



## Evaluate The Maternal Hemoglobin and Birth Weight of Newborn: A Tertiary Care Hospital Based Study.

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### KEYWORDS

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Maternal, Hemoglobin,  
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Anemia, Pregnant  
Women, Low Birth  
Weight (LBW),  
Haemoglobin  
Concentration.

### ABSTRACT:

**Background:** Maternal anemia in pregnancy is common and has several deleterious effects on the health of the mother and the fetus. Maternal anemia is an important risk factor for LBW babies and preterm babies. The birth weight of an infant is the most important determinant of its chance of survival health growth and development. The prevalence of low birth weight (LBW) is higher in Asia than elsewhere. Low birth weight is a major determinant of mortality, morbidity and disability in infancy and childhood and has a longterm impact on health outcomes in adult life.

**Aims and Objectives:** To evaluate the maternal hemoglobin and birth weight of newborn in a tertiary care centre.

**Materials and Methods:** To assess the relationship between maternal hemoglobin concentration with neonatal birth weight. This retrospective study, was undertaken at S.M.M.H. Government Medical College, Saharanpur, Uttar Pradesh, and F.H. Medical college Agra, Uttar Pradesh, Bharat, for duration of 12 months (July 2022-June 2023). Relevant data of mother and baby pair was obtained from medical record department.

**Results and Observations:** There was significant correlation between maternal haemoglobin and neonatal birth weight (p value<0.01, R value-0.25), among low haemoglobin group, LBW was most common with maternal haemoglobin <11g/dl. However maximum LBW babies were under group with maternal haemoglobin 14-16 g/dl.

**Conclusion:** There was significant correlation between maternal haemoglobin, birth weight and gestational age. The trend shows decrease in birth weight with maternal haemoglobin >14 g/dl, should caution us regarding the use of iron supplementation in mothers with haemoglobin above 14g/dl.

### Introduction:

Maternal anemia in pregnancy is common and has several deleterious effects on the health of the mother and the fetus. Maternal anemia is an important risk factor for LBW babies and preterm babies. There exists an insufficient information regarding the adverse effect of anemia during pregnancy especially among rural population. [1] During pregnancy anemia is common due to increased demand of iron for the growing fetus and placenta and increased red blood cell mass, which is further aggravated with other factors such as childbearing at an early age, repeated pregnancies, short intervals between pregnancies and poor access to antenatal care and supplementation. The consequences of iron deficiency anemia during gestation include increased risks of preterm delivery, lower birth weight

and perinatal mortality.[2] Reduced level of hemoglobin favor changes in placental angiogenicThe birth weight of an infant is the most important determinant of chance of survival, growth and development. The prevalence of low birth weight (LBW) is higher in Asia than elsewhere. Low birth weight is a major determinant of mortality, morbidity and disability in infancy and childhood and has a long term impact on health outcomes in adult life.[3] According to WHO, "babies with a weight of 2,500 grams or less should be designated as low birth-weight babies. Birth weight is a strong indicator not only of the mother's health and nutritional status but also of the new-born's chances for survival, growth, longterm health and development.[3,4] Globally an estimated 15% of births result in low birth weight babies, whereas in India prevalence of low birth



weight babies is 21.5%. [5,6] (NFHS-3) Low birth weight babies includes preterm and small for gestational age babies. Majority of LBW in India are small for gestational age babies. LBW is major cause of infant mortality and is considered as a sensitive index of nation health and development. The low birth weight neonates are predisposed to a number of neonatal problems like hypothermia, inability to suckle the breast, asphyxia, sepsis, infection, hypoglycemia etc. Intrauterine growth is now considered an important determinant of both short and long-term outcomes for an individual.[5,6] Maternal anaemia is one of the important factor that influences birth weight. There is striking association of birth weight with haemoglobin concentration, both low and high Hb concentration show adverse effect. The relation of haemoglobin concentration to birth outcome will probably depend on when the haemoglobin is measured, although this has not been fully described [7]. The normal haemoglobin concentration in the women is between 12-14 gm/dl. During pregnancy, plasma volume increases by 50 per cent and there is a consequent fall in Hb concentration, haematocrit and red cell count because of haemodilution. This is referred as physiological anaemia of pregnancy. According to WHO anaemia in pregnancy is defined as haemoglobin level below 11g/dl. Anaemia is classified as mild when haemoglobin concentration is between 10-10.9

g/dl, moderate when between 7-9.9g/dl and severe when haemoglobin below 7 g/dl. This study was aimed to evaluate the correlation between maternal haemoglobin and neonatal birth weight.

#### Materials And Methods :

This retrospective study, was undertaken at S.M.M.H. Government Medical College, Saharanpur, Uttar Pradesh, and F.H. Medical college Agra, Uttar Pradesh, Bharat, for duration of 12 months (July 2022-June 2023). Relevant data of mother and baby pair was obtained from medical record department.

Exclusion criteria:

1-Maternal age <18

2-Gravida>4

3- Maternal weight <40kg

4-Medical illness in mother like PIH, GDM, APH, renal disease, TORCH infection or any acute heart diseases.

Analysis of Data: Statistical analysis was done by using SPSS-22. Statistical significance was evaluated using Chisquare test and Pearson correlation, Z test. The p value <0.05 was considered statistically significant.

#### Results and Observations:

190 mother baby pair meeting inclusion criteria during study period was included

**Table 1:** Baseline characteristics of the study

	Frequency	%
<b>Mothers age(in years)</b>		
19-25	131	69
26-30	49	26
31-35	10	5
<b>Delivery mode</b>		
Normal	70	37
LSCl	118	62
Instrumental	2	1
<b>Gestation age</b>		
<37 weeks	29	15
>37 weeks	161	85
<b>Neonates status post delivery</b>		
Discharge	142	75
Nicu admission	42	22
Death	6	3
<b>Birth weight</b>		
<2.5kg	85	45
>2.5kg	105	55

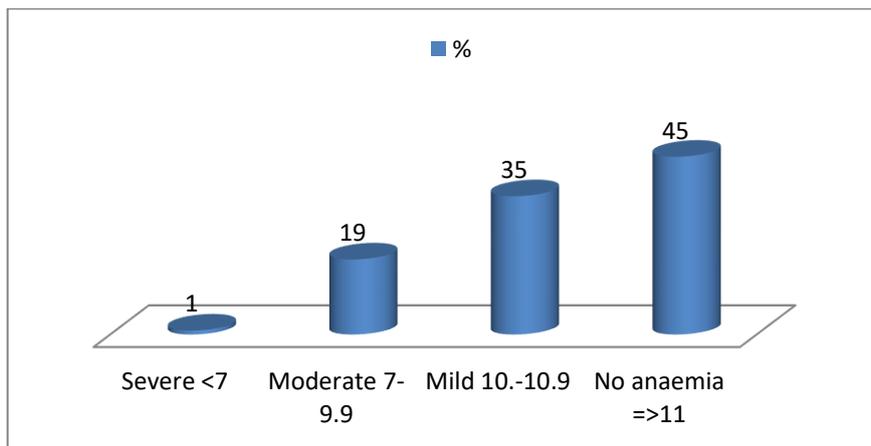
Most of women were between age group of 19-25 years (69%) followed by 26-30 years( 26%) and 30-35 years(5%). Out of 190 delivery, LSCS (62%), vaginal delivery (37%) and instrumental (1%). Majority (85%)

of babies were term and 15 % babies were preterm. Majority of newborn with birth weight >2.5 kg (55%) followed by LBW(45%).



**Table 2: Status of Anaemia**

Anaemia(Hb gm%)	Number	%
Severe <7	2	1
Moderate 7-9.9	36	19
Mild 10.-10.9	66	35
No anaemia =>11	86	45
Total	190	100

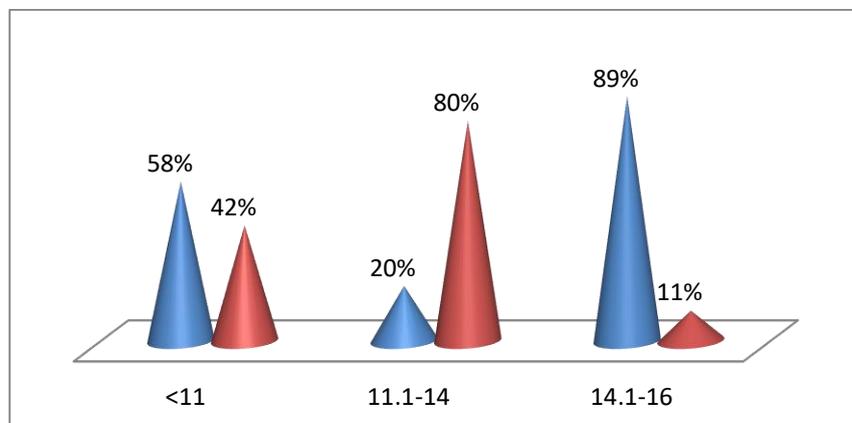


**Figure 1- Anaemia status**

As in Table 2 and figure 1 showed out of 190, 1% women are severely anemic, 19% moderately , 35% mildly and 45% women are non anaemic.

**Table 3: Maternal Haemoglobin vs Birth Weight.**

Haemoglobin level(g/dl)	Birth weight <2.5kg	Birth weight >2.5kg	Total	P value
<11	63(58%)	45(42%)	108	
11.1-14	14(20%)	59(80%)	73	P<0.00001
14.1-16	8(89%)	1(11%)	9	
Total	85(45%)	105(55%)	190(100%)	



**Figure 2- Haemoglobin vs Birth Weight**

**Table 4:** Maternal haemoglobin vs gestational age.

Haemoglobin level(g/dl)	Preterm	Term	Total	P value
<11	23(78%)	85(53%)	108	
11.1-14	5(19%)	69(43%)	73	P=0.02
14.1-16	1(3%)	8(4%)	9	
Total	29(15.3%)	161(84.7%)	190	

Table 3 and figure 2 and Table 4 showed there was significant correlation between maternal haemoglobin, birth weight and gestational age. Among low haemoglobin group, LBW was most common with maternal haemoglobin.

### Discussion

In India prevalence of anaemia in pregnant women aged 15-49 years is 57.9%<sup>3,4</sup>(NFHS 3). Anaemia is most prevalent nutritional deficiency problem afflicting pregnant women. Anaemia complicates pregnancy and threatens the life of both mother and foetus. Traditionally anaemia was associated with suboptimal pregnancy outcome due to low birth weight. Birth weight is the single determinant of mortality in first year of life and good indicator of efficiency with which a woman has supported her foetus.[8] In present study, 194 mother baby pair were included. Most of mothers were between age group 19-25 years (69%). Eighty five percentage babies were term and mostly born by LSCS(62%).In our study, 35% mothers had mild anaemia, 19% moderate anaemia and 1% severe anaemia. Mean birth weight of newborn was 2.3+ 0.28 kg (range 1.50-2.79 kg). Nearly half (45%) of babies were low birth weight. Most of babies (75%) were discharged from postnatal ward, 22% required NICU admission and 3 % died. Beauty et al<sup>5</sup> reported a higher percentage (65%) of low birth weight baby in these study. There was a significant correlation between maternal haemoglobin and neonatal birth weight (p value < 0.01, r value-0.25) which were similar to studies done by Beauty et al, Leila et al and Philip et al [9]. Among low haemoglobin group, LBW was most common with maternal haemoglobin <11g/dl. However maximum low birth weight babies were under group with maternal haemoglobin 14.1-16g/dl. Beauty et al and Malhotra, et al [10], also observed that the birth weight decreases with increase and decrease of maternal haemoglobin. Possible explanation for decrease in birth weight with low maternal haemoglobin level is due to decrease in oxygen delivery to foetus which results in intrauterine growth restriction and low birth weight babies.<sup>5</sup> Similarly low birth weight in higher maternal haemoglobin is by failure in adequate plasma volume expansion or increased blood viscosity as a result of macrocytosis which leads to uteroplacental insufficiency and cerebrovascular complication. This, in turn, might adversely affect fetal growth. Polycythemia may be due

to PIH, maternal diabetes, maternal smoking and maternal cyanotic heart disease<sup>6</sup>. We also observed that there was significant association with maternal haemoglobin and gestational age (p<0.02) which is similar to Philips et al [9] study. On an average when maternal haemoglobin fell below 11 g/dl, the mean birth weight decreased by 0.192+ 0.64 kg. Similarly when maternal haemoglobin increased above 14 g/dl the mean change in birth weight was 0.5+ 0.212 kg in our study. Both these observations are highly statistically significant (p<0.01). In this study, maternal haemoglobin variation by 1g/dl, resulted in change of mean birth weight by 0.199 kg.Raman et al [11]also reported change in mean birth weight by 0.3839 kg when maternal haemoglobin increased by 1 g/dl. Present study tells us the prevalence of maternal anemia is 48.75% in a rural population. In 2008, Milman N described that in tropical countries, the incidence of anemia in pregnancy is about 40-80%.[12] Maximum babies having birth weight between 2000 to 2499 grams (LBW) were born to mother who have severe maternal anemia with a p value <0.001 thus being statistically significant. Singla PN et al, stated that the birth weight was significantly reduced in the very severely anemic mothers and had direct relationship with the maternal haemoglobin levels.[13]

### Conclusion:

There was significant correlation between maternal haemoglobin, birth weight and gestational age. The trend showing birth weight decreased by maternal haemoglobin above 14 g/dl,Should caution us regarding use of iron supplementation in mother with haemoglobin above 14 g/dl.

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