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Original Article

The incidence of retinopathy of prematurity in different gestational ages

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Abstract

Introduction: Since retinopathy of prematurity (ROP) is a preventable cause of blindness in children, evaluation of declared criteria for their screening is crucial. The aim of this study is to evaluate the incidence of the disease in Nikukari Eye Hospital according to gestational age and neonatal birth weight.

Methods: In this cross-sectional study, after determining the frequency of neonatal retinopathy based on patients referred to the ROP clinic, neonates were divided into groups of 500 to 1000 g, 1001 to 1500 g, 1501 to 2000 g, and above 2000 g, and 28 weeks, 28-30 weeks, 30-32 weeks, 32-34 weeks, and over 34 weeks, and the frequency of ROP in each group was compared.

Results: In the present study, 661 cases were evaluated, of which 93 infants (14.1%) had ROP. The mean ± standard deviation of birth weight of patients with ROP was 1199.51 ± 406.80 g and was significantly lower than those without ROP who had a mean birth weight of 2022.69 ± 649.73 g ($P = 0.001$). The mean ± standard deviation (SD) of gestational age of patients with ROP was 29.22 ± 2.67 weeks and was significantly lower than non-ROP patients, who had a mean gestational age of 33.41 ± 2.73 weeks ($P = 0.001$).

Conclusion: The results of our study showed that 13 newborns weighing between 1500 and 2000 g were affected by the disease, which indicates the importance of ongoing screening in this group of children.

Introduction

Retinopathy of prematurity (ROP) is the abnormal growth of blood vessels in the infants' retinal. The main pathological lesion in this disease is ischemic retinal neovascularization, which can lead to a wide range of visual impairments, ranging from minor defects in visual acuity to retinal detachment and blindness.[1,2] The disease is often preventable and can be treated if diagnosed early; otherwise, it can progress quickly and lead to blindness. Premature retinopathy prevalence and severity increase with low gestational age and birth weight.[3-5] ROP affects 30%-60% of infants weighing less than 1500 g, with 10% progressing to severe disease. ROP can be found in 98% of babies weighing less than 750 g.[5]

Different countries use different screening standards to determine premature babies who need to be screened. The latest clinical guidelines from the American Academy of Pediatrics in 2013 recommend that all infants less than 30 weeks of gestation and weighing less than 1501 grams should be examined.[6] Screening criteria in the United Kingdom include gestational age less than 32 weeks or birth weight less than or equal to 1500 g.[7,8] In 2012, the National ROP Commission of Iran stated in 2012 that the screening criteria were the gestational age of fewer than 32 weeks or the birth weight of less than 1501 g. However, in 2015, the criteria changed to be infants less than 34 weeks of gestation or a birth weight of less than or equal to 2000 g. Given that the National ROP Commission has decided to decrease the screening age to less than 32 weeks of gestation, obtaining information on cases of ROP born over 32 weeks of age can be used in committee decision-making.

It is necessary to have an appropriate screening standard in each community since eye examination of premature infants is painful and costly. Considering the differences between various sources in screening premature infants, in this study we aimed to evaluate the frequency of the disease at Nikukari Eye Hospital and to determine the frequency of disease based on gestational age and birth weight.

Methods

In a cross-sectional retrospective study, the medical

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records of all children who were examined in the ROP clinic of Nikukari Eye Hospital, Tabriz, Iran, in 2018 were studied. Given that the ROP Clinic of Tabriz Nikukari Eye Hospital is the only ROP diagnostic and treatment center in the province and all premature infants from intensive care units in the province are referred to this center, the frequency of ROP patients in the clinic indicates the incidence of ROP at Tabriz University of Medical Sciences. The inclusion criteria included the latest criteria of the National Commission for ROP approved in 2015, including infants equal or less than 34 weeks of gestation or birth weight equal or less than 2000 g or infants over 34 weeks of age who were referred because of critical conditions such as blood transfusions or severe infection. All examinations were performed by a retinal specialist. Diagnosis of ROP was made by the use of indirect ophthalmoscopy after administration of one drop of tropicamide (0.5%) and one drop of phenylephrine (2.5%). The posterior pole is visualized without scleral depression for plus disease, followed by peripheral examination with scleral depression for 360 degrees. The mentioned criteria in the International Classification of Retinopathy of prematurity were used for diagnosis. Cases with incomplete records or missed followed up were excluded. After determining the frequency of neonatal retinopathy based on the number of referrals, infants were divided into 500 to 1000, 1001 to 1500, 1501 to 2000, and over 2000 g in terms of birth weight, and the frequency of ROP was compared in each of the weight groups. Also, infants were divided into groups of under 28 weeks, 29 to 30 weeks, 31 to 32 weeks, 33 to 34 weeks, and over 34 weeks in terms of gestational age, and the frequency of ROP was compared in each age group.

The obtained data were analyzed using SPSS version 18 software. The quantitative variables' results were reported as mean and standard deviation, while the qualitative variables' results were reported as number and percentage. For the statistical study of qualitative variables, the chi square test was used and for quantitative variables, the paired *t* test was used. Success and significance were statistically significant in each of the variables with a *P* value of less than or equal to 0.05.

Results

In this study, the charts of 661 patients referred to the premature infant clinic were studied. Of the 661 cases, 379 were male (57.3%) and 282 were female (42.7%). The mean gestational age of the subjects was 32.82 ± 3.09 weeks (range: 25-42 weeks) with a median of 33 weeks. Also, the mean birth weight of all study cases was 1906.87 ± 683.95 g (range: 600-4200 g) with a median of 1800 g.

Of the 661 cases in this study, 93 (14.1%) had ROP. In terms of laterality, 17 cases (17.5%) of the right eye, 19 cases (19.6%) of the left eye, and 61 cases (62.9%) of both eyes were involved. The mean birth weight of patients with ROP was 1199.51 ± 406.80 g, which was significantly lower than patients without ROP, who had an average birth weight of 2022.69 ± 649.73 g at birth ($P = 0.001$). Table 1 shows the frequency of ROP in the different weight groups. Intragroup comparisons in the frequency of ROP in the different weight groups of patients are shown in Table 2. Among all infants examined at the premature infant clinic, 71.2% of patients weighing 500 to 1000 g had ROP. It was 25.2% in the group of 1001-1500 g, 6.3% in the group of 1501-2000 g and 1.2% in the group of over 2000 g.

In the study of the gestational age of patients with ROP, the mean was 29.22 ± 2.67 weeks, which was significantly lower than patients without ROP, who had an average gestational age of 33.41 ± 2.73 weeks ($P = 0.001$). Table 3 shows the frequency of ROP at the different gestational ages. Regarding pregnancy age, 61.7% in the group under 28 weeks, 33.8% in the group of 29-30 weeks, 13.3% in the group of 31-32 weeks, 4.4% in the group of 33-34 weeks, and 1% in the group over 34 weeks, had the disease. The results of intragroup comparisons are shown in Table 4.

Discussion

ROP is one of the ophthalmological problems that has an ascending trend in the world.[9] The main reason for the increase in the disease include the improvement of health indicators and the quality of neonatal intensive care unit departments, which led to the survival of a large number of premature infants. ROP can cause blindness in children and many economic, social, and psychological complications for families and society if left untreated. The present study showed that the overall frequency of ROP was 14.1% in the patients referred to Nikukari Eye Hospital in 2018. The prevalence of ROP in preterm infants with very low birth weight (1500 g and less) was 11.6%.

Table 1. The frequency of ROP cases based on the birth weight

Birth weight (g)	Frequency
500-1000	37
1001-1500	40
1501-2000	13
<2000	3
Total	93

Table 2. Intra-group comparison of the frequency of ROP in different weight groups

Group A	Group B	Difference of frequency in groups A and B	*P* value
500-1000	1001-1500	-3	0.1
500-1000	1501-2000	24	0.003
500-1000	2000<	34	0.004
1001-1500	1501-2000	27	0.001
1001-1500	2000<	37	0.01
1501-2000	2000<	10	0.06

Group A: Group that has been studied.
Group B: Group that was used to be compare to group A.

Table 3. The frequency of ROP cases based on the gestational age

Gestational age (wk)	Frequency
≤28	37
29-30	24
31-32	23
33-34	7
>34	2
total	93

Table 4. Intra-group comparison of the frequency of ROP in different gestational age groups

Group A	Group B	Difference of frequency in groups A and B	*P* value
≤28	29-30	13	0.002
≤28	31-32	14	0.01
≤28	32-34	30	0.002
≤28	34<	35	0.001
29-30	31-32	1	0.4
29-30	33-34	17	0.002
29-30	34<	22	0.01
31-32	33-34	16	0.01
31-32	34<	21	0.02
32-34	34<	5	0.09

Group A: Group that has been studied.
Group B: Group that was used to be compare to group A.

In a study by Riazi-Esfahani et al on 185 infants, patients with a gestational age of less than 37 weeks or a birth weight of less than 2500 g were assessed. The frequency of ROP was 12.4% in their study.[5] Fouladinejad et al examined 89 infants aged 29 to 34 weeks. They reported that the frequency of ROP was 6.5%. Low gestational age, low birth weight and receiving auxiliary oxygen were risk factors involved in the occurrence of ROP.[10] In the study of Naderian et al in Isfahan, which examined 604 newborns weighing between 560 and 1960 g and gestational age between 24 and 35 weeks, the incidence of ROP was 17.5%. In this study, it was noted that low birth weight and low gestational age are the main risk factors for ROP.[11]

Shah et al studied 564 low birth weight babies in Singapore. The frequency of ROP was 29.2%, and none of the patients over the age of 33 weeks had ROP.[12] Sarikabadayi et al, who examined 700 infants under 34 weeks of gestation and birth weight below 2000 g in Turkey, reported an ROP rate of 32.7%.[13] In a study by Gonçalves et al, in Brazil, infants with a gestational age of less than 32 weeks or a birth weight of less than 1500 g were assessed. In this study, the incidence of ROP was reported to be 44.5%, and similar to our study, birth weight below 1000 g and gestational age below 30 weeks were important risk factors for ROP.[14]

The rate of ROP in different countries is very various. In the less developed countries where most premature infants die, the prevalence of ROP is low, but in developed countries where premature infants survive with special care, the frequency ROP percentage is higher. Our country is in the middle of these two groups. Another reason for the low prevalence of ROP in our center is the examination of children with a gestational age of over 34 weeks and a weight of over 2000 g, most of whom were healthy on examination. In our study, 16 babies who weighed more than 1500 g at birth had ROP. Therefore, it is recommended that infants with a birth weight of 1500-2000 g be screened, especially when they have undergone cardiopulmonary support. The American Academy of Ophthalmology has also recommended this for ROP screening in 2018.[15] In our study, no association was found between the sex of patients and the incidence of ROP, which is consistent with other studies.[13,16]

The limitations of the present study include the retrospective design of the study; failure to record the duration of hospitalization of patients in neonatal intensive care unit (NICU); and the lack of staging of disease in the patients.

Conclusion

In summary, our study showed that the prevalence of ROP in Nikukari Eye Hospital was 14.1%, which was significantly lower than other parts of the country and the world. Also, 13 babies weighing between 1500 and 2000 g were affected by the disease, which indicates the importance of continuing screening in this group of children.

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Authors' Contribution

AEM carried out the design and coordinated the study, and participated in fundus exams. MRN participated in the neonate's examinations and follow-ups. VM and SEM assisted in data gathering and participated in manuscript editing.

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Ethical Approval

The present study, with code (IR.TBZMED.REC.1398.789), has been registered in the ethics committee of Tabriz University of Medical Sciences.

Study Highlights

What is current knowledge?

- Screening for ROP is essential for babies with gestational age less than 32 weeks and birth weight less than 1500 g.

What is new here?

- Screening is still important for babies weighting between 1500 and 2000 g.

Conflict of Interest

The author declares that they have no conflict of interest.

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