Original Article

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Paediatrics Section

Incidence of Retinopathy of Prematurity in a Tertiary Care Center of Northeast India

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ABSTRACT

Introduction: Retinopathy of Prematurity (ROP) is a blinding disease of premature and low birth weight babies with abnormal proliferation of the immature blood vessels at the junction of vascular and the avascular retina.

Aim: To study incidence of ROP in new born infants and its associated risk factors.

Materials and Methods: This was a prospective observational study done at a tertiary care centre after obtaining the ethical clearance and consent of parents. All the babies fulfilling the inclusion criteria were examined using indirect ophthalmoscopy after full mydriasis and subsequently followed up according to the schedule. Treatment was done according to the stages.

Results: Out of the total 89 babies, 13 babies (14.61%) had developed ROP in both the eyes during screening. The most important risk factors which were positively correlated were oxygen supplementation, Respiratory Distress Syndrome (RDS), foetal distress. Various other anterior and posterior segment diseases were identified during screening of ROP.

Conclusion: ROP is still one of the leading causes of preventable blindness in children. Universal eye screening must be implicated in all centres for all neonates.

Keywords: Oxygen supplementation, Premature babies, Respiratory Distress Syndrome

INTRODUCTION

ROP is a blinding disease of premature and low birth weight babies with abnormal proliferation of the immature blood vessels at the junction of vascular and the avascular retina.

The incidence of ROP is supposed to be relatively very high in middle income countries leading to a new epidemic, which may be due to the following reasons [1]-

1) Preterm birth occurs in higher ratio in middle income countries.

2) Such countries have high proportion of women giving birth in health care systems where premature babies are admitted in Neonatal Intensive Care Unit (NICU) which give them exposure to oxygen supplementation.

3) Improving survival rates.

4) Varying levels of neonatal care

5) Screening programs coverage is not 100%.

The American academy of Paediatrics, the American Association of Paediatric Ophthalmology and Strabismus, and the American Academy of Ophthalmology [2] has described many risk factors associated with increased risk of ROP, among which low birth weight and prematurity are supposed to be the most important ones.

MATERIALS AND METHODS

This prospective observational study was conducted for a period of one year between September 2015 and August 2016. The study was done in the NICU of a Guwahati Medical College and Hospital, Guwahati which is a tertiary care centre in Northeast India. All the babies admitted in Department of Neonatology were evaluated and those babies fulfilling the inclusion and exclusion criteria were undertaken for the study. The total of 178 eyes of 89 babies was evaluated and the results were statistically analysed.

Ethical clearance was obtained from the hospital ethics committee and informed consent of the parents was also obtained.

Inclusion Criteria

1. All neonates with birth weight < 1500 grams.
2. All neonates with gestational age < 32 weeks.
3. All infants with a birth weight between 1500 gm and 2000 gm or gestational age of more than 32 weeks with morbidities like

apnea of prematurity, twins and requiring cardiorespiratory support, prolonged oxygen therapy and blood transfusion etc.

Exclusion Criteria

1. All newborns with birth weight of more than 1500 gm and or gestational age more than 32 weeks with no history of cardiorespiratory support, ventilation, long duration oxygen therapy, apnea of prematurity, blood transfusion.

2. Lost to follow-up cases.

Ethical clearance was taken from the committee.

Procedure for Evaluation of Fundus

Pupils were dilated using tropicamide 0.4% and 1.25% phenylepherine thrice or more at interval of 10 minutes till complete mydriasis. All the babies were screened by a trained ophthalmologist after instilling topical anaesthesia 2% proparacaine and using lid speculum with indirect ophthalmoscopy and +20D lens with sclera depressor.

The babies diagnosed with ROP were classified according to International Classification of ROP (ICROP) [3]. Follow-up was done according to the schedule.

STATISTICAL ANALYSIS

The results were statistically analysed using fisher's exact test or Chi-square test for independence. The p-value < 0.05 was considered to be statistically significant.

RESULTS

Out of the total 89 babies, 13 babies (14.61%) had developed ROP in both the eyes during screening. The incidence of male babies having ROP was (8 out of 57) 14.04% whereas, for female babies was (5 out of 32) 15.63%. The male to female ratio was 1.6:1 among all screened babies.

The mean birth weight of all screened was 1414 gm, and the mean birth weight of ROP babies was 1405 gm. The mean gestational age was 32.65 weeks.

The risk factors which had very significant association with ROP in this study were oxygen supplementation (p-value-0.0182) with relative risk factor=0.8104, RDS p-value 0.0094, foetal distress with p-value of 0.0167. Around 29% of babies with ROP had RDS whereas, 30% had foetal distress, oxygen supplementation was given to 53% of babies out of which 22.91% had developed ROP which showed a strong association with p-value of 0.0182.

Other significant factors with positive correlation were phototherapy (p-value-0.0182) and gestational diabetes mellitus (p-value-0.0236).

The risk factors which were statistically not significant with ROP in the present study [Table/Fig-1].

Out of 178 eyes screened for ROP, 33 eyes were detected with diseases of anterior segment which were most probably not related to ROP [Table/Fig-2].

While screening the babies few posterior segment diseases other than ROP were also detected [Table/Fig-3].

Adequate and appropriate management was done for the above listed diseases.

Factors (Present Study)	p-value
Mode of delivery	0.75
Sex of baby	1.00
Fits	0.47
Apnea	0.15
Hyperbilirubinemia	0.05
HMD	1.00
Pre eclampsia	0.08
Multiple pregnancy	0.29

[Table/Fig-1]: Risk factors without significant correlation to ROP.

Anterior Segment Disease	Number of Total Eyes
Cataract	7
Conjunctivitis	17
Corneal Abrasion	3
Lid Ecchymosis	1
Cavernous Haemangioma Lids	2
Corneal Opacity	2
Iris Coloboma with Microphthalmus	1
Total	33

[Table/Fig-2]: Anterior segment disease among all screened babies.

Posterior Segment Fidings	Total Eyes
CMV Retinitis	2
Congenital Myopic Fundus	2
Pre Retinal Macular + Disc Haemmorhage	1
Chorioretinal Atrophic Patch	1
Total	6

[Table/Fig-3]: Posterior segment disease among all screened babies.

DISCUSSION

Various studies have been done all over the world to describe the incidence and risk factors of ROP, though few studies have been done in India specially in Northeast India.

The International Classification of Retinopathy of Prematurity (ICROP) [4] was used to stage the disease progression.

Recent studies by Chawla D et al., [5] and Chaudhari S et al., [6] have also suggested the same screening criteria.

The United Kingdom National Guidelines [7] recommended following guidelines for screening-

a) Birth weight <1501 gm.

b) Gestational age < 32 weeks.

The total of 178 eyes of 89 babies within the inclusion criteria in the present study showed the incidence of ROP to be 14.61%.

Earlier studies done by authors had different screening criteria which lead to different proportion of ROP babies. Also after detection of various risk factors specially like low birth weight and oxygen monitoring, many precautionary measures were taken to stop the occurrence and progression of ROP which lead to decrease in incidence of ROP [Table/Fig-4].

Few of the Indian studies with demonstration of incidence of ROP are [Table/Fig-5].

The present study showed slightly lower incidence compared to the few recent studies in India.

The reasons could be-

1) Smaller sample size due to smaller duration as compared to other studies.

2) Lost to follow-up cases, this could be due to-

a) Poor educational status and low socio-economic status of the parents.

b) Many patients were from far rural location with poor transportation services.

3) Different screening criteria used by various studies.

Low birth weight has already been described as the most important risk factor in most of the studies. The mean birth weight of babies who developed ROP in this study was found to be approximately 1415 gm. As prematurity of the retina has been found to be the primary factor for development of the disease, low birth weight babies are at the highest risk as most of them are premature [Table/Fig-6].

Study	Year	Incidence
Schaffer DB et al., [8]	1993	65.80%
Archambault P et al.,[9]	1987	15%
Fajolu IB et al.,[10]	2015	15%
Present Study	2016	14.61%

[Table/Fig-4]: Showing incidence of ROP in various studies worldwide.

Study	Year	Incidence
Charan R et al.,[11]	1995	38.00%
Maheshwari R et al.,[12]	1995	20%
Chaudhari S et al.,[13]	2009	22.30%
Present Study	2016	15%

[Table/Fig-5]: Demonstrating incidence of ROP in various indian studies.

The risk factors which had significant association with ROP in this study were as follows-

Study	Mean POG (weeks)	Mean BW (grams)
Charan R et al.,[11]	32.47	1382
Gopal L et al.,[14]	32.4	1477
Vinekar A et al.,[15]	30.09	1533
Present Study	32.65	1415

[Table/Fig-6]: Showing mean POG and birth weight of all screened babies in various Indian studies.

1) Oxygen Supplementation

In the present study oxygen supplementation was found to be a very significant factor (p-value- 0.0182) with relative risk factor= 0.8104 [Table/Fig-7].

Study	p-value
Chaudhri S et al.,[13]	<0.05
Gupta N et al.,[16]	0.031
Present study	0.0182

[Table/Fig-7]: Showing association of oxygen supplementation with ROP in various studies.

The high association of extended oxygen supplementation with ROP in present study can be due to –

a) This study was done in a tertiary care centre where a huge number of babies are referred to Department of Paediatrics and Neonatology which leads to voluminous admission.

b) Lack of adequate para medical staff and man power to manage this volume of admissions and have constant monitoring of oxygen supplementation.

c) Lack of pulse oxymetry and other devices for each and every baby.

2) Foetal Distress

The present study signifies foetal distress to be a very significant independent risk factor with p-value of 0.0167.

The high number of high risk pregnancies contributes to the large amount of fetal distress cases in our hospital as it is a referral tertiary centre.

3) Respiratory Distress Syndrome

The two-sided p-value was 0.0094 and was statistically very significant to be an associated risk factor for ROP in the present study. Lin HJ et al., [17] in China have recorded the same

risk factor. Recently Kavurt S et al., [18] found RDS to be an associated risk factor with p-value < 0.001. The finding of the present study correlates with the findings of the other studies.

4) Phototherapy

In the current study phototherapy is found to be statistically related to ROP with p-value of 0.0036.

The association in the present study could be due to-

a) High number of cases with neonatal hyperbilirubinemia.

b) Lack of adequate para medical staff to monitor each baby for adequate time exposure to phototherapy light.

5) Gestational Diabetes

The present study showed the association of gestational diabetes with ROP to be significant (p-value is 0.0036).

Being a tertiary centre many high risk cases are referred to our tertiary hospital. Gestational diabetes leads to foetal distress which in turn requires extended oxygen supplementation. Yau GS et al., found gestational diabetes to be not statistically significant [19].

In the current study finding, mode of delivery (p=0.7503) and the sex of the baby (p=1.000) had no significant correlation with development of retinopathy of prematurity, which resembles to the results reported by most of the studies.

Stages of ROP

In the present study during screening around 61.5% of babies has stage 1 ROP, 23% had stage 2 ROP, 7.2% had stage 4 and stage 5 ROP each.

All the cases of stage 1 and 2 irrespective of zone had resolved spontaneously. Cases in stage 4 or stage 5 did not resolve even after the appropriate management. The babies were referred for laser therapy in stage 4 zone 1 and for retinal surgery in stage 5 zone 1.

Ju RH et al., reported spontaneous regression of 87% and 57% cases in stage 1 and 2 respectively. He also reported diseases in zone 3 had 100% regression rate and 0 % if the disease was in zone 1 [20]. The present study shows similar result.

Anterior and Posterior Segment Disorders: In the present study, the total of 33 eyes out of 178 screened eyes demonstrated few anterior segment disorders and six eyes demonstrated posterior segment disorders, which were probably not related to ROP disease.

The most common anterior segment disorders were conjunctivitis, followed by mild to moderate lenticular opacity in one or both eyes and corneal abrasion. Other diseases were lid ecchymosis, cavernous haemangioma, corneal opacity, iris neovascularisation an iris coloboma with mircrophthalmos.

Posterior segment diseases- other than ROP few other diseases like cmv retinitis, congenital myopic fundus, pre retinal macular haemorrhage and chorioretinal atrophic patch were found among the screened newborns.

The neonate with CMV retinitis had vasculitis with multiple haemorrhages in both eyes on fundoscopy, along with positive CMV antibody titre.

These findings were found to be in babies who fulfilled the screening criteria. Appropriate examination and management was done for all diseases.

Many of the diseases such as cataract, lid haemangioma, corneal opacity, pre retinal macular haemorrhage can lead to amblyopia and blinding disease. As the screening criteria consisted only a small chunk of babies which underwent examination, many of the babies who might have had such similar disease would had been missed due to not fulfilling the screening criteria. Hence, we propose that universal eye screening is essential for all neonates irrespective of their birth weight and gestational age.

Vinekar A et al., proposed universal eye screening of newborns. They reported that out of 1021 healthy full-term newborns, 48(4.7%) babies had abnormal findings and few of whom needed surgical intervention. This shows that a large number of diseases go unnoticed in newborns [21].

LIMITATIONS

1) Small group of study population as compared to other studies.

2) Study done in tertiary centre with high load of complicated delivery along with inadequate para medical staff for constant monitoring.

CONCLUSION

ROP is currently one of the leading causes of preventable blindness in children especially in the developing countries. A universal eye screening program with wide coverage is essential for early detection of the disease and a good working knowledge has to be imparted to all medical and para medical staff about the disease.

REFERENCES

[1] Azad R, Chandra P. Retinopathy of prematurity. Journal of the Indian Medical Association. 2005;103(7):370-72.
[2] American Academy of Pediatrics. Screening examination of premature infants for retinopathy of prematurity. Pediatrics. 2006;117(2):572-76.
[3] Gole GA, Ells AL, Katz X, Holmstrom G, Fielder AR, Capone Jr A, et al. The international classification of retinopathy of prematurity revisited. JAMA Ophthalmology. 2005;123(7):991-99.
[4] Garner A. An international classification of retinopathy of prematurity. Archives of Ophthalmology. 1984;102(8):1130-34.

[5] Chawla D, Agarwal R, Deorari AK, Paul VK. Retinopathy of prematurity. Indian J Pediatr. 2008;75(1):73-76.
[6] Chaudhari S, Patwardhan V, Vaidya U, Kadam S, Kamat A. Retinopathy of prematurity in a tertiary care center-incidence, risk factors and outcome. Indian Pediatrics. 2009;46(3):219.
[7] Wilkinson AR, Haines L, Head K, Fielder AR. UK retinopathy of prematurity guideline. Eye. 2009;23(11):2137.
[8] Schaffer DB, Palmer EA, Plotsky DF, Metz HS, Flynn JT, Tung B, et al. Cryotherapy for retinopathy of prematurity cooperative group. prognostic factors in the natural course of retinopathy of prematurity. Ophthalmology. 1993;100(2):230-37.
[9] Archambault P, Gomolin JE. Incidence of retinopathy of prematurity among infants weighing 2000 g or less at birth. Canadian Journal of Ophthalmology. 1987;22(4):218-20.
[10] Fajolu IB, Rotimi-Samuel A, Aribaba OT, Musa KO, Akinsola FB, Ezeaka VC, et al. Retinopathy of prematurity and associated factors in Lagos, Nigeria. Paediatrics and International Child Health. 2015;35(4):324-28.
[11] Charan R, Dogra MR, Gupta A, Narang A. The incidence of retinopathy of prematurity in a neonatal care unit. Indian Journal of Ophthalmology. 1995;43(3):123.
[12] Maheshwari R, Kumar H, Paul VK, Singh M, Deorari AK, Tiwari HK. Incidence and risk factors of retinopathy of prematurity in a tertiary care newborn unit in New Delhi. The National Medical Journal of India. 1995;9(5):211-14.
[13] Chaudhari S, Patwardhan V, Vaidya U, Kadam S, Kamat A. Retinopathy of prematurity in a tertiary care center--incidence, risk factors and outcome. Indian pediatrics. 2009 ;46(3):219.
[14] Gopal L, Sharma T, Ramachandran S, Shanmugasundaram R, Asha V. Retinopathy of prematurity: a study. Indian journal of ophthalmology. 1995;43(2):59.
[15] Vinekar A, Dogra MR, Sangtam T, Narang A, Gupta A. Retinopathy of prematurity in Asian Indian babies weighing greater than 1250 grams at birth: ten year data from a tertiary care center in a developing country. Indian Journal of Ophthalmology. 2007;55(5):331.
[16] Gupta N, Datti NP, Beeregowda Y, Krishnappa K, Krishnamurthy D. Study of Incidence, Clinical Staging and Risk Factors of Retinopathy of Prematurity in Rural Area. J Clin Biomed Sci. 2013;3(2):80.
[17] Lin HJ, Lin CC, Tsai SW, Lin HC, Su BH. Risk factors for retinopathy of prematurity in very low birth-weight infants. Journal of the Chinese Medical Association: JCMA. 2003;66(11):662-68.
[18] Kavurt S, Özcan B, Aydemir O, Bas AY, Demirel N. Risk of retinopathy of prematurity in small for gestational age premature infants. Indian Pediatrics. 2014;51(10):804-06.
[19] Yau GS, Lee JW, Tam VT, Liu CC, Chu BC, Yuen CY. Incidence and risk factors for retinopathy of prematurity in extreme low birth weight Chinese infants. International Ophthalmology. 2015;35(3):365-73.
[20] Ju RH, Zhang JQ, Ke XY, Lu XH, Liang LF, Wang WJ. Spontaneous regression of retinopathy of prematurity: incidence and predictive factors. International Journal of Ophthalmology. 2013;6(4):475.
[21] Vinekar A, Govindaraj I, Jayadev C, Kumar AK, Sharma P, Mangalesh S, et al. Universal ocular screening of 1021 term infants using wide-field digital imaging in a single public hospital in India–a pilot study. Acta ophthalmologica. 2015;93(5):e372-76.

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