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Research Article

## Maternal anaemia and its severity: an independent risk factor for preterm delivery and adverse neonatal outcome

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### ABSTRACT

**Background:** This study was done to evaluate the effect of maternal anaemia and its severity on gestational age and neonatal outcome.

**Methods:** This was a retrospective study, conducted in Vardhman Mahavir medical college and Safdarjang hospital, New Delhi between April 2012 to March 2013. Cases were divided in three groups i.e. non anaemic, mild to moderately anaemic and severely anaemic (according to WHO classification). A total of 1050 woman (350 in each group) were recruited for study. The following outcome measures were used: preterm delivery (<37 weeks), birth weight, APGAR score, admission of baby in neonatal intensive care unit and early neonatal death. Data was analyzed by Chi-square test. A P value of or less than 0.05 was considered as significant.

**Results:** The risk of preterm delivery, low birth weight, poor APGAR score and admission of baby in neonatal intensive care unit was more in anaemic group and it increased with severity of anaemia which was statistically significant. The increase in risk of early neonatal death was not significant in mild/moderate anaemic group (P value 0.326) while it was statistically significant in severely anaemic group (P value 0.004).

**Conclusions:** Anaemia in pregnancy has a recognizable association with prematurity, low birth weight and poor neonatal outcome.

**Keywords:** Maternal anaemia, Preterm, Birth weight, Neonatal outcome, APGAR score

### INTRODUCTION

Anaemia has been very important and widespread nutritional disorder in the world affecting a big chunk of global population and is even more prevalent in pregnant woman. India has reported very high prevalence of anaemia in pregnancy. Anaemia in pregnancy is considered as a major risk factor for adverse maternal and fetal outcome. WHO has defined Hb of <11 gm/dl as anaemia in pregnancy. It is divided into three category viz mild degree (9.0-10.9 gm%), moderate degree (7.0-8.9 gm%), and severe degree (<7.0 gm%). Although the

association between anaemia in pregnancy and perinatal outcome has been studied extensively, the literature is still conflicting. Most of the studies have demonstrated a strong association between maternal anaemia and adverse outcome such as low birth weight, preterm delivery and intrauterine growth retardation,<sup>1-5</sup> while study by Xiong X et al.<sup>6</sup> found no such association. Study done by B Mahamuda et al.<sup>7</sup> had shown poor Apgar score in anaemic group when compared to non-anaemic group, while study done by Reshetnikova OS et al.<sup>8</sup> had found no such association.

Keeping all this in view, this study was done to investigate effect of maternal anaemia on gestational age and neonatal outcomes. The following outcome measures were used: preterm delivery (<37 weeks), birth weight, APGAR score, admission of baby in neonatal intensive care unit (NICU) and early neonatal death (death within one week of birth).

## METHODS

This was a retrospective study conducted in Vardhman Mahavir medical college and Safdarjang hospital, New Delhi from April 2012 to March 2013. No intervention for the sake of study was done. Study was done after delivery. Required information was obtained from antenatal card, case history at admission, delivery notes and baby case sheet. The cases were divided in three groups according to haemoglobin level at admission for delivery and third trimester i.e. non-anaemic, mild to moderately anaemic and severely anaemic (as per WHO classification). A total of 1050 woman (350 in each group) were recruited for study. Statistical analysis was done by Chi square test. A P value of or less than 0.05 was considered as significant.

Our hospital is a tertiary care hospital. The average number of deliveries per year ranges from 20000 to 25,000. We commonly met patients with anaemia in late pregnancy without prior antenatal care. A large number

of unbooked cases (approximately 40-45%) are coming for delivery to our hospital.

### Inclusion criteria

Pregnant woman who delivered in our institute were included in this study.

### Exclusion criteria

- Multiparty (5 and above)
- Hypertensive disorders in pregnancy
- Pregnancy with diabetes mellitus
- Ante partum haemorrhage
- Pregnancy with chronic medical illness
- Multiple gestations
- HIV/HBsAg/VDRL positive cases

## RESULTS

Birth weight- In the present study birth weight < 2 kg was 7.14 % in non-anaemic group, 22 % in mild/moderately anaemic and 50.86% in severely anaemic group; this is respectively about 3.4 times and 7 times more than non-anaemic group. In severely anaemic group only 20 % had birth weight more than 2.5 kg while in non-anaemic group it was 66.86 %. These differences are statistically significant with p value <0.0001.

**Table 1: Comparison of birth weight between nonanaemic and anaemic groups.**

Birth weight	Gestational age	Normal Hb (n=350)	Mild/moderate anaemia (n=350)	Severe anaemia (n=350)	P value
<2 kg	Term	14	32	73	<0.0001
	Preterm	11	45	105	
	Total	25 (7.14%)	77 (22%)	178 (50.86%)	
2-2.5 kg	Term	52	88	28	
	Preterm	39	101	74	
	Total	91 (26 %)	189 (54%)	102 (29.14%)	
>2.5 kg	Term	214	60	39	
	Preterm	20	24	31	
	Total	234 (66.86 %)	84 (24%)	70 (20%)	

**Table 2: Comparison of gestational age at delivery and neonatal outcome between nonanaemic and anaemic groups.**

Variables	Normal Hb (n=350)	Mild/moderate anaemia (n=350)	Severe anaemia (n=350)	P value
Preterm delivery	70 (20% )	170 (48.57%)	210 (60%)	<0.0001
Poor APGAR score (at 5 min <7 )	33 (9.43%)	87 (24.86%)	146 (41.71%)	<0.0001
NICU admission	29 (8.29%)	56 (16%)	118 (33.71%)	<0.0001
Early neonatal death	11 (3.14%)	16 (4.57%)	36 (10.29%)	<0.0001

Pre term delivery in non-anaemic group was 20% while it was 2.4 times and 3 times more in mild/moderately anaemic group and severely anaemic group respectively.

Poor Apgar score (taken at 5 minutes <7) was 9.43% in non-anaemic group and it was increased to 2.6 times in mild/moderately anaemic group and 4.4 times in severely anaemic group.

Admission to neonatal intensive care unit (NICU) was almost double in mild/moderately anaemic group and about 4 times more in severely anaemic group when compared to non-anaemic group.

Early neonatal death was 3.08 % in non-anaemic group and while it was 1.4 times and 3.2 times more in mild/moderately anaemic group and severely anaemic group respectively.

All these differences are statistically significant having P value <0.0001.

### Group analysis

Table 3 to 6 shows analysis between non-anaemic versus mild/moderately anaemic group, non-anaemic versus severely anaemic group and mild/moderately anaemic versus severely anaemic group.

**Table 3: Pre-term.**

Variable	Anaemia		P value
	Normal Hb	Mild/moderate anaemia	
Pre-term	70 (20%)	170 (48.57%)	<0.0001
	<b>Normal Hb</b>	<b>Severe anaemia</b>	
	70 (20%)	210 (60%)	<0.0001
	<b>Mild/moderate anaemia</b>	<b>Severe anaemia</b>	
	170	210 (60%)	0.002

**Table 4: APGAR score.**

Variable	Anaemia		P value
	Normal Hb	Mild/moderate anaemia	
Poor APGAR	33 (9.43%)	87 (24.86%)	<0.0001
	<b>Normal Hb</b>	<b>Severe anaemia</b>	
	33 (9.43%)	146 (33.71%)	<0.0001
	<b>Mild/moderate anaemia</b>	<b>Severe anaemia</b>	
	87(24.86%)	146 (33.71%)	<0.0001

When analysis done in relation to severity of anaemia (table 3 to 6) it was found that all parameters studied except early neonatal death had statistically significant increased risk with both groups of anaemia and it increases with severity of anaemia. Increased risk of early

neonatal death was not significant in mild/ moderate group (P value 0.326) while it was significant in severely anaemic group (P value 0.004).

**Table 5: NICU admission.**

Variable	Anaemia		P value
	Normal Hb	Mild/moderate anaemia	
NICU admission	29 (8.29%)	56 (16%)	0.002
	<b>Normal Hb</b>	<b>Severe anaemia</b>	
	29 (8.29%)	118 (33.71%)	<0.0001
	<b>Mild/moderate anaemia</b>	<b>Severe anaemia</b>	
	56 (16%)	118 (33.71%)	<0.0001

**Table 6: Early neonatal death.**

Variable	Anaemia		P value
	Normal Hb	Mild/moderate anaemia	
Early neonatal death	11(3.14%)	16 (4.57%)	0.326
	<b>Normal Hb</b>	<b>Severe anaemia</b>	
	11 (3.14%)	36 (10.29%)	<0.0001
	<b>Mild/moderate anaemia</b>	<b>Severe anaemia</b>	
	16 (4.57%)	36 (10.29%)	0.004

### Limitations

In the present study outcome evaluated were affected by few co-factors such as socioeconomic condition and poor nutrition which could not be eliminated. Anaemia and poor nutrition frequently co-exist and it contributes to several maternal diseases which may affects pregnancy outcome & fetal development. We also could not eliminate possibility of co-existing maternal infection with anaemia which may have influence the result. Anaemia diminishes resistance to infection and these factors generally co-exist.

### DISCUSSION

Anaemia is a common problem during pregnancy. Pregnancy outcomes vary depending on its type and severity. In our study the risk of low birth weight and preterm delivery is more in anaemic group and it increases with severity of anaemia. Study done by Jain Preeti et al. and Levy et al.<sup>1,2</sup> also showed higher rates of preterm deliveries and low birth weight among mother with anaemia. Study by Umber et al.<sup>5</sup> showed that risk of preterm and low birth weight among anaemic woman was 3.4 and 1.8 times more than non-anaemic group. They have taken two group for study, anaemic <11 gmHb and non-anaemic >11 gmHb. This is in agreement with our

study which shows preterm and low birth weight 3.4 and 2.4 times more in mild/moderately anaemic cases. They have also shown poor APGAR score in anaemic group which supports our study.

Studies done by Kumar et al., Malhotra et al. and K Jagdish et al.<sup>10-12</sup> had shown such an association only when mothers are severely anaemic. However study done by Xiong X et al.<sup>6</sup> shows no significant difference in gestational age and birth weight between anaemic and control group. According to them, maternal anaemia during early pregnancy was associated with slightly increase preterm birth and non-statistically significant increase low birth weight, however there was a non-statistically significant inverse relationship between anaemia during late pregnancy and preterm & low birth weight.

Some studies have also shown that increase in Hb beyond a certain level could in fact have a negative outcome.<sup>12-13</sup> According to study done by Lu ZM et al.<sup>13</sup> both early and later in pregnancy Haematocrit above 40% were associated with preterm deliveries and fetal growth retardation.

In our study poor APGAR score (taken as score less than 7 at 5 minutes), early neonatal death and NICU admission were higher in anaemic group than non-anaemic group and it was statistically significant. This is in agreement with many studies.<sup>5,7,14,15</sup>

Study done by Ram Hari et al.<sup>14</sup> showed perinatal death 5% in nonanaemic group 11% in severely anaemic group. Present study also shows early neonatal death 3.08% in non-anaemic group and 10.08% in severely anaemic group.

Hussein L et al.<sup>3</sup> found that risk of preterm delivery and low birth weight were significantly increased with severity of anaemia but in contrast to our study, they found no association between severity of anaemia and APGAR score and early neonatal deaths.

## CONCLUSION

The current study shows that prematurity, low birth weight and poor neonatal outcome is directly related to anaemia and it increases with severity of anaemia.

India has high prevalence of anaemia and it is a measure cause maternal and neonatal morbidity and mortality. As per report published in "The Times of India" on 8<sup>th</sup> & 11<sup>th</sup> June 2012<sup>16</sup> India recorded highest number of preterm birth in 2010, nearly 24% or one in four children born prematurely across the globe in 2010 were from India".

Prematurity is a leading cause of neonatal mortality and morbidity in India. Anaemia being an important cause of preterm birth and poor neonatal outcome, proper antenatal care, good nutrition and iron supplementation

throughout the pregnancy can prevent all these adverse outcomes.

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