

Hematological Profile of Neonates Born to Mother with Pregnancy Induced Hypertension Presenting at Tertiary Care Hospital

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ABSTRACT

Background: The aim of this research is to collate the hematological profile of neonates born to mothers with and without pregnancy induce hypertension.

Methodology: A Case-control study was undertaken at the Department of NICU, National institute of child health, Sindh between October 2020 and March 2021. We have evaluated details and full blood count results of neonates born to mother with pregnancy induced hypertension (PIH) in collation with the data of control group.

Results: Around of 156 neonates born to mother with gestational hypertension and 156 neonates of healthy pregnant mother were enlisted. Full blood counts showed Hemoglobin (hb) levels were significantly higher in newborns of mothers with pregnancy induced hypertension (16.3+ 0.38) than the control (14.81+ 0.04) (p=0.001). White blood cells (WBSs) were notably reduced in neonates of PIH mothers (9.02±0.64 and 15.41+ 0.8 respectively) (p=0.001). In our study Neutropenia was seen in 42% of neonates born to PIH mothers as compared to 8% in control group. Mean ANC in neonates born to mother to hypertensive disorders of pregnancy (5000) was significantly lower than that of babies born to normotensive mothers (8200) in our study. The platelet count in the case group was notably reduced (138.79±4.52) when compared to the control group, which registered a count of 209.11±15.54.

Conclusions: Neonates born to mothers with gestational hypertension are more vulnerable for occurrence of neutropenia, leucopenia, thrombocytopenia and polycythemia. Timely hematological screening assist to reduce morbidity, improve growth, development and survival of the baby.

Keywords: Neutropenia, thrombocytopenia, hematology, gestational hypertension, newborn.

INTRODUCTION

Pregnancy induce hypertension (PIH) is a form high blood pressure which was developed in pregnancy, with or without proteinuria and fits.¹ The National High Blood Education Program (NHBPEP) is an organization that classifies this condition into five distinct categories: (1) long-term high blood pressure, (2) high blood pressure developed during pregnancy, (3) pre-eclampsia condition, (4) eclampsia syndrome, and (5) the occurrence of pre-eclampsia on top of existing chronic high blood pressure.²⁻⁴

These diseases complicate 10-15% of all pregnancies, but it is estimated that this proportion is higher in underdeveloped counties due to a variety of reasons like inadequate care during prenatal period, poverty and poor health awareness.³⁻⁶ Pregnancy induced hypertension (PIH) is culpable for death during pregnancy and neonatal period of 10% and 40-50% of low birth weight newborns.⁷ In the industrialized world, 16.1% of maternal mortality is attributed to hypertensive diseases and continues to contribute significantly to global maternal mortality.⁸ An eminent mortality of over 300 per 1000 live births has been observed in underdeveloped regions [9].

Etiology of PIH stays unknown; it is known that two interrelated mechanisms played a central role in the pathogenesis: placental trophoblast dysfunction and endothelial dysfunction within the mother's systemic vessels. Endothelial dysfunction may result from an imbalance among angiogenic and antiangiogenic factors (e.g. placental growth factor and vascular endothelial growth factor) and from immunological changes that cause changes in cytokines and toxic compounds that ultimately lead to increased oxidative stress in cells of the placenta lead manifests as placental hypoxia and hypoplasia¹⁰.

Therefore, neonates of hypertensive mothers increase the chance to develop intrauterine death, preterm and premature birth, transient tachypnea of newborn (TTN), respiratory distress syndrome (RDS), persistent pulmonary hypertension (PPHN), bronchopulmonary dysplasia (BPD), respiratory failure, perinatal asphyxia, neonatal infections, bleeding complications and hematological abnormalities, such as low platelets counts, increased concentration of haemoglobin, and decrease neutrophils counts in blood.^{1,3-4,6-7,10-13} Physiological changes in

pregnant women are neutrophilic leukocytosis, hyperlipidemia, procoagulant, and hypofibrinolytic changes. Physiological changes and placental abnormalities in hypertensive mothers that lead to fetal and neonatal complications

The literature shows conflicting results in the hematological indices (Hemoglobin, neutrophil, red cell count and platelet counts, and mean cell volume (MCV)) of newborns delivered to mothers having PIH. This variation in results may be attributed to differences in ethnicity, diet, genetic and environmental elements. As the thrombocytopenia and neutropenia are the frequently revealed hematologic abnormalities in newborns, so the newborns delivered to mothers with PIH are more prone to bleeding issues and infections than newborns from healthy pregnant mothers.⁹

The purpose of this article is to evaluate the changes in full blood count parameters of newborns from mothers with PIH compared to healthy pregnant mothers. Early neonatal hematology screening of such neonates can help reduce morbidity and improve the baby's growth, development and survival.

MATERIAL & METHODS

A case-control study was carried out after ethical permission from the institutional ethical review board (IRB) of National institute of child health Karachi (NICH). The study period spans over 6 months from October 2020 to March 2021 in the department of neonatology, National institute of child health, Karachi. The numbers of babies were 316, selected using non-probability, consecutive sampling technique in which 158 neonates born to pregnancy-induced hypertension mothers as case and 158 neonates born to normotensive mothers as control. Comprehensive mother's history, which included information before, during and after delivery were collected. A medical assessment was carried out on the newborns and the observations were documented in a structured format. When the baby was born, a sample of 2 ml of cord blood was gathered into a vial containing ethylenediaminetetraacetic acid. The measurements of red blood cell indicators, including MCV, MCH, MCHC, as well as the total leukocyte count and platelet count, were determined utilizing a five-part system automated cell counter.

Inclusion Criteria: We enrolled all neonates who were admitted to

NICU during the study period born to mothers with pregnancy induced hypertension as cases while neonates born to healthy mothers as controls after seeking consent from parents or guardians.

Exclusion Criteria: All those neonates having major anomalies incompatible with life, birth asphyxia, Preterm babies, maternal history of renal disorders, heart disease, connective tissue disorder, diabetes mellitus, intake of aspirin, premature rupture of membranes (PROM), or parents who refused to grant permission to participate in the study were excluded.^{21,22}

Data Analysis: Data were analyzed using SPSS 22.0 software version. Data represented numerically were documented in terms of averages and standard deviations, while non-numerical data were reported through counts and proportions. The differences between two groups were examined using a t test for independent samples. A p-value of less than 0.05 was deemed to indicate statistical significance.

RESULT

Three hundred sixteen newborn babies were included in this study. In this comparative analysis, we included a total of 158 mothers experiencing various hypertensive conditions during pregnancy. Chronic hypertension was found in 10 (6.0%) of these cases, gestational hypertension in 80 (50.5%), preeclampsia-eclampsia in 62 (39.5%), and chronic hypertension with subsequent preeclampsia in 6 (4.0%) of the cases.

The study group has 1.35 time more females as compared to males (58% vs 42%) whereas it's 1.3time in control group. Regarding age distribution, the mean age of case group mothers was (29.43±0.81) years while that of control group mothers was (25.67±1.84) years.

The majority of mothers fell into the 20-30 age range, accounting for 64% of those with hypertension and 84% of those without hypertension. Table 1 illustrates the fundamental characteristics of both the case and control groups.

Table-1: Baseline characteristics of cases and controls

Variables	Hypertensive mothers	Normotensive mothers	P-value	
Age (mean)	29.43	25.67	<0.001	
Age groups	20-30years	101(64%)	133(84%)	
	31-40years	41(26%)	25(16%)	
	>40years	16(10%)	0	
Mode of delivery	Normal	74 (47%)	110 (70%)	
	Caesarian section	84(53%)	48 (30.32%)	
Primipara	Yes	87 (55%)	55 (35%)	<0.001

The average values of Hb, MCH, MCHC, and MCV in newborns from hypertensive mothers (cases) and normotensive mothers (controls) exhibited a significant statistical difference. Newborns from mothers with hypertension had a discernibly lower platelet count than those born to healthy mothers. A notable statistical variance was also observed between the two groups regarding both white blood cell count and absolute neutrophil count. The hematologic parameters of both groups were as presented in Table 2.

Table: 2 Comparison of hematological parameters among babies in two groups. (Cases and Controls)

Investigation	Case	Control	P Value
Hb	16.30	14.81	<0.001
WBC	9021	15417	<0.001
ANC	5000	8200	<0.001
Platelets	138	209	<0.001
MCV	108	105	<0.001
MCH	37.5	36.32	<0.001
MCHC	34.16	33.58	<0.001

DISCUSSION

Despite all modern medical knowledge, pregnancy induced high

blood pressure is still a real concern on society as it is responsible for various problems in the mother and fetus. The neonatal morbidity and mortality only relate to the severity of the disease. However, the modern obstetrician and pediatrician are pushing for prevention, timely detection, and treatment of potential complications associated with PIH.⁷

Several investigators have assessed the hematological characteristics of neonates of women with PIH and have revealed contradictory results. Our findings indicated a significant increase in average hemoglobin levels in newborns from mothers with Pregnancy-Induced Hypertension (PIH) when compared to those of babies from normotensive mothers. This elevation can be attributed to the fetus's relative hypoxia resulting from the mother's high blood pressure, a condition that triggers the release of erythropoietin, thereby boosting the production of red blood cells.¹²

Our study disclosed a statistically significant distinction in hematological indices like mean MCV, mean MCH, and mean MCHC of PIH among the cases and controls group; Conversely, the work of Naim Eman displayed an insignificant difference in average MCV, MCH, and MCHC, findings that stand in contrast to our results.¹

We found a significant difference (P-value of 0.001), among WBCs count of case and control groups (9.21 and 15.41). This finding was akin to that noted by Al-bahadily and Zisovska.¹⁴⁻¹⁵

Mean absolute neutrophil count in neonates born to mother to hypertensive disorders of pregnancy (5000) was significantly lower than that of neonates of non hypertensive mother (8200) in our study. In our study Neutropenia was seen in 40% of neonates born to HDP mothers as compared to 6% in control group. Neutropenia is a frequently observed complication in the neonates to mothers suffering from PIH.^{1,13}

Neutropenia occurs in neonates of hypertensive mothers because of the intricate complex mechanism that includes decreased levels of growth factors, the function of the colony-stimulating factor is reduced, the interaction with the Fas Fas ligand, and increase production of RBC because of hypoxia exhibit reduce number of stem cells to be had for granulopoiesis which results in neutropenia.^{7,9}

Thrombocytopenia has been frequently found in newborn of hypertensive mothers collate to neonates of non hypertensive mothers. Previous studies have also identified a recurring observation of low platelet count in infants born to mothers with Pregnancy-Induced Hypertension (PIH).⁷

Newborns of hypertensive mother are more vulnerable to have low platelets count. This is because of microangiopathic platelet sequestration, megakaryocytic lineage depression associated with fetal hypoxia, and unknown elements transport from hypertensive mothers.^{16,17}

CONCLUSION

It is concluded that newborns of hypertensive mothers are more amenable to have neutropenia and thrombocytopenia. Babies should be observed for complication like sepsis and bleeding tendencies in order to improve morbidity and mortality among neonates.

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