

Original Research Article

Cord blood parameters change in pregnancy induced hypertension

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ABSTRACT

Background: Pregnancy induced hypertension (PIH) is a multisystem disease of unknown etiology which affects only human beings. It poses several problems to both mother and child. Complications in newborns like intrauterine death (IUD), intrauterine growth retardation (IUGR), perinatal asphyxia, neonatal sepsis and bleeding disorders are associated with toxemia of pregnancy. To decrease the perinatal morbidity and mortality, babies of hypertensive mothers should be carefully monitored and managed. Aim of this study was to establish the changes in total platelet count, reticulocyte count and absolute neutrophil count of umbilical cord blood in pregnancy induced hypertension as compared to normotensive mothers.

Methods: This case-control study was conducted among 60 subjects including 30 case (diagnosed cases of pregnancy induced hypertension) and 30 control (normotensive pregnant women). The case group was again categorized into three subgroups – gestational hypertension (06), pre-eclampsia (16) and eclampsia (08). In all the subjects, 2 ml of umbilical cord blood anticoagulated with EDTA was collected and haematological tests for reticulocyte count, total platelet count (TPC) and absolute neutrophil count was done.

Results: There was significant decrease in TPC ($p < 0.01$) and absolute neutrophil count ($p < 0.01$), but significant rise in reticulocyte count ($p < 0.05$) in umbilical cord blood of babies born to hypertensive mothers compared to normotensive mothers.

Conclusions: From this study, it can be concluded that newborns of hypertensive mothers carry risks for infection and bleeding complications. So, these simple haematological tests can be done at early stage in neonates to reduce possible perinatal morbidities and mortality.

Keywords: Absolute neutrophil count, Hypertension, TPC

INTRODUCTION

Pregnancy induced hypertension is a multisystem disease of unknown etiology which affects only human being. Hippocrates was the first to observe the disorders like swelling of face, oedema of legs and headache during pregnancy. Now-a-days, with the help of modern biochemical, histological and enzymatic study, it is possible to observe the precise changes in the body of the mothers and its effect on their babies. It is a threat to the wellbeing of both mother and child. In the developing countries with poor assessment of health condition of

pregnant women, pregnancy induced hypertension is a leading cause of maternal and fetal morbidity and mortality. Worldwide, PIH is responsible for perinatal and neonatal mortality rate of 10% and 40-50% of low birth weight babies.¹ It has been reported that more than 60,000 of maternal deaths occur due to PIH.² Incidence of development of pre-eclampsia ranges between 10-14% in primi gravida and 5.7-7.3% of multigravida women.³ Complications in the mother include eclampsia, abruptio placenty, oliguria, anuria, dimness of vision and HELLP syndrome.⁴ Common complications in babies born to PIH mothers include intrauterine death (IUD), intrauterine

growth retardation (IUGR), perinatal asphyxia, neonatal infections and bleeding complications. It has been reported that these neonates may have some haematological complications which add to the existing morbidity in them. Severe and long term PIH mothers deliver prematurely because of which neonates carry a risk for IUGR development due to decrease in nutrients nourishing the baby. It has been reported that neonatal neutropenia and infection occurs in babies of pre-eclamptic mothers.⁵

Overall the present piece of work was carried out to see the changes in cord blood reticulocyte count, total platelet count and absolute neutrophil count in the babies of pregnancy induced hypertensive mothers as compare to the normotensive pregnant mothers.

METHODS

The present study was carried out in the department of physiology in collaboration with department of O&G, V.S.S institute of medical science and research. This was a hospital based case- control study. The total number of subjects were sixty. Out of these, 30 were normal pregnant women taken as control and 30 were diagnosed cases of pregnancy induced hypertension taken as study group. Depending upon the blood pressure level, the study group were again divided into three subgroups i.e. gestational hypertension, pre-eclampsia and eclampsia. Out of 30 cases, the number of gestational hypertensive mothers were 06, pre-eclampsia 16 and eclampsia 08 in number.

The pregnant women having history of hypertension, diabetes, autonomic disorders, epilepsy, congenital heart disease, platelet disorders and drug administration altering hematological profile were excluded from the study. After inclusion, a detailed history was taken according to the case proforma prepared for the study and patients were subjected to the study design. All enrolled subjects gave their informed consent to participate in the study. Two ml of cord blood anticoagulated with EDTA was collected after delivery in all subjects and haematological tests i.e. total platelet count, reticulocyte count and absolute neutrophil count were done.

The study was approved by institutional ethical committee. Statistical analysis was done by software SPSS 16. Statistical tests implemented was one way ANOVA test. P- value <0.05 was taken as significant.

RESULTS

The various profile of the cases and control groups of this study were shown in the Table 1. Distribution of subjects was shown in Figure 1 in pie chart form. The most significant finding we observed in this study was fall in total platelet count, increase in reticulocyte count and decrease in absolute neutrophil count in study group as compared to control group. This changes in

haematological parameters were associated with severity of hypertension.

Table 1: Profile of the cases and control.

Parameter	Cases	Controls
Mother (mean)		
Maternal age (in years)	22.3	24.5
Socioeconomic status	60% poor	50% poor
Primipara	80%	50%
Cord blood (mean)		
TPC (lakhs/mm ³)	1.82	2.58
Reticulocyte count (%)	7%	4%
Absolute neutrophil count	8123	10483

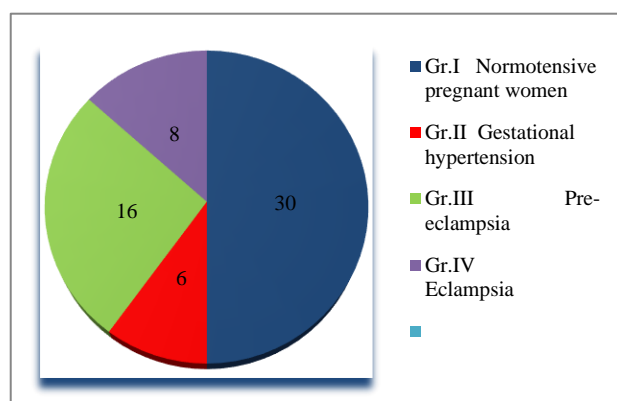


Figure 1: Distribution of cases.

When we compared umbilical cord blood total platelet count in both the groups, we found that the mean value of TPC in control group was 2.58lakhs/mm³. But in gestational hypertension, it was 1.99lakhs/mm³, in pre-eclampsia it was 1.88lakhs/mm³ and in eclampsia patients mean TPC value was 1.58 lakhs/mm³. This fall in total platelet count was significant (p<0.01) as shown in Table 2.

Table 2: Total platelet count in both control and different study groups.

Groups	Mean TPC (lakhs/mm ³) with S. D	P - Value
Control (normotensive)	2.58±0.53	P<0.01
Gestational hypertension	1.99±0.34	
Preeclampsia	1.88±0.26	
Eclampsia	1.58±0.29	

While comparing reticulocyte count, we found that study group had higher value of reticulocyte count than control. The mean reticulocyte count in cord blood of normotensive mothers was 4%, in gestational hypertension 6%, in pre-eclampsia 7% and in eclampsia patients it was about 10%. This variation in nucleated RBC count was significant (p<0.05) as shown in Table 3.

Table 3: Reticulocyte count in both control and study group.

Group	Mean Reticulocyte count (percentage) with SD	P Value
Control (normotensive)	4%±1%	P<0.05
Gestational hypertension	6%±1%	
Preeclampsia	7%±1%	
Eclampsia	10%±1%	

When we compared both the groups in terms of mean absolute neutrophil count, control groups showed 10483/mm³. But in gestational hypertension, this value was 9216/mm³, in pre-eclampsia it was 7968/mm³ and in eclampsia patients it was 7612/mm³. This changes in absolute neutrophil count was also significant (p<0.01) as shown in Table 4.

Table 4: Absolute neutrophil count in both case and control group.

Group	Mean Absolute Neutrophil Count per mm ³ with SD	P Value
Control (normotensive)	10483±1936	P<0.01
Gestational hypertension	9216±1456	
Preeclampsia	7968±776.93	
Eclampsia	7612±885.49	

DISCUSSION

At present inspite of all modern sophistication of medical science, the pregnancy induced hypertension is a real burden to the society. It is responsible to cause several problems in mother as well as fetus. The main objective of this study is that it is essential to prevent PIH at it's early stage for better maternal and fetal outcome. The neonatal morbidity and mortality solely pertain to the severity of this disease. However, the modern obstetrician and pediatrician press upon the prevention, early diagnosis and treatment of possible complications related to PIH.

In this study, maximum number of PIH mothers were found to be primigravidae (80%) and below 23 years. This result is in accordance with the study of Kaul et al.⁶ We also found that most of the pregnant mothers of study group (60%) were belonged to low socioeconomic status. Thus undernutrition, poverty and ignorance have got definite relation to PIH.

The most important finding in this study was significant fall of TPC count in the babies born to PIH mothers. Similar finding of thrombocytopenia in newborns of pre-eclamptic mothers was observed in previous studies.^{7,8}

Although the exact pathophysiologic mechanism is not known, it was reported that utero-placental insufficiency secondary to pregnancy induced hypertension is responsible for the development of thrombocytopenia.⁹ Bleeding in newborns occurs if the platelet count decrease to <50,000/mm³.¹⁰ The study of Kleckner et al reported that cause of this thrombocytopenia was thrombocyte destruction due to platelet adherence to abnormal placental endothelium.¹¹ But study of Burrow et al reported that there was no significant change in total platelet count in term babies of hypertensive mothers and normotensive mothers.¹²

When both the groups were compared in terms of reticulocyte count, we found reticulocytosis in cases than the control group. This rise in nucleated RBC was significant (p<0.05). Utero-placental failure may be the pathophysiologic mechanism leading to accelerated erythropoiesis. Similar observations were reported in a study by Philip et al.¹³ Also in their study, they suggested that chronic placental hypoxia increase the erythropoietin level which in turn leads to activated erythropoiesis in newborns. Higher value of nRBC in babies of pre-eclamptic mothers was found in previous studies.¹⁴⁻¹⁶ Thus this increased reticulocyte count in cord blood of hypertensive mothers explain the underlying hypoxic condition of placenta.¹⁷

Another highlighting result in our study was decrease number of neutrophil in cord blood of PIH mothers than the normotensive mothers. In another study, similar findings of decrease in neutrophil count was reported in babies of PIH mothers.¹⁸⁻²⁰ Congenital neutropenia most commonly occurs due to Toxaemia of pregnancy.²¹ As per the study by Koenig and Christensen where they reported that this neutropenia was caused by inhibition of neutrophil production due to deficiency of a growth factor.²² They also found that, in the placenta of PIH mothers there was reduced activity of colony stimulating factor. Pre-eclampsia causing leucopenia due to Fas-Fas ligand interaction was reported in a previous study.²³ But the study of Sivkumar S, et al reported no significant change in neutrophil count in babies born to PIH mothers as compared to normotensive mothers.²⁴ In the study of Bolat A et al, total count of lymphocyte, eosinophil, monocyte, neutrophil was significantly lower in babies of pregnancy induced hypertension.²⁵ But in this study we documented only change in neutrophil count. It has been reported that risks of sepsis decrease in neutropenic infants by G-CSF administration.²⁶⁻²⁸

Limitations

In this study an attempt has been made to compare the changes in some important haematological cord blood test parameters in normotensive pregnant mothers and pregnancy induced hypertensive mothers and upto what extent these variations can lead to develop possible health hazards in neonates. However as studies are few in number, further studies are required for better results.

Again studies on peripheral blood smear and complete blood count are needed to be done which will be of utility.

CONCLUSION

Based on the results of this study, it can be concluded that pregnancy induced hypertension in mothers is a risk for the development of thrombocytopenia, reticulocytosis and neutropenia in the babies. More over with the progress of the disease, these haematological parameters may significantly changes. Hence the newborns of hypertensive mothers carry a risk for polycythemia, infection or sepsis and bleeding abnormalities. These newborns should be carefully evaluated and managed to reduce haematologic abnormalities and related complications mainly infection and bleeding. With this correlation of haematological parameter changes and PIH with it 's severity, these simple tests (TPC, Reticulocyte count and Absolute neutrophil count) in the high-risk neonates can be done for better neonatal and perinatal outcome.

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