

## Original Research Article

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# Impact of maternal anaemia on cord blood haemoglobin

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## ABSTRACT

**Background:** Anaemia during pregnancy is associated with serious maternal and fetal complications. Cord blood hemoglobin of the newborn is an important indicator of anaemia in newborn at birth. So, this study is done to assess the impact of maternal anaemia on cord blood hemoglobin levels of neonates.

**Methods:** It is a cross sectional study done at government Kilpauk medical college and hospital in the department of paediatrics in year 2016.400 pregnant mothers attending the labour room in Kilpauk medical college were included and cord blood haemoglobin of their babies were collected. Mean cord blood haemoglobin of new-borns born to anaemic mothers (mild, moderate and severe) were compared with cord blood haemoglobin of new-borns born to non-anaemic mothers.

**Results:** Out of 400 mothers, 192 mothers were anemic, and 208 mothers were non anemic. The mean maternal hemoglobin among non-anemic mothers was  $16.37 \pm 0.85$  and among the anemic mothers it was  $15.03 \pm 1.04$ . The mean cord hemoglobin of neonates born to anemic mothers among the three groups (mild moderate severe) were compared with mean cord hemoglobin of the non-anemic group. The difference between groups were statistically significant with P values  $<0.05$ ,  $0.01$  and  $0.05$  respectively.

**Conclusions:** In present study maternal anaemia affects the cord blood haemoglobin of neonates. Present study infers that anaemic mothers deliver babies with lower haemoglobin compared to non-anaemic mothers. Authors have found a linear relationship between maternal haemoglobin and cord blood haemoglobin of the new-borns.

**Keywords:** Cord blood, Hb, Maternal anaemia

## INTRODUCTION

Maternal anaemia during pregnancy is common in developing countries which affects 57% of pregnancies. According to WHO, hemoglobin level less than 11 gm/dl is defined as maternal anaemia during pregnancy.<sup>1,2</sup> Maternal anaemia in pregnancy is classified as mild, moderate and severe anaemia with Hb levels being 10 to 10.9 gm/dl,<sup>7</sup> 9 to 9.9 gm/dl and  $<7$  gm/dl respectively.<sup>3</sup> Maternal anaemia may be caused by decreased iron supply, increased iron requirement by growing fetus and by expansion of maternal plasma volume.<sup>4</sup> Maternal anaemia has several deleterious effects on health of the mother and fetus.<sup>5</sup>

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 which has shown to improve neonatal outcomes. Full implementation of this practice is therefore an important step in better utilization of umbilical cord blood in improving the outcomes of neonates.<sup>6</sup>

Cord blood hemoglobin of the newborn is an important indicator of anaemia in newborn at birth.<sup>7</sup> It was thought previously that whatever may be the hemoglobin level in the mother, baby will not be anemic. Some studies concluded that mothers with iron deficiency anaemia

during pregnancy gave birth to newborns with lower cord blood Hb levels.<sup>8</sup> Recent studies are showing a linear relationship between cord blood hemoglobin of newborns and maternal haemoglobin.<sup>9</sup>

Still further studies are needed to confirm positive correlation between maternal Hb levels and cord blood Hb levels in newborn. So, this study was aimed to assess the effect of maternal anemia on cord blood hemoglobin in newborn.

## METHODS

This study is a cross sectional type of study done at Goverment Kilpauk Medical College and Hospital in the department of pediatrics. The study protocol was approved by ethical committee for research studies in Kilpauk medical college and hospital. The duration of study was for 6 months in the year 2016.

### Inclusion criteria

- Full-term neonates (37-41 weeks),
- Preterm neonates > 34 weeks,
- Women with singleton pregnancies/twins,
- Primi/multiparity,
- Babies born to normal vaginal deliveries/caesarean section.

### Exclusion criteria

- Newborns with congenital malformations,
- Birth asphyxia,
- Rh incompatibility,
- Maternal risk factors like gestational diabetes mellitus, pregnancy induced hypertension.

A 400 pregnant mothers attending the labour room in Kilpauk Medical college and their babies delivered were included in this study. Pre-delivery maternal haemoglobin was estimated. Based on the maternal haemoglobin values, mothers were classified in to two groups, namely anaemic and non-anaemic. Maternal anaemia in pregnancy classified as mild (10-10.9 gm/dl), moderate (9.9-7 gm/dl) and severe (<7 gm/dl). The cord blood haemoglobin of neonates born to anaemic mothers (mild, moderate, severe) were compared with the cord blood haemoglobin of the neonates born to non-anaemic mothers.

### Statistical analysis

Statistical analysis was performed using SPSS 21. Sample size was calculated depending upon the prevalence of anaemia in antenatal mothers in previous studies by using the formula  $4p/L^2$ . Student t test was used to determine whether there was any significant difference between the groups. P value less than 0.05 was taken as significant.

## RESULTS

Out of 400 pregnant women enrolled in present study, 192 mothers were anemic, and 208 mothers were non anemic as shown in (Table 1). Authors found that mean age of anemic mothers was  $25.79 \pm 2.22$  and mean age of non-anemic mothers were  $25.72 \pm 2.46$ .

**Table 1: Number and percentage of anemic and non-anemic mothers**

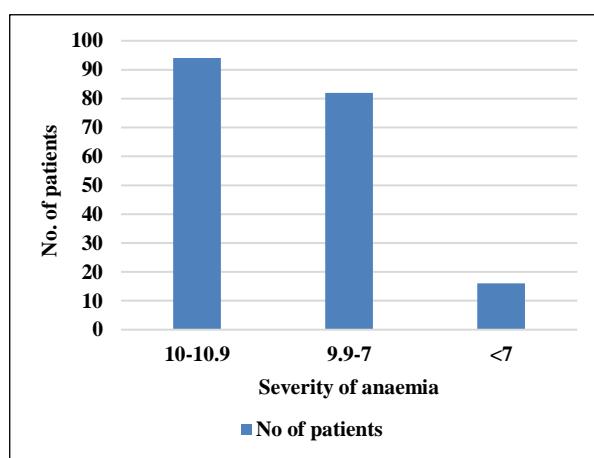
Group	No. of subjects	Percentage of subjects
Anemic mothers	192	48
Non -anemic mothers	208	52

Authors observed about 48% of the mothers were anemic and 52% were non anemic.

**Table 2: Categorization of 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

Among the anemic mothers 48.9% of them had mild anaemia (Hb level:10-10.9 gm/dl),42.8% of them had moderate anaemia (9.9-7 gm/dl) and 8.3% of them had severe (<7 gm/dl) anaemia as shown in (Table 2). Bar diagram showing number of anemic mothers based on its severity was shown in (Figure 1).



**Figure 1: Number of anemic mothers based on its severity.**

Mean age, mean maternal hemoglobin and mean cord hemoglobin among anemic and non-anemic mothers was shown in (Table 3). The mean maternal hemoglobin among non-anemic mothers were  $11.78 \pm 0.52$  and among the anemic mothers was found to be  $9.38 \pm 1.08$ . The mean cord hemoglobin of newborns born to non-anemic

mothers was  $16.37 \pm 0.85$  and among the anemic mothers

it was  $15.03 \pm 1.04$  as shown in (Table 3).

**Table 3: Mean maternal hemoglobin and mean cord hemoglobin among anemic and non-anemic mothers.**

Group	Mean age	Mean maternal haemoglobin	Mean cord blood haemoglobin of neonates	P value
Anaemic mothers	$25.79 \pm 2.22$	$9.38 \pm 1.08$	$15.03 \pm 1.04$	$P < 0.05$
Non anaemic mothers	$25.72 \pm 2.46$	$11.78 \pm 0.52$	$16.37 \pm 0.85$	

**Table 4: Mean maternal hemoglobin among three groups (mild, moderate, severe) and mean cord blood hemoglobin of newborns respectively.**

Maternal hemoglobin	Mean haemoglobin gm/dl	No. of patients	Mean cord blood hemoglobin gm/dl	P value
10-10.9 gm/dl	$10.43 \pm 0.23$	94	$15.54 \pm 0.77$	$P < 0.05$
9.9-7 gm/dl	$9.03 \pm 0.85$	82	$14.7 \pm 0.93$	$P < 0.01$
<7 gm/dl	$6.6 \pm 0.31$	16	$14.08 \pm 0.88$	$P < 0.05$

Mean cord hemoglobin of neonates born to anemic and non-anemic mothers were compared and the difference between them was statistically significant with  $p < 0.05$ . Mean maternal hemoglobin among three groups (mild, moderate, severe) and mean cord blood hemoglobin of newborns respectively shown in (Table 4).

The mean cord hemoglobin among the three groups (mild moderate severe) were compared with mean cord hemoglobin of the non-anemic group and the difference was statistically significant with  $P$  value less than 0.05, 0.01 and 0.05 respectively as shown in (Table 4).

## DISCUSSION

In present study authors compared the maternal hemoglobin with cord hemoglobin of newborns in order to find whether there is any relationship between the two parameters. Authors enrolled 400 mothers in the study and their pre delivery hemoglobin level was determined. Out of 400 mothers, 192 mothers had hemoglobin less than 11g/dl and 208 mothers had hemoglobin more than 11 g/dl.

Authors observed about 48% of the mothers were anemic and 52% were non-anemic. Among the anemic mothers 48.9% of them had mild anaemia, 42.8% of them had moderate anaemia and 8.3% of them had severe anaemia.

The mean maternal hemoglobin in mothers with mild anaemia was  $10.43 \pm 0.23$  and the mean hemoglobin in mothers with moderate anaemia was  $9.03 \pm 0.85$  and the mean hemoglobin in mothers with severe anaemia was  $6.6 \pm 0.23$ . The mean cord hemoglobin of newborns born to non-anemic mothers was  $16.37 \pm 0.85$  and among the anemic mothers it was  $15.03 \pm 1.04$ . The mean cord hemoglobin 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 hemoglobin of newborns born to anemic mothers in the group (mild, moderate, severe) was  $15.54 \pm 0.77$ ,  $14.7 \pm 0.93$  and  $14.08 \pm 0.88$  respectively. The mean cord hemoglobin among the three groups (mild moderate severe) were compared with mean cord hemoglobin of the non-anemic group and the difference was statistically significant with  $P$  value less than 0.05, 0.01 and 0.05 respectively.

On comparing the cord hemoglobin with maternal hemoglobin, authors found that there was a linear relationship between the two parameters. It was observed as that as mean maternal hemoglobin decreases, there was a decrease in the cord hemoglobin. This denotes that there is an impact of maternal anaemia on cord hemoglobin. Present study also demonstrated that the cord hemoglobin is lower in anemic mothers and that the decrease in cord hemoglobin appears to be proportional to the degree of anaemia. This suggests that placental iron transport mechanisms may not work at higher degrees of anaemia and thereby it leads to a fall in cord hemoglobin.

This observation was similar to the study done by Najeeba CM et al, in Babylon university which showed a linear relationship between maternal hemoglobin and cord hemoglobin of newborn.<sup>10</sup> Debbarma R et al, also showed a linear relationship between the cord and maternal hemoglobin similar to present study.<sup>11</sup> Marmoury GH et al, study differs from present study as they reported that there was no association between cord hemoglobin and maternal hemoglobin levels.<sup>12</sup>

Limitations of this study was the iron status of the mother was not determined and maternal hemoglobin 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 hemoglobin level. Further studies could be done comparing the maternal hemoglobin levels with the birth weight of the neonates.

## CONCLUSION

In present study authors observed that maternal anaemia affects the cord haemoglobin of neonates. Present study inferred that anaemic mothers deliver babies with lower haemoglobin compared to non-anaemic mothers. Authors have found a linear relationship between maternal haemoglobin and cord blood haemoglobin of their newborns. Anaemia during pregnancy is a common complication that can be detected by simple screening test.

In developing countries like India, prophylaxis during pregnancy can prevent anaemia and this may decrease the incidence of foetal and maternal complications.

Overall neonatal survival outcome may also be increased. 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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