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Prevalence and risk factors of retinopathy of prematurity among neonates in Bharatpur, Chitawan, Nepal

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ABSTRACT

Introduction: Retinopathy of prematurity (ROP) is an important cause of preventable blindness in prematurely born children. With the advancement of neonatal care for these children, the rate of their survival is increasing, so is the probability of development of ROP among them.

Objectives: To assess the prevalence and risk factors of retinopathy of prematurity among infants

Methodology: A retrospective observational study was conducted at the Department of Paediatric ophthalmology, Bharapur Eye Hospital. Records from 1st July 2022 to 31st Dec 2023 were analyzed. It included preterm babies with a gestational age of ≤ 34 weeks and/or a birth weight of ≤1750 g and older children on oxygen therapy referred for ocular examination. maternal and neonatal risk factors were noted. Chi-square test and independent t-tests were used to analyze data with p- value ≤ 0.05 as significant.

Results: A total of 141 neonates were screened, 68 (48.23%) male and 73 (51.77%) female. Mean delivery age was 33.007±2.38 weeks (range: 26-40 weeks), and mean birth weight was 1638.16±464.58 g (range: 840-3180 g). Normal vaginal deliveries were 35 (24.82%), and C-sections were 106 (75.18%). ROP incidence was 20 (14.18%) out of which 8 (40%) neonates with ROP were referred to higher centre, while the rest resolved spontaneously. Premature rupture of the membrane 44 (31.31%) was the major maternal risk factor, and respiratory distress syndrome was noted in 21 (14.89%) neonates.

Conclusion: ROP screening should be performed in all preterm low birth weight infants. Reducing childhood blindness from ROP requires combined efforts from neonatologists, obstetricians, and ophthalmologists.

Keywords: Preterm delivery; Retinopathy of prematurity (ROP); Risk factors; screening.

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INTRODUCTION

Every year, approximately 15 million babies, accounting for 11.1% of all births worldwide, are born preterm. Notably, 13.3% of these preterm births occur in South Asia alone.[1] In Nepal, around 81,000 newborns are born preterm annually.[2] A study conducted in 2010 reported an incidence rate of 93 preterm births per 1,000 live births in Nepal.[3] Globally, we are witnessing an increase in the incidence of Retinopathy of Prematurity (ROP), particularly in low- and middle-income countries (LMICs). This trend is largely due to the growing number of neonatal intensive care units and the enhanced survival rates of preterm and low birth weight infants.[4] Infants with ROP in developing countries tend to have higher birth weights and older gestational ages compared to those in developed countries. Consequently, this has led to more liberal screening guidelines and a higher population at risk in LMICs.[5-7] This increase in screening burden is particularly challenging due to the lower number of trained ophthalmologists available per capita

in these regions.[7] With the improvement of neonatal care facilities and the expertise of healthcare professionals, the survival rates of premature infants in our hospitals are also increasing. In Nepal, the incidence of ROP has been reported to range between 22.6% and 29.5%.[8-10].

METHODOLOGY

A Retrospective observational study was conducted at the Department of Paediatric Ophthalmology in Bharatpur Eye Hospital (BEH) from July 1, 2022 to Dec 31, 2023. The data were taken from hospital-based record. All preterm babies with the gestational age of ≤ 34 weeks and/or birth weight of ≤1750 gm as well as older newborns who were sick requiring oxygen therapy and were referred to BEH from general hospital for ocular examination were included in the study. ROP classification followed international classification of retinopathy of prematurity (ICROP) guideline. Ethical approval was obtained before the commencement of the study, from the Institutional Review Committee (IRC) of Nepal Netra Jyoti Sangh (NNJS, Reg. no 31/2024).

First examination was conducted at the time when the child presented to the Pediatric Department of BEH. Pupils were dilated with a mixture of Phenylephrine 2.5% and Tropicamide 0.5% instilled three times at 15 minutes' interval about one hour before the scheduled examination. After decreasing the room illumination, indirect ophthalmoscopy was done by using a 20D Volk lens. One drop of two percent proparacaine was used for anesthesia. A pediatric wire speculum was used to keep the eyelids apart. Indentation was done using a scleral depressor. Classification of ROP was done according to the international classification of ROP (ICROP).[11] Babies were divided into two groups, ROP positive and ROP negative groups. They were further divided according to the stage and the zone of involvement of the disease. Maternal and neonatal risk factors were noted.

Follow up: If ROP was not detected at the initial examination, the infants were re-evaluated once every two weeks until vascularization was complete. If ROP was detected, the examinations were performed weekly for stage one to two disease and more frequently for stage three disease, till the disease started resolving or progressed to the pre threshold stage. Babies showing evidence of regression were followed up weekly till vascularization was complete. Babies progressing to the pre threshold stage were referred for treatment with intravitreal bevacizumab or photocoagulation.

The data generated was managed with Microsoft Excel 2016 (Microsoft Corporation, Redmond, Washington, United States) and Epi info version 7.02 (Centers for Disease Control, Atlanta, Georgia, United States). Chi square test was used to determine associations and Students' t- test was used to compare two means. A p-value of <0.05 was taken as significant.

RESULTS

Total number of neonates screened for the first time were 141, 68 (48.23%) of them were male and 73 (51.77%) were female. Among them 20 (14.18%) were positive for ROP screening and remaining i.e., 121 (85.82%) were negative . Fifteen (75%) of them had stage three ROP. In the classification according to the zone of involvement, 11 (55%) were in zone three, seven (35%) in zone two and two (10%) were in in zone one group (table 1).

The mean age of delivery was 33.007±2.38 weeks (range, 26-40 weeks).

The mean birth weight was 1638.16464.58gm (range, 840-3180 gm). Oxygen supplementation was given in 127 (90.07%) children and 13 (9.22%) had received mechanical ventilation. The gestational age (p value=0.02) and duration of oxygen therapy (p value= 0.03) were significantly associated with ROP where as birth weight had no significant association with ROP (p value=0.23)

Spontaneous vaginal delivery cases were 35 (24.82%) and Caesarean Section delivery were 106 (75.18%). Ninety-three (65.96%) were single born Forty-five (31.91%) of the neonates were twins, 3 (2.13%) were triplets. Respiratory distress syndrome (RDS) was present in 21(14.89%) of the neonates. Forty-four (31.31%) of mothers had premature rupture of membrane. Gestational diabetes and maternal hypertension were present in 19 (13.48%) each. Gender of newborn, type of pregnancy, use of mechanical ventilation and presence of respiratory distress syndrome were not significantly associated with ROP (table 2).

Among the 20 children in who were ROP positive 8 (40%) were referred to higher centre for further evaluation and treatment and the rest 12 (60%) resolved spontaneously.

Table 1: Prevalence of retinopathy of prematurity among neonates

Retinopathy of prematurity	n (%)
Total Positive	20 (14.18)
Stage 2	4(20)
Stage 3	15 (75)
Stage 4	1(5)
Negative	121(85.82)

Table 2: Association of various risk factors with retinopathy of prematurity

Variables	ROP positive mean±SD	ROP negative mean±SD	*p-value
Gestational age, weeks	31.35±2.23	33.28±2.29	0.02†
Birth weight, gram	1393.75±353.54	1678.55±469.49	0.23
Duration of Oxygen therapy, days (mean)	10.6±10.97	5.09±7.22	0.003†
	n (%)	**n (%)**	**‡p-value**
Gender			
Male	13(19.12%)	55 (80.88%)	0.17
Female	7 (9.59%)	66 (90.41%)	
Delivery type			
Spontaneous vaginal delivery	7 (20%)	28 (80%)	0.39
Caesarian section	13 (12.26%)	93 (87.74%)	
Type of Gestation			
Single	17 (18.28%)	76 (81.72%)	0.09
Multiple	3 (6.25%)	45 (93.75%)	
Mechanical ventilation	3 (23.08%)	10 (76.92%)	0.58
Respiratory distress syndrome (RDS)	4 (19.05%)	17 (80.95%)	0.49
Premature rupture of membrane (PROM)	9 (20.45%)	35 (79.55%)	0.15

*=independent t test, †=p value significant at <0.05, ‡= chi-square test

DISCUSSION

ROP is a leading cause of treatable visual impairment in premature babies. With the advancement of neonatal intensive care units (NICUs) in Nepal, more small and sick neonates are surviving, leading to a likely rise in the incidence of ROP and an increase in the number of ROP examinations. In our study, the incidence of ROP was 14.18% which was lower than that reported in other studies conducted in Nepal[8-10]. This discrepancy may be due to the fact that we analyzed the hospital records of the prematurely born children who visited BEH, whereas, other studies included preterm children whose examination were performed in the NICUs. Additionally, not all the premature children from Bharatpur might have reached BEH, which could also account for the lower incidence rate observed in our study.Many studies have revealed that Gestational age and birth weight are important factors related to the development of ROP in premature infants.[12-18] The results of our study align with previous findings that the incidence of ROP is inversely proportional to gestational age and birth weight. While gestational age remained significantly associated with ROP in our study, no statistical association was found between birth weight and ROP, consistent with the study by Nguyen et al.[12] The presentation of ROP in infants with lower gestational age and birth weight suggests that appropriate screening criteria should be established for detecting premature infants with ROP in Nepal. Our study did not show significant relationship between sex and the occurrence of ROP, in contrast to Darlow et al.,[19] who found that male sex is a significant risk factor. Longer duration of oxygen supplementation has been suggested to relate to ROP severity. [20,21] We found a significant relationship between the occurrence of ROP and the duration of oxygen therapy, consistent with the study by Abdel et al. [22] Additionally, while mechanical ventilation was identified as a significant risk factor in the study by Nguyen et al.[12], [it] it did not show statistical

significance in our study. Of the mothers, 44 (31.21%) had a history of premature rupture of the membrane (PROM) which was similar to the study done by Shrestha et al.[10] where 28 (31%) had a history of PROM.

In our study, 21 (14.89%) babies had respiratory distress syndrome (RDS), out of which only 4 (19.04%) developed ROP. In contrast, the study by Shrestha et al. found that 13 (30.2%) with ROP also had had RDS. [10] Out of 20 neonates with ROP, 15 (75%) had stage 3 disease, 4 (20%) had stage 2 ROP and 1 (5%) had stage 4 ROP which was different from the study done by Adhikari et al. where Stage 1 disease was seen in 5 (35.71%) babies, stage 2 in 6 (42.85%) and stage 3-5 seen in 3 (21.42%) babies.[8] In the classification according to the zone of involvement, 11 (55%) were in zone 3, 7 (35%) in zone 2 and 2(10%) in zone 1 group which was similar to the study done by Adhikari et al.[8]

Our study found an insignificant association between ROP and several factors, including gender, type of delivery, multiple gestation, premature rupture of fetal membrane, and respiratory distress syndrome. This observation aligns with other published data.[23]

CONCLUSION

Retinopathy of Prematurity is a significant cause of preventable blindness. With the improvement of NICU facilities in our part of the world, the incidence of ROP is on the rise. Prevention of prematurity, providing appropriate medical care to neonates and using oxygen judiciously may reduce the incidence of ROP in these newborns. A team approach and inter-disciplinary coordination are essential in the national effort to combat this preventable cause of blindness.

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REFERENCES

1. Blencowe H, Cousens S, Oestergaard MZ, Chou D, Moller AB, Narwal R, Adler A, Vera Garcia C, Rohde S, Say L, Lawn JE. National, regional, and worldwide estimates of preterm birth rates in the year 2010 with time trends since 1990 for selected countries: a systematic analysis and implications. Lancet. 2012 Jun 9;379(9832):2162-72. [PubMed | Full Text | DOI]
2. Every Preemie - SCALE. Nepal profile of preterm and low birth weight prevention and care. 2014. [Full Text]
3. Gurung A, Wrammert J, Sunny AK, Gurung R, Rana N, Basaula YN, Paudel P, Pokhrel A, Kc A. Incidence, risk factors and consequences of preterm birth - findings from a multi-centric observational study for 14 months in Nepal. Arch Public Health. 2020 Jul 17;78:64. [PubMed | Full Text | DOI]
4. Quinn GE. Retinopathy of prematurity blindness worldwide: phenotypes in the third epidemic. Eye Brain. 2016 May 19;8:31-36. [PubMed | Full Text | DOI]
5. Gilbert C. Retinopathy of prematurity: a global perspective of the epidemics, population of babies at risk and implications for control. Early Hum Dev. 2008 Feb;84(2):77-82. [PubMed | Full Text | DOI]
6. Gilbert C, Fielder A, Gordillo L, Quinn G, Semiglia R, Visintin P, Zin A; International NO-ROP Group. Characteristics of infants with severe retinopathy of prematurity in countries with low, moderate, and high levels of development: implications for screening programs. Pediatrics. 2005 May;115(5):e518-25. [PubMed | Full Text | DOI]
7. Dogra MR, Katoch D. Clinical features and characteristics of retinopathy of prematurity in developing countries. Ann Eye Sci. 2018 Jan;3(1):1e7. [PubMed | Full Text | DOI]
8. Adhikari S, Badhu BP, Bhatta NK, Rajbhandari RS, Kalakheti BK. Retinopathy of prematurity in a tertiary care hospital in eastern Nepal. JNMA J Nepal Med Assoc. 2008 Jan-Mar;47(169):24-7. [PubMed | Full Text | DOI]
9. Shrestha JB, Bajimaya S, Sharma A, Shresthal J, Karmacharya P. Incidence of retinopathy of prematurity in a neonatal intensive care unit in Nepal. J Pediatr Ophthalmol Strabismus. 2010 Sep-Oct;47(5):297-300. [PubMed | Full Text | DOI]
10. Shrestha JB,Yadav R, Shrestha J, Shrestha L.Risk factors associated with retinopathy of prematurity among neonates in a tertiary care hospital in Nepal.J Kathmandu Medical College. 2016; 5(1): 28-33.[Full Text | DOI]
11. International Committee for the Classification of Retinopathy of Prematurity. The International Classification of Retinopathy of Prematurity revisited. Arch Ophthalmol. 2005 Jul;123(7):991-9. [PubMed | Full Text | DOI]
12. Nguyen TTB, Bui VT, Pham VPT, Pham TN. Retinopathy of Prematurity: A Study of Incidence and Risk Factors in a Tertiary Hospital in Vietnam. Clin Ophthalmol. 2022 Oct 10;16:3361-3367. [PubMed | Full Text | DOI]

13. Reyes ZS, Al-Mulaabed SW, Bataclan F, Montemayor C, Ganesh A, Al-Zuhaibi S, Al-Waili H, Al-Wahibi F. Retinopathy of prematurity: Revisiting incidence and risk factors from Oman compared to other countries. Oman J Ophthalmol. 2017 Jan-Apr;10(1):26-32. [PubMed | Full Text | DOI]
14. Yau GS, Lee JW, Tam VT, Liu CC, Yip S, Cheng E, Chu BC, Yuen CY. Incidence and Risk Factors of Retinopathy of Prematurity From 2 Neonatal Intensive Care Units in a Hong Kong Chinese Population. Asia Pac J Ophthalmol (Phila). 2016 May;5(3):185-91. [PubMed | Full Text | DOI]
15. Bassiouny RM, Ellakkany RS, Aboelkhair SA, Mohsen TA, Othman IS. Incidence and risk factors of retinopathy of prematurity in neonatal intensive care units: Mansoura, Egypt. J Egypt Ophthalmol Soc. 2017;110(3):71. [Full Text | DOI]
16. Coutinho I, Pedrosa C, Mota M, et al. Retinopathy of prematurity: results from 10 years in a single neonatal intensive care unit. J Pediatr Neonat Individual Med. 2017;6(1):e060122. [Full Text | DOI]
17. Azami M, Jaafari Z, Rahmati S, Farahani AD, Badfar G. Prevalence and risk factors of retinopathy of prematurity in Iran: a systematic review and meta-analysis. BMC Ophthalmol. 2018 Apr 2;18(1):83. [PubMed | Full Text | DOI]
18. Kim SJ, Port AD, Swan R, Campbell JP, Chan RVP, Chiang MF. Retinopathy of prematurity: a review of risk factors and their clinical significance. Surv Ophthalmol. 2018 Sep-Oct;63(5):618-637. [PubMed | Full Text | DOI]
19. Darlow BA, Hutchinson JL, Henderson-Smart DJ, Donoghue DA, Simpson JM, Evans NJ; Australian and New Zealand Neonatal Network. Prenatal risk factors for severe retinopathy of prematurity among very preterm infants of the Australian and New Zealand Neonatal Network. Pediatrics. 2005 Apr;115(4):990-6. [PubMed | Full Text | DOI]
20. Ashton N, Ward B, Serpell G. Effect of oxygen on developing retinal vessels with particular reference to the problem of retrolental fibroplasia. Br J Ophthalmol. 1954 Jul;38(7):397-432. [PubMed | Full Text | DOI]
21. Teoh SL, Boo NY, Ong LC, Nyein MK, Lye MS, Au MK. Duration of oxygen therapy and exchange transfusion as risk factors associated with retinopathy of prematurity in very low birthweight infants. Eye (Lond). 1995;9 (Pt 6):733-7. [PubMed | Full Text | DOI]
22. Abdel HA, Mohamed GB, Othman MF. Retinopathy of Prematurity: A Study of Incidence and Risk Factors in NICU of Al-Minya University Hospital in Egypt. J Clin Neonatol. 2012 Apr;1(2):76-81. doi: 10.4103/2249-4847.96755. PMID: 24027695; PMCID: PMC3743140. [PubMed | Full Text | DOI]
23. Chaudhari S, Patwardhan V, Vaidya U, Kadam S, Kamat A. Retinopathy of prematurity in a tertiary care center--incidence, risk factors and outcome. Indian Pediatr. 2009 Mar;46(3):219-24. [PubMed | Full Text]