

# Incidence of Retinopathy of Prematurity (ROP) in Low Birth Weight Newborns

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## ABSTRACT

**Background:** Retinopathy of prematurity (ROP) is a common cause of blindness and accounts for up to 10% of childhood blindness in developed countries. Also Before surfactant became available in the NICU, an incidence of 11% to 60% was reported in the VLBW population. However, there are few studies on the incidence of ROP among low-birth-weight (LBW) infants in Iran and the aim of this study is determined the incidence of ROP in LBW infants.

**Methods:** this was a cross-sectional study. In this study we screened 152 LBW infants admitted at Imam Reza Hospital, Mashhad, Iran, between October 2013 and October 2015. We gathered patients information from their files and they examined by neonatologist and ophthalmologist. Finally we analyzed the data with T-test and square tes.

**Results:** in our study, 152 LBW infants, including 79 males and 73 females, were evaluated. The mean gestational age was 30.32 + -2.84 (26-37). In this study we identified 31 patients (20.39% ) with ROP. 19 patients with 26 to 29 weeks gestational age and 9 patients between 30 to 33 weeks and just 3 patients between 33 to 37 weeks of gestational age.

However, there were no meaningful relationship was found with gender. (P=0.395)

**Conclusion:** ROP is rising in Iran and low birth weight is an important risk factor for ROP and screening program is very important in this group of newborns.

**Keywords:** Low birth weight, Newborn, Retinopathy of prematurity

## Introduction

Retinopathy of Prematurity (ROP) or retrolental fibroplasia is a potentially serious condition and common cause of blindness of preterm newborns. Timely and correct identification of individuals at risk of developing a serious form of ROP is therefore of paramount importance. (1)

ROP or vascular abnormality of retina in premature infants is a common cause of blindness and accounts for up to 10% of childhood blindness in developed countries.(2)

Also Before surfactant became available in the NICU, an incidence of 11% to 60% was reported in the VLBW population. (1-3)

epidemiological studies have shown falling mortality rates among ELBW infants in developing countries but unfortunately neonatal

morbidities like The incidence of ROP and the need for laser treatment for this condition were increased.(4,5)

In some studies 66 percent of infants weighing less than 1250 grams and 82 percent of infants less than 1000 grams had ROPs (2).

In a study conducted in Mashhad (Saeidi et al) in 2008, the frequency of ROP was less than that of developed countries. (4)

In Brazil the incidence of severe visual impairment or blindness due to ROP is estimated to be around 500–1500 cases/year. (6,7)

Also in Singapore advances in neonatal management, including surfactant therapy and new methods of mechanical ventilation has increased the incidence of ROP but It is also not clear whether the increased survival of smaller

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and sicker infants has resulted in an increased proportion of ROP.17,18 (8,9)

recently, Siatskowski and Flynn noted that “we are as lacking in basic epidemiological data of varying rates of incidence of ROP in geographic area as we were in the 1940s and 1950s”. (10)

In one study in Bangladesh, 4.4% children seen in follow-up were diagnosed as ROP(11).

and in different studies from India,the incidence of ROP has been reported at 24– 47% among high risk preterm infant populations (11).

Incidence of ROP in developed countries is 10–27%, depending on degree of prematurity and birth weight(11)

In Thailand and the Philippines, ROP is not reported in rural areas but causes 15% of visual loss in the cities where better medical facilities are available(11).

In one study in Iran, 8.5% infants developed ROP (included all stages of the disease).The incidence rate of ROP in this study was like those found in Bangladesh and lower than in developed countries.(11) The reasons for this low incidence rate are , high neonatal mortality rate , poor screening program, poor follow up examination programs.

This shows the importance of screening of prematures for ROP during hospitalization. It is predicted that as the survival of premature infants increasingly improves in developing countries, the overall number of children with ROP will increase(11,12)

ROP recovers in %85 of cases but Severe side effects such as proximal nose, astigmatism, cataracts, strabismus and retinal opacity may be seen in residual cases which need follow up throughout the life of the patient.

In the poor countries, with high infant mortality and morbidity (more than 60 per 1,000 live births), due to lack of NICU facilities (NICU), a small number of premature infants survive. As a result, ROP is very unpredictable in these countries.

On the contrary, in countries where infant mortality rates are less than 10 per 1000 live births, ROP is responsible for 6 to 20% of blindness.(12-14)

Although ROP is the main cause of blindness around the world but it can be prevented by early screening in neonates.

The joint statement issued at the time recommended ROP screening for all infants with BW  $\leq$ 1500 g or gestational age (GA)  $\leq$ 32 weeks or for any infant with BW >1500 g, presenting

with an unstable clinical course.(5-7)

### **ROP screening Schedules**

Eye examinations were performed on all infants who met the criteria set by the Royal College of Ophthalmologists’ guidelines published in 1995.20,21 Eligible infants were referred by the attending neonatologist according to the Royal College Of Ophthalmologists’ guidelines: (1) Birth weight 1500 g.) (2) Maternal post-menstrual age.

The infants were examined at 6 weeks chronological age or 34 weeks corrected age, whichever was earlier. Eye Examination Methods Cyclomydril 0.5% eye drops were instilled twice – 1 hour and 30 minutes – before examination. Indirect ophthalmoscopy was performed using a binocular indirect ophthalmoscope. Lid speculum and scleral depressors were routinely used.

Monitoring and Management of Infants at Risk for ROP If no ROP was noted, eye examinations were continued every 2 weeks until vascularisation had reached zone 3. Those with ROP were screened at intervals indicated by the severity of the disease. The stages of ROP were classified according to the International Classification of Retinopathy of Prematurity: (15, 16)

Stage 1. Demarcation line separating the avascular retina anteriorly from vascularised retina posteriorly with abnormal branching of small vessels immediately posterior to this.

Stage 2. Retinal ridge: the demarcation line has increased in volume, but this proliferative tissue remains intraretinal.

Stage 3. Ridge with extraretinal fibrovascular proliferation.

Stage 4. Partial retinal detachment.

Stage 5. Total retinal detachment. The threshold for treatment followed the protocol used in the CRYO-ROP trial. (17)

However, there are few studies on the incidence of ROP among low-birth-weight (LBW) infants and The aim of this study is determined the incidence of ROP in LBW infants admitted in a teaching hospital in mashhad, Iran.

### **Methods**

This is a cross-sectional study in which the population studied were infants who had been hospitalized in Imam Reza hospital that referred to the Razi Clinic and Khatam hospital ( ROP clinic) during the years 2013 to 2015.

The inclusion criteria were all newborn that hospitalized in Imam Reza hospital with less than 37 weeks gestational age and less than 2500

grams birth weight.

We excluded all infants with congenital anomaly, chromosomal anomalies and infants who died before eye examinations and the patients whose parents didn't have the consent to participate in the study.

The screening was done in ROP Clinic, in Khatam-hospital. T-test was used for comparison of means and square test was used for quantifying the frequency. Chi-square test was used to compare gender.

## Results

A total of 152 infants were 79 males and 73 females. The mean gestational age of newborns is equal  $31.0 \pm 2.8831$  and their average weight was  $1625.2 \pm 459.32$ .

The weight distribution of infected and non-ROP infants is presented in Table-1.

Newborns with BW less than 1000 grams (ELBW) with ROP were 7, (50% of the whole

group under 1000 grams).

In the range of between 1,000 and 1250 grams, 40% of the 8 infants suffered from ROP. In the range of 1250 to 1500 grams, 34.5% were present, with 10 neonates with ROP.

And in the range of 1500 to 1750 grams, 11.2% of the 3 infants suffered from ROP.

Finally, in newborns over 1750 g, 4.3%, 3 infants with ROP.

The incidence of ROP with low birth weight had a significant relationship.

Based on the table -2, the percentage of ROP in the G.A 26-29 weeks was 61.4% (19 infants).

In the 30th to 33th week, 29.2% were 9, and in the 33 to 37 weeks 9.4% were namely 3 infants.

The highest percentage of infants under the age of 29 weeks and the lowest percentage of infants in the 33-37 week period.

There is a significant relationship gestational age and incidence of ROP.

**Table 1.** Weight distribution of ROP

Birth weight (gr)	(ROP) %	Non ROP	Total
1000 $\geq$	7(50%)	7	14
1001-1250	8(40%)	14	22
1251-150d	10(34.5)	19	29
1501-1750	3(11.2)	23	26
1751 $\leq$	3(4.3)	60	63
total	31	121	152

**Table 2.** age distribution of ROP

Gestational age(week)	Non ROP %	ROP %	Total
26-29	33(27.3%)	19(61.4 %)	52 (34.2%)
30-33	56(46.4%)	9(29.2%)	65 (42.7%)
33-37	32(26.3%)	3(9.4 %)	35 (23.1)
Total	121(100%)	31(100%)	152(100%)

## Discussion

ROP is an important cause of potentially preventable blindness.(1-4)

Our study represents an evaluating of the incidence and some risk factors of ROP in Mashhad, Iran.

In a study in Singapore the incidence of ROP was 58/147 (39.4%) in the presurfactant period compared to 107/417 (25.6%) in surfactant period. The incidence of ROP requiring surgery was 7/147 (4.8%) in presurfactant period and 21/417 (5%) in surfactant period, which has not changed significantly in 2 periods. Recent reports from Europe and Australia suggest a decreasing incidence of severe ROP.(8-10)

The CRYO-ROP16 multi-centre study showed that among infants with BW.

This raised the possibility of genetic

predisposition to ROP in at least some cases.

Norrie's disease, a rare hereditary exudative vitreopathy, which is phenotypically similar to ROP, has also been associated with mutation in the ND gene.(15)

### Risk Factors

Although many causative factors have been proposed for ROP, only low birth weight and low gestational age have been consistently associated with the disease, and supplemental oxygen therapy following delivery had a borderline association. A multicenter US study of infants born in 1986-7 reported that of those infants weighing less than 1000 g, 81.6% developed ROP, while 46.9% of those 1000-1250 g developed the disorder(11,18,19). In another study ROP remains

prevalent in very low birth weight infants with as many as 12.5%(11). In our analysis the mean birth weight of all cases was 1224 gr. ROP begins to develop between 32 and 34 weeks after conception, regardless of gestational age at delivery. In the rat model both hypoxia and unstable oxygen levels are important causes of ischemic retinopathy(11,18).

In our study there was no significant difference between the two groups (with and without ROP) and O<sub>2</sub> therapy. We think that low number of our cases could explain this finding. Most epidemiological studies of ROP do not find a sex imbalance. Interestingly, two studies have reported a skewed sex ratio in ROP, with twice the number of male infants affected. In our study the prevalence of ROP was not different between the two genders.

In our study there was a significant relationship between ROP and LBW. results of another study in Iran indicated a benefit of earlier intervention for both visual acuity and structural outcome (11), although rate of complications such as apnea, bradycardia, or intubation following earlier treatment are a little high (11).

As a limitation of the study we could not screen all patients, as we lost some of them out of sight after discharge from NICU and this could account for the remarkably low incidence of ROP in our patients.

In the 2020 Vision Plan, retinopathy is considered as a preventable condition that requires early diagnosis and treatment to prevent blindness. The suggestion is that, in the case of newborns less the age of 32 weeks or less than 1250 grams, care should be taken to monitor for excess oxygen and complete eye examination for ROP.

thus gynecologists should focus on reducing preterm delivery and neonatologist should be focus on control of risk factors and ophtalgotist should be done early screening and subsequent follow-up.

## Conclusion

ROP is rising in Iran and low birth weight is an important risk factor for ROP and screening program is very important in this group of newborns.

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## Conflicts of interests

None declared.

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