

A STUDY ON THE RELATIONSHIP BETWEEN HAEMOGLOBIN CONCENTRATION IN THIRD TRIMESTER OF PREGNANCY AND BIRTH WEIGHT OF THE BABY

Gitartha Bordoloi



Guwahati, Assam

ARTICLE INFO

Corresponding Author:

Dr. Gitartha Bordoloi
Guwahati, Assam
gitartha.bordoloi@gmail.com

Keywords: Anemia, Hemoglobin, LBW



DOI: <http://dx.doi.org/10.15520/ijmhs.2017.vol7.iss1.153>

ABSTRACT

Background- Iron deficiency anaemia, being the most common nutritional disorder in the world, affects a large population of pregnant women in India. Low haemoglobin concentration not only is hazardous for the mother, it also poses a significant morbidity for the babies.

Aim- This study was done to observe the relationship between haemoglobin concentration in the third trimester of pregnancy in a group of women and they were followed up till the birth weight of the babies were recorded.

Materials and method: A hospital-based cross sectional study was conducted among 100 pregnant women. Maternal Hemoglobin levels during the third trimester (32-36 weeks) of pregnancy were measured by Cyanmet hemoglobin method. The patients were followed up and the weight of the babies were recorded immediately after birth.

Results and observation: The number of low birth weight babies increased as the maternal haemoglobin concentration decreased. The number was highest in severe maternal anemia. The percentage of LBW babies was slightly more in non-anemic women than mildly anemic women.

Conclusion: Maternal hemoglobin concentration was closely related to the birth weight of the baby. There is a need to closely observe and correct the iron deficiency anemia in pregnant women.

©2017, IJMHS, All Right Reserved

INTRODUCTION

Iron deficiency anaemia is the most common nutritional disorder in the world. It is estimated that in developing countries every second pregnant women is suffering from anaemia, mostly due to iron deficiency. Pregnancy considerably increases iron needs in the mother and her fetus. There is progressive hemodilution in the mother's body which together with malnutrition leads to iron deficiency anaemia. It is estimated that almost twenty percent of maternal deaths are directly caused by anaemia and causes of another fifty percent of maternal deaths are associated with anemia in the world. ¹About 30-40% of newborns from malnourished women will suffer from low birth weight compared to about 8-10% in normal population. ²

Strong evidence exists in scientific literatures for an association between maternal hemoglobin concentration and birth weight of the baby. A study conducted in Karnataka in 2013 found that Mean birth weight of babies born to anemic mothers was marginally lower compared to that of babies born to nonanemic mothers and this difference was statistically significant. ³ Similarly there have been studies in other countries also which closely associates maternal haemoglobin concentration with the birth weight of the baby. ^{4,5,6} There are some interesting results too where high maternal haemoglobin have been shown to cause foetal morbidity. ⁷ Meta analysis of a number of studies have also

been done in this regard. ⁸ This study was done to see the association between the two parameters in cases admitted in Assam Medical College and hospital, Dibrugarh, Assam.

Anaemia

Anaemia is defined as qualitative or quantitative deficiency of haemoglobin or red cells in circulation. ⁹ The quantitative displays include: decrease in the number of RBCs in a unit of blood, reduction of hemoglobin concentration, reduction of hematocrit, and change of a color index. Qualitative attributes of anemias include: presence of immature forms of erythrocytes, degenerative changes of erythrocytes and cells of pathological regeneration. Anaemia during pregnancy may be classified based on etiology as physiological anaemia of pregnancy, acquired anaemias like nutritional (most commonly iron deficiency anaemia), infestations like hookworm, haemorrhagic, bone marrow suppression, renal disease or genetic. Nutritional anaemia is the most common type of anaemia in India and it affects about 51.8% of women and 49.7% of pregnant women. ¹⁰ Maternal blood volume increases during pregnancy as adaptive mechanism and the RBC volume increases too but the increment is less than that of volume. So there is progressive hemodilution resulting in physiological anaemia or relative of pregnancy. ¹¹ Concentrations decline during the first trimester, reaching their lowest point in the second trimester, and begin to rise again in the third trimester. ¹²

This combined with the nutritional anaemia produces a serious health concern for the pregnant women of India.

Classification

WHO proposed the following classification to diagnose anaemia in pregnant women at sea level (g/dl)¹²:

Low birth weight (LBW) is defined by the world health organization as weight at birth less than 2500 g.¹⁴ An Indian study in 2011 found that nearly 20% of new-borns in India are LBW.¹⁵

Objective:

To find any relation between the maternal hemoglobin concentration in third trimester of pregnancy with the birth weight of the baby.

Materials and methods:

Materials used: Photoelectric colorimeter and proper diluting fluid for Cyanmet hemoglobin method.

INCLUSION CRITERIA: 100 apparently healthy pregnant women aged 18-30 years who attended Assam Medical College & Hospital, Dibrugarh for antenatal care and delivery in the period July 2012 to October 2012.

Exclusion Criteria:

1. Women with twin pregnancies.
2. Women delivering infants with congenital malformations.
3. Women with prior systemic diseases.
4. IUD and Stillborns.

Method: A hospital-based cross sectional study was conducted among 100 pregnant women. Maternal Hemoglobin levels during the third trimester (32-36 weeks) of pregnancy were measured by Cyanmet hemoglobin method. The patients were followed up and the weight of the babies was recorded immediately after birth.

Observation and Results: Haemoglobin concentration of the mother was plotted with birth weight of the baby in a scatter diagram and Pearson correlation coefficient was calculated. From that the P-value was also calculated. It was found that maternal hemoglobin concentration was closely related to the birth weight of the baby (Pearson Correlation value 0.69).

Table 1: Classification of anaemia in pregnant women

Non-anaemia	Mild anaemia	Moderate anaemia	Severe anaemia
11 or higher	10-10.9	7-9.9	<7

ICMR (1989) defined the following haemoglobin levels for classification of anaemia¹³:

Table 2: Anaemia classification (ICMR)

Hb level	Classification
10-10.9 g/dl	Mild
7-9.9 g/dl	Moderate
4-6.9 g/dl	severe
<4g/dl	Very severe

Low birth weight

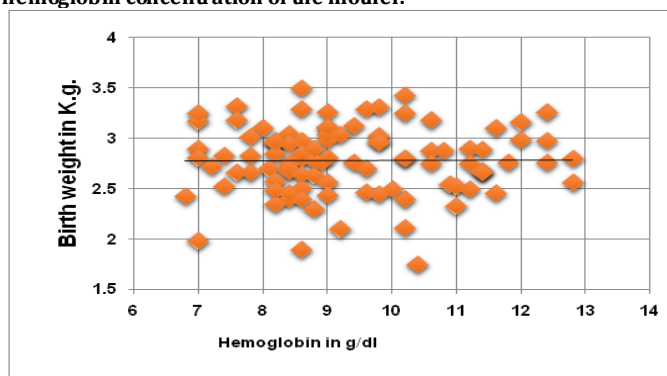
Table 3: The results of the study in a nutshell

No. of women	100
Hb range	6.8-13 g/dl
Pearson Correlation value	0.69
P-value	<0.001

Table 4: Distribution of birth weights of baby corresponding to hemoglobin concentration of the mother.

Hb (g/dl)	No. of women	No. of LBW babies
6-6.9	1	1
7-7.9	14	8
8-8.9	30	4
9-9.9	20	3
10-10.9	13	1
11-11.9	14	1
12-12.9	8	1

Figure 1: Distribution of birth weights of baby corresponding to hemoglobin concentration of the mother.



From the above figure it can be analysed that moderately low maternal haemoglobin concentration was associated with an increased risk of low birth weight (<2500 g) babies (Relative risk being 5.1) than relatively high maternal haemoglobin concentration. In case of mild anaemia the incidence of low birth weight baby was low (12.7%).

Figure 2: Table 4: Bar diagram showing birth weights of baby corresponding to hemoglobin concentration of the mother.

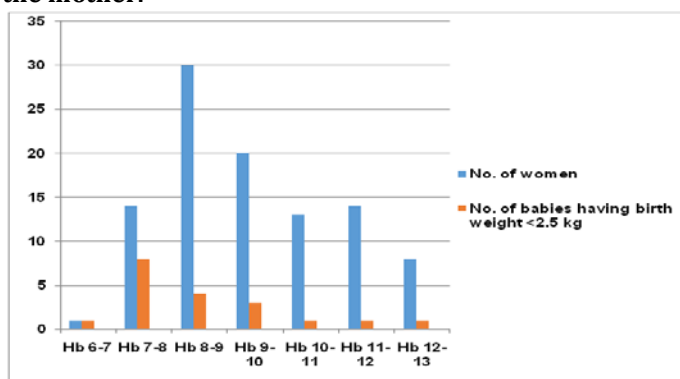


Table 5: No. of women with different Hb levels and no. of low birth weight babies

Hb level	No. of women	LBW babies	Percentage
>11 g/dl	22	2	9.1
10-10.9 g/dl	13	1	7.7
7-9.9 g/dl	64	15	23.4
<7 g/dl	1	1	100

From the above table, it is seen that non-anaemic others had slightly more chance of LBW babies than the mildly anaemic mothers. On the other hand percentage of LBW babies increased as the women had progressively low hemoglobin concentration in third trimester of pregnancy.

CONCLUSION

Anaemia during pregnancy is not only harmful for the mother but also for the baby. This study confirms the prior observations that maternal hemoglobin in third trimester of pregnancy is positively correlated with the birth weight of the newborn.

BIBLIOGRAPHY

1. Micronutrient deficiencies: Iron deficiency anaemia. (n.d.). Retrieved January 4, 2017, from <http://www.who.int/nutrition/topics/ida/en/>
2. Nisha, M. (2006). *Diet planning for diseases* (1st ed., p. 225). Delhi: Kalpaz.
3. Jagadish Kumar, K., Asha, N., Srinivasa Murthy, D., Sujatha, M., & Manjunath, V. (2013). Maternal Anemia in Various Trimesters and its Effect on Newborn Weight and Maturity: An Observational Study [Abstract]. *Maternal Anemia in Various Trimesters and its Effect on Newborn Weight and Maturity: An Observational Study*,4(2), 193-199. Retrieved July 23,

4. Ahmad , M., Kalsoom, U., Sughra, U., Hadi, U., & Imran, M. (2011). Effect of maternal anaemia on birth weight. [Abstract]. *J Ayub Med Coll Abbottabad*,23(1), 77-79. Retrieved November 6, 2016, from <https://www.ncbi.nlm.nih.gov/pubmed/22830153>.
5. Sekhavat, L., Davar, R., & Hosseinidezoki, S. (2011). Relationship between maternal hemoglobin concentration and neonatal birth weight. *Hematology*, 16(6), 373-376. <http://dx.doi.org/10.1179/102453311x13085644680186>
6. 2016, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3604852/>.
7. Jwa, S., Fujiwara, T., Yamanobe, Y., Kozuka, K., & Sago, H. (2015). Changes in maternal hemoglobin during pregnancy and birth outcomes. *BMC Pregnancy And Childbirth*, 15(1). <http://dx.doi.org/10.1186/s12884-015-0516-1>
8. Ahankari, A. & LeonardiBee, J. (2015). Maternal hemoglobin and birth weight: systematic review and meta-analysis. *International Journal Of Medical Science And Public Health*, 4(4), 435. <http://dx.doi.org/10.5455/ijmsph.2015.2212201489>
9. *Anaemia - Biology-Online Dictionary*. (2017). *Biology-online.org*. Retrieved 13 November 2016, from <http://www.biology-online.org/dictionary/Anaemia>
10. Girerd-Barclay, E. & Tiwari, K. *Prevention and Control of Nutritional Anaemia: A south asea priority*. (2002). *unicef.org*. Retrieved 19 August 2016, from <https://www.unicef.org/rosa/Anaemin.pdf>
11. B Rigby, F. & M Ramus, R. (2016). *Anemia and Thrombocytopenia in Pregnancy: Anemias in Pregnancy, Sickle Cell Hemoglobinopathies in Pregnancy, Thalassemias in Pregnancy*. *Emedicine.medscape.com*. Retrieved 18 December 2016, from <http://emedicine.medscape.com/article/261586-overview>
12. *Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity*. (2017). *Who.int*. Retrieved 8 December 2016, from <http://www.who.int/vmnis/indicators/haemoglobin.pdf?ua=1>
13. *GUIDELINES FOR PREVENTION OF MATERNAL ANAEMIA*. (2012). *nrhmtn.gov*. Retrieved 17 July 2016, from <http://www.nrhmtn.gov.in/guideline/RGPMa.pdf>
14. *WHA Global Nutrition Targets 2025: Low Birth Weight Policy Brief*. (2017). *who.int*. Retrieved 13 May 2016, from http://www.who.int/nutrition/topics/globaltargets_lowbirthweight_policybrief.pdf
15. Bharati, P., Pal, M., Bandyopadhyay, M., Bhakta, M., & Chakraborty, S. (2011). Prevalence and causes of low birth weight in India. *Malays J Nutr*, 17(3), 301-13. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/22655452>