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CBC an indicator of development of retinopathy of prematurity

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ABSTRACT

Aim: To detect the association of complete blood count with retinopathy of prematurity.
Materials and Methods: A prospective cohort study from May 2020-April 2021. Preterm infants having Gestation Age<34 weeks and birth weight <1750grams were included. All preterm babies CBC were done at birth. Ocular examination was done in all preterm babies after 3 weeks of birth and divided into two group one with ROP and other non-ROP. Chi-square test was used to analyze the difference between the ROP vs non-ROP group and p value <0.05 was taken as statistically significant.
Results: 150 preterm infants were screened for ROP out of which 47 were having ROP and 103 no any sign of ROP. The mean GA was 31 Weeks and mean birth weight was 1300 grams of ROP group. The mean Hb of ROP Group was 9.8g/dl as compared to Non-ROP Group having mean Hb-11.4g/dl (p<0.05) and MCH, PLT, MCV all were lower in ROP group as compared to non-ROP. CRP and leukocyte were higher in ROP Group as compared to non-ROP.
Conclusion: As Hb and MCH plays an principal role in oxygen transport, low levels of these may cause increased vascular endothelial growth factor secretion from the hypoxic retina, leading to ROP. In our study we found that Retinopathy of prematurity infants were having lower Hb, MCH as compared to non-ROP Group.

1. Introduction

In developing countries[1] there has been a rise in the incidence of ROP in recent years, which corresponds to the establishment of intensive neonatal treatment regimens in premature babies who would not have survived previously. In India, approximately 3.5 million babies are born preterm, which forms major proportion of an estimated 15 million preterm births in the world every year.[2,3]

ICROP[4,5] recommends screening of infants <1750gms or GA <34 weeks as well as at risk infants outside this criterion. Many studies have reported several risk factors associated with ROP, some of which can cause severe disease. Birth Weight (BW), Gestational age (GA), supplemental oxygen, prolonged mechanical ventilation, APGAR Score, pulmonary complications, anemia intraventricular hemorrhage (IVH), necrotizing enterocolitis, sepsis[6–10] are some of the few risk factors that could promote disease severity. The early identification of risk factors and knowledge of its etiology may help ophthalmologists and neonatologists to diagnose the disease early and prevent development of the disease.[11]

In order to prevent blindness related to ROP, simple, reliable, and predictive data are needed to distinguish infants at risk. Aim of this study was to detect the association of CBC with Retinopathy of prematurity.

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2. Materials and Methods

This was a prospective cohort study carried from May 2020-April 2021.

2.1. Inclusion criteria was

1. Preterm infants having GA<34 Weeks and birth weight <1750grams were included.
2. All preterm babies were subjected to CBC evaluation at birth.

Babies that underwent blood transfusion or diagnosed with any infection were excluded from the study.

2.2. Statistical test

Chi-square test was used to analyze the difference between the ROP vs non-ROP group and p value <0.05 was taken as statistically significant.

The parents of preterm babies were explained the procedure in detail and a written informed consent was obtained from each parent before start of screening.

All preterm babies were ophthalmologically examined after 3 weeks of birth and were divided into two groups one with ROP and other non-ROP.

3. Results

150 preterm infants were screened for Retinopathy of Prematurity out of which 47 were diagnosed with ROP and 103 had no signs of the disease. 47 infants having ROP were assigned to the Retinopathy of prematurity group and 103 preterm infants were assigned to non-Retinopathy of Prematurity group.

The mean GA was 31 Weeks and mean birth weight was 1300 grams of ROP group. The mean GA was 33 weeks and mean birth weight was 1650 grams of non-ROP group.

3.1. Hematocrit parameters (Table 1)

1. Hemoglobin (mean value)
   (a) ROP group- 9 8mg/dl (8-11gm/dl)
   (b) Non ROP- 11 4 mg/dl (9 3-13 gm/dl)

Of 47 ROP babies, 34(72.3%) had Hb<10mg/dl and 13(28.7%) had Hb>10mg/dl.

Of 103 Non-ROP group 38(36.8%) had Hb<10gm/dl and 65(63.2%) had Hb>10mg/dl (Table 1)

Table 1: ROP vs Non ROP group in association with Hb

	Hb<10gm/dl	Hb>10gm/dl
ROP Group	34	13
Non ROP Group	38	65
Chi Square	16.24	
P value	0.00005 (Statistically significant)	

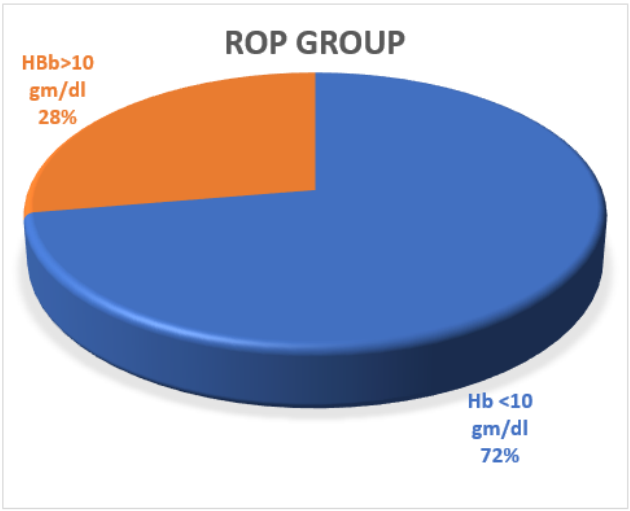

Fig. 1: Percentage of ROP babies having Hb<10gm/dl vs Hb >10gm/dl

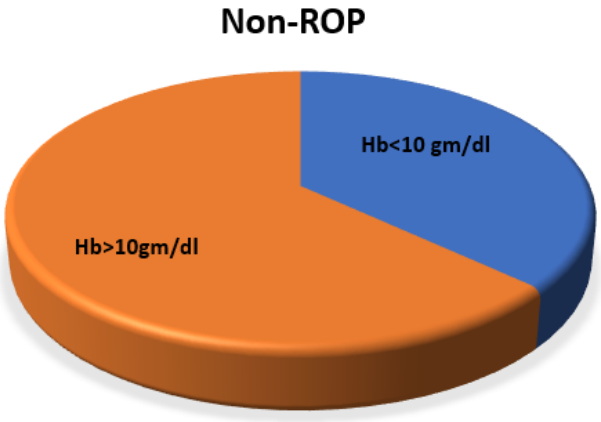

Fig. 2: Showing percentage of non-ROP babies having Hb<10gm/dl vs Hb >10gm/dl

Out of 34 ROP babies with Hb<10mg/dl

1. 26 babies required intervention in terms of Anti-VEGF or Laser,
2. 6 babies were in zone 2 stage 2/3 without plus
3. 2 babies were in zone 3 stage 2.

Out of 13 ROP babies with Hb >10mgdl

1. 8 were in zone 3 stage 2/1
2. 3 in zone 2 stage 2
3. 2 in zone 2 stage 1

3.2. MCH (mean corpuscular hemoglobin)

1. ROP group - 31 pg (28-32pg

2. Non-ROP group - 34 pg (29-35 pg

Of 47 ROP babies, 38(80.8%) had MCH<31pg/dl and 9(19.2%) had MCH>31pg/dl.

Of 103 non-ROP Babies 25(24.2%) had MCH<31pg/dl and 78(75.7%) had MCH>31pg/dl (Table 2)

Table 2: ROP vs non-ROP Group in association with MCH)

	MCH<31 pg (No. Of Babies)	MCH> 31 pg (No. Of Babies)
ROP	38	9
Non ROP	25	78
Chi- Square	42.42	
P value	0.00001 (Statistically significant)	

Table 3: Demographic distribution of ROP and non-ROP group

Groups	Male	Female	Total
ROP	22	25	47
Non-ROP	56	47	103
P value	.389956(not significant)		

No statistically significant difference was found between the gender of babies and ROP development.

We observed that there was no correlation between blood group and ROP development.

4. Discussion

150 preterm infants were screened for ROP out of which 47 had ROP and 103 had no signs of ROP. The mean GA was 31 Weeks and mean birth weight was 1300 grams of ROP group.

The mean Hb of ROP Group was 9.8g/dl as compared to Non-ROP Group which had mean Hb-11.4g/dl ($p<0.05$) The mean MCH of ROP Group was 31 pg as compared to Non –ROP Group which had a mean MCH-34 pg ($p<0.05$).

We recommend that Hb<10mg/dl could be taken as risk factor for development of ROP. We have observed in our study, that there is a statistically significant relationship between Hb<10gm/dl and ROP. In another view the ROP group having >10mg/dl doesn't require any intervention as compared to group having Hb<10mg/dl.

Butcher JT et al[12] reported that Hb not only provides oxygen to tissue but it also scavenges the Nitrogen Oxides . Frost MT et al[13] reported that NO reacts with superoxide and forms highly toxic peroxynitrite (ONOO-) which in turn increases the VEGF release

We recommends that MCH<31pg could be taken as a risk factor for development of ROP. We have observed in our study, that there is a statistically significant relationship between MCH<31pg and ROP. As MCH represents the mean Hb value in red blood cells. As soon as hyperoxia ends, infants with low Hb and MCH cannot withstand the increased need for oxygen in the developing retina and ultimately leading to increased VEGF levels.

Akyüz Ünsal Aİ et al[14] reported that mean Hb in ROP group was 10.1 mg/dl, mean MCH in ROP group was 30.5mg/dl and suggested that MCH was the most prominent risk factor which was similar to our study. No statistically significant difference was found between the gender of babies and ROP development. No relationship of blood group to ROP development.

Others parameters like MCV, platelets, RDW all were lower in ROP Group as compared to non-ROP none of which was statistically significant. WBC, lymphocytes, monocytes and CRP were higher in ROP group as compared to non-ROP group which was similar to the findings of Akyüz Ünsal Aİ et al.[14]

Ashki et al.[15] reported that macrophages, monocytes, and WBC infiltration causes NO release from tissues and NO consequently transforms into peroxynitrite.

5. Conclusion

As Hb and MCH plays a crucial role in oxygen transport, low levels of these may lead to an increase in vascular endothelial growth factor secretion from the hypoxic retina, leading to ROP.

In our study we found that Retinopathy of prematurity infants had lower Hb, MCH as compared to the Non-ROP Group. Hb less than 10 mg/dl and MCH less than 31 pgs could be proposed as a risk factor for development of ROP. WBC, lymphocytes, monocytes and CRP were higher in the ROP group as compared to the non-ROP group.

The main lacunae in regards to ROP screening is in the lack of training of pediatrician and another void is in the lack of trained ophthalmologist.[16] CBC is a simple, easy, reliable, reproducible tool that can help pediatrician and even non-trained ophthalmologist in predicting the development of ROP.

It can also prevent the unnecessary and cumbersome ROP examination. It could be used as a beneficial tool for timely detection of treatable ROP hence decreasing the burden of blindness in society.

6. Source of Funding

None.

7. Conflict of Interest

The authors declare no conflict of interest.

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