MEDICAL RESEARCH REPORTS

Med Res Rep 2022;5(2):62-67
https://doi.org/10.55517/mrr.1089438

ORIGINAL ARTICLE

The Effect of Third Trimester Maternal Hemoglobin Value on Fetal Weight and Birth Week

Musa BÜYÜK [1], Murat SUMAN[2] Kamuran SUMAN[3], Zafer BÜTÜN[4]

[1] Çay State Hospital, Obstetrics, Afyonkarahisar/Türkiye.
[2] Çay State Hospital, Pediatrics, Afyonkarahisar/Türkiye.
[3] Afyon State Hospital, Perinatology, Afyonkarahisar/Türkiye.
[4] Eskişehir City Hospital, Perinatology, Eskişehir/Türkiye

ÖZET

Giriş: Maternal aneminin doğum haftası ve bebeğin ağırlığı üzerindeki etkisini incelemek. **Materyal ve Metod:** 1 Ağustos-30 Ekim 2019 tarihleri arasında üç merkezde doğum yapan 1114 hastanın hemoglobin düzeyleri değerlendirildi. Hasta yaşı, doğum şekli, gravide ve parite, hemogram parametreleri, doğum haftası ve doğum ağırlığı kaydedildi. 37. gebelik haftasından önceki doğumlar preterm, 2500 gr'ın altındaki bebekler düşük doğum ağırlıklı bebekler olarak sınıflandırıldı. **Bulgular**: Doğum ağırlığı skorlarında gruplar arasında anlamlı fark bulundu ($p<0.05$). Hemoglobin değeri <9 g/dl olan gebelerin bebekleri incelendiğinde, doğum ağırlığının anlamlı olarak daha düşük olduğu tespit edildi. Öte yandan doğum haftası ve doğum şekli değerlendirildiğinde anlamlı bir fark bulundu. **Sonuç:** Gebelikte 9'un altındaki hemoglobin düzeylerinin bebeklerde düşük doğum ağırlığına neden olduğu gözlemlenmiştir.
Anahtar kelimeler: Doğum Ağırlığı, Doğum Haftası, Gebelik, Hemoglobin Düzeyi

ABSTRACT

Introduction: To study the effect of maternal anemia on the week of birth and the weight of the baby. **Material and Methods:** Hemoglobin levels of 1114 patients who delivered at three centers between August 1 and October 30, 2019, were evaluated. Patient age, mode of delivery, gravidity and parity, hemogram parameters, week of birth, and birth weight were recorded. Births before 37 weeks' gestation were classified as preterm and babies with a birth weight of less than 2500 g were classified as low birth weight babies. **Results:** A significant difference was found between groups in birth weight scores ($p <0.05$). When the babies of pregnant women with a hemoglobin value of <9 g/dl were examined, it was found that the birth weight was significantly lower. On the other hand, when evaluating the week of birth and the mode of delivery, a significant difference was found. **Conclusion:** Hemoglobin levels below 9 during pregnancy have been observed to cause low birth weight in babies.
Keywords: Birth Weight, Week of Birth, Pregnancy, Hemoglobin Level

Cite this article as: Suman M, Büyük M, Suman K, Bütün Z. The Effect of Third Trimester Maternal Hemoglobin Value on Fetal Weight and Birth Week. Medical Research Reports 2022; 5(2):62-67

Corresponding Author: Murat Suman **Correspondence Adress**: : Ali Kaleli Mahallesi Cumhuriyet Caddesi No: 200 Çay Afyonkarahisar/Türkiye Mail: muratsuman@hotmail.com Received: 17.03.2022; Accepted: 08.06.2022

INTRODUCTION

Anemia is a common health problem especially in developing countries. 43% of pregnant women in developing countries and 9% in developed countries suffer from anemia. (1, 2)

WHO (World Health Organization) defined a hemoglobin level below 11 g/dL as anemia in pregnant women. Physiologic anemia during pregnancy and iron deficiency are the two most common causes of anemia in pregnancy. Physiologic changes during pregnancy result in dilutional anemia despite an overall increase in red blood cell (RBC) mass. Iron deficiency is the second most common cause of anemia in pregnancy after physiologic anemia. (2) The prevalence of anemia in pregnant women may vary depending on socioeconomic status, number of births, presence of additional diseases, and status of prenatal care. Iron deficiency is the most common form of anemia in pregnant women. According to the World Health Organization, iron deficiency anemia, which affects 30% of the world's population, is found in 43% of preschool children and 51% of pregnant women. The main function of Hb is to transport oxygen from the lungs to the tissues. When Hb levels decrease, the oxygen carrying capacity of the blood decreases, less oxygen reaches the tissues, and hypoxia occurs in the tissues. As a result of hypoxia, tissue functions deteriorate.

Symptoms of anemia occur in systems such as the muscular system, the cardiovascular system, and the central nervous system. Anemias are morphologically classified as macrocytic anemias, hypochromic microcytic anemias, and normocytic anemias. Iron deficiency anemia is the most common group of hypochromic microcytic anemias. Anemia can lead to poor perinatal outcomes in pregnant women (low Apgar score, preterm birth, low birth weight, perinatal loss). Prematurity and birth hypoxia are the most common causes of perinatal death. Because perinatal anemia may be one of the causes, we investigated the impact of maternal anemia on perinatal outcomes.

MATERIAL AND METHODS

After the Ethics Committee approved File No. 250 on May 28, 2019, the study began. The files of 1114 pregnant women who had delivered at three centers between August 1 and October 30, 2019, were scanned. Three hundred and eighteen patients were excluded from the study because they met exclusion criteria. Pregnant women at normal risk were included in the study, and data were analyzed retrospectively. The relationship between hemoglobin, week of birth, and fetal weight was examined. We also divided Hb levels into 3 groups: 11 g/dL and above, 9-11 g/dL, and below 9 g/dL. Group 1 (396 patients with hemoglobin: 11-13 g/dL), group 2 (338 patients with hemoglobin: 9-11 g/dL), and group 3 (62 patients with hemoglobin <9 g/dL) total.

Inclusion criteria for the study:

Pregnant women who gave birth between August 1 and October 30, 2019, at three centers were included.

Exclusion criteria:

Of the maternal causes, multiparity (>5), hypertension, gestational diabetes, antepartum hemorrhage, anemia of chronic disease, HIV positivity, HBsag (+) pregnant women, vdrl (+) pregnant women, and Hb >13 g/dl cases were not included in the study. Babies with multiple pregnancies and fetal anomalies were excluded from the study.

Statistics

IBM SPSS 20 (IBM SPSS Inc, USA) was used for statistical analysis. Descriptive statistical methods (mean, standard deviation, frequency, rate, median) were used to analyze the study data, and the Anova test was used to compare more than two groups with normal distribution. The Kruskal-Wallis test was used for comparisons of more than two groups that did not have a normal distribution. Chi-square test was used for comparison of qualitative data.

RESULTS

A total of 1114 deliveries were performed between August 1 and October 30, 2019. 318 patients were excluded from the study because they met the exclusion criteria. A total of 796 patients made up the study group. The age of patients included in the study ranged from 18 to 36 years, with a mean age of 25±0.5 years. A total of 796 patients were evaluated, including 396 patients in group 1, 338 patients in group 2, and 62 patients in group 3. There was a statistically significant difference in the age distribution between the groups (p=0.001). It was found that this difference was due to the older age of patients in group 1 and 2 compared to group 3. The birth weeks of all cases ranged from 32 to 42, and they delivered at 38 weeks on average. A difference was found between the groups in terms of birth week (p=0.001). It was found that this difference was due to the fact that patients in groups 1 and 2 were at a more advanced birth week compared to group 3. Birth weights of all cases ranged from 2000 g to 4300 g, with a mean of 3150±410.4. A statistically significant difference was found between the groups in terms of birth weight (p=0.002). This difference was due to the lower weight of patients in group 3 compared to the other groups. When those born before 37 weeks were classified as preterm and those born after were classified as term, a statistically significant difference was found between the groups in terms of term status (p=0.001). Table 1

There were 60 patients with low birth weight (<2500 g). 49 of these patients are in group 3, 6 in group 2 and 5 in group 1. There was a statistically significant difference between the groups in terms of low birth weight (p=0.001). Table 2

Table 1. Intergroup evaluation of Term-Preterm status

	Group 1(%)	Group 2(%)	Group 3(%)	p
Term	13(21,3)	332(98,2)	391(98,7)	P=0,001
Preterm	48(78,7)	6(1,8)	5(1,3)	

Chi-Square

Table 2. Low birth weight distribution between groups

	Group 1(%)	Group 2(%)	Group 3(%)	p
Low birth weight (<2500)	5(1,3)	6(1,8)	49(79)	P=0,001
Normal birth weight (>2500)	391(98,7)	332(98,2)	13(21)	

Chi-square, *p<0,05

It was observed that mainly low birth weight was concentrated in patients of group 3. When patients were evaluated by gravida and parity, patients with G1P1 accounted for 21.2% of the total population, those with G2P2 for 36.8%, and those with G3P3 and above for 42%. There was no statistically significant difference between groups in terms of parity (p < 0.982). 21% of P1 patients, 37.1% of P2 patients, 33.9% of P3 patients, and 8.1% of P4 patients were in group 3. No significant difference was found between Hb and parity. There was no statistically significant difference between groups in terms of gravida (p=0.980). Table 3

Table 3. Parity distribution between groups

	Group 1(%)	Group 2(%)	Group 3(%)
1	85(50,3)	71(42)	13(7,7)
2	143(48,8)	127(43,3)	23(7,8)
3	135(50,6)	32(48,5)	1(100)
4	111(41,6)	29(43,9)	0(0)
5	21(7,9)	5(7,6)	0(0)

Chi-square, *p<0,05 (p=0,980)

There was a difference between the groups regarding the type of delivery (p=0.001). It was observed that especially cesarean delivery was more frequent in patients of group 3.

DISCUSSION

In the literature, there are studies showing that maternal anemia leads to poor pregnancy outcomes (such as preterm birth, low birth weight, perinatal death, low Apgar score) (3-5), and there are several publications showing that there is no association between the two (6, 7).

In our study, we found a significant association between anemia in pregnancy and perinatal outcomes. Anemia in pregnancy is defined as an Hb concentration < 11 g/dL according to World Health Organization criteria (8). In our study, those with an Hb concentration < 11 g/dL were classified as anemic. Those with an Hb concentration < 9 g/dL were classified as severe anemia (group 3). Because women with an Hb > 14 g/dL are at risk for small gestational age (SGA) babies, we set our upper limit for Hb

in the nonanemic group at 13 g/dL (9). Levy et al found 13,204 (8.6%) anemic pregnant women in their 2005 study of 153,396 pregnant women and showed that maternal anemia leads to low birth weight and preterm delivery (5). In a 2018 series in which iron status was assessed in 299 healthy young females in the general population in Australia, 87 (29 percent) had iron deficiency. Of these, only 16 (representing 18 percent of those who were iron deficient; 5 percent of the total cohort) were anemic; the remainder would not have been identified by hemoglobin alone. (10) In our study, the weight of babies born to patients in group 3 was <2500 g, and it was found that this also resulted in low birth weight. Anemia is an important risk factor for maternal mortality because anemic pregnant women have difficulty coping with postpartum hemorrhage, their vital signs are impaired, and they have an increased tendency to infection (11). Anemia has been found to be directly responsible for 3.7% of maternal deaths in Africa and 12.8% in Asia (12). In a study conducted in Tanzania in 2009 by Kidanto et al (12), they reported that the incidence of preterm birth and low birth weight increased with the severity of anemia. According to the results of our study, the average birth weight of babies born to patients in group 3 with an Hb <9 g/dL was significantly lower. At the same time, the weight of babies born to patients in group 3 was <2500 g, and it was found that this also resulted in low birth weight. According to a 2014 study of 1050 pregnant women in India, anemia was found to be associated with low birth weight, preterm birth, and poor neonatal outcomes (13). In our study, we have shown that preterm birth is associated with poor perinatal outcomes.

CONCLUSION

According to the results of this study, the mean birth weight of the babies of Group 3 patients with Hb<9 g/dl was found to be significantly lower. At the same time, the weight of the babies of group 3 patients was <2500 g, and it was observed that it also caused low birth weight. There was no significant difference in terms of low birth weight in group 1 and 2 patients. In this study, it was seen that parity had no effect on the Hb value. There was a difference between the groups in terms of the week of birth. Anemia in pregnancy is an important problem in our country. Anemia needs to be diagnosed and treated preconceptionally. All pregnant women should be followed closely in terms of anemia because of the problems that anemia creates in the patient and the baby.

Source(s) of financial support: None.

Conflict of interest: There is no conflict of interest in our study.

References

1. Sak ME, Özkul Ö, Evsen MS, Sibel S, Evliyaoglu O. Gebelik anemisinin perinatal sonuçlara etkisi. Dicle Tıp Dergisi. 2009;36(1):39-42.
2. Obstetricians ACo, Gynecologists. Anemia in Pregnancy: ACOG Practice Bulletin, Number 233. Obstetrics and gynecology. 2021;138(2): e55-e64.
3. Lone FW, Qureshi RN, Emanuel F. Maternal anaemia and its impact on perinatal outcome. Tropical medicine & international health. 2004;9(4):486-90.
4. Bakhtiar UJ, Khan Y, Nasar R. Relationship between maternal hemoglobin and perinatal outcome. Age. 2007; 25:24.
5. Levy A, Fraser D, Katz M, Mazor M, Sheiner E. Maternal anemia during pregnancy is an independent risk factor for low birthweight and preterm delivery. European journal of obstetrics & gynecology and reproductive biology. 2005;122(2):182-6.
6. Choi JW, Im MW, Pai SH. Serum transferrin receptor concentrations during normal pregnancy. Clinical Chemistry. 2000;46(5):725-7.
7. Scanlon KS, Yip R, Schieve LA, Cogswell ME. High and low hemoglobin levels during pregnancy: differential risks for preterm birth and small for gestational age. Obstetrics & Gynecology. 2000;96(5):741-8.
8. Young I, Parker HM, Rangan A, Prvan T, Cook RL, Donges CE, et al. Association between haem and non-haem iron intake and serum ferritin in healthy young women. Nutrients. 2018;10(1):81.
9. Paiva ADA, Rondó PH, Pagliusi RA, Latorre MDR, Cardoso MA, Gondim SS. Relationship between the iron status of pregnant women and their newborns. Revista de Saúde Pública. 2007; 41:321-7.
10. Pavord S, Daru J, Prasannan N, Robinson S, Stanworth S, Girling J, et al. UK guidelines on the management of iron deficiency in pregnancy. Br J Haematol. 2020.
11. Khan KS, Wojdyla D, Say L, Gülmezoglu AM, Van Look PF. WHO analysis of causes of maternal death: a systematic review. The lancet. 2006;367(9516):1066-74.
12. Kidanto HL, Mogren I, Lindmark G, Massawe S, Nystrom L. Risks for preterm delivery and low birth weight are independently increased by severity of maternal anaemia. South African Medical Journal. 2009;99(2):98-102.
13. Rani KU, Gupta J, Gupta R, Aggarwal KC. Maternal anaemia and its severity: an independent risk factor for preterm delivery and adverse neonatal outcome. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2014;3(2):325-30.