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THE RELATIONSHIP BETWEEN HEMOGRAM PARAMETERS OBSERVED IN THE SECOND TRIMESTER AND BIRTH WEIGHT-RETROSPECTIVE CASE-CONTROL STUDY*

İKİNCİ TRİMESTERDEKİ HEMOGRAM PARAMETRELERİNİN DOĞUM AĞIRLIĞIYLA İLİŞKİSİ – RETROSPEKTİF VAKA-KONTROL ÇALIŞMASI*

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ABSTRACT

Objective: This study was conducted on pregnant women who applied to Adnan Menderes University Hospital Gynecology and Obstetrics outpatient clinic between January 2012 and June 2016. To evaluate the prevalence of anemia in pregnant women retrospectively and to determine its effect on the newborn birth weight of the baby.

Method: It was applied to pregnant women who had a cesarean section or vaginal delivery and who met the criteria for inclusion at 37 weeks or more. Second trimester (14-28 weeks) hemogram parameters; The effects of hemoglobin (Hb), hematocrit (Hct), mean red blood cell volume (MCV), mean red blood cell hemoglobin concentration (MCHC), red blood cell (RBC), and red cell distribution width (RDW) on newborn birth weight were evaluated. The patients were divided into two groups: Group 1; anemic pregnant women (n=237) and Group 2; control group (n=237). SPSS for Windows 22.0 program was used in the analysis of the studies.

Results: The mean age of the patients was 29.96±5.74 years. Of the patients, 247 (23.5%) were delivered vaginally and 804 (76.49%) by cesarean section. Hb value of 237 (22.5%) patients was below 10.5gr/dl. 54 (5.1%) of the patients had low birth weight newborns (Fetal weight<2500g). In our study, no statistically significant correlation was found between the 2nd trimester Hb, Hct, MCV, MCHC, RBC, and RDW parameters of pregnant women and newborn birth weight (p>0.05).

Conclusion: The 2nd trimester Hb, Hct, MCV, MCHC, RBC, and RDW values have no effect on the newborn's birth weight.

Key Words: Iron Deficiency Anemia, Low Birth Weight, Hemogram, Anemia in Pregnancy

ÖZET

Amaç: Adnan Menderes Üniversitesi Hastanesi obstetri polikliniğine Ocak 2012 ile Haziran 2016 yılları arasında başvuran gebelerin anemi prevalansını retrospektif olarak değerlendirip yenidoğanın doğum kilosuna etkisini tespit etmektir.

Gereç ve Yöntem: 37 Hafta ve üstünde sezaryen doğum veya vajinal doğum yapmış dahil edilme kriterlerini karşılayan gebeler üzerinde yapılmıştır. İkinci trimester (14-28 gebelik haftası) hemoglobin (Hb), hematokrit (Hct), ortalama eritrosit hacmi=mean corpuscular volüme (MCV), ortalama eritrosit hemoglobin konsantrasyonu=mean corpuscular hemoglobin concentration (MCHC), eritrosit sayısı=red blood cell (RBC) ve eritrosit dağılım genişliği=red cell distribution width (RDW) içeren hemogram parametrelerinin doğum kilosuna etkisi değerlendirilmiştir. Hastalar grup 1; anemik gebeler (n=237) ve grup 2; kontrol grubu (n=237) olarak iki grupta ele alınmıştır. Çalışmada elde edilen bulgular değerlendirilirken değişkenlerin analizinde SPSS for Windows 22.0 programı kullanılmıştır.

Bulgular: Hastaların ortalama yaşları 29,96±5,74'tür. Hastaların 247'si (%23,5) vajinal doğum ve 804'ü (%76,49) sezaryen doğum yapmıştır. Hastaların 237 (%22,5)'sinin Hb değeri 10,5gr/dl'nin altında idi. Hastaların 54 (%5,1)'ü düşük doğum ağırlıklı yenidoğana (Fetal ağırlık<2500gr) sahipti. Çalışmamızda hastaların 2. Trimester Hb, Hct, MCV, MCHC, RBC ve RDW parametreleri ile yenidoğanın doğum ağırlığı arasında istatiksel olarak anlamlı bir ilişki saptanmamıştır (p>0,05).

Sonuç: Yenidoğanın doğum ağırlığı üzerinde 2. Trimester Hb, Hct, MCV, MCHC, RBC ve RDW değerlerinin bir etkisi yoktur.

Anahtar Kelimeler: Demir Eksikliği Anemisi, Düşük Doğum Ağırlığı, Hemogram, Gebelikte Anemi

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**Tez çalışmasından uyarlanmıştır.*

INTRODUCTION

Anemia during pregnancy is one of the most common problems, especially in developing countries. Anemia in pregnancy was determined by the Center for Disease Control and Prevention (CDC) in 1989 when the hemoglobin (Hb) value in the 1st and 3rd trimesters was below 11 g/dl or the hematocrit (Hct) value was below 33%, and the Hb value was 10.5 g/d and, Hct value less than 32% in the 2nd trimester. (1). According to the World Health Organization (WHO), about 30% of the world's population and more than half of pregnant women are thought to have anemia. WHO suggests that up to 20% of maternal deaths may be due to anemia (2). The prevalence of anemia in pregnancy varies between 35-100% in various sources. Values ranging from 35% to 56% have been reported in previous studies in Turkey (1-3). Anemia is a health problem that should be seriously addressed in terms of women's and pregnant women's health. Studies report that maternal anemia is associated with fetal complications such as preterm delivery, intrauterine growth retardation (IUGR), perinatal mortality, low birth weight, and maternal complications such as preeclampsia and eclampsia. (3,4). Maternal Hb values are affected by many factors such as adequate maternal iron intake, multiple pregnancies, smoking, body mass index (BMI), altitude above sea level, maternal age and ethnic group, trimester of pregnancy, parity, and educational status (4). Determination and treatment of anemia in pregnant women during antenatal follow-up is important in terms of preventing possible perinatal complications. In studies, the most common and sometimes fatal problems in low birth weight infants have been reported as respiratory distress syndrome (RDS) and/or respiratory problems, sepsis, feeding intolerance, and hydrocephalus (4-6). In our study, the relationship between second-trimester hemogram values and fetal birth weight was investigated.

MATERIAL AND METHOD

Our study was carried out in Aydın Adnan Menderes University Medical Faculty Hospital between January 2012 and June 2016. The prevalence of anemia in pregnant women was evaluated retrospectively and its relationship with newborn birth weight was examined. Approval dated 30.06.2016 and decision number 2016/926 was obtained from the Ethics Committee. The study was carried out by the Declaration of Helsinki.

Our study was designed on 1051 pregnant women aged 20-50 years who had a cesarean or vaginal delivery at 37 weeks or more. For the 2nd trimester, a Hb value of less than 10.5 g/dl or an Hct value of 32% was taken as the criterion for anemia (1). Hemoglobin (Hb), hematocrit (Hct), and mean erythrocyte volume were the hemogram parameters of 237 pregnant women who were anemic (Hb: below 10.5 g/dl) and 237 pregnant women who were randomly selected who were not anemic (over Hb: 10.5 g/dl). The non-anemic group was randomly selected by the blinding method. All pregnant women included in the study received daily 60 mg oral iron supplementation throughout pregnancy. The relationship between mean corpuscular volume (MCV), mean erythrocyte hemoglobin concentration=mean corpuscular hemoglobin concentration (MCHC), erythrocyte count=red blood cell (RBC), and erythrocyte distribution width=red cell distribution width (RDW) and birth weight of the newborn was investigated. Hemogram parameters were studied on a device called Sysmex xn 1000. Patients who met the inclusion criteria were included in the study. The inclusion and exclusion criteria of the study are;

Inclusion criterias are having given birth at 1-37 weeks or more, second Trimester (14-28 weeks of gestation) hemogram parameters and patient information required for the study can be accessed. Exclusion Criterias are diagnosis of anemia other than iron deficiency anemia, having multiple pregnancies, having a preeclamptic pregnancy, abrupt placenta or bleeding placenta previa, intrauterine growth retardation, having a previous splenectomy, maternal systemic disease, gastrointestinal or urinary system bleeding during pregnancy. It is classified as having vaginal bleeding during pregnancy (Abortus imminent, cervical polyp, etc.).

SPSS 22.0 program for Windows was used for the statistical analysis of data in the study. The suitability of the data for normal distribution was evaluated with the Kolmogorov-Smirnov test, which has higher sensitivity and more power. Homogeneity of variance was evaluated with the Levene test. Spearman's Rho test was applied to examine the correlations of variables with each other. To reveal the causality between the dependent variable and independent variables as a mathematical model, Linear Regression analysis was tested by applying a transformation to the data with the Forward Stepwise method. Quantitative variables are stated in the tables as mean ± std (standard deviation). The median range (maximum-minimum) and the categorical variables were indicated as n (%). Variables were analyzed at the 95% confidence interval. A p-value of less than 0.05 was considered significant.

RESULTS

The study was designed on a total of 1051 pregnant women, whose ages ranged from 15 to 47. The mean age of the patients was 29.96±5.74. The Hb value of 237 (22.5%) patients was below 10.5gr/dl. 54 (5.1%) of 1051 patients had low birth weight newborns (Fetal weight <2500gr). Of the patients, 247 (23.5%) had a vaginal delivery and 804 (76.5%) had a cesarean section. General specifications are given in Tables 1 and 2. The hemogram parameters of Hb, Hct, MCV, MCHC, RBC, and RDW values of 237 pregnant women who were anemic (below Hb: 10.5 g/dl) and 237 pregnant women who were randomly selected who were not anemic (over Hb: 10.5 g/dl) It was investigated whether it had any effect on weight. In our study, no statistically significant correlation was found between Hb, Hct, MCV, MCHC, RBC, and RDW values and newborn birth weight ($p>0.05$). The relationship between birth weight and second-trimester hemogram parameters is given in Table 3. No additional problems related to anemia were observed in newborn babies.

Table 1: General Characteristics

	Mean±SD	Median	Minimum-Maximum
Fetal weight (kg)	3247.64±465.60	3220	1610-6100
Age (Year)	29.96±5.74	30	15-47
Gravida	2.35±1.38	2	1-10
Parity	2.01±1.07	2	0-8
Abortion	0.31±0.67	0	0-4
Living child	1.98±1.02	4	0-8
Number of VD	0.67±1.12	0	0-7
Number of CS	1.33±1.06	1	0-6
LMP	38.45±1.02	38	37-42
Hb (gr/dl)	11.36±1.30	11.5	6.9-14.7
Hct (%)	34.89±3.42	35	21.9-43.7
MCV (fL)	85.09±7.73	86.2	53.9-104
MCHC (gr/dl)	32.53±1.20	32.6	26.9-37.9
RBC ($x10^6$/MCL)	4.11±0.44	4.1	2.72-6.51
RDW (%)	14.70±2.47	14.1	11.5-33.4

VD: Vaginal Delivery, CS: Cesarean Section, LMP: Last Menstrual Period, Hb: Hemoglobin, Hct: Hematocrit, MCV: Mean Corpuscular Volume, MCHC: Mean Corpuscular Hemoglobin Concentration, RDW: Red Cell Distribution Width

Table 2: Vaginal delivery and cesarean section rates

	Number (n)	Percent (%)
Vaginal delivery	247	23.5
Cesarean section	804	76.5
Total	1051	100

Table 3: Relationship between Birth Weight and Second Trimester Hemogram Parameters

	Anemic group	Control group	P
Hb (gr/dl) (mean±SD)	9.82±0.73	12.58±0.89	**0.001***
Hct (%) (mean±SD)	29.46±2.52	37.74±3.42	**0.001***
Birth weight (Kg) (mean±SD)	3336.69±466.34	3327.16±433.65	0.763

Hb: Hemoglobin, Hct: Hematocrit, MCV: Mean Corpuscular Volume, MCHC: Mean Corpuscular Hemoglobin Concentration, RDW: Red Cell Distribution Width

* P<0.05 values with a 95% confidence interval were considered significant.

DISCUSSION

In our retrospective study, in which we investigated the relationship between 2nd-trimester hemogram parameters and birth weight of 1051 pregnant women who were followed up in our hospital's obstetrics outpatient clinic and delivered in our hospital, we showed that hemogram parameters alone did not have a significant effect on birth weight. We believe that the parameters affecting birth weight are the gestational week of the patient, the patient's age, gravida, parity, and various factors. The Center for Disease Control and Prevention (CDC) stated that the Hb value of pregnant women using iron supplementation is 11 g/dl in the first and third trimesters, and below 10.5 g/dl in the 2nd trimester (1). Since the second-trimester hemogram parameters were evaluated in our study, the lower limit Hb value for anemia was taken as 10.5 g/dl. Various studies investigating iron deficiency anemia in pregnancy show different results. In a study conducted on 164.667 term pregnant women in China, the rate of anemia was found to be 32.6%. (7). Malhotra et al. found the prevalence of anemia in pregnancy to be 72.5% in India (8). Pathak et al. In 2007, the prevalence of iron deficiency anemia during pregnancy in India was found to be 67.7% (9). Choi et al. In their study conducted in Korea in 2000, reported an anemia prevalence of 35.3% during pregnancy (10). In our study, 237 of 1051 pregnant women had 2nd trimester Hb values below 10.5 g/dl. In our study, we found an anemia prevalence of 22.5%. Different mechanisms explain why maternal anemia leads to poor pregnancy outcomes. In the first place, the decrease in the amount of oxygen to the fetus due to anemia may lead to IUGR. It may also be associated with severe anemia, malnutrition, and infections that may affect pregnancy outcomes (11). In a study in which Bondevik et al. examined 2856 pregnant women, they found that babies born to mothers with a Hct level of 25-27% had a lower birth weight than babies born to mothers with a Hct level of 34-36% (11). Dane et al. evaluated 307 patients and classified pregnant women as anemic and non-anemic. There was no difference in mean birth weight between these two groups, but they found more low-birth-weight fetuses in the anemic group (12). In the study of Alizadeh et al., in which they examined 312 adolescent, pregnant women, they found a significantly lower birth weight in the babies of women with Hb concentration <10gr/dl than those with >10gr/dl Hb concentration (13). Sweet et al. found the birth weight of babies of non-anemic mothers as 3374 g and the birth weight of babies of anemic mothers as 3287 g, and they could not find a significant difference between them (14). Numerous factors have been identified that lead to low birth weight. These; small or advanced maternal age, low pre-pregnancy weight, low weight gain during pregnancy, short interpregnancy period, smoking, nulliparity, and low education level (15-17). In our study, the birth rate of 2500 g and above was 95%, and no correlation was found between birth weight and the mother's 2nd trimester Hb, Hct, MCV, MCHC, RBC, and RDW parameters. We think that this result is due to the existence of many factors affecting the newborn's weight and the

hematological status of the mother being only one of them. When the 2008 data of the Turkey Demographic and Health Survey (TNSA) are analyzed, the incidence of low birth weight babies increases as the maternal parity increases. While the rate of low-birth-weight babies was 9.8% in the babies of mothers who gave their first birth, the rate of low-birth-weight babies was reported as 10.2% in the 2nd or 3rd birth, and 17.3% in the 4th or 5th birth. order (18). In our study, only hemogram parameters were examined. Different studies have been conducted showing the relationship between birth weight and maternal age. In a study carried out by Çağlar in 2006, no statistical relationship was found between the birth weight of the baby and the age of the mother (19). In our study, the relationship between maternal age and newborn birth weight was not investigated. Our study is based on hemogram parameters. Considering the maternal and fetal complications caused by iron deficiency anemia in various studies, due to the above-mentioned reasons, especially in developing countries, in line with the recommendations of WHO and our Ministry of Health, pregnant women are given daily 40-week intervals for a total of 9 months, starting from the second trimester and 3 months after delivery. It is recommended to give 60 mg iron supplement (17-19). Our study has limitations in terms of the fact that it is not a prospective study, the patients were not followed up before pregnancy, and the patient population. There is a need for prospective studies with larger participation and standardized anemia treatment on the subject.

CONCLUSION

As a result of our study, it was determined that the mother's 2nd trimester Hb, Hct, MCV, MCHC, RBC, and RDW values did not have any effect on the birth weight of the newborn.

Conflict of Interest: This article has been written for purely scientific purposes and the authors have no conflict of interest with this article. No person or organization financially supports the study. This article is derived from the first-line author's medical specialty thesis.

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