery of retina). During follow up, only one case (2 eyes)

showed progression to stage 2 (elevated ridge) and none progressed to prethreshold or threshold stage, and finally all showed complete regression.

In 2 (22.2%) cases the first examination showed stage 3 (extraretinal fibrovascular proliferation) ROP. The first of these neonates (stage 3, zone III) at follow up showed regression in one eye but progression of the fellow eye to stage 4A (partial retinal detachment outside macula) at zone III, which was closely followed without any treatment until regression was detected. In the second patient (stage 3-plus, zone II), both eyes were treated with argon laser photocoagulation via indirect ophthalmoscope. At follow-up, right eye that had greater extension of ROP, showed further progression so additional photocoagulation was performed, which was unable to control the disease and progression to stage 4B (partial retinal detachment including macula) and finally stage 5 (total retinal detachment) occurred. Pars plicata vitrectomy was also unable to save the eye and the final result was visually lost eye. The left eye showed signs of regression after first laser treatment, which led to complete regression. The last case was at stage 5 at first examination and diagnosed to be inoperable.

By the results of statistical analysis, those risk factors that seem to be correlated to ROP are listed in table 2.

Table 2. Statistical correlated risk factors for ROP

		ROP		Chi-square P value	Odds Ratio
		Yes	No		
		n	%	n	%
Birth weight	≤ 1250 g	5	(56)	20	(15)
	1251-1500g	3	(33)	16	(11)
	> 1500g	1	(11)	105	(74)
Gestational age	< 32 weeks	9	(100)	45	(32)
	32-34 weeks	0	(0)	39	(28)
	> 34 weeks	0	(0)	57	(40)
Oxygen Concentration (FIO <sub>2</sub> )	no additional O <sub>2</sub>	0	(0)	39	(27.6)
	35%	1	(11)	41	(29)
	36-60%	3	(33)	37	(26.1)
	> 60%	5	(56)	23	(16.3)
RDS	yes	6	(66.7)	14	(10)
	no	3	(33.3)	127	(90)
IVH	yes	2	(22)	1	(0.7)
	no	7	(78)	140	(99.3)

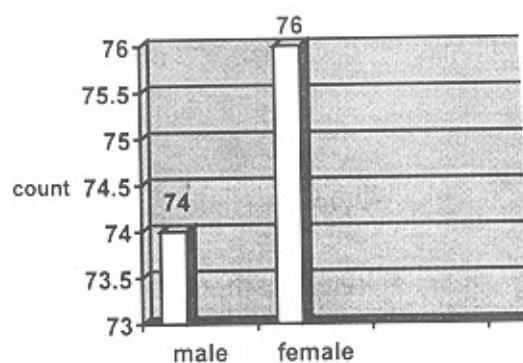


Fig. 1. Gender

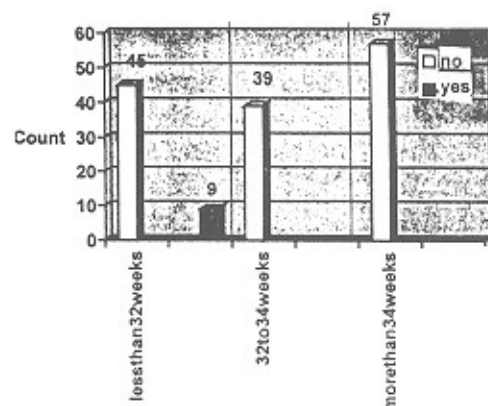


Fig. 2. ROP by gestational age

Table 3. Incidence of ROP in different studies

Study	Birth weight	Incidence rate
Keith and Doyle (1995)	1000-1250g	14.6%
	1251-1500g	6.4%
Smith et al (1995)	< 1500g	16%
Holmsterom et al(1993)	≤1500g	40.4%
Chou et al (1993)	< 1500g	42.5%

However, because of insufficient number of cases, these values must be reassessed by further studies.

T-test was performed for birth weight and gestational age (ungrouped). In ROP group, the mean birth weight was  $1297.78 \pm 194.4$ g compared to  $1847.45 \pm 486.6$ g in no ROP group ( $<0.001$ ). The mean gestational age in ROP group was  $29.55 \pm 0.88$  weeks that was also significantly ( $<0.001$ ) lower than mean gestational age of the no ROP group ( $33.71 \pm 2.51$  weeks).

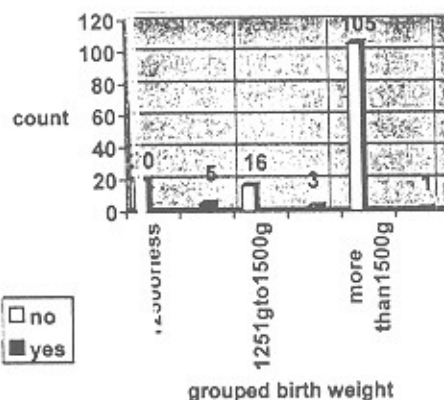


Fig. 3. ROP by birth weight

Table 4. Odds ratio of other risk factors or ROP

Risk factor	Odds ratio	P value
Gender (female)	2.29	< 0.322
Phototherapy	5.6	< 0.075
Multiple pregnancy	2.582	< 0.159
Transfusion	2.082	< 0.374
BPD	18.143	< 0.065
Sepsis	4.281	< 0.180

## DISCUSSION

The etiology of ROP remains obscure and is thought to be multifactorial (9,15). Immaturity per se seems to be the most important risk factor (7,9,10,13). The pathogenic (15-17) role of oxygen, as related to modern neonatology principles, remains enigmatic. This study also suggests that prematurity is the most important risk factor for developing ROP. As one can see, all cases of ROP occurred in neonates younger than 32 weeks at birth (Fig. 2). The next most important factor is low birth weight. The incidence of ROP in neonates of 1250 g or less was estimated to be 20%, between 1251g and 1500g to be 15%, and as a whole in neonates lighter than 1500g to be 18% (Fig.3). Other studies showed different incidence rates according to birth weight (Table 3).

Such differences are partly due to different screening criteria of these studies. Another important point is the higher mean birth weight in our study due to our poor neonatal care technology that prevents us from saving very low birth weight or highly immature neonates.

Among other risk factors, this study showed correlation between oxygen administration and presence of RDS or IVH in the neonates with

development of ROP. Although there is no statistically significant correlation between other risk factors and ROP, but due to calculated odds ratio (Table 4), there is higher incidence of ROP in the presence of them. It should be noted that many of these risk factors are confounding factors rather than etiologic factors for ROP.

We suggest that the best criteria for determining neonates as high risk for developing ROP are gestational age younger than 32 weeks or birth weight less than 1500g, which were also suggested by Royal College of Ophthalmologists and the British Association of Perinatal Medicine (22). Should this inclusion criteria be approved by more extensive studies, it can be of great socio-economical value to our country by preventing many unnecessary ophthalmologic examinations. However we still recommend that if there are any other risk factors present, ophthalmologic consultation should be ordered even if the neonate is out of criteria. Further studies seem to be necessary to verify these findings statistically.

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