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Journal of Bioscience and Applied Research

www.jbaar.org



High and Low Hemoglobin Levels During Pregnancy

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DOI: [10.21608/jbaar.2018.148881](https://doi.org/10.21608/jbaar.2018.148881)

Abstract

This study aims to measure the percentage of hemoglobin in the blood of pregnant women (Hb) and study its variations with the progress of pregnancy months and times of pregnancy. Blood samples were taken and hemoglobin was examined for about 150 pregnant women in different pregnancy months (from 4 to 9) and for three pregnancy times (the first, the second, and the third pregnancy). It is found in this study that Hemoglobin is decreasing generally with the progress of pregnancy months. Hemoglobin also decreases with an increasing number of pregnancies, with the highest mean hemoglobin in the first pregnancy and the lowest average hemoglobin in the third pregnancy. This means that hemoglobin decreases with the recurrence of pregnancy. Then a statistical test using Chi-square was made and it is found that there is statistical significance for decreasing hemoglobin with the recurrence pregnancy times at a confidence level of 10.

KEYWORDS: Red Blood Cell, Hemoglobin, Packed Cell Volume, Pregnancy

Received: June 15, 2018. Accepted: September 15, 2018. Published: September 20, 2018

Introduction

Anemia is defined as a reduction in the concentration of circulating hemoglobin or oxygen-carrying capacity of blood below the level that is expected for healthy persons of the same age and sex in the same environment. Normal hemoglobin levels are 13-17 in adult males and 12-15 in adult women⁽¹⁾. Anemia exists if hemoglobin is below the lower limit of normal for a particular age and sex. The RBCs are produced in the bone marrow. They

have a life expectancy of about 120 days. Among other things, the human body needs iron, vitamin B12, and folic acid for erythropoiesis. If there is a lack of one or more of these ingredients there would be an increased loss of RBCs. In pregnancy increased iron is needed because of an increased maternal red cell mass of approximately 35%, transfer of 300 mg of iron to the fetus, and blood loss at delivery⁽²⁾. Although iron absorption is also increased, iron therapy is often needed. If the hemoglobin (Hb) falls below 100 g/L, anemia

develops. Any patient with Hb of less than 11 gm/dl to 11.5 gm/dl at the start of pregnancy will be treated as anemic. The reason is that as the pregnancy progresses, the blood is diluted and the woman will eventually become anemic. The dilution of blood in pregnancy is a natural process and starts at approximately the eighth week of pregnancy and progresses until the 32nd to 34th week of pregnancy⁽³⁾. The lower level of hemoglobin during pregnancy as compared to the non-pregnant state is due to hemodilution caused by an expansion of plasma volume. The normal hemoglobin level in the newborn period is highest; subsequently, hemoglobin level falls and reaches minimum level by 2 months of age. Anemia increases the risk of certain problems, including *preterm* delivery and having a low-birth-weight baby⁽⁴⁾. The recommended daily intake for iron during pregnancy is 27 mg, which is found in most prenatal vitamin supplements. One of the most common side effects of pregnancy is known as “nausea and vomiting of pregnancy” (NVP), more commonly known as “morning sickness.” Ironically, morning sickness is usually not limited to the morning, although that may be when a woman experiences it most acutely⁽⁵⁾.

Methodology

Blood samples were taken and hemoglobin was examined for about 150 healthy pregnant women age between 21-28 in different pregnancy months from 4 to 9 for three pregnancies: the first pregnancy, the second pregnancy, and the third pregnancy. Specimens were collected in Sedat Alhendia City and data was recorded in a table (1) according to the sequences and months of pregnancy. Values of Hb for the third month were removed to get homogeneous data. Data then analyzed by using the SPSS program. To measure Hb the anticoagulated capillary blood is centrifuged at 3000 g for 10 minutes to pack the red cells. The level of the column of the red cells is directly read from the tube. The results of these tests are influenced by plasma volume and calculated by equation. (1)

$$\text{Haemoglobin} = \text{PCV} \cdot 1/3$$

Results

SPSS program was used to extract the mean values of Hb for each month of pregnancy and each sequence of pregnancy as shown in table (1). Minimum and maximum values are also shown together with standard deviations.

Table(1) :mean for first .second .third pregnancy

	Minimum	Maximum	Mean	Std. Deviation
First Pr.	10.76	11.30	10.9850	0.20147
Second Pr.	10.38	11.15	10.8850	0.26987
Third Pr.	10.58	10.87	10.7033	0.10328

From the mean values in a table (1) it is clear that Hb values are decreasing with increasing times of pregnancy.

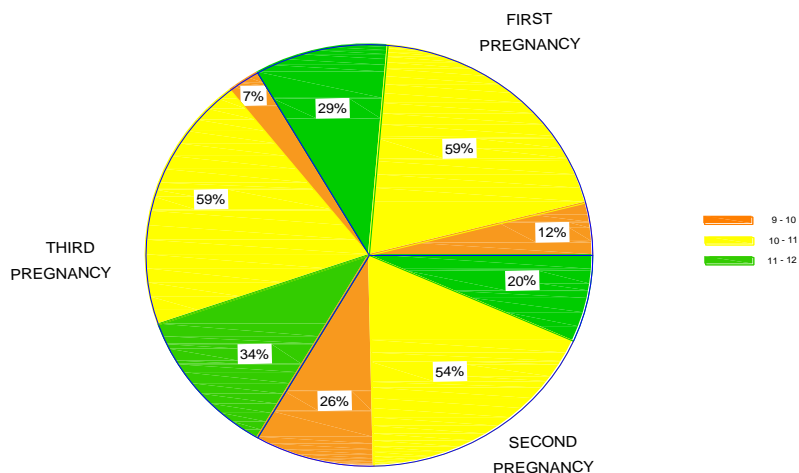


Figure (1): Hb for first, second, and third pregnant

Chi-Square tests were made to ensure enough statistical significance. Calculations are as follows :Three intervals were made for Hb : (9-10) , (10-11) , (11-12) .Frequencies are calculated and recorded in a table(2).

Table (2) Intervals for Hb

	9 to 10	10 to 11	11 to 12	sum
pr1	6	30	15	51
pr2	3	24	14	41
pr3	12	25	9	46
sum	21	79	38	138

Table (3) Results of Chi- Sqr test for each cell table

t	t1	t-t1	(t-t1)^2	(t-t1)^2/t1
6	7.76	-1.76	3.10	0.40
30	29.2	0.80	0.64	0.02
15	14.04	0.96	0.92	0.07
3	6.24	-3.24	10.50	1.68
24	23.47	0.53	0.28	0.01
14	11.29	2.71	7.34	0.65
12	7	5.00	25.00	3.57
25	26.33	-1.33	1.77	0.07
9	12.67	-3.67	13.47	1.06
			SUM	7.53

From the final sum of Chi – Sqr which is (7.53), there is a statistical significance for the confidence of 10%.

Histograms for HB values for each month of pregnancy are made as in Figure (2) through (4)

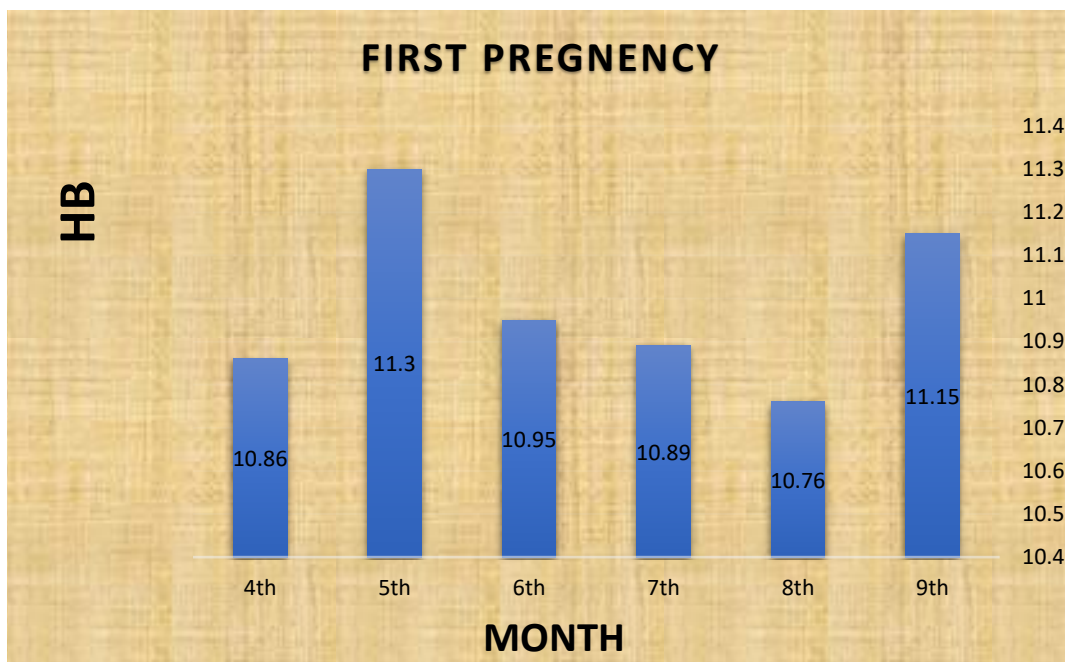


Figure (2) Hb for a first pregnancy

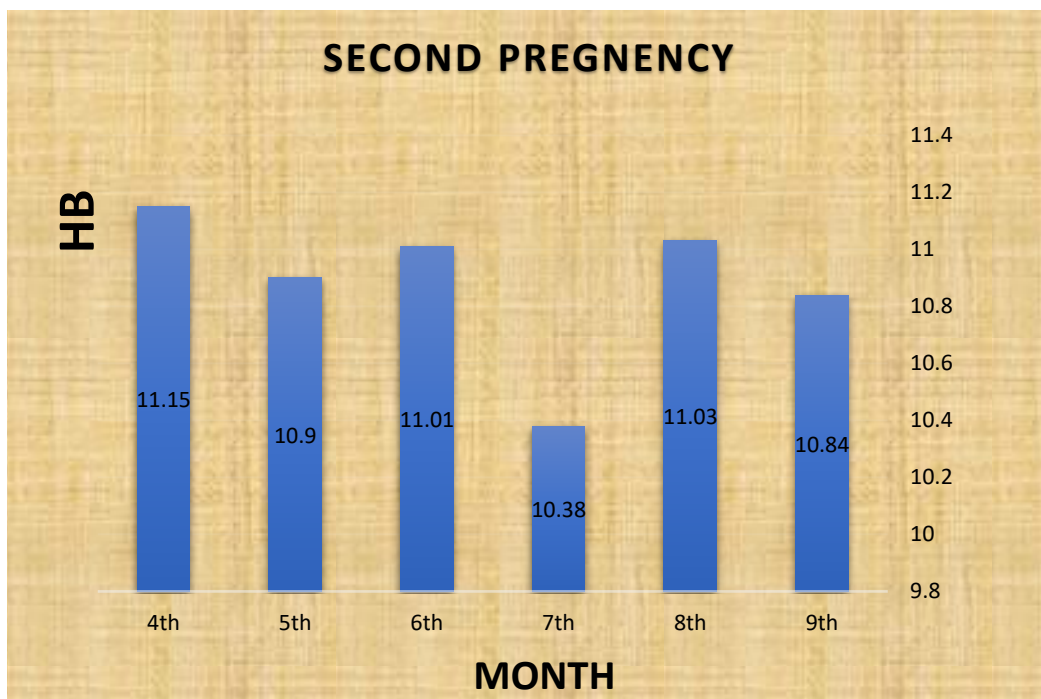


Figure (3) Hb for a second pregnancy

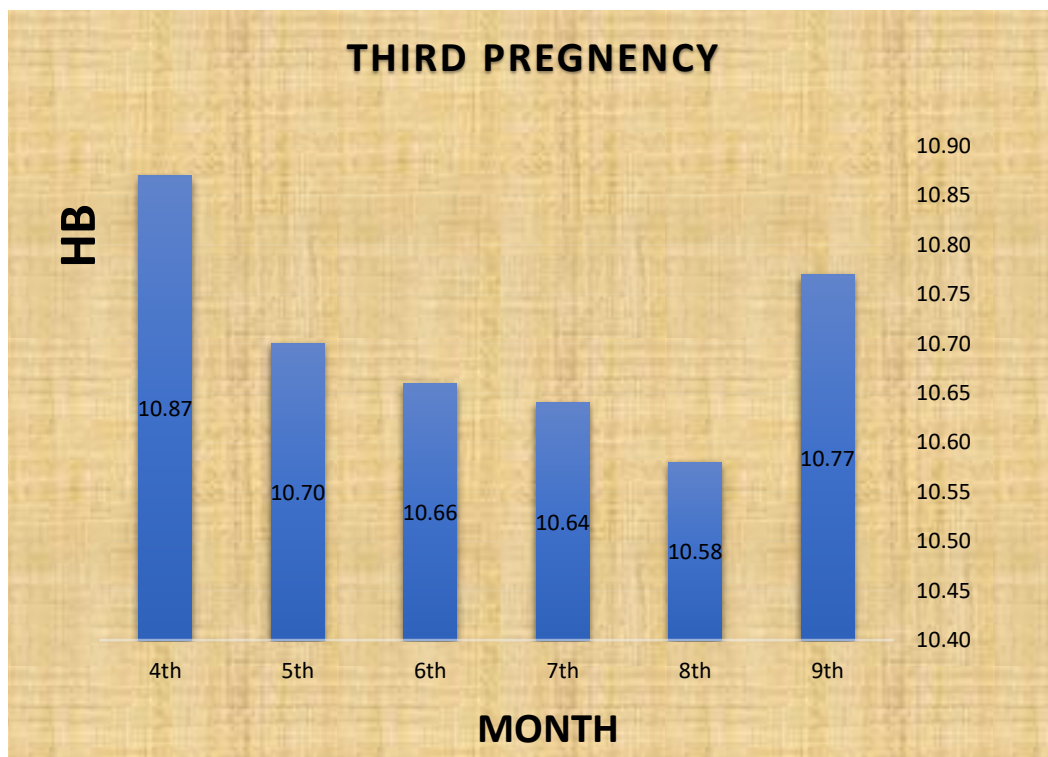


Figure (4) Hb for a third pregnancy

From Figures (2) through (4), the variation of Hb values may be considered as if it is following a wave-shape behavior. It is decreasing generally with the progress of pregnancy months until the 8th and 9th month where it goes back to increase. The interpretation of this behavior is that the Hb values

tend to increase in the last two months due to the desire of the woman that makes her taking food in more than she used to do. The correlation was made for each pregnancy sequence and Hb values. The results are shown in table (4).

Table (4) Correlation between month and Hb

Pregnancy	Pearson Correlation
1	0.1
2	0.4
3	0.5

From these values, it is shown that the path of Hb becomes more constrained with months progressing as the times of pregnancy increases.

Discussion

Pregnancy in women's lives, marked by numerous physiological and anatomical changes in a short amount of time. the red cell mass expansion and The maternal plasmatic volume are necessary to produce fetal amniotic liquid, to increase the total capacity of blood connection with oxygen, and to facilitate the distribution of oxygen in tissues⁽⁶⁾. Anemia during pregnancy, particularly iron deficiency anemia, continues to be a worldwide concern. Anemia is present when the hemoglobin (Hb) level in the blood is below the lower level of the normal range for the age and sex of the individual. The lower limit of normality is reduced during pregnancy⁽⁷⁾. Researchers from various developing countries have shown a prevalence of anemia in pregnancy of 19 to 50%⁽⁸⁾.

This study showed that Hb is decreasing generally with the progress of pregnancy months until last two months where it goes back to increase, Hb values are decreasing with increasing of times of pregnancy, Hb becomes more constrained with progressing of pregnancy months as the times of pregnancy increases.

Rahman, and Moniruddin (2014) showed that the growth of the fetus as well as birth action accompanied by the loss of blood especially with the repetition of the pregnancy and birth are the most important reasons for the loss of iron stored in the body⁽⁴⁾. United Nations (UN) has reported that 56% of pregnant women in low-income countries were suffering from anemia, in contrast to 18% in high-income countries⁽⁹⁾.

F. M. Tabrizi and S. Barjasteh(2015) showed that anemia was more prevalent in the third semester . Iron deficiency anemia in a later phase of pregnancy is associated with the birth weight of the neonates⁽¹⁰⁾.

Conclusions

- 1- Hb is decreasing generally with the progress of pregnancy months until the last two months where it goes back to increase.
- 2- Hb values are decreasing with increasing times of pregnancy.
- 3- Hb becomes more constrained with progressing of pregnancy months as the times of pregnancy increase.

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