

ORIGINAL ARTICLE

A Prospective Study to Assess the Correlation of Neonatal Birth Weight with the Hemoglobin Level of the Mother During PregnancyASMA IQBAL¹, MAHWISH KANWAL², NEETA RANI³, SADAF ABBAS⁴, SAMINA LAKHAN⁵, NIRMALA PAWAN⁶¹Assistant Professor Department of Gynaecology, Sobhraj Maternity Hospital Karachi Pakistan^{2,3}Senior Registrar Department of Gynaecology, Sobhraj Maternity Hospital Karachi Pakistan⁴Specialist Obstetrician, Abdullah Bin Omran Hospital UAE^{5,6}Senior Registrar Department of Gynaecology, Sobhraj Maternity Hospital Karachi PakistanCorresponding author: Asma Iqbal, Email: salmanasma150@gmail.com**ABSTRACT****Objective:** The present study aims to the identification of an association between neonatal birth weights and the extent of anemia in mothers during pregnancy.**Study design:** A case-control study**Place and Duration:** This study was done in Sobhraj Maternity Hospital Karachi from November 2021 to November 2022**Methodology:** A total of 1050 pregnant women were included in the study who later delivered babies in the given time frame. The blood samples of all the women were collected for the measurement of Hemoglobin (Hb) during the 16th to 19th week, then the 22nd to 24th week, and finally during the 34th to 36th week of pregnancy. The women were divided into four groups based on their hemoglobin levels. The patients in group 1 had Hb more than 10.1 gm/100ml and this group was considered as a control group. Group two constituted patients with mild anemia having Hb of 8.1 to 10 gm/100ml. Group 3 had patients with Hb 6.5-8 gm/100ml and were considered to have moderate anemia. The patients in the Group 4 had severe anemia with Hb of <6.5 gm/100ml. The weight of all the neonates was measured in the first 24 hours after delivery. A comparison of the birth weight of the neonates with the hemoglobin of mothers was done.**Results:** The prevalence of anemia was seen in 210 (20%) women who had Hb lesser than 10 g/dl. Out of these, 33 (15.7%) presented with moderate anemia, and 177 (84.3%) had mild anemia. None of the patients had severe anemia. An overall drop in the Hb level was seen in the second trimester. The average birth weight of neonates born to women with Hb lesser than 10 g/dl was 2.7 kg, whereas, the average birth weight of babies of women with Hb more than 10 g/dl was 3.3 kg. The drop in Hb and the extent of anemia were highly related to the birth weight of neonates.**Conclusion:** There is a strong association between the severity of anemia and low birth weight (LBW). Maternal anemia is a potent factor behind intrauterine growth retardation (IUGR).**Keywords:** Birth weight, maternal hemoglobin, Anemia, Pregnancy**INTRODUCTION**

Anemia is one of the commonest health issues in 25-50% of the total global population and it affects 50% of women during gestation [1]. It had a strong correlation with neonatal and maternal mortality, low birth weight, premature delivery, and various other unpleasant outcomes [2]. The low birth weight of newborn babies is a significant factor that defines the rate of child mortality and morbidity. The birth weight is highly dependent on the nutritional status of the mother and it is adversely affected by deficiency of vitamin B and Hb in the mother [3]. An overall anemia prevalence is 51% on a global level [4].

The prevalence of anemia increases to four folds from the first trimester to the third trimester of pregnancy [5]. However, a prominent physiological drop in Hb is observed in the second trimester [6]. This alteration leads to an increase in the volume of plasma, resulting in a decrease in the viscosity of blood. This phenomenon helps maintain better placental circulation [7]. The typical pattern of Hb and hematocrit fluctuation is such a way that it decreases to the least level by the end of the second trimester and then again increases in the third trimester [8]. An adequate increase in Hb also increases birth weight [9]. Low birth weight and small for gestational age babies are affected by the deficiency of iron in the mother [10].

The present study is designed in such a way as to determine the correlation between the birth weights of neonates with anemia in different trimesters of pregnancy.

METHODOLOGY

A total of 1050 pregnant women were included in the present study. The mean age of the participants was 25.5 ± 15.1 years ranging from 17 years to 45 years. According to the inclusion criteria of the study, the women added to the study were confirmed to be pregnant. They all went through prenatal care during all the trimesters of pregnancy. They all were registered for the present study by a proper channel. All the patients were explained about the study and asked to sign a written informed consent.

Participants who had diabetes mellitus, parathyroid disease, placenta previa, history of placental abruption, cardiovascular disease, multiple pregnancies, or any other such complication, were not included.

The blood samples were drawn from all the women. The concentration of Hb was measured in the first, second, and third trimesters of the pregnancy. The Cyanomethemoglobin method was used for the assessment of the Hb level. The women were divided into four categories based on their Hb level. Those who had Hb > 10.1 gm/100ml, were allocated to Group 1, and this group was called the control group. Women with Hb 8.1-10 gm/100ml were said to have mild anemia and they were allocated to Group 2. The women in Group 3 had Hb 6.5-8 gm/100ml and they were said to have moderate anemia. In Group 4, women had Hb lower than 6.5 gm/100ml and this group had patients with severe anemia.

The weight of all the neonates was measured in the first 24 hours after birth. The standard protocols and procedures for measuring weight were observed. An accurate weighing balance was used. The babies were dressed in minimum clothing. The weight was measured while the babies were completely restful.

RESULTS

A total of 1050 women were included in the present study for the assessment of alteration in the level of Hb in all the trimesters and its relation with newborn birth weight. The demographic data of all the patients have been given in table 1. The mean age of the participants was 25.5 ± 15.1 years. Most of the women were between the age group 26-35 years.

The concentration of hemoglobin in all the trimesters has been given in table 2. The overall prevalence of anemia was 20%. It can be seen that out of that 20% of women, 84.3% had mild anemia and the remaining 15.7% had moderate anemia. None of the women was found with severe anemia. There was a significant difference in the level of hemoglobin in the women in the three

trimesters of pregnancy. A significant drop in the second trimester can be seen.

The average birth weights of the neonates compared with maternal anemia present in all the trimesters of pregnancy have been given in table 3. It can be seen in table 3 that the average birth weight of neonates born to anemic pregnant women is lower than those born to mothers with optimum Hb levels.

Table 1: Demographic data of all the participants included in the study (n=1050)

Variable	Category	Number of women (N)	Percentage
Age group (in years)	<20	157	14.95
	20-25	189	18

	26-30	315	30
	31-35	325	30.95
	36-40	53	5.04
	41-45	11	1.04
Mean age of the patients (in years)	25.5 ± 15.1		
Financial status	Middle class	315	30
	Lower middle class	245	23.33
	Poor financial status	490	46.66
Level of education	Illiterate	153	14.57
	High school	465	44.29
	Secondary education	321	30.57
	University graduate	111	10.57

Table 2. The concentration of hemoglobin in all three trimesters of pregnancy

Trimesters	Non-anemic women (n=840)	P value	Anemic patients (N=210) 20%			
			women with mild anemia (N=177) 84.3%	P value	Women with moderate anemia (N=33) 15.7%	P value
First trimester	10.53±1.8	0.031	9.35±1.35	0.083	8.23±1.07	0.041
Second trimester	9.45±1.2		9.38±1.75		8.32±0.89	
Third trimester	11.2±0.85		8.89±0.79		7.42±0.06	

Table 3: Classification of maternal anemia and comparison with a birth weight of neonates

Trimesters of pregnancy	Hb concentration (g/dl)	Class of anemia	Mean birth weight in grams
First Trimester	6.5-8	Moderate	2610±429
	8.1-10	Mild	2764±531
	More than 10.1	Optimum	3265±731
Second Trimester	6.5-8	Moderate	2662±634
	8.1-10	Mild	2667±621
	More than 10.1	Optimum	3268±521
Third Trimester	6.5-8	Moderate	2672±635
	8.1-10	Mild	2764±713
	More than 10.1	Optimum	3378±668

DISCUSSION

The present study demonstrates that the prevalence of anemia in the population under study was 20%. There are some other similar studies conducted in developing countries that have shown a greater prevalence of anemia, however, the prevalence in the present study is lesser because of the encouragement of iron supplementation on all the prenatal visits. According to the results of the present study, it can be observed that there was a drop in the Hb level in the second trimester of pregnancy and it again raised in the third trimester. The study of Ford and James et al has also shown this decline in the Hb in the second trimester and a rise in the third trimester [11, 12]. However, the drop was seen in the mothers who had anemia and not in those who had an optimum level of hemoglobin.

A similar study was conducted by Kumar et al. They found that the neonates born to mothers with anemia and mothers without anemia did not have a significant difference. These results are not similar to the results of the present study [13]. However, the study of Figueiredo et al showed a significant association between low birth weights with anemia in pregnancy [14]. Some other studies have agreed with the present study and indicated the significance of optimal Hb during pregnancy [15-17]. Most of the studies are in the favor of the maintenance of a good level of Hb during pregnancy because it reduces the mortality rate of the mother as well as the neonate.

CONCLUSION

The low level of hemoglobin during pregnancy is responsible for the lower birth weight of newborns. The Hb of the mother drops in the second trimester due to plasma expansion and it again increases in the third trimester. The correction of anemia can be done by the administration of adequate iron supplements.

Funding source: None

Permission: It was taken from the ethical review committee

Conflict: No conflict of interest

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