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The Effect Of Maternal Anemia On Cord Blood Hemoglobin Levels

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Abstract

Background: Anemia in mothers is a serious issue. Babies born to anemic mothers are likely to have anemic parents. Neonatal anemia can be diagnosed using cord blood hemoglobin. **Aim and Objective:** The aim of the study was to find any correlation between maternal anemia and neonatal cord blood hemoglobin (Hb) levels. **Material and Methods:**This study is a cross-sectional type of study done at the Department of Pediatrics and Obstetrics and Gynecology Department at Adesh Medical College and Hospital, Mohri, Shahbad, Haryana, over 9 months from January 2022 to September 2022. **Observation and Result:** Out of 400 mothers, 192 had hemoglobin less than 11 g/dl, and 208 had hemoglobin more than 11 g/dl. Among the anemic mothers, 94 had mild anemia (hemoglobin between 10 and 10.9 g/dl). 82 mothers had moderate anemia (hemoglobin between 7-9.9 g/dl). 16 mothers had severe anemia with hemoglobin less than 7 g/dl. We observed that about 48% of the mothers 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. **Conclusion: Maternal anemia** affects the cord hemoglobin of neonates. Our study infers that anemic mothers deliver babies with lower hemoglobin compared to non-anemic mothers.

Keywords: cord hemoglobin, maternal anemia, newborn

INTRODUCTION

The umbilical cord blood hemoglobin is an important hemological parameter in newborns. [1] In developing countries, up to 50% of children become anemic by 12 months of age. [2] Mothers who had anemia were more likely to deliver anemic babies. [3]

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Maternal anemia has several deleterious effects on the health of the mother and fetus. [4] About 50% of women do not have adequate stores of iron during pregnancy. [5] Because the iron required for pregnancy is higher, the risk of anemia increases with gestation. [6] Maternal anemia may be caused by decreased iron supply, increased iron requirement by growing fetus, and expansion of maternal plasma volume. [7]

According to the WHO, a hemoglobin level less than 11 g/dL is defined as maternal anemia during pregnancy. [8] Maternal anemia in pregnancy is classified as mild, moderate,moderate and severe anemia, with Hb levels being 10 to 10. [9] gm/dl, 7 to 9.9 gm/dl, and <7 gm/dl, respectively. The birth weight of infants born to women with anemia was low compared to infants born to non-anemic mothers. The incidence of preterm delivery and birth of IUGR babies and IUD (intrauterine death) was higher in women with maternal anemia. [10]

Anaemia is a common medical disorder, and around 50% of women become anemic during pregnancy worldwide. Maternal anemia during pregnancy is common in developing countries and affects 57% of pregnancies. [11,12] Umbilical cord blood is the most valuable underutilized resource in the care of neonates. Utilization of umbilical cord blood for laboratory testing of neonates is a promising new practice that has been shown to improve neonatal outcomes. Full implementation of this practice is therefore an important step in better utilizing umbilical cord blood and improving the outcomes of neonates. [13] More research is required to validate the significant correlation between maternal Hb levels and neonatal cord blood Hb levels. The aim of the study was to see how maternal anemia affected newborn cord blood Hb.

Material and Method

This study is a cross-sectional type of study done at the Department of Pediatrics and Obstetrics and Gynecology Department at Adesh Medical College and Hospital, Mohri, Shahbad, Haryana, over 9 months from January 2022 to September 2022. The study protocol was approved by the ethical committee.

Sample size

400 pregnant mothers attending the labor room in Adesh Medical College and Hospital and having 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. The prevalence of anemia in the previous study was around 50%.

Inclusion Criteria

- Full-term neonates [37–41 weeks]
- Preterm neonates > 34 weeks

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- Women with singleton pregnancies
- Primi/multiparity
- Babies born to normal vaginal deliveries or caesarean sections
- Babies born with a birth weight of 2–4 kg

Exclusion Criteria

- Newborns with congenital malformations
- Birth asphyxia
- Twins
- Rh incompatability
- Maternal risk factors like gestational diabetes mellitus and pregnancy
- induced hypertension, placenta praevia, and abruptio placenta.

Statistical Analysis

Statistical analysis was performed using SPSS 21. A student t test was used to determine whether there was any significant difference between the two groups. A P value of less than 0.05 was taken as significant.

Observation and Result

Table No. 1 shows the number and percentage of anemic and non-anemic mothers.

GROUP	Number of subjects	Percentage of subjects (%)
Anaemic mothers	192	48
Non-anemic mothers	208	52

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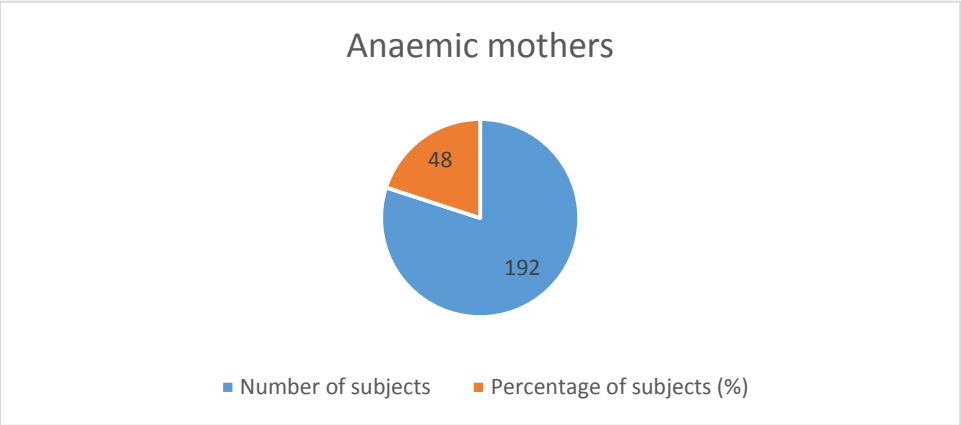
Pie chart showing the number of anemic and non-anemic mothers



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

Table No. 2 showing number of anemic mothers based on their severity.

Classification	Number of anemic mothers	Percentage(%)
Mild: 10–10.9 g/dl	84	48.9
Moderate: 9.9–7 g/dl	82	82.9
Severe: <7 gm/dl	16	8.3

Table showing categorization of anemic mothers based on their severity:

Table No. 3 shows the number and percentage of preterm and term babies.

Gestation	Number of babies	Percentage of babies
Preterm babies	52	13
Term babies	348	87

Table No. 4 shows the number and percentage of anemic mothers based on their rural or urban area.

Rural/urban area	Number of anemic mothers	Percentage of anaemic mothers (%)
Rural	122	63.6
Urban	70	36.6

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Table No. 5 shows the mean age,mean maternal hemoglobin, and mean cord hemoglobin among anemic and non-anemic mothers.

Group	Mean age	Mean maternal haemoglobin	Mean cord haemoglobin	P -value
Anaemic mothers	25.79±2.22	9.38±1.08	15.03±1.04	P<0.05
Non anaemic mothers	25.72± 2.46	11.78 ± 0.52	16.37 ± 0.85	

Mean cord hemoglobin between anemic and non-anemic mothers was compared, and the difference between them was statistically significant with p<0.05.

Table No. 6: Showing mean hemoglobin in anemic mothers based on the severity of anemia

Number of patients	Maternal haemoglobin	Mean haemoglobin gm/dl
94	10-10.9 gm/dl	10.43±0.23
82	9.9-7gm/dl	9.03±0.85
16	<7gm/dl	6.6 ±0.31

Table No. 7 shows the mean maternal and cord blood hemoglobin.

Maternal Haemoglobin	Mean haemoglobin gm/dl	No. of patients	Mean Cord blood hamoglobin gm/dl	P- value
10-10.9 gm/dl	10.43±0.23	**94**	15.54±0.77	P<0.05
9.9-7gm/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 hemoglobin among the three groups (mild to moderately severe) was compared with the mean cord hemoglobin of the non-anemic group. The differences between the groups were statistically significant, with P values <0.05, 0.01 and 0.05, respectively.

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DISCUSSION

In our study, we compared maternal hemoglobin with cord hemoglobin in order to find whether there is any relationship between the two parameters. We enrolled 400 mothers in the study, and their predelivery hemoglobin level was determined. Out of 400 mothers, 192 had hemoglobin less than 11 g/dl, and 208 had hemoglobin more than 11 g/dl. Among the anemic mothers, 94 had mild anemia (hemoglobin between 10 and 10.9 g/dl). 82 mothers had moderate anemia (hemoglobin between 7-9.9 g/dl). 16 mothers had severe anemia with hemoglobin less than 7 g/dl. We observed that about 48% of the mothers 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.

Among the 400 babies delivered, 348 were term babies (87%), and 52 were preterm babies (13%). We observed that among the 192 anemic mothers, 122 were from rural areas, which accounts for about 63.6%, and 70 were from urban areas, which account for about 36.4%.

We found that the mean age of anemic mothers was 25.79± 2.22 and the mean age of non-anemic mothers was 25.72± 2.46. The mean maternal hemoglobin among non-anaemic mothers was 11.78 ± 0.52, and among anaemic mothers, it was found to be 9.38 ± 1.08. The mean cord hemoglobin among non-anemic mothers was 16.37 ± 0.85, and among anemic mothers it was 15.03 ± 1.04. The mean maternal hemoglobin in mothers with mild anemia was 10.43 ± 0.23, the mean hemoglobin in mothers with moderate anemia was 9.03 ± 0.85, and the mean hemoglobin in mothers with severe anemia was 6.6 ± 0.23.

The mean cord hemoglobin among the three groups (mild, moderate, and severe) was 15.54 ± 0.77, 14.7 ± 0.93, and 14.08 ± 0.88, respectively. The mean cord hemoglobin between the anemic and non-anemic groups was compared, and the difference between the two groups was statistically significant with a p value < 0.05. The mean cord hemoglobin among the three groups (mild to moderately severe) was compared with the mean cord hemoglobin of the non-anaemic group, and the difference was statistically significant with a P value less than 0.05, 0.01 and 0.05, respectively.

On comparing cord hemoglobin with maternal hemoglobin, we found that there was a linear relationship between the two parameters. It was observed that as the mean maternal hemoglobin decreased, there was a decrease in the cord hemoglobin. This denotes that there is an impact of maternal anemia on cord hemoglobin. This observation was similar to the study done by Nadia et al. at Babylon University, which showed a linear relationship between maternal hemoglobin and cord hemoglobin.

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Debbarmarubi et al. also showed a linear relationship between the cord and maternal hemoglobin, similar to our study. The Marmoury GH et al. study differs from ours in that they reported that there was no association between cord hemoglobin and maternal hemoglobin levels. [14]

In our study, we found that mothers with anemia were more likely to deliver babies with lower hemoglobin levels. This observation made us rethink the belief that the fetus continues to extract iron from the mother regardless of her iron status. Sweet et al., in their study, showed that mothers with iron deficiency anemia gave birth to newborns with a lower hemoglobin level. Previous studies also suggest that iron supply to the placenta and the fetus is affected by maternal anemia, and the fetus takes iron in direct proportion to the levels available in the mother.

Our study findings matched those of Klebanoff et al. (1991) and Lu et al. (1991), who reported a relationship between maternal anemia and a higher risk of preterm delivery. [15-16] The present study findings were similar to those of a study done by Prasad et al., who reported a significant positive association with an increasing number of children and gravida status. [16] Our findings were comparable to those of Tembhare et al., who discovered that the number of vaginal deliveries, instrumental deliveries, and caesarean sections (LSCS) was similar in both anemic and non-anemic mothers, but that more anemic mothers required induction of labor. [17] Our findings matched those of Figueiredo et al., who found that maternal anemia was linked to low or insufficient birth weight, indicating that it was a risk factor for the gestational outcomes evaluated. [17]

Similar studies by Rathoria R. et al. also found that maternal anemia affects neonatal cord blood hemoglobin. According to the findings, anemic women deliver new-born with lower hemoglobin levels than non-anemic mothers. The findings revealed a linear correlation between maternal hemoglobin and cord blood hemoglobin of their new-born. Our study also demonstrated that cord hemoglobin is lower in anemic mothers and that the decrease in cord hemoglobin appears to be proportional to the degree of anemia. This suggests that placental iron transport mechanisms may not work at higher degrees of anemia, which thereby leads to a fall in cord hemoglobin.

Strength and limitation

There are some limitations in our study; the iron status of the mother was not determined, and the maternal hemoglobin level was not determined in the first and second trimesters. 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 a decreased hemoglobin level.

Conclusion

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In our study, we observed that maternal anemia affects the cord hemoglobin of neonates. Our study infers that anemic mothers deliver babies with lower hemoglobin compared to non-anemic mothers. We have found a linear relationship between maternal hemoglobin and cord blood hemoglobin in newborns. Anemia during pregnancy is a common complication that can be detected by a simple screening test. Anaemia can lead to complications in both mother and fetus. In developing countries like India, prophylaxis during pregnancy can prevent anemia, and this may decrease the incidence of fetal and maternal complications. Overall neonatal survival outcomes may also increase. Further studies are needed to determine the relationship between the iron stores of the mother and the fetal iron and ferritin levels.

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