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STUDY OF ASSOCIATION BETWEEN PERINATAL ASPHYXIA AND NUCLEATED RED BLOOD CELL COUNT IN UMBLICAL CORD BLOOD

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ABSTRACT

Objective to study and establish the relation between nucleated Red blood cells and Perinatal Asphyxia and to compare the efficacy of Nucleated RBC count as a predictor of Perinatal Asphyxia with the other parameter. Cross sectional Comparative study conducted over a period of 1 year from Oct 2013 to Sept 2014, which included 80 neonates with 40 cases of suspected asphyxia and 40 controls. The cord blood was collected immediately after delivery for NRBCs count under peripheral smear. Statistical analysis was performed with chi-square and t test. Mean NRBCs count in case and control was $8\pm8.57/100$wbcs and $5.97\pm4.79/100$wbcs respectively. Also significant correlation is seen in the NRBCs of APGAR score at 1min and 5min which is statistically valued as p value $P<0.05$. It is a simple and cost effective test in early diagnosis of perinatal asphyxia. It will help the clinicians in early diagnosis and treatment whenever applicable, thereby reducing the neonatal morbidity and mortality.

INTRODUCTION

Asphyxia is the leading cause of acute mortality and morbidity in the perinatal period and chronic neurologic disability amongst survivors. Incidence is estimated to be of 4 million perinatal deaths each year [1]. Hypoxic ischemic encephalopathy is the most common and severe complication of perinatal Asphyxia. The common permanent neurological abnormalities include Cerebral Palsy and Mental Retardation [1].

Risk factors like arrest of labour, prolonged rupture of membranes, eclampsia, prolonged labour and non-cephalic presentation are the important significant risk factors for perinatal asphyxia [2].

Clinically birth asphyxia presents as fetal distress, FHS>100/min or <160/min. presence of meconium stained liquor and APGAR score will be less than 5 in these cases [3].

Parameters that have been used to identify Perinatal hypoxia includes fetal or umblical cord pH, meconium stained Amniotic fluid (MSAF), APGAR score and intrapartum Electronic fetal monitoring [1]. Considering the fetal bone marrow respone to hypoxia in utero, the elevated n-RBC/100 WBC count as the marker for not only Perinatal Asphyxia but also indicate developing Neurological Sequelae [4,7]. The staging of HIE was done according to Sarnat and Sarnat [5,6].

The present study will access the n-RBC/100 WBC count as a simple marker of perinatal asphyxia and its ability to predict immediate neonatal prognosis in case of Asphyxia [4].

OBJECTIVE

1- To study and establish the relation between nucleated Red blood cells and Perinatal Asphyxia.
2- To compare the efficacy of Nucleated Redblood cell count as a predictor of Perinatal Asphyxia with the other parameter like Haemoglobin and total leucocyte count.

MATERIAL AND METHOD
Study Design
The present study is a cross sectional Comparative study conducted over a period of 1 year from Oct 2013 to Sept 2014.

Source of Study
The study was undertaken at AIMS, B.G. Nagara. in collaboration with the Department of Obstretics and Gynecology. This study is approved by the Ethical committee of our institution.

Sample size
40 Cases of clinically suspected asphyxia and 40 Control(Normal neonate) . Subject were constantly monitored during labour for the signs of asphyxia such as irregular FHS, presences of meconium staining and APGAR score <5 at 1min and 5min.

Data Collection
Collection of blood Sample
Soon after delivery and complete expulsion of placenta**,** Under aseptic condition 2 ml of Venous blood from the Umblical Cord was collected in a K3 EDTA Vaccutainers. (EDTA: Ethylene diamine tetra acetic acid)
Peripheral smear was prepared , stained by Leishmann's stain and NRBC Count was done on Peripheral smear.

Inclusion Criteria
1) All the deliveries associated with the risk factors of Asphyxia.
2) All the deliveries with Sign of Asphyxia.

Exclusion Criteria
1) Prematurity
2) Intra Uterine Growth Retardation (IUGR)
3) Congenital anomalies

4) ABO and Rh incompatibility.

Statistical tests
Data will be expressed as mean values, standard deviation.Quantitative variables will be analysed by independent t test. Nominal data will be analyzed by Chi – square test .Fisher exact test will be applied when the expected frequencies will be less than 5SPSS software 16 version will be used for analysis.

RESULT
Table 1:- Shows the distribution of neonates according to NRBCs. The number of NRBCs in the control group ranged from 0-30 where 90% of babies had NRBCs between 0 to 10/100WBCs.Around 10% of the neonates had NRBCs between 11-30/100WBCs. In the case group, the NRBCs ranged from 0-80 /100WBCs where as 25% had NRBCs between 11-30/100WBCs. Mean NRBCs count in case and control group was 8 ± 8.573/100WBCs and 5.97 ± 4.29/100WBCs respectively. This is again statistically significant as p<0.09.
Table 2- In this table the mean APGAR scores at 1 min and 5 min of age were compared and analysed with both groups. APGAR scores at 1min and 5 min between the two age group are significantly lower as compared to the control group (Figure 1)
Table 3: In our study, the mean Haemoglobin concentration,Total leucocyte count and NRBC was significantly higher in asphyxiated neonates as correlated to normal neonates .(p<0.002,p<0.001 and p<0.002 respectively)
Table 4:- This table shows NRBCs distribution according to the stages of HIE(Hypoxic induced Encephalopathy) . Our study revealed that 30% of the cases had NRBCs ranging from 7-89 NRBCs/100wbcs in the stage II HIE which is statistically again significant as value is higher as compared to normal babies who have (90%) NRBCs ranging from 0-10/100wbcs.

Table 1. Distribution of neonates according to NRBCs

NRBC/100WBC	Cases		Control	
	Number	percentage	Number	percentage
0-10	22	55%	36	90%
11-30	10	25%	04	10%
31-50	05	12.5%	00	00%
51-70	02	05%	00	00%
>71	01	2.5%	00	00%
Total	40	100%	40	100%

Table 2. Comparison of NRBCs and APGAR scores at1min and 5min

| Parameters	1 min	5 min	Mean	SD	P value
APGAR score	5	7	6	1.41	0.009
NRBCS	80	96	88	11.31	0.05

Table 3. Distribution of NRBCs according to stages of HIE(Hypoxic induced encephalopathy)

Stages of HIE	Number of babies	percentage	NRBCs range
No HIE	15	37.5%	5-15
Stage I	10	25%	6-28
Stage II	12	30%	7-89
Stage III	03	7.5%	8-104

P value :- <0.001

Table 4. Distribution of Neonates according to laboratory parameters

Lab Investigation	Cases(n=40)	Control(n=40)	t value	p value
Hb%(g/dl)	16.18±1.50	15.20±1.35	3.07	p<0.002
Total leucocyte Count (cell/cmm)	20065±6250	16343±4868	11.39	P<0.001
NRBCs/100WBCs	16.43±17.16	3.90±4.69	4.45	P<0.002

Figure 1. Graph deplicting comparision of NRBCS and APGAR score.
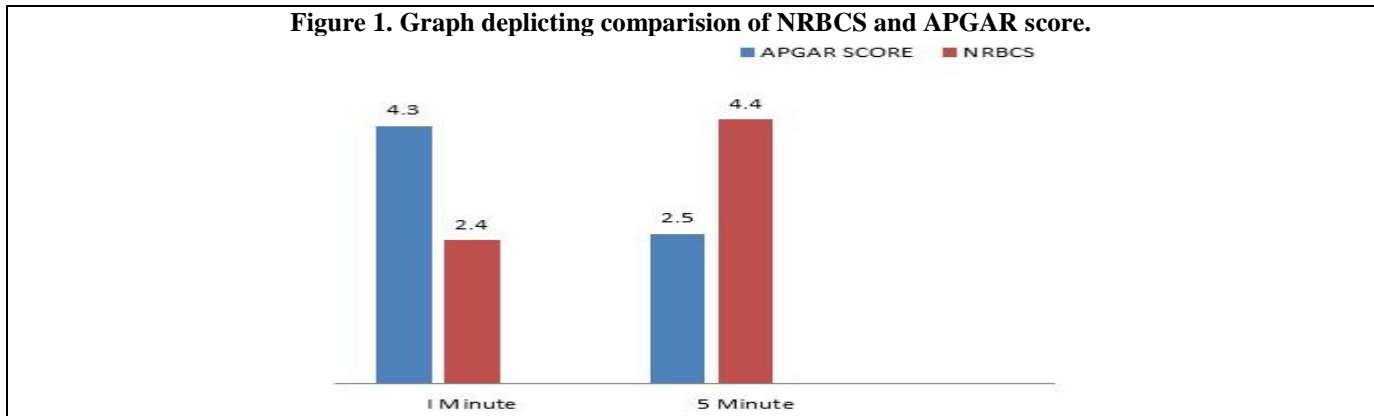
DISCUSSION

Nucleated red blood cells are commonly present in the blood of newborns. Birth asphyxia is common problem encountered in term pregnancy in the developing countries.[2]According to WHO, birth asphyxia means as failure to initiate and maintain breathing at birth [2].

In the present study the NRBC/100WBC count in control and case group was 8±8.573/100WBCs and 5.97±4.29/100WBCs respectively, Gupta et al [11] reported increased NRBC/100 WBC count in case group which supported our study. They found in their studies that NRBCs count of 10.34#3.87 in case group compared control group with NRBCs of 5.7#2.33. Many different studies all over the world have revealed increased NRBC/100 WBC in umbilical cord blood following prenatal asphyxia [9,10,12].

Phelan JP et al [10], Saracoghrf et al [11], in their studies, reported higher number of NRBC count in the cord blood following asphyxia cases. They suggested that increase NRBCs in the peripheral circulation is due to hypoxia. Hermansen et al [9], Borskabadi et al [14], Phelan et al [10] and Philip AG et al [12] had found increase NRBC with increase in stages of HIE.

In the present study, We found higher NRBC/100wbc with higher degree of Hypoxic induced encephalopathy, 15.98in stage I, 46.5 in stage II, 76.125 in stage III, which is statistically significant (P Value <0.001). Our study also revealed increased NRBC/100WBC count with APGAR score at 5min.

Many authors like Ghosh B et al [16], Boskabadi [14] and saracoglu F et al [15] had reported similar finding in their studies. They also reported that neurological impairment was directly related to the severity of asphyxia.

CONCLUSION

Assessment of clinically diagnosed perinatal asphyxia cases with parameters like cord blood ph, blood gas study is not easy in rural setup with limited population. The NRBCs count can be easily done in the laboratory, which is commonly neglected by the clinicians. These nRbc count parameter can serve as simple and cost effective test in early diagnosis of perinatal asphyxia.

It will guide clinicians in instituting early treatment and adopting aggressive treatment whenever applicable, thus reducing the neonatal morbidity and mortality.

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