RESEARCH

A CROSS SECTIONAL STUDY ON THE CORRELATION BETWEEN CORD BLOOD HAEMOGLOBIN IN RELATION TO MATERNAL ANAEMIA

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Abstract

Background: Anaemia is a major public health problem worldwide. Global prevelance of Anaemia during pregnancy is 40.1%. half of maternal deaths in South East Asia are due to Anaemia& India alone contributes to 80% of Maternal Deaths due to Anaemia. The aim study the correlation between cord haemoglobin and maternal Anaemia. To evaluate maternal haemoglobin before delivery and to evaluate cord haemoglobin and to correlate both maternal and cord haemoglobin. **Materials and Methods:** This is a cross sectional study done in department of obstetrics at Modern Government Hospital, Petlaburz, Hyderabad during the period between February 2021 to January 2022. 400 pregnant mothers attending the labour room and their babies delivered were included in the study. **Result:** Results were expressed in terms of frequencies mean, standard deviation and percentages calculated for categorical variables. Inferential significance testing by t-test. Results were represented using appropriate graphs and charts wherever applicable. Mean age of anemic mothers was 25.79 + 2.22 and mean age of non-anemic mothers was 25.72 +2.46. 48% were anemic and 52% were non-anemic. Among the anemic mothers 48.9% had mild anemia, 42.8% had moderate anemia and 8.3% had severe anemia. Mean maternal haemoglobin among non-anemic mothers were 11.78 + .52 and among the anemic mothers was found to be 9.38 + 1.08. Mean maternal Haemoglobin in mothers with mild anemia was 10.43 + .23 and the Mean Haemoglobin in mothers with moderate anemia was 9.03 + .85 and the mean Haemoglobin in mothers with severe anemia was 6.6 + .23. The main cord Haemoglobin among the three groups (Mild, Moderate & Severe) was 15.54 + .77, 14.7 + .93 & 14.08 + .88 respectively. The mean cord Haemoglobin between the anemic and non-anemic group was compared and the difference between the two groups was statistically significant with p value < 0.05. The mean cord Haemoglobin among the 3 groups were compared with the Mean cord haemoglobin of the non-anemic group and the difference was statistically significant with p value less than 0.05, 0.01 & 0.05 respectively. **Conclusion:** In our study we observed that maternal Anaemia affects the cord Haemoglobin of the neonates. Laboratory testing of neonates by utilizing umbilical cord blood is a promising new practice which has shown to improve the neonatal outcome. Our study infers that anemic mothers deliver babies with lower haemoglobin compared to non anemic mothers.

INTRODUCTION

"Prevent anemia in mother, help the baby grow better"

Anemia is a major public health problem worldwide. According to the latest World Health Organization (WHO) report of 2016, the global prevalence of anemia during pregnancy is 40.1%, varying from 17% in Canada to over 60% in some African countries.[1] The situation is grave in Southeast Asian countries where about half of all global maternal deaths are due to anemia.

India alone contributes to about 80% of the maternal deaths due to anemia in South Asia.[2] There is a marginal decrease in prevalence of anemia in pregnant women inIndia from 58% in NFHS-3

survey (2005-2006) to 50% in NFHS-4 survey (2015-16).[3]

Maternal anemia has several deleterious effects on the health of the mother and fetus. During pregnancy, about 50% of women do not have adequate stores for iron. The risk of anemia increases with gestation as the iron required for pregnancy is more.[4] Maternal anemia may be caused by increased iron requirement by growing fetus and maternal tissues, decreased iron supply, and by expansion of maternal plasma volume.[5]

The umbilical cord blood haemoglobin is an important hematological parameter in newborn.[6] In developing countries up to 50% of children become anemic by 12 months of age.[7]

In comparison to the infants born to non-anemic mothers, the birth weight of the infants born to anemic mothers was found to be low. Incidence of pre term delivery and birth of IUGR babies, IUD (Intra uterine death) was more in women with maternal anemia.[8,9]

MATERIALS AND METHODS

This study is a crosssectional type of study done in the department of obstetrics, at Modern Government maternity Hospital, Petlaburz, Hyderabad. Study design cross section study period February 2021 to January 2022.

Study Population

Pregnant mothers attending the labor room in modern government maternity hospital and their babies delivered were included in the study.

Sample Size

400 pregnant mothers attending the labor room in modern government maternity hospital and their babies delivered were included in this study. Sample size was calculated depending upon the prevalence of anemia in antenatal mothers in previous studies by using the formula 4p/L^2.prevalance of anemia in the previous study was around 50%.

Inclusion Criteria

- Full-term neonates [37-41weeks]
- Preterm neonates > 34 weeks
- Women with singleton pregnancies
- Primi/multiparity
- Babies born to normal vaginal deliveries/caesarean section
- Babies born with birth weight of 2-4 kg

Exclusion Criteria

- Newborns with congenital malformations
- Birth asphyxia
- Twins
- Rh incompatibility
- Maternal risk factors like Gestational diabetes mellitus, Pregnancy induced hypertension, placenta previa and abruptio placenta.

Methodology

400 pregnant mothers attending the labor room in Modern government maternity hospital and their babies delivered were included in this study. After the delivery of the baby, cord blood haemoglobin was collected. Double clamping of the umbilical cord is done after delivery of the infant and also prior to expulsion of the placenta. Umbilical vein was identified and the needle insertion site was sterilized with antiseptic preparation pad. Cord blood sample was collected from the placental end of severed cord. About 2 ml of blood was aspirated from the umbilical vein using a sterile syringe and blood was transferred to a test tube containing EDTA. Collected blood samples were analyzed in the pathology lab in automated analyzer for haemoglobin estimation.

Predelivery maternal haemoglobin was estimated. Both cord blood and the maternal haemoglobin were determined. Based on the maternal haemoglobin values mothers were classified in to two groups, namely anemic and non-anemic. Those mothers with haemoglobin values less than 11g/dl were considered as anemic and those mothers with haemoglobin more than 11g/dl were considered as non-anemic. Anemic mothers with haemoglobin less than 11g/dl were classified into 3 groups, namely mild, moderate and severe anemia.

Cord blood haemoglobin values of anemic and non-anemic group was compared. Among the anemic mothers the mean cord blood haemoglobin in the three groups (mild, moderate, severe) were determined. The mean cord blood haemoglobin of each group was compared with the mean cord blood haemoglobin of the neonates born to the non-anemic mothers.

Statistical Analysis

Statistical analysis was performed using SPSS 21. Student t test was used to determine whether there was any significant difference between the two groups.

P value of less than 0.05 was taken as significant.

Figure 1: Cord Blood Collection

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RESULTS

Table 1: Age Distribution in Study Population

Age	Anemic	Non-anemic
< 20	1	0
20-25	81	96
26-30	111	109
>30	1	1

In age wise distribution of study population, we found that mean age of anemic mothers was 25.79± 2.22 and mean age of non-anemic mothers was 25.72±2.46.

Table 2: percentage of anemic mothers based on their rural/ urban area

Rural/ urban area	Number of anemic mother	Percentage of anemic mother (%)
Rural	122	63.6%
Urban	70	36.4%

Among the 192 anemic mothers, 122 of them were from rural area which accounts to about 63.6% and 70 of them were from urban area which accounts to about 36.4%.

Table 3: number and percentage of anemic and non-anemic mother

Group	Number of subjects (=400)	Percentage of subjects (%)
Anemic mothers	192	48%
Non-anemic mothers	208	52%

48% of anemic mother and 52% of non-anemic mothers were included in our study.

Table 4: anemic mothers based on its severity

Classification	No of anemic mothers	Percentage (%)
Mild – 10-10.9 gm/dl	94	48.9
Moderate – 9.9-7 gm/dl	82	42.8
Severe - <7 gm/dl	16	8.3

Table 5: Mean Haemoglobin In Anemic Mothers Based On The Severity Of Anemia

Maternal Haemoglobin	Mean Haemoglobin Gm/dl	No. Of Patients
10-10.0 gm/dl	10.43 + 0.23	94
9.97 gm/dl	9.03 + 0.85	82
<7gm/dl	6.6 + 0.31	16

Table 6: Mean Material and Cord Blood Haemoglobin

Maternal Haemoglobin	Mean Haemoglobingm/dl	No. ofPatients	Mean Cord Blood Haemoglobingm/dl	P Value
10-10.9 gm/dl	1043 + 0.23	94	15.54 + 0.77	P < 0.05
9.9-7 gm/dl	9.03 + 0.85	82	14.7 + 0.93	P < 0.01
< 7gm/dl	6.6 + 0.31	16	14.08 + 0.88	P < 0.05

The mean cord haemoglobin among the three groups (mild, moderate, severe) were compared with mean cord haemoglobin of the non-anemic group. The difference between the groups were statistically significant with P values < 0.05, 0.01 and 0.05 respectively.

Table 7: Mean Age, Mean Maternal Haemoglobin and Mean Cord Haemoglobin among Anemic and Non-Anemic Mothers

Age	MeanAge	Mean Maternal Haemoglobin	Mean Cord Haemoglobin	P Value
Anemic Mothers	25.79 + 2.22	9.38 + 1.08	15.03 + 1.04	P < 0.05
Non-anemicMothers	25.72 + 2.46	11.78 + 0.52	16.37 + 0.85	

Mean cord haemoglobin between anemic and non-anemic mothers were compared and the difference between them was statistically significant with p<0.05

Table 8: Percentage of Pre-Term and Term Babies

Gestation	Number of Babies	Percentage of Babies
Pre term babies	52	13%
Term babies	348	87%

Table 9: Relation of Maternal Haemoglobin with Newborn Birth Weight

Maternal Haemoglobin (g/dl)	Number of Patients	Neonatal birth Weight (Kg)
10-10.9 g/dl	94	3.1 + 0.35
7 – 9.9 g/dl	82	2.7 + 0.29

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< 7 g/dl	16	2.2 + 0.25
11	208	3.3 + 0.42

Table 10: Comparison of incidence of maternal anemia

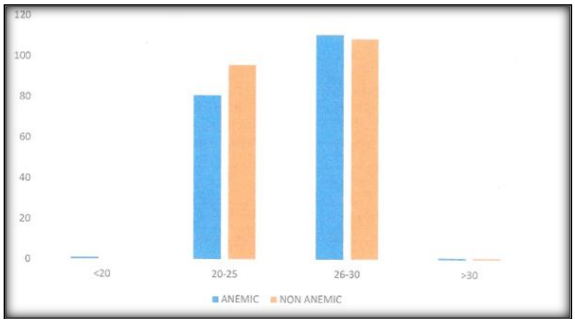
Study	PresentStudy	Nadia et al	Debbarmarubiet al
Study population	400	90	114
No. Of Women with anemia	192	50	54
% Incidence of maternal anemia	48%	55.55%	47.36%

Table 11: Comparison of mean haemoglobin concentration of mothers

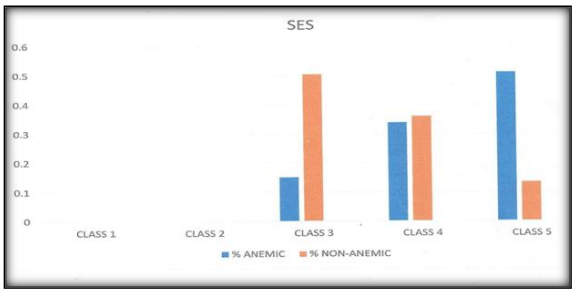
Study	PresentStudy	Debbarmarubiet al
Mild anemia	10.43 + 0.23	1057 + 0.27
Moderate anemia	9.03 + 0.85	9.18 + 0.65
Severe Anemia	6.6 + 0.31	6.5 + 0.54
Control	11.78 + 0.52	12.17 + 0.81

Table 12: Comparison of mean cord blood haemoglobin levels

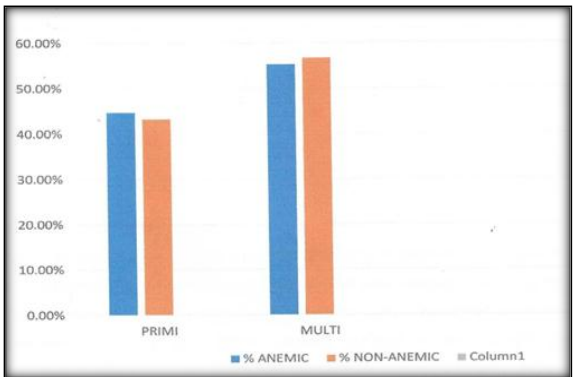
Maternal Haemoglobin (gm/dl)	Present Study	Nadia et al
10-10.9 gm/dl	15.54 + 0.77	14.79+1.36
9.9 – 7 gm/dl	14.7+0.93	13.89+ 0.9
< 7 gm/dl	14.08 +0.88	12.1 +1.04
Non-anemic	16.37 + 0.85	16.75 + 1.17



Graph 1: Age Distribution in Study Population



Graph 2: Distribution according to socioeconomic class (Modified Kuppuswamy scale)



Graph 3: Percentage of anemic and non-anemic mothers based on parity

DISCUSSION

In our study the maternal haemoglobin is compared with cord haemoglobin in order to find whether there is any relationship between the two parameters.

We found that mean age of anemic mothers was 25.79± 2.22 and mean age of non-anemic mothers was 25.72±2.46.

We observed that among the 192 anemic mothers, 122 of them were from rural area which accounts to about 63.6% and 70 of them were from urban area which accounts to about 36.4%.

Out of 400 mothers enrolled in our study, 192 mothers had haemoglobin less than 11g/dl and 208 mothers had haemoglobin more than 11g/dl. Among the anemic mothers 94 had mild anemia (haemoglobin between 10-10.9g/dl). 82 mothers had moderate anemia (haemoglobin between 7-9.9g/dl). 16 mothers had severe anemia with haemoglobin less than 7g/dl.

About 48% of the mothers were observed to be anemic and 52% were observed to be non-anemic. Among the anemic mothers 48.9% of them had mild anemia, 42.8% of them had moderate anemia and 8.3% of them had severe anemia.

The mean maternal haemoglobin in mothers with mild anemia was 10.43±0.23 and the mean haemoglobin in mothers with moderate anemia was 9.03± 0.85 and themean haemoglobin in mothers with severe anemia was 6.6 ± 0.23.

The mean cord haemoglobin among non-anemic mothers was 16.37 ± 0.85 and among the anemic mothers it was 15.03±1.04.

The mean cord haemoglobin among the three groups (mild, moderate, severe) was 15.54± 0.77, 14.7± 0.93 and 14.08± 0.88 respectively. The mean cord haemoglobin between the anemic and non-anemic group was compared and the difference between the

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two groups was statistically significant with p value < 0.05.

The mean cord haemoglobin among the three groups (mild moderate severe) were compared with mean cord haemoglobin of the non-anemic group and the difference was statistically significant with P value less than 0.05,0.01 and 0.05 respectively.

Among the 400 babies delivered 348 were term babies (87%) and 52 were pretermbabies (13%).

On comparing the cord haemoglobin with maternal haemoglobin, we found that there was a linear relationship between the two parameters. A decrease in the cord haemoglobin was observed with a decrease in the mean maternal haemoglobin. This denotes that there is an impact of maternal anemia on cord haemoglobin. This observation was similar to the study done in babylon university which showed a linear relationship between maternal haemoglobin and cord haemoglobin.[10]A linear relationship between the cord and maternal haemoglobin similar to our study.[11]Study differs from our study asthey reported that there was no association between cord haemoglobin and maternal haemoglobin levels.[12]

In our study we found that mothers with anemia were more likely to deliver babies with lower haemoglobin levels. This observation made us to rethink the belief that fetus continues to extract iron from the mother regardless of her iron status.

Study had shown that mothers with iron deficiency anemia gave birth to newborn with lower haemoglobin level.[13] Previous studies also suggest that iron supply to the placenta and the fetus is affected in maternal anemia and the fetus takes iron in direct proportion to the levels available in the mother.

Study titled "Effect of Maternal Iron Deficiency Anemia on the Iron Store of New borns "enrolled 21 anemic mothers and 78 non-anemic mothers and found that lower level of ferritin in newborns delivered from Iron deficiency anemia (IDA) mothers compared to non-anemic mothers suggests reduced iron stores in these newborns.[14] And also found that newborns delivered from IDA mothers had a significantly lower concentration of haemoglobin than newborns from non-anemic mother, which is correlating with the results of our study.

Iron is actively transported from mother to fetus. In order to ensure an adequate iron supply to the growing fetus even in the anemic mother, there is up regulation of iron transport proteins in the placenta in the iron deficiency state. Our study also demonstrated that the cord haemoglobin is lower in anemic mothers and that the decrease in cord haemoglobin appears to be proportional to the degree of anemia.[15]

This suggests that placental iron transport mechanisms may not work at higher degrees of anemia and thereby it leads to a fall in cord haemoglobin.[16]

There are some limitations in our study, iron status of the mother was not determined and maternal haemoglobin level was not determined in the first and second trimester. However, it is likely that mothers who were anemic in the third trimester had poor iron intake throughout their pregnancy and this may lead to decreased cord haemoglobin level.[17]

CONCLUSION

In our study we observed that maternal anemia affects the cord haemoglobin of the neonates. We have found a linear relationship between maternal haemoglobin and cord blood haemoglobin of the newborns. Our study infers that, anemic mothers deliver babies with lower haemoglobin compared to non-anemic mothers. Anemia during pregnancy is a common complication that can be detected by simple screening test. Anemia can lead to complications in both mother and the fetus. In developing countries like India, prophylaxis during pregnancy can prevent anemia and this has a direct impact on the decreased incidence of fetal and maternal complications. Umbilical cord blood, being the most valuable resource is the most under-utilized resource in the care of neonates. Laboratory testing of neonates by utilizing the umbilical cord blood, is a promising new practice which has shown to improve neonatal outcomes. Therefore, full implementation of this practice is an important step in better utilization of umbilical cord blood in improving the outcomes of neonates. Overall neonatal survival outcome would also be improved. Further studies are needed to determine the relation of iron stores of the mother to the fetal iron and ferritin levels.

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