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**Original research article**

# A study on impact of maternal anemia on hemoglobin levels of umbilical cord blood in a tertiary care hospital

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**Abstract**

**Background:** Anemia during the time of pregnancy is a widely recognized problem causing significant maternal and neonatal complications. Maternal anemia causes decreased oxygen carrying capacity of blood in fetuses which can impact the overall growth and development.

**Materials and Methodology:** A total of 250 patients presenting after 34 weeks of gestational age were included in the study which was conducted by Department of Pediatrics. The study period was of 1 year duration.

**Results:** Out of the 250 study participants, 7% were found to be anemic. Most of the study participants were illiterate, belonged to low socio-economic status, and were from rural areas. The mean cord blood hemoglobin levels were decreasing significantly with decrease in the levels of maternal hemoglobin levels.

**Conclusion:** Illiteracy, low socio-economic background are some of the factors associated with lower hemoglobin levels in pregnant women. This has a direct impact on the growth of neonates. Awareness must be spread regarding the need of iron and folic acid supplementation, going to regular antenatal visits, and frequent screening for anemia in pregnant women throughout pregnancy.

**Keywords:** Anemia during pregnancy, cord blood hemoglobin levels, neonates, growth restriction.

## Introduction

Anemia, defined as per WHO is decrease in hemoglobin levels according to their age, race and gender, which is usually below 13 g/dL in males and below 11 g/dL in females. Anemia in pregnancy is often more pronounced due to increased demand of red cell mass and volume expansion. Anemia in pregnancy is categorized into mild anemia (Hb 10.9 g/dL – 10.0 g/dL); moderate anemia (9.9-7.0 g/dL) and severe anemia (<7 g/dL) [1, 2].

The commonest cause of anemia during pregnancy is microcytic anemia due to iron deficiency, followed by megaloblastic anemia due to folic acid deficiency. Owing to increased demand of iron during pregnancy, especially during the second trimester, most of the pregnant women develop iron deficiency anemia, if they are not supplemented with oral iron preparations [3].

Presence of iron deficiency anemia has adverse effects on the newborn and on the mother. Maternal effects include excessive tiredness, sleep difficulties, palpitations, increased risk of acquiring perinatal infections and pre-eclampsia. Perinatal outcomes due to maternal anemia include prematurity, low birth weight, intra-uterine growth retardation and fetal demise, in severe cases (severe anemia when Hb <6 g/dL). Iron deficiency anemia during the first trimester has been associated with poor organogenesis and neurulation problems [4-6].

Adequate fetal growth and development depends on uninterrupted supply of nutrients and oxygen from the mother. Studies have shown that maternal anemia is bound to affect fetal growth patterns. Estimation of fetal hemoglobin levels extremely difficult and hazardous. Instead, estimation of umbilical cord blood hemoglobin levels gives a rough estimate of fetal hemoglobin levels and can be used as a method to understand neonatal outcomes [7].

This study was done with the aim to evaluate the impact of maternal anemia on umbilical cord blood hemoglobin levels in a tertiary care hospital in South India.

## Materials and Methodology

This prospective observational study was conducted over 1 year, i.e. from April 2023 to March 2024 in the Department of Pediatrics, RVM Institute of Medical Sciences and Research Centre, Telangana. All pregnant women above 34 weeks of gestational age were included in this study. Patients with risk of ante-partum hemorrhage, medical comorbidities such as diabetes, hypertension disorders of pregnance, hypothyroidism, renal conditions were excluded. Patients with newborns who were twins, presence of pathological jaundice (due to Rh incompatibility), presence of any congenital anomalies, or birth

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asphyxia were excluded from this study.
After the inclusion and exclusion criteria, 250 participants were included in the study.
History was taken regarding the demographic details, ante-partum history, obstetric history. Maternal hemoglobin levels were estimated and were graded into mild, moderate and severe anemia based on hemoglobin levels. Cord blood hemoglobin levels of the newborns was estimated after taking proper consent from the parents.
Data was compiled into Microsoft excel and was analyzed. Ethical committee approval was taken before commencement of study. Patients were assured of the confidentiality norms.

**Results**

After taking a written informed consent, 250 participants were included in this study. The mean age of study group is 25.9 ± 3 years with age ranging from 18-33 years.

**Table 1:** Demographic details

| Variable | | No. of patients |
|---|---|---|
| Age | <20 years | 50 (20%) |
| | 20-30 years | 165 (66%) |
| | >30 years | 35 (14%) |
| Socio-economic status | Low | 130 (52%) |
| | Middle | 100 (40%) |
| | High | 20 (8%) |
| Literacy rate | Literate | 82 (32.8%) |
| | Illiterate | 168 (67.2%) |
| Background | Rural | 180 (72%) |
| | Urban | 70 (28%) |

**Table 2:** Obstetric history

| Variable | | No. of patients |
|---|---|---|
| Gravida | Primigravida | 160 (64%) |
| | Multigravida | 90 (36%) |
| Gestational age | 34-37 weeks | 150 (60%) |
| | ≥37 weeks | 100 (40%) |
| Mode of delivery | Vaginal delivery | 115 (46%) |
| | Cesarean section | 135 (54%) |
| Birth weight of newborn | Normal | 158 (63.2%) |
| | Low birth weight | 92 (36.8%) |

Amongst the 250 patients, 75 were non-anemic (30%) and the rest 180 were found to have anemia.

**Table 3:** Degree of maternal anemia

| Degree | No. of patients |
|---|---|
| Non-anemic | 75 (30%) |
| Mild anemia (10-10.9 g/dL) | 65 (26%) |
| Moderate anemia(7-9.9 g/dL) | 75 (30%) |
| Severe anemia (<7g/dL) | 40 (16%) |

The mean hemoglobin level of study was 8.2 ± 2 g/dL.

**Table 4:** Correlation between the maternal hemoglobin levels and cord blood hemoglobin levels

| Variable | Maternal hemoglobin levels (mean) | Cord blood hemoglobin levels (mean) | P value |
|---|---|---|---|
| Non-anemic | 11.3 ± 2.3 | 13.8 ± 1.2 | 0.002 |
| Mild anemia (10-10.9 g/dL) | 10.5 ± 0.1 | 12.5 ± 0.2 | 0.0078 |
| Moderate anemia (7-9.9 g/dL) | 8.23 ± 0.79 | 11.5 ± 0.1 | 0.012 |
| Severe anemia (<7g/dL) | 6.2 ± 0.5 | 10.8 ± 0.7 | 0.035 |

The correlation between the mean maternal hemoglobin levels and the mean cord blood hemoglobin levels was found to be significant.

**Discussion**

Maternal anemia is associated with adverse maternal and perinatal outcomes. This study was conducted to assessthe impact of maternal anemia on umbilical cord blood hemoglobin levels.
Most of the study participants were aged between 20-30 years. Mean age of present study is 25.9 ± 3

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years.

Most of the patients were from lower socio-economic status (52%). 67.2% of the study group were illiterate. 72% belonged to rural background.

In this study only 30% of the study participants were found to be non-anemic and the rest of the 70% were anemic. This could be attributable to the poor economic and educational background of the study participants.

Most of the patients had mild anemia (26%). The mean hemoglobin levels in patients with mild anemia were 10.5 $\pm$ 0.1 g/dL. The mean umbilical cord blood hemoglobin levels in newborns of patients with mild anemia were 12.5 $\pm$ 0.2, with its levels dropping significantly with the decrease in maternal hemoglobin levels. This is similar to the study done by Timilsina, *et al*. [8], Sareen *et al*. [9], Najeeba *et al*. [10] and Adedrian *et al*. [11].

**Conclusion**

This study concludes that maternal hemoglobin levels have a significant impact on the neonatal hemoglobin levels. Low levels of literacy and poor socio-economic background has a role to play in maternal health.

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**Conflicts of interest:** Nil.

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