Acta Scientific PAEDIATRICS (ISSN: 2581-883X)

Volume 4 Issue 4 April 2021

Research Article

A Study on Incidence, Risk Factors and Clinical Profile on Retinopathy of Prematurity in Preterm Babies

Chaya K A[1]* and Prakash K Wari[2]

[1]*Assistant Professor, Department of Pediatric, JJMMC, Davanagere, Karnataka, India*

[2]*Professor and HOD of Pediatrics , KIMS Hubli, Karnataka, India*

***Corresponding Author:** Chaya K A, Assistant Professor, Department of Pediatric, JJMMC, Davanagere, Karnataka, India.

Received: February 24, 2021

Published: March 29, 2021

Abstract

Introduction: Retinopathy of prematurity (ROP) is a multi-factorial vasoproliferative retinal disorder. Prematurity being the important consistent risk factor for the development of ROP, along with other risk factors like - low birth weight (LBW), very low birth weight (VLBW), extremely low birth weight (ELBW), unmonitored oxygen therapy, sepsis, apnea, blood transfusion, babies on mechanical ventilation for longer duration [1]. Infants with birth weight < 1,250 grams (g) have 65% risk of developing ROP and 80% of those with birth weight < 1,000g [8].

Objective: Preterm babies are acutely vulnerable requiring special care to remain alive. Retinopathy of prematurity is an important complication in premature babies. Objective was to study the incidence, risk factors and clinical profile of retinopathy of prematurity in preterm neonates admitted to NICU of KIMS, Hubli.

Materials and Methods: Hospital based, prospective clinical study was carried out for one year on neonates born with gestational age ≤ 35 weeks or birth weight ≤ 2000 grams during study period. They were examined by indirect ophthalmoscopy between 3 to 4 weeks after birth and followed up till retinal vascularization was complete. Antenatal and neonatal risk factors were noted. Data analyzed by using IBMSPSS20.0.

Results: Hospital based, prospective clinical study was carried out for one year on neonates born with gestational age ≤ 35 weeks or birth weight ≤ 2000 grams during study period. They were examined by indirect ophthalmoscopy between 3 to 4 weeks after birth and followed up till retinal vascularization was complete. Antenatal and neonatal risk factors were noted. Data analyzed by using IBMSPSS20.0.

Conclusion: Meticulous fundus examination with indirect ophthalmoscopy in all preterm babies with gestational age < 35 weeks and birth weight < 2000 grams will yield better detection of retinopathy of prematurity and prevents complications. Babies with antenatal risk factors like multiple gestation and maternal anemia, events during NICU stay like development of sepsis, respiratory distress syndrome, apnea and oxygen therapy should be closely monitored for development of ROP. Existing non-invasive and cost effective measures for early detection of ROP should be utilized.

Keywords: Preterm; Retinopathy of Prematurity; Respiratory Distress Syndrome; Sepsis; Oxygen Therapy; Premature

Abbreviations

BW: Birth Weight; CPAP: Continuous Positive Airway pressure; CVS: Cardio-Vascular System; ELBW: Extremely low birth weight; GA -Gestational Age; GCSF: Granulocyte colony-stimulating factor; GDP: Gross Domestic Product; HIV: Human Immunodeficiency Virus; HBsAg: Hepatitis B surface Antigen; ICROP: The International Classification of Retinopathy of Prematurity; KIMS: Karnataka Institute of Medical Sciences; LBW: Low birth weight; MDG: Millennium Development Goal; NEC: Necrotising; Entero: Colitis; NICU: Neonatal Intensive Care Unit; POG: Period of Gestation; RET Cam:

Retinal examination Camera; RDS: Respiratory Distress Syndrome; ROP: Retinopathy of prematurity; RS: Respiratory System; STI: Sexually Transmitted Infection; VEGF: Vascular Endothelial Growth Factor; VLBW: Very low birth weight; Yrs: Years; WHO: World Health Organization

Introduction

Retinopathy of prematurity (ROP) is a multi-factorial vasoproliferative retinal disorder. Prematurity being the important consistent risk factor for the development of ROP, along with other risk factors like - low birth weight (LBW), very low birth weight (VLBW), extremely low birth weight (ELBW), unmonitored oxygen therapy, sepsis, apnea, blood transfusion, babies on mechanical ventilation for longer duration [1]. Infants with birth weight < 1,250 grams (g) have 65% risk of developing ROP and 80% of those with birth weight < 1,000g [8]. More than one in 10 of babies born around the world are born prematurely, constituting about 15 million. Preterm babies are acutely vulnerable requiring special care to remain alive [1]. Preventable and treatable conditions constitute more than 80% of all newborn deaths [2]. Causes of neonatal death like low birth weight (LBW) and prematurity, infections, birth asphyxia and birth trauma remain the same over years [3]. Preterm babies particularly with low birth weight are at much greater risk of dying or getting sick like becoming blind than other newborns [4].

Child's eyes cannot be considered smaller versions of that of adults [5]. Since ROP is essentially asymptomatic in early stages without clinical signs or symptoms, present recommendation is to screen and conduct regular examination of retinal changes of ROP in "at risk" infants to minimize risk of visual loss [7]. Children's eye care require specific expertise, special equipment and long term follow up to manage complications [5].

Objective of the Study

- To study the incidence of retinopathy of prematurity in preterm neonates.
- To study the risk factors and clinical profile of retinopathy of prematurity in preterm neonates.

Materials and Methods

The study was conducted over a period of 1 year from December 2012 to November 2013, Study population included all preterm babies admitted in Neonatal Intensive Care Unit from Karnataka Institute of Medical Science, Hubli.

Inclusion criteria

Preterm babies with gestational age ≤ 35 weeks or Birth weight ≤ 2000 grams.

Exclusion criteria

Presence of congenital cataract, hazy cornea, abnormal anterior chamber.

Study instrument:

- Weighing machine (electronic)
- Complete blood count
- Indirect Ophthalmoscope
- RET Cam
- Following were done in selected cases to find the etiology:
  - Serum bilirubin levels
  - Blood culture
  - Serum electrolytes
  - Chest X ray
  - Arterial blood gas analysis.

Study variables:

- General information: Date of admission, in born or out born, duration of stay in NICU, number of visits to screening,
- Information about the mother: Maternal age, pregnancy status, antenatal risk factors, obstetric history, mode of delivery.
- Information about the baby:
  - History and examination: Sex of the baby, birth weight, and gestational age was assessed by modified Ballads Scoring system, events during delivery, APGAR score, vital events during hospital stay, general physical examination and complications.
  - RDS was diagnosed by using Downe's scoring system.
  - Sepsis screen include:
    - WBC count < 5000/mm^3
    - CRP = positive (> 1 mg/dl)
    - Blood culture.
  - Investigations and management: Resuscitation during stay at hospital, necessary investigations and treatment received including phototherapy, oxygen administration and exchange transfusion.

- Ocular examination: Staging, plus status and zone of retinopathy of prematurity in both eyes and decision taken for management. First ophthalmic examination for all surviving preterm babies satisfying inclusion criteria was done between 3 to 6 weeks of postnatal age

Method of ocular examination:

- Mydriatrics (cyclopentolate, 0.5%) drops were introduced in to both eyes half an hour before the examination i.e. 2 drops to both eyes for 3 times in interval of 5 to 10 min gaps. Again eyes were checked whether dilated adequately for examination using pen torch.
- Eye lids were retracted using Verner's eyelid retractor and indirect ophthalmic examination was performed on both eyes by investigator and trained technician from the team of National Rural Health Mission in collaboration with Narayana Nethraalaya. Results were reviewed by expert ophthalmologist in case of requirement of treatment of ROP.

Follow up

After the initial screening for retinopathy of prematurity, all infants were followed up once in every week or two week at least until the healing was seen in both the eyes or for a maximum period of 6 months from the day of initial visit. On each follow up, ocular examination was done based on stage as following.

Eligible infants were screened for retinopathy of prematurity. Infants with normal vascularization up to the periphery were not examined again and taken as complete cure of disease. Infants with ROP were examined every week or 2 weeks till regression occurs or till they reached threshold [Any stage 3 ROP with plus disease with 5 contiguous clock hours of disease or a total 8 non contiguous clock hours in zone 1 or 2].

During each visit, parents or guardians were given advice on importance of exclusive breast feeding, hygiene practice, growth monitoring, immunization, and other danger signs. Retinopathy of prematurity, its staging and treatment was explained in local language.

Statistical analysis

Descriptive statistics like mean, standard deviation, percentages was used to describe study variable. Statistical difference between the nominal data and independent sample was assessed by chi square test. Statistical difference between two groups containing continuous data was done by student t-test. Statistical difference between more than two groups containing continuous data was done by ANOVA [Analysis of variance]. The p value of < 0.05 was taken as statistical significant difference. Microsoft Excel 2010 was used to enter data and analyzed using SPSS 20.0 software.

Results

Distribution of cases according to presence of ROP

Among 176 preterm babies screened (Figure 1), 71 (40.3%) babies had ROP and remaining 105 (59.7%) did not have ROP. Incidence of ROP in our study was 40.3%.

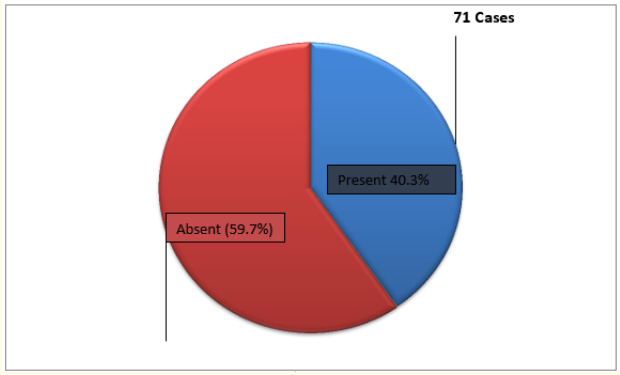

Figure 1: Distribution of cases according to presence of ROP.

Distribution of cases according to gestational age group category

Among the 27 babies with less than 28 weeks of gestational age, 17 (62.9%) had ROP and 10 (37.1%) babies did not had ROP. Among the 88 babies in with gestational age group of 28 to 32 weeks, 41 (46.6%) had ROP and 47 (53.4%) did not have ROP. Among the 61 babies with gestational age more than 32 weeks, 13 (21.3%) had ROP and 48 (78.7%) did not had ROP. This difference seen between different gestational age group and occurrence of ROP was statistically significant [$p < 0.05$].

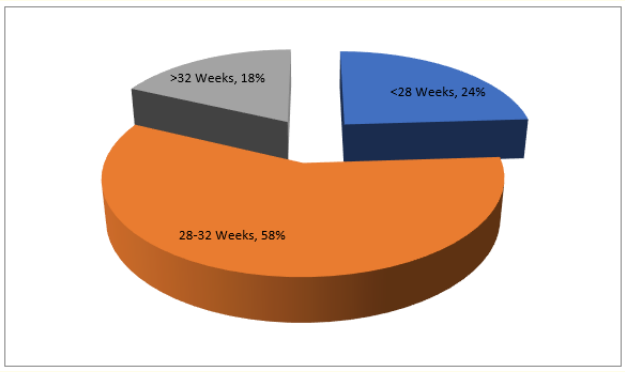

Figure 2: Distribution of cases according to gestational age group category.

Distribution of cases in relation to birth weight categories

Among 71 babies with ROP (Table 1), mean birth weight of 19 babies in stage I ROP was 1594.21 ± 313.81 grams, 52 babies in stage II ROP was 1324.52 ± 285.45 grams, 5 babies with fully vascularised retina was 1695.00 ± 166.80 grams and 100 babies without ROP was 1537.17 ± 309.31 grams. This variation in birth weight across different ROP group according to stage was statistically significant [p < 0.05].

Discussion

Retinopathy of prematurity (ROP) is a potentially preventable cause of childhood blindness especially in developing countries, as premature babies will be exposed to multiple risk factors during prenatal, natal and postnatal period will have unfavorable influence on outcome of ROP.

Variable	NO ROP [n = 100]	Stage I [n = 19]	Stage II [n = 52]	Fully vascularized retina [n = 5]	P value
	Mean	Mean	Mean	Mean	
Birth weight (in grams)	1537.17 ± 309.314	1594.21 ± 313.813	1324.52 ± 285.453	1695.00 ± 166.808	< 0.05

Table 1: Distribution of cases in relation to birth weight categories.

Incidence

The overall incidence of ROP in the present study was 40.3%. Study on babies with < 32 weeks gestational age and < 1500 gms birth weight by Sunil B., *et al*. in 2013 reported 35.1% incidence of ROP. In a study on 66 babies with < 35 weeks or < 1500 gms by Maheshwari., *et al*. in 1996 reported incidence of ROP as 20% and Gupta., *et al*. in 2003 reported incidence as 21.7%. Overall incidence of ROP in Indian studies range from 20% to 50% and international studies ranging from 10.0% to 45.4%.

Comparison of different studies is challenging due to wide variation in using birth weight as an inclusion criteria. Current study included babies weighing 1500 to 2000 gms. Many other studies included babies weighing less than 1500 gms. This might be the reason for increased incidence of ROP in current study. Therefore even babies in the range of 1500 to 2000 gms should be screened for early identification of ROP.

Sex

In the current study, among the 71 babies with ROP, 38 (53.3%) were males and 33 (46.5%) were females. Male: Female sex ratio was 1.15:1. This finding is similar with studies done by Gupta., *et al*, Sunil B., *et al*. and Shu Fen Ho., *et al*. where there were more male babies, but difference was not significant. Preferential health seeking behaviour for male children might be the reason for more number of males in study.

Birth weight

In our study, birth weight of babies ranged from 770g to 2000g. Mean birth weight of babies with ROP [n = 71] was 1396.69 ± 314.879g and those of babies without ROP [n = 105] was 1544.69 ± 305.428 gm. The difference seen between the two group was significant (p < 0.05). Variation in the birth weight of babies with different stages of ROP and without ROP was also statistically significant [p < 0.05]. Inverse relationship between birth weight and ROP was noted in our study and this was similar with studies done by Karkhaneh R., *et al*. [10], Lad E M., *et al*. Thus low birth weight is a significant risk factor in the occurrence of ROP.

Gestational age

Gestation age in our study was assessed by Modified Ballad Score. Mean GA for babies with ROP was 30.70 ± 2.290 weeks and without ROP were 32.11 ± 2.118 weeks. Among 71 babies with ROP, majority of babies with ROP changes belonged to 32 weeks [n = 20 babies, 28.2%].

Variation in the period of gestation of babies with different stages of ROP and without ROP was also statistically significant [$p < 0.05$]. Inverse relationship between GA and incidence of ROP was noted which was similar to studies by Karkhaneh R., *et al*. [10], Rekha S., *et al*. [6] lower the period of gestation, higher is the chances of occurrence ROP in babies.

Conclusion

- The incidence of ROP in the study was 40.3%, was comparable with other studies.
- The present study throws an insight into antenatal, natal and postnatal factors which influences the development of ROP in a tertiary care center.
- Gestational age of ≤ 35 weeks and birth weight ≤ 2000 grams are important risk factors for ROP (significant inverse relation exists between gestational age, birth weight and occurrence of ROP).
- Multiple gestation and maternal anemia are significant antenatal risk factor associated with the occurrence of ROP in babies.
- Events like apnea, respiratory distress syndrome and increased oxygen therapy during NICU stay is significantly associated with the occurrence of ROP.
- Presence of C reactive protein, positive blood culture and sepsis is significantly associated with the occurrence of ROP in babies.
- Across all birth weight and period of gestation group, presence of risk factors like maternal anemia, multiple gestation, events during NICU stay like presence of apnea, RDS, sepsis and receiving of oxygen therapy was more in babies with ROP than babies without ROP.

Bibliography

1. "Born Too Soon. The Global action report on preterm Birth". Geneva: World Health Organization (2012).
2. "Every Newborn: an action plan to end preventable deaths: Executive summary". Geneva: World Health Organization (2014).
3. Improving neonatal and child health and development in South-East Asia. Report of meeting of South-East Asia Regional Programme Managers. Kathmandu, Nepal: World Health Organization; 2011 November 15-18.
4. Home visits for the newborn child- a strategy to improve survival. Geneva: World Health Organization (2009).
5. Global Initiative for the Elimination of Avoidable Blindness: action plan 2006- 2011. Geneva: World Health Organization press (2007).
6. Global Data on Visual Impairments 2010. Geneva: World Health Organization (2012).
7. Cloherty J P., *et al*. "Manual of Neonatal Care".7th edition. New Delhi: Wolters Kluwer Pvt Ltd (2012).
8. Chawla D., *et al*. "Retinopathy of prematurity". AIIMS- NICU protocols (2010).
9. Gilbert C and Foster A. "Blindness in children: control priorities and research opportunities". *British Journal of Ophthalmology* 85 (2001): 1025-1027.
10. Zin AA., *et al*. "Retinopathy of Prematurity in 7 Neonatal Units in Rio de Janeiro: Screening: Criteria and Workload Implications" (2010).