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Original Article

Incidence of retinopathy of prematurity at two tertiary centers in Jeddah, Saudi Arabia

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Abstract

Purpose: To review the incidence and risk factors for retinopathy of prematurity (ROP) King Faisal Specialist Hospital and King Abdulaziz University Hospital in Jeddah, Saudi Arabia.
Material and methods: In this prospective cohort study, preterm infants who were admitted to a neonatal intensive care unit from 2012 to 2013 were evaluated for ROP. Inclusion criteria were, preterm infants with gestational age <32 weeks and/or birth weight <1500 g. The risk factors that were assessed were intraventricular hemorrhage, patent ductus arteriosus (PDA), sepsis and hydrocephalus. The relative risk was used to measure the risk and logistic regression was used to adjust for confounding factors. Statistical significance was indicated by $p < 0.05$.
Results: Thirty-one of 92 (33.7%) preterm infants had unilateral or bilateral ROP. The mean gestational age was 26.7 weeks (range, 24–29 weeks) and mean birth weight was 0.843 kg (range, 0.606–1.450 kg). There were 7 infants with stage 1 ROP, 10 infants with stage 2, 14 infants with stage 3 and no cases of stage 4 or 5. Twelve (13%) infants had plus disease and received laser therapy within 72 h of diagnosis. Statistically significant risk factors for ROP were PDA ($p = 0.0005$) and intraventricular hemorrhage ($p = 0.0005$).
Conclusion: The incidence of ROP was 33.7% and risk factors were PDA and intraventricular hemorrhage. Laser therapy was very effective for the treatment of plus disease and preventing progression of ROP. Clinicians should assess for potential risk factors when monitoring premature infants.

Keywords: Retinopathy of prematurity (ROP), Plus disease, Threshold disease, Patent ductus arteriosus, Hydrocephalus, Intraventricular hemorrhage

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Introduction

Retinopathy of prematurity (ROP) is an abnormal growth of retinal blood vessels that affect premature infants born at or before 32 weeks and weighing 1500 g or less at birth. ROP is usually bilateral and can lead to lifelong vision impairment or blindness.[1] The smaller an infant at birth, the greater the likelihood of developing ROP. However, ROP can affect larger and more mature infants. A study of ROP in Riyadh, Saudi Arabia reported 56% of all premature births developed ROP and 15% of these patients had stage 3 disease (severe ROP).[2] The mean gestational age (GA) of the ROP patients was 30 weeks.[2]

In 2010, approximately 184,700 (uncertainty range, 169,600–214,500) preterm infants developed ROP (all stages) worldwide. Twenty-thousand (range, 15,500–27,200) of these

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infants were severely visually impaired or blind. Additionally, 12,300 (8,300–18,400) preterm babies had mild to moderate visual impairment. Sixty-five percent of patients who are visually impaired due to ROP, were born in middle-income regions; 6.2% (4.3–8.9%) of all visually impaired infants with ROP were born later than 32 weeks gestational age.[3] In the majority of cases, ROP regresses and improves with observation. However, a small percentage of infants develop severe ROP that warrants laser treatment.

This prospective study evaluates the incidence of ROP among highly vulnerable infants at 32 weeks (or younger) gestational age and/or weighing less than 1500 g at birth. Additionally, the risk factors for ROP that contributed to ROP in this Saudi Arabian study population were evaluated.

Material and methods

This prospective, cohort study evaluated the incidence of ROP at the two hospitals and investigated the risk factors for ROP. This study evaluated premature infants for ROP who are admitted to the neonatal intensive care unit (NICU) from September 2012 to October 2013 at King Faisal Specialist Hospital and King Abdulaziz University Hospital in Jeddah, Saudi Arabia. Both facilities are tertiary care hospitals that treat ROP cases referred from the entire country. The research committee and biomedical ethics unit at King Abdulaziz University Hospital approved this study.

Inclusion criteria were, all infants who born $\leqslant$32 weeks gestational age and/or birth weight $\leqslant$1500 g. Infants born before 27 weeks were screened at 30–31 weeks postmenstrual age (PMA). Infants born after 27 weeks or weighing <1500 g were screened at 28–35 days postnatal age and screened weekly or every 2 weeks.[4] All infants were followed up till they developed ROP or the retina was fully vascularized.

All infants underwent indirect ophthalmoscopy after pupil dilation with 1% topical mydriacyl with a 28 D lens, insertion of a sterile lid speculum and scleral depression. Data were collected on gestational age, birth weight, risk factors, stage of ROP, zone of ROP, presence of plus disease, presence of threshold disease and the type of treatment.

A group of infants who did not develop ROP was compared to the group who developed ROP for the presence and absence of risk factors (Table 4). The risk factors that were assessed were, intraventricular hemorrhage, patent ductus arteriosus (PDA), sepsis, and hydrocephalus. The infants were assessed regularly until the retina was fully vascularized. Treatment was performed within 72 h of diagnosis. Infants who did not require laser treatment underwent routine vision screening, unless there was a specific concern. The indications for treatment of severe ROP were: zone I, any ROP with plus disease; zone I, stage 3 without plus disease; zone II, stage 3 with plus disease or; zone II, stage 2 with plus disease.[5]

Statistical analysis

The data were collected for statistical analysis and entered into the statistical package for social sciences (IBM Corp., Armonk, NY, USA). The relative risk was used to measure the risk and logistic regression was used to adjust for confounding factors. A *p* value less than 0.05 was considered statistically significant.

Results

Ninety-two premature infants were screened for ROP. There were 31 (33.7%; 16 females and 15 males) infants diagnosed with ROP and 12 (13%) infants required laser treatment. The mean gestational age was 26.7 weeks (range, 24 weeks to 29 weeks) and the mean birth weight was 0.843 kg (range, 0.606–1.450 kg).

There were fourteen (45.2%) infants with stage 3 ROP which was the most common type of ROP in this study (Table 1). The majority of cases (20 infants; 64.5%) were found in zone 3 (Table 2). The fewest cases of ROP were in zone 1 (2 cases; 6.5%) (Table 2). All cases needing treatment received laser therapy within 72 h of diagnosis (Table 3).

After adjusting for confounding factors with logistic regression, PDA and IVH had a significant effect on the occurrence of ROP. Hydrocephalus and sepsis were not significant risk factors for ROP (Tables 4 and 5). Laser photocoagulation was very effective in treating ROP. Out of all 31 patients with ROP, 19 cases regressed with observation and 12 cases regressed with laser therapy.

Discussion

The incidence of ROP is rising in developing countries and some premature infants with ROP are heavier than 1500 g. In Western countries, extremely low-birth-weight infants ($\leqslant$1000 g) are surviving due to advances in neonatal care. Hence there is an increase in the incidence of ROP in Western countries also. The mean birth weights of infants from highly developed countries ranged from 737 g to 763 g compared with values ranging from 903 g to 1527 g in less developed countries.[6] Mean GAs of infants from highly developed countries ranged from 25.3 weeks to 25.6 weeks compared to 26.3–33.5 weeks in less developed countries.[6]

A 2003 study of infants at King Khalid University Hospital in Riyadh, Saudi Arabia, reported an incidence rate of 41% for infants weighing <1500 g and the mean gestational age was 28 weeks and the mean birth weight was 1103 g.[7] Similarly, our study reported a relatively high incidence of ROP at 33.7% for infants weighing <1500 g with mean gestational age of 26.6 weeks and mean birth weight of 0.843 g. Another study in Saudi Arabia reported an incidence of ROP was 56% with a mean gestational age of 30 weeks for ROP patients and 15% of the patients were in stage 3 disease (severe ROP).[2] However, in our study there were 13% of cases with severe ROP that received laser treatment. A study from King Fahad Medical City, Saudi Arabia evaluated premature infants born at gestational age (GA) 32 weeks or younger

Table 1. Stages of the retinopathy of prematurity among premature infants from two tertiary care hospitals in Saudi Arabia.

Stage of ROP	Frequency (infants)	Percentage (%)
1	7	22.5
2	10	32.3
3	14	45.2
Total	31	100

ROP = retinopathy of prematurity

Table 2. Frequency of retinopathy of prematurity classified by zone.

Zone	Frequency (infants)	Percentage (%)
1	2	6.5
2	9	29
3	20	64.5
Total	31	100

Table 3. Plus disease among premature infants from two tertiary care hospitals in Saudi Arabia.

Plus disease	Frequency (infants)	Percentage (%)
Yes	12	38.7
No	19	61.3
Total	31	100

or birth weight (BW) 1500 g or less from January 1, 2007, until the end of December 2009.[8] The study by Dr. Afaf reported an ROP incidence of 30% in infants with mean GA of 27 weeks (range, 23–35 weeks) and mean birth weight of 907 g (range, 530–1730 g).[8]

The incidence of ROP in the current study is well within the range reported for other countries in the region and elsewhere. For example the incidence of ROP in Kuwait is 38.9%,[9] in Taiwan is 37.8%,[10] in Iran is 32%,[11] in Egypt is 19.2%,[12] in Jordan is 28.6%[13] and in Bahrain is 20.4%.[14] Most of these countries are reporting an increased incidence of ROP in infants weighing less than 1500 g.

In our study, the risk factors that were statistically significantly associated to ROP were PDA and IVH. However, two studies one from Turkey and the other from India, reported a relationship between PDA and incidence of ROP in infants younger than 32 weeks.[15,16] Additionally, an Irish study reported that in 68 infants with IVH, ROP was present in 33 infants (48.5%).[17] Another study from Saudi Arabia used predictive logistic regression model and reported intraventricular hemorrhage was a risk factor for ROP (OR = 2.90).[8]

Laser therapy is extremely effective for treatment of type 1 threshold ROP, with a success rate of 91–95% except for some zone 1 eyes.[18] We found that 13% of ROP cases required treatment. However, other studies have reported ROP treatment rates of 6.6% in Jordan,[13] 15% in Saudi Arabia,[2] 19% in Saudi Arabia,[7] 6% in Bahrain,[14] and 7.8% in Kuwait.[9] In our study, the disease regressed in all infants who received laser therapy. Based on our experience in the current study, laser photocoagulation was very effective in treating ROP. All our patients regressed either with observation or laser treatment and none progressed to stage 4 or 5 disease.

Table 5. Risk factors for retinopathy of prematurity after adjustment for confounding factors with logistic regression analysis.

	p-Value	Odds ratio O.R	95% confidence interval
PDA	0.003	6.201	1.850–20.780
IVH	0.000	29.968	5.515–162.828
Hydrocephalus	0.106	8.979	0.629–128.230
Sepsis	0.841	1.127	0.352–3.607

Intraventricular hemorrhage = IVH; patent ductus arteriosus = PDA

Conclusions

The incidence of ROP was 33.7%. The significant risk factors for ROP were PDA and IVH. Twelve (13%) cases underwent laser therapy which was very effective in preventing progression of the disease. Therefore, clinicians should be aware of the presence of these risk factors when monitoring premature infants. Timely laser therapy can reduce the visual morbidity associated with ROP.

Conflict of interest

The authors declared that there is no conflict of interest.

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Table 4. Risk factors for retinopathy of prematurity in the study group and a control group.

	ROP group	No ROP group	Relative risk(RR)	95% confidence interval	*p*-Value
PDA	Yes: 16 No:15	Yes: 9 No: 52	2.86	1.8–4.9	0.0005
IVH	Yes: 15 No: 16	Yes: 2 No: 59	4.13	2.6–6.6	0.0005
Hydrocephalus	Yes: 5 No: 26	Yes: 1 No: 60	2.76	1.7–4.46	0.008
Sepsis	Yes: 18 No: 13	Yes: 32 No: 29	1.163	0.649–2.085	0.610

ROP = retinopathy of prematurity

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