



Original Research Article

ANTHROPOMETRY AND HAEMATOLOGICAL PROFILE OF BABIES BORN TO MOTHERS WITH PRE-ECLAMPSIA VERSUS NORMAL MOTHERS

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ABSTRACT

Background: Neonatal survival depends on a wide range of factors of which the birth weight, head circumference, hematological parameters at birth are key determinants. To tackle the high rates of neonatal deaths related to low birth weight, prematurity etc it is important to understand the factors leading to the same, of which maternal hypertension is one of the common cause. The objective is to compare the hematological profile and anthropometrical values of neonates born to mothers with preeclampsia and neonates born to healthy mothers.

Materials and Methods: This was a cross sectional study design comprising 76 newborns who met the inclusion criteria. Neonates were grouped into neonates born to preeclamptic mothers and healthy mothers equally, 38 in each group. After birth immediately 2 ml of blood was collected from the umbilical cord into the vacutainer anti coagulated with EDTA and following parameters were studied- Hemoglobin, Total count, Differential Count, Platelet Count and the red cell indices – MCV, MCH, MCHC. The proforma was filled and all the values were collected and entered systematically. All categorical data were analysed with Chi square test.

Results: On comparing the newborns born to mothers with preeclampsia versus normal mothers, the former group had higher hemoglobin levels, hematocrit values, lower leukocyte count and platelet count than the later group. MCV, MCH, MCHC were more or less similar in both the groups.

Conclusion: Leukopenia, thrombocytopenia were found at a higher rate in newborns of hypertensive mothers. Newborns of hypertensive mothers carry a risk for complications including primarily infection and bleeding.

Keywords: Preeclampsia, Neonatal Hematological Profile, Anthropometric Measurements in Newborns, Birth Weight and Head Circumference, Maternal Hypertension, Neonatal Leukopenia.

INTRODUCTION

Neonatal survival is influenced by various factors, with birth weight being a critical determinant.^[1] Across all contexts globally, infants born with lower birth weights face a higher risk of perinatal mortality compared to those who are appropriately sized for their gestational age.

Pre-eclampsia is a prevalent and severe maternal condition that often goes unrecognized and untreated. Several factors, such as genetics, poor health, and limited access to quality antenatal care, may contribute to the increased severity of pre-eclampsia

in women. The perinatal death rate in pregnancies complicated by severe pre-eclampsia is twice as high as in normotensive pregnancies, with some evidence indicating a perinatal death rate exceeding 20% for such cases.^[2]

Pre-eclampsia is primarily a placental disorder and is a well-known risk factor for low birth weight. The condition is initiated by incomplete remodelling of the spiral arteries in early pregnancy, which occurs due to insufficient invasion of the vessel walls by the extra-villous trophoblast cells. Severe hypertension during pregnancy disrupts maternal homeostasis and creates an unfavourable environment for the foetus.^[3]

While numerous obstetric studies have documented vascular, haematological, and biochemical abnormalities in the mother, the effects of this condition on the foetus, especially the neonate, remain insufficiently understood.

The neonatal outcomes of maternal hypertension are further complicated by the use of antihypertensive and antiepileptic medications. These treatments can impact the perinatal outcome, which is influenced by both the maternal condition and pharmacological interventions. Additionally, these infants may face complications resulting from a higher rate of operative deliveries. Newborns of mothers with pre-eclampsia are more vulnerable to morbidity and mortality due to factors like prematurity, physical disorders, and complications during or after birth. These babies often exhibit an increased incidence of decreased growth, low platelet counts, low total count, neutropenia, low Apgar, delayed adaptation, patent ductus arteriosus.^[4]

Newborns with low birth weight or born prematurely to mothers with gestational hypertension, preeclampsia, or eclampsia require careful monitoring for thrombocytopenia during the initial days of life. The variability in neonatal haematological values can make it challenging to distinguish between normal and abnormal results, as even minor changes may have a significant impact on the final clinical outcome.

MATERIALS AND METHODS

It was a cross sectional study conducted for a period of 12 months after obtaining IRB approval in department of pediatrics, government, medical college, kottayam among Neonates born to mothers with preeclampsia. Neonates born to healthymothers. Based on a study by Kalavakuru mauna et al,^[1]

Total Sample Size: 38 in each group (Total – 76)

Inclusion Criteria

Babies born to mothers with pre eclampsia, Babies born to mothers healthy mothers (without any comorbidities – GDM /Thyroid abnormalities / Rh incompatibility/ cardiac disorders / renal disorders / liver disorders/ hemoglobinopathies/ connective tissue diseases.

Exclusion criteria

Babies with less than 37 weeks of gestation, Congenital malformation, Severe birth asphyxia.

Methodology: After getting Institutional review board clearance and consent from mother, a comparative study will be conducted on babies born to preeclamptic mothers and those born to healthy normotensive mothers according to the inclusion criteria, born at Government Medical College, Kottayam during the period of 12 months from obtaining the International Review Board clearance. For all the neonates who were included in the study detailed maternal history, details of labour and details of baby was taken. After birth immediately 2 ml of blood was collected from the umbilical cord into the vacutainer anticoagulated with EDTA and following parameters were studied- Hb, TC, DC, Platelet Count and the red cell indices – MCV, MCH, MCHC, Reticulocyte count.

Thorough clinical examination of the newborns selected using inclusion criteria will be done and looked for following anthropometric variables- Length, height, chest circumference, head circumference, ponderal index.

Statistical Analysis: Data was entered in MS Office-Excel sheet and analysed using SPSS software. All quantitative variables (Hb, Platelet count, Total Count, Reticulocyte count, MCV, MCH, MCHC, Length, Weight, Head Circumference, Ponderal index) were expressed in mean and standard deviation Chi square test (Fischers exact test, if required) was used to test the differences in categorical measures. Statistical significance was set at $P < 0.05$.

RESULTS

Table 1: Comparison of Hb of neonates born to mothers with preeclampsia and neonates born to healthy mothers

Group	N	Mean	SD	t	p
Babies born to Healthy mothers	38	16.3	1.4	5.4	p<0.01
Babies born to Mothers with preeclampsia	38	18.2	1.6		

The mean value of Haemoglobin of babies born to mothers with preeclampsia was 18.2 g/dl which was significantly high in comparison to newborns of normal mothers which was 16.3 g/dl, as the p value was <0.05.

Table 2: Comparison of HCT between two groups

Group	N	Mean	SD	t	P
Babies born to Healthy mothers	38	48.9	4.8	2.71**	0.008
Babies born to Mothers with preeclampsia	38	52.0	5.2		

**:- Significant at 0.01 level

The mean haematocrit value of newborns of preeclamptic mothers was 52 which was higher than that of babies normal mothers who had a mean haematocrit value of 48.9, and the result was statistically significant, as the p value was less than 0.05.

Table 3: Comparison of MCV of neonates born to mothers with preeclampsia and neonates born to healthy mothers

Group	N	Mean	SD	t	p
Babies born to Healthy mothers	38	96.8	3.7	5.37	p<0.01
Babies born to Mothers with preeclampsia	38	101.1	3.3		

The mean MCV value of newborns of preeclamptic mothers was 101.1 which was higher than that of babies normal mothers who had a mean MCV value

of 96.8, and the result was statistically significant, as the p value was less than 0.05.

Table 4: Comparison of MCH of neonates born to mothers with preeclampsia and neonates born to healthy mothers

Group	N	Mean	SD	t	p
Babies born to Healthy mothers	38	32.1	5.1	1.29	0.202
Babies born to Mothers with preeclampsia	38	33.2	1.2		

The mean MCH value of newborns of preeclamptic mothers was 33.2 which was higher than that of babies normal mothers who had a mean MCH value

of 32.1, and the result was not statistically significant, as the p value was greater than 0.05.

Table 5: Comparison of MCHC of neonates born to mothers with preeclampsia and neonates born to healthy mothers

Group	N	Mean	SD	t	p
Babies born to Healthy mothers	38	33.3	0.7	1.41	0.164
Babies born to Mothers with preeclampsia	38	33.5	0.8		

The mean MCHC value of newborns of preeclamptic mothers was 33.5 which was higher than that of babies normal mothers who had a mean MCHC value

of 33.5, and the result was not statistically significant, as the p value was greater than 0.05.

Table 6: Comparison of TC of neonates born to mothers with preeclampsia and neonates born to healthy mothers

Group	N	Mean	SD	t	p
Babies born to Healthy mothers	38	12697.6	1913.3	7.5	p<0.01
Babies born to Mothers with preeclampsia	38	9827.4	1380.4		

The mean total leucocyte count of newborns of preeclamptic mothers was 9827 which was lower than that of babies normal mothers who had a mean

total leucocyte count 12697, and the result was statistically significant, as the p value was lower than 0.05.

Table 7: Comparison of Neutrophil and Lymphocytes between groups

		N	Mean	SD	t	p
Neutrophil	Babies born to Healthy mothers	38	7149.2	1805.2	4.21	p<0.01
	Babies born to Mothers with preeclampsia	38	5636.2	1281.7		
Lymphocytes	Babies born to Healthy mothers	38	4109.7	1022.7	4.57	p<0.01
	Babies born to Mothers with preeclampsia	38	2980.9	1125.7		

The mean neutrophil and lymphocyte count of babies born to preeclamptic mothers was 5636.2 and 2980 cells/mm³ respectively which was significantly

lower than the that of control group which came to be 7149 and 4109 respectively.

Table 8: Comparison of PC of neonates born to mothers with preeclampsia and neonates born to healthy mothers

Group	N	Mean	SD	t	p
Babies born to Healthy mothers	38	2.4	0.6	5.75	p<0.01
Babies born to Mothers with preeclampsia	38	1.7	0.4		

The mean platelet count of babies born to preeclamptic mothers was 1.7 lakhs which was

significantly lower than the that of control group which came to be 2.4 lakhs.

Table 9: Comparison of Anthropometrical values between groups.

Anthropometric variables	Healthy mothers			Mothers with preeclampsia			t	p
	N	Mean	SD	N	Mean	SD		
Weight	38	2.8	0.3	38	2.3	0.3	7.8	p<0.01
Length	38	48.1	1.2	38	45.8	1.4	7.61	p<0.01
HC	38	32.3	0.6	38	30.5	1.5	7.34	p<0.01
CC	38	30.4	0.7	38	28.7	1.5	6.16	p<0.01
Pon ind	38	2.5	0.2	38	2.4	0.4	1.93	0.058

DISCUSSION

The mean birth weight of babies born to mothers with preeclampsia was 2.3kg as compared to those born to

normal mothers which was 2.8 kg .The mean length , head circumference, chest circumference and ponderal index of babies of mothers with preeclampsia was 45.8cm, 30.5 cm, 28.7 cm, 2.4

respectively in comparison to that of normal mothers who had mean value of 48.1 cm, 32.3 cm, 30.4 cm, 2.5 respectively.

In study done by Verma et al,^[5] mean birth weight of newborns of pre-eclamptic mothers was 2.085 kg and also showed that 64.5% of babies had low birth weight. Similar studies done Sharma et al,^[6] also showed 56% of babies born to preeclampsia with low birth weight. Similar finding was also shown by study done by Sachan et al.^[7] However study done by Xion et al,^[8] shows that birth weight was not lower among pre eclamptic mothers who delivered after 37 weeks with an average difference of birth weight being only 49 grams.

Kingdom and colleagues,^[9] reported that the majority of women who later developed term preeclampsia—specifically 85% at 20 weeks and 94% at 30–34 weeks—had normal uterine Doppler flow measurements at those respective time points.

The mean hemoglobin concentration of newborns to preeclampsia was 18.2, i.e. polycythemia which was comparable to Bolat A et al.^[10] Mean haematocrit value observed in this study was 50.2% in cases and 4.1% in controls as compared to Saarinen UM and Siimes MA (35 59%).^[11] As haemoglobin increases haematocrit also increases.

In our study, we observed an increase in MCV (101.1±3.3) in the infants born to mothers of preeclampsia which correlated well with Saarinen UM and Siimes MA and this increase may be due to increase in the size of RBCs in preterm babies. There was no significant difference found in MCH (33.2 +/- 1.2) and MCHC (33.5 +/-0.8) which was comparable to the study done by Sivakumar S et al.^[12]

The mean total leucocyte count and neutrophil count in the newborns of preeclamptic mothers was 9827 /mm³ and 5636/mm³ respectively which was low in comparison to the other group. Which correlated well with Bolat A et al., Cristina C et al., and Prakash PL et al.^[13] Newborns of mothers with preeclampsia had significantly lower platelet counts, averaging 94,250/mm³, compared to those born to normotensive mothers, whose mean platelet count was around 240,000/mm³, with a statistically significant difference. Similar result was noticed in a study done by Mulatie et al,^[14] showing low platelet count in affected newborns compared to the normal ones - 221.25 ± 83.56 and 260.24 ± 83.01 × 10³/ul respectively) (P < 0.001). Thrombocytopenia was more frequently observed in infants of preeclamptic mothers than in those of mothers with normal blood pressure. Although the exact mechanism is not fully understood, some studies suggest that the condition originates at the placental level.

Limitations: Consecutive anthropometric measures of various ages was not determined which could have helped in knowing the linear growth of affected babies and when did they caught up in future. This study was done in a tertiary care centre where most of the referral cases are dealt with, hence may not be generalised for the entire population, for which a

larger study including the secondary care and primary care centre have to be included.

CONCLUSION

Total count, neutrophil count, lymphocyte count and Platelet Count was significantly low in neonates of pre eclamptic mothers in comparison to the normal group. Weight, Length, Head circumference, Chest Circumference was significantly low in babies born to mothers with Preeclampsia in comparison to that of normal mothers. MCH, MCHC and ponderal index did not show significant difference between the two groups. Given the higher rate of low birth weight, leucopenia, neutropenia and thrombocytopenia in babies of preeclamptic mothers, regular monitoring of blood pressure, prevention and management of pre-eclampsia is essential.

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