

# **Anemia in Pregnancy and its Association with Low Birth Weight in Sulaimani Primary Health Care Centers**

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## **Background:**

Anemia during pregnancy is commonly associated with poor pregnancy outcomes and can result in complications that threaten the life of both mother and fetus.

## **Aim of the Study:**

This study aimed to find the incidence of low birth weight and the association of anemia in different trimesters of Pregnancy with the Mean birth weight of newborn

## **Methods:**

In a prospective cohort study, a total of 224 Pregnant women followed from three primary health care centers in Sulaimani city Kurdistan Region, Iraq till the birth of full term. Data were analyzed using the statistical package for the Social Sciences version 26.0. A P-value  $\leq 0.05$  is considered a significant value.

## **Result:**

low birth weight incidence was 5.8%. The rate of anemia was different in each trimester. The rate increased throughout the pregnancy from 32 %, 34.9 and 35.7% in the first, second, and third trimesters respectively. The mean Birth weight  $\pm$  Standard deviation of the newborn in this study was  $3043.53 \pm 389.7$ . However, the MBW of newborns from mothers with persistent anemia was significantly lower ( $2693.4 \pm 289$ ). Relative Risk (95%Confidence interval) of low

birth among anemic to non-anemic mothers was in the first trimester 2.5 (1.793-3.702). And 3.2 (2.652-3.974) and 3.1 (2.584-3.838) in the second and third trimesters respectively.

**Conclusion:** An association was found between Anemia in each trimester of pregnancy and the gender of the newborn with Mean birth weight. But for the mode of delivery, there is no association.

**Keywords:** Anemia in pregnancy, Low birth weight, Sulaimani city.

## Introduction

Anemia during pregnancy defined by hemoglobin (Hb) concentration lower than 11 g/dl, is a leading public health concern in poor and developing countries. It is the most common hematologic problem in pregnancy. What is referred to as the physiologic anemia of pregnancy is a dilution process secondary to an increase in plasma volume. However, nutritional deficiencies, hemolysis, and other diseases can cause significant anemia that is capable of affecting the mother as well as the fetus (WHO, 2001) ,(Williams & Wheby, 1992) . According to the report of the World Health Organization (WHO) in 2011 among women of reproductive age, the incidence of anemia was 29.4%, with 38.2% in pregnant women and 29.0% in non-pregnant women(WHO, 2015) . The grade of anemia graduated from mild, moderate to severe, the WHO pegs the hemoglobin level for each of these types of anemia in pregnancy at 10.0-10.9 g/dl (mild anemia), 7-9.9 g/dl (moderate anemia) and < 7 g/dl (severe anemia) (AL-Shawi, Obaid, Mohammad, & Mohammed, 2012). A birth weight of less than 2,500 g is defined as Low Birth Weight(LBW), which constitutes an extensive public health issue. LBW is caused by defective growth of the fetus, shortened gestation, or a combination of both. Approximately 90% of LBW infants are born in developing countries. In countries where the percentage of LBW infants is low, most are preterm, and in countries where the percentage is high, the bulk of LBW infants experience retardation of fetus growth. The origin of fetal growth retardation is multiple and interrelated, including low maternal food intake, tough physical work during pregnancy, and illness, principally infections. Short maternal stature, very young age, high parity, and close birth spacing are all associated factors. Statistics are showing that both infection-related mortality and infection risk are raised in both preterm and LBW infants. Therefore, strategies to diminish the frequency of low birth weight and prematurity may have a measurable effect on neonatal infection. Potential interference to enhance intrauterine growth to prolong gestation, or both, consist of postponing childbearing in adolescents, enhanced maternal education, before and during pregnancy caloric supplementation, general boosting of nutrition, prophylaxis from malaria or its treatment, treating sexually transmitted diseases and any other maternal infections, efforts to minimize tobacco usage, better and improved water and sanitation, limitation of maternal work during pregnancy in addition to enhancing and improving the socioeconomic situation(Stoll, 2006).

## Method

**Design of the Study:** A prospective cohort study.

**Settings of the Study:** The study was conducted in three primary healthcare centers P.H.C (Kareza Weshk, Ibrahim Ahmad, Ali Kamal) in Sulaimani City Kurdistan Region, Iraq from November 2021 to July 2022.

### Sampling Of The Study:

women visiting P.H.C centers for pregnancy care were initially interviewed then the antenatal record was checked and followed. If they met any one of the exclusion criteria, they were excluded. This exercise was continued till the required sample size was achieved. 224 pregnant women were followed up till the birth of a full-term baby.

### Inclusion Criteria:

Those registering for antenatal care in their first visit during the first trimester of pregnancy at selected primary health care centers (PHC) of Sulaimani.

### Exclusion Criteria:

Women were excluded from the study in the following situations: twin pregnancy, a history of bleeding that required hospital treatment for at least 24 hours, a history of diabetes mellitus, preterm birth, stillbirth, and if they did less than 3 visits to P.H.C centers.

### Administrative Arrangement:

Permission has been obtained from: The Ministry of Higher Education and Scientific Research / Sulaimani University /College of Medicine / Ethical Committee of the College of Medicine then permission from the Sulaimani Directorate of Health D.O.H Consequently, through formal letters to managers of those chosen primary health care centers through which they were informed of the research finally formal consent was signed by the pregnant women.

### Study Instrument And Data Collection:

Based on the required information, the researcher designed a data collection questionnaire, including; sociodemographic characteristics, clinical information, gestational age, hemoglobin measures taken during different trimesters, followed by pregnancy outcome (the fate of pregnancy and gender, and weight of newborn) recorded.

### Statistical Analysis:

Excel file 2016 (Microsoft) was used for data entry and then Data were analyzed using the SPSS version 26.0. Frequency and percentages were used to describe the characteristics of qualitative variables. The Chi-square test was used to evaluate the relationship between different categorical variables. The normality of quantitative variables was analyzed by Kolmogorov-Smirnov and Shapiro – Wilk tests. Mean and standard deviation (SD) were used to describe quantitative variables that were normally distributed and t-test and ANOVA were used to compare the means of these quantitative variables, while the variables that are not normally distributed were described by median and interquartile range (IQR) as well and non-parametric tests as Mann Whitney, and Kruskal Wallis tests were used for non-normally distributed variables. The incidence of low birth weight was calculated and then relative Risk was calculated and used to assess the relationship between the anemia in different trimesters and the pregnancy outcome. The level of significance was set at P value  $\leq 0.05$  as significant.

### Results:

The total number of pregnant females followed was 224 from selected three Primary Health Care Centers in Sulaimani City Kurdistan region Iraq. The incidence of low birth weight was 5.8 % regarding birth weight, 94.2 % of babies born were normal weight. The mean Birth weight of the newborn is  $3043.53 \pm 389.7$  (figure 1). Regarding anemia in the first trimester (151) 67.4 % were nonanemic and 73 (32.6 %) were anemic. In the Second trimester mild and moderate anemic were 42 (18.8%) and 36 (16.1) % respectively. Third-trimester Nonanemic pregnant women were (144) 64.3% and anemic were (80 )35.7 % shown anemia shown in (figure2).

Comparing mean birth weight (MBW) among pregnant women with persistent anemia throughout pregnancy who are 53 women (23.7%) of the study population with the rest of the participants with different hemoglobin statuses through the pregnancy, the MBW of those with anemic throughout the pregnancy was  $2693.4 \pm 289$ , while the MBW among the rest was  $3152.1 \pm 352$  which was the highly statistically significant result (table 1).

Regarding the Distribution of participants according to the mode of delivery and Birth outcome, only 90 children in this study were born through Normal Delivery which makes less than half participants (40 %) 134 pregnant mothers (59.8%) in this study gave birth to their child through the Caesarian section while Birth outcome 116 newborns (51.8 %) were male 108 (48.2%) were females (table 2).

Mean Birth Weight is higher for those born with normal delivery than those born with caesarian section but no significant result while MBW $\pm$ SD of male is 3095.7 $\pm$ 398.4 and for female is smaller 2987.5 $\pm$ 373.9 with a significant P value 0.04 (table2).

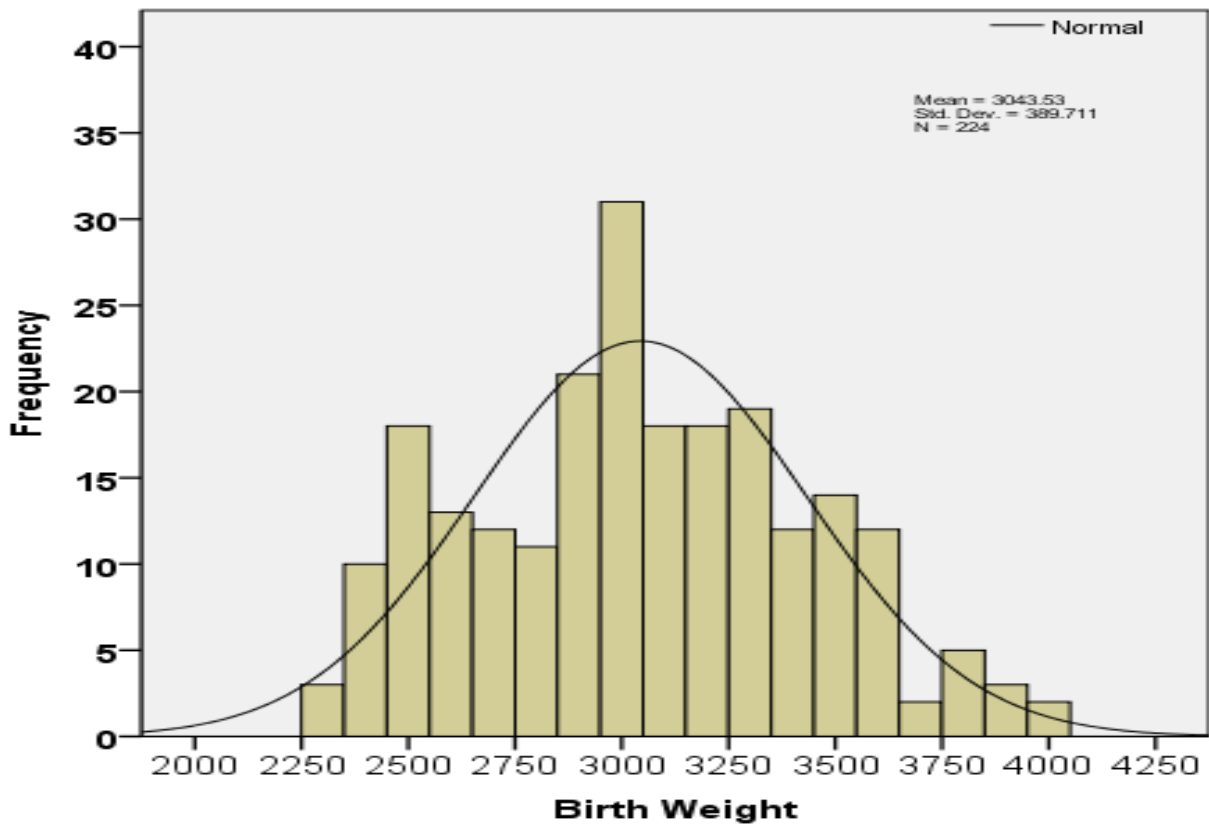
Regarding Mean and median Birth weight and hemoglobin status, In the First trimester, nonanemic females had the highest MBW  $\pm$  SD 3159.9 $\pm$  343.7 with nearly similar Median (IQR)3100 (400), MBW Mild anemia was 2820.8  $\pm$ 368.3 and the lowest MBW was recorded for moderate Anemia 2768 $\pm$ 379.4. and showing statistical significance with p Value < 0.001 with ANOVA and Kruskal Wallis test (table 3).

The mean Birth Weight of newborns in the second trimester was highest for those who were nonanemic 3202.7  $\pm$ 323, and 2821.4 $\pm$ 354, 2656.9 $\pm$ 262. mild, and moderate anemia respectively. With P value less than <0.001 and median Birth Weight (IQR) 3200 (400),2700 (500), and 2600 (500) for Nonanemic, mild and moderate anemic respectively. Showing p value < 0.001 with both tests.

Also for the third trimester, MBW was highest for non-anemic 3203.5  $\pm$ 314 with p Value <0.001 and lowest median 2500 (200) for moderate anemia (Table 3).

Regarding Relative Risk, from those 13 Low Birth Weight, children born in this study population 10 of their mothers were anemic in the first trimester and only 3 mothers were nonanemic while those who gave birth to Normal birth weight 63 mothers were anemic and 148 were nonanemic. Relative risk 95% Confidence Interval 2.576 (1.793-3.702).

In the second and third trimesters mothers of all 13 low birth weight children were born to mothers who were anemic mothers with relative risk 95%CL of 3.2(2.652-3.974), 3.1(2.584-3.838) respectively (table 4).



Figure( 1 )The Birth Weight distribution of the study sample

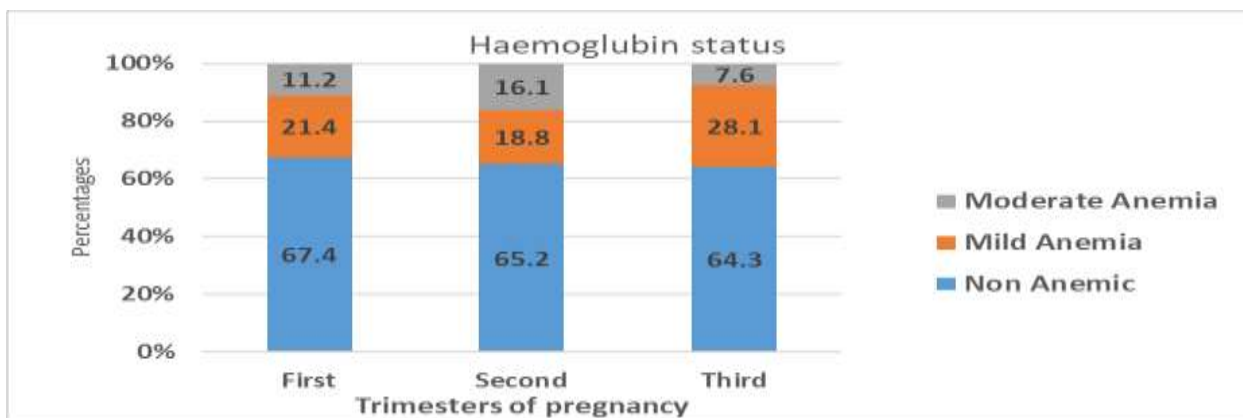


Figure (2) Hemoglobin status during different trimesters of pregnancy

Table (1) Mean Birth weight according to hemoglobin status

Variable	Count	%	Mean Birth Weight	SD	P Value
Persistent Anemic During All Trimesters	53	23.7	2693.4	289	< 0.001*
Different Hemoglobin Statuses During Each Trimester Regarding Anemic Or Not	171	76.3	3152.1	352	
Total	224	100	3043.53	389.71	

\*Highly significant

Table( 2) Mean birth weight with respect to some birth outcomes

Birth Outcome		Number	Percentage	MBW	STD	P Value
Mode Of Delivery	Normal Vaginal Delivery	90	40.2	3086.67	373.925	0.18
	Caesarian Section	134	59.8	3014.55	398.721	
New Born Gender	Male	116	51.8	3095.7	398.4	0.04*
	Female	108	48.2	2987.5	373.9	
Total		224	100	3043.53	389.7	

\*statically significant

Table (3 )Birth weight according to hemoglobin status in different trimesters of pregnancy

Hb Status According To Trimesters		Birth Weight					
		Mean	SD	P Value*	Median	IQR	P Value **
First Trimester	Non Anemic	3159.9	343.7	<0.001	3100	400	< 0.001
	Mild Anemia	2820.8	368.3		2750	475	
	Moderate Anemia	2768	389.7		2700	450	
Second Trimester	Non Anemic	3202.7	323.4	<0.001	3200	400	<0.001
	Mild Anemia	2821.4	354.4		2700	500	
	Moderate Anemia	2656.9	261.6		2600	500	
Third Trimester	Non Anemic	3203.5	314.4	<0.001	3200	400	<0.001
	Mild Anemia	2815.1	357.6		2800	500	
	Moderate Anemia	2535.3	165.6		2500	200	
<b>Total</b>		<b>3043.5</b>	<b>389.7</b>				

\*ANOVA

\*\* Kruskal Wallis test



**Table (4) Relative risk of low birth weight among anemic to non-anemic mothers.**

Birth Weight		Anemic	Non Anemic	Relative Risk	95% Confidence Interval	
					Lower	Upper
First Trimester	Low Birth Weight	10	3	2.576	1.793	3.702
	Normal Birth Weight	63	148			
Second Trimester	Low Birth Weight	13	0	3.246	2.652	3.974
	Normal Birth Weight	65	146			
Third Trimester	Low Birth Weight	13	0	3.149	2.584	3.838
	Normal Birth Weight	67	144			

## Discussion:

When comparing the hemoglobin status of the pregnant women in the first trimester, second trimester and third trimester with an Average Birth weight study result showed statistical significance. These findings are in agreement with a study done on the effect of third-trimester maternal hemoglobin Value on Fetal Weight and Birth Week which showed Hemoglobin levels below 9 during pregnancy have been observed to cause low birth weight in babies (Büyük M. , 2022) .

Our result is also consistent with a previous study done on Korean pregnant women's Iron status and its association with pregnancy to assess the association between maternal hemoglobin (Hb) level and pregnancy outcome Which showed that hemoglobin less than 11 g/d increases LBW risk in pregnancy. (Lee, Kim, Kim, Kim, & Kim, 2006).

Our results are also Parallel to a study in Purba Bardhaman; west Bengal done shows that anemia during pregnancy is highly associated with LBW [Relative risk 1.85 (1.36-2.54)]. (Biswas, Samsuzzaman, Chakraborty, & Das, 2019)

Also study done prospectively examined 829 women in Shanghai, China, and observed a strong relationship between early pregnancy anemia and the risk of low birth weight as a result of

preterm birth. The relative risk of preterm birth in women with hemoglobin of 90–99 g/l was 2.63 and in those with hemoglobin levels of 60–89 g/l the risk was 3.73 (Zhou et al., 1998).

A cross-sectional study showed that gestational age at birth and first-trimester hemoglobin levels were the factors of most influence in Which low hemoglobin concentrations in the first trimester are the factors that most influence LBW While hemoglobin concentrations in different trimesters A positive correlation was determined between fetal weight and increased first-trimester maternal hemoglobin concentration ( $p: 0.025$ ) but No correlation was found between fetal weights and second and third-trimester hemoglobin concentrations ( $p = 0.287$ ,  $p = 0.298$ , respectively) (Bakacak et al., 2015). The explanation for this difference could be due to the study design since the cohort is considered to be more powerful for finding the incidence and relative risk.

Regarding birth outcome, The results show that In this study very high percentage (59.8%) had C/S. only 40.2 % had Normal Delivery. Results in the current study are even higher compared to studies done and published on rates and trends in caesarian Sections between 2008 and 2012 in Iraq showed that caesarian section for all birth weight in Iraq is 24.4 % in 2012 (Shabila, 2017). Similar to these results. it's also high in neighboring countries such as Turkey Overall CS rate was 51.2% in 2017 according to an analysis done on high cesarean section rates in Turkey by Robson classification. while analysis in Iran shows that CS increased from 40.7% in 2005 to 53% in 2014 (Pourshirazi et al., 2022).

The explanation for this high rate could be mostly due to requests by the mothers thinking it's easier and cause less pain this result is parallel to worldwide in which the figure is even higher in the private sector in most developing countries. Many factors have contributed to the increasing rates of cesarean sections worldwide including medical and non-medical factors. Examples of medical factors include increases in maternal age and body mass index and changes in obstetric practices and technologies. Examples of non-medical factors include cesarean sections requested by the mother, fear of litigation among caregivers, the inappropriate organization of maternity care, and physician- induced demand for cesarean sections (Mossialos, Allin, Karras, & Davaki, 2005; Tollånes, 2009).

According to Birth outcome results in the newborn who were male was higher (51.8%) than females (48.2%), about Birth weight 94.2 % of babies born were normal weight only (5.8%) were Low Birth weight 8 were female and 5 were male although the results show among male LBW percentage is lower compared to females.

Our result is consistent with a study published in 2020 about the determination of Factors Associated with Low Birth Weight among Babies Born in Sulaimani City, Kurdistan-Iraq. For the LBW group, the female percentage was higher than the male. The highest percentage of LBW was among those born preterm 75.4% and the lowest was among full term 24.6%. LBW was reported in 44.7% of the participants (Weli, 2020) explanation for these results could be at term birth boys are heavier than girls. Relative Risk (95% Confidence interval) of low birth among anemic to non-anemic mothers was in the first trimester 2.5 (1.793-3.702), And 3.2 (2.652-3.974) 3.1 (2.584-3.838) in second and third trimester respectively.

## Conclusion

Anemia in pregnancy is an important problem in our country. Anemia needs to be diagnosed and treated before conception. Multiple factors were found to be associated with LBW in Sulaimani City, Kurdistan region of Iraq. Anemia in pregnancy, Gender of newborns showed significant results. But for the mode of delivery, there is no association found.

## Recommendation:

Early checkups and suitable control and management of the anemia factors would possibly reduce the incidence of LBW and therefore, to improve maternal and fetal outcomes and prevent its short and long-term consequences.

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