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Does maternal anemia affect the newborn?

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Summary

Aim: In this study, we aimed to evaluate the effect of maternal anemia on the newborn.

Material and Method: We determined hemoglobin (Hb), hematocrit (Hct) levels of 307 pregnant women who delivered in our clinic and Hb, Hct, bilirubin levels in the cord blood, mode of delivery and Apgar scores of their newborns. The pregnant women were evaluated in two groups according to their Hb levels with the ones with a Hb value above 11.1 mg/dl as the nonanemic group and a Hb value below 11mg/dl as the anemic group. We also created four groups with Hb levels ≥11.1 mg/dl, between 11-10.1 mg/dl, between 10-9.1mg/dl and ≤9 mg/dl.

Results: We We included 146 anemic and 161 nonanemic patients in the study. The rate of delivery of babies with low birth weight was significantly higher in the anemic group (11.6 % vs. 4.3 %, P=0.029). The rate of low birth weight was significantly higher in the patients with Hb level <10 mg/dl (62.5 % sensitivity, 74.7 % specificity). The cord blood Hb (17.49±2.4 g/dl vs. 18.1±2.4; P=0.026) and Hct level (53.3 ±7.4 % vs. 55.6±7.2 %; P=0.006) in the anemic group were significantly lower.

Conclusions: Anemia in pregnancy increases the risk of low birth weight and lowers the levels of Hb and Hct of the newborn. Anemia should be screened and treated before delivery. *(Turk Arch Ped 2013; 48: 195-199)*

Key words: Anemia, hemoglobin, low birth weight, newborn

Introduction

Presence of anemia during pregnancy and after pregnancy is a common problem which has significant effects on the mother and developing baby (1). It has been reported that low maternal hemoglobin level increases the risk of low birth weight, premature delivery and small for gestational age baby (2,3). Small for gestational age babies constitute a significant portion of neonatal morbidity and mortality. Although these babies constitute 6-7% of newborns, 2/3 of all neonatal deaths occur in this group (4,5). In many studies including pregnant women with iron deficiency anemia, iron supplement has been shown to improve birth weight and decrease the mortality rate (6,7).

The iron storage of the newborn baby may depend on the iron status of the mother. In many studies, it was found that iron deficiency during pregnancy affected fetal iron stores (8-10). It is recommended to start iron supplements before pregnancy, if possible or in the early pregnancy to prevent the effects of iron deficiency on the fetus and newborn (6).

In this study, we aimed to determine the problems related with the mode of delivery and the newborn as a result of anemia before delivery in pregnant women who delivered in our clinic.

Material and Method

307 subjects among the pregnant women who delivered in our clinic between June 2009 and October 2009 were included in the study. The data were collected by obtaining information related with the mother and newborn from delivery room and computer records. The study exclusion

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criteria were as follows: multiple pregnancy, preeclampsia, premature seperation of placenta and placenta previa with hemorrhage and fetal anomaly. The maternal age, gravida, parity and mode of delivery, birth weight of newborn and Apgar scores at the first and fifth minutes were determined from the records of the delivery room for each mother. In routine practice of our clinic, a 2 cc blood sample is obtained from pregnant women for hemogram when they present for delivery and a 2 cc blood sample is obtained from the umbilical cord after delivery. The samples are placed in 2 cc EDTA tubes and are processed in 2 hours in our emergency laboratory. Hemoglobin (Hb) and hematocrite (Hct) values obtained as a result of hemogram are recorded seperately for the mother and baby. At the 6-8th hour postnatally, 1 cc blood is obtained from the newborn and placed in a dry tube containing gel. Total bilirubin value is determined using Abbot's 16 000 colorometric method. The results are recorded in the hospital computer program.

Based on the hemoglobin levels, the subjects were divided into two groups as the ones with a Hb value of ≤11 g/dL (146 anemic subjects) and a Hb value of ≥11,1g/dL (161 nonanemic subjects). A birth weight of ≤ 2 500 g was considered low for gestational age (LGA) and an Apgar score of <7 at the fifth minute was considered low Apgar score.

Med Calc program was used in the statistical analysis of the study. The results were expressed as mean±standard deviation. Independent T test was used for comparison of the groups and chi-square and Fisher's exact test was used for evaluation of non-numerical data. Prediction of presence of LGA with maternal Hb was evaluated using Roc curve. A p value of <0,05 was considered statistically significant in all assessments.

Results

307 subjects 146 of whom were anemic and 161 of whom were nonanemic were included in the study. The mean maternal Hb value was 11.07±1.5 g/dL and Hct value was %33,9±4,5.

No significant difference was found between he anemic and nonanemic groups in terms of maternal age, gravida, parity and delivery by cesarean section (Table1).

While no difference was found between the groups in terms of mean birth weight, the rate of LGA subjects was significantly higher in the anemic group (11.6% vs 4.3%; P=0,02). There was no difference between the groups in terms of mean Apgar scores at the first and fifth minutes. The number of the subjects with a low Apgar score at the fifth minute did not show significant difference. The results are shown in Table 2.

It was found that the mean Hb (17.49±2.4 g/dL vs 18.1±2.4 g/dL; P=0.026) and Hct values (53.3% ±7.4 vs 55.6%±7.2; p=0.006) of the newborns in the anemic group were significantly low. The mean bilirubin values of the newborns did not show significant difference between the two groups. The results are shown in Table 3.

The anemic subjects were divided into three groups according to Hb values: the first group had a Hb value of 11-10.1 g/dL (n: 59), the second group had a Hb value of 10-9.1 g/dL (n: 60) and the third group had a Hb value of ≤9 g/dL (n: 27). The rate of cesarean section and the mean birth weight in these three anemic subgroups with different Hb values were not different from the nonanemic group. The frequency of LGA subjects was significantly higher in the two groups with a Hb value of ≤10 g/dL compared to the nonanemic group. No significant difference was found between the groups in terms of the rate of the subjects with a low Apgar score at the fifth minute. The results are shown in Table 4.

Maternal Hb values and presence of LGA in the newborn were evaluated using Roc curve (Picture 1). It was found that the frequency of LGA increased significantly when the Hb value was ≤10 g/dL (62.5% sensitivity, 74.7% specificity).

It was found that the mean cord blood Hb (17.3±3 g/dL vs 18.1±2.4 g/dL; P<0.05) and Hct (52.8%±6.7 vs 55.6%±7.2) values were significantly lower in the group with a maternal Hb value of 11-10,1 g/dL compared to the nonanemic group. The mean bilirubin value of the newborn did not show significant difference. The results are shown in Table 5.

Table 1. Comparison of anemic pregnant women with nonanemic pregnant women in terms of maternal age, gravida, parity and mode of delivery

	Hb≤11 g/dL	Hb≥11.1 g/dL (n: 161)	p value
Maternal age (mean ±SD)	(n:146)	Hb≥11.1 g/dL	0.87
Gravida (mean±SD)	2.74±1.74	2.52±1.62	0.25
Parity (mean ± SD)	2.39±1.37	2.23±1.24	0.28
Delivery by cesarean section (%)	31.5	22.9	0.11

Gravida: the number of pregnancies
Parity: the number of viable births

Discussion

Anemia is a real public health problem especially in developing countries. The rate of anemia in women of child-bearing age in our country has been reported to be 32.8-40% (11,12). In studies performed in pregnant women in different countries, the frequency of anemia ranges between 32.6% and 80% (13,14,15). In pregnant women included in our study, the rate of anemia was found to be 44.8%.

Kilbride et al. (16) found the maternal Hb concentration to be 12.2±0.9 g/dL and 9.9±0.7 g/dl in the normal and anemic groups, respectively. Okuyamo et al. (17) found these values to be 11.7±0.8 g/dL and 9.8±1.1 g/dL. In our study, the mean Hb value was found to be 11.07±1.5 g/dL and the mean Hct value was found to be 33.9%±4.5 in pregnant women. The mean Hb value was found to be 9.7±0.9 g/dL in the anemic group and 12.3±0.8 g/dL in the nonanemic group.

The difference between the mean birth weight values in babies of anemic mothers (3 251±491 g) and nonanemic mothers (3 251±491 g) was not significant. However, the rate of LGA was 11,6% in the anemic group and 4,3% in the nonanemic group. The difference was statisticslly significant (P=0.029).

Table 2. Comparison of anemic pregnant women with nonanemic pregnant women in terms of results of the newborn

	Hb≤11 g/dL	Hb≥11.1 g/dL (n:161)	p değeri
Birth weight (g) (mean±SD)	3 243±621	3 251±491	0.9
Low birth weight (n)	17 (%11.6)	7 (%4,3)	0.029
Apgar (1st min) (mean±SD)	8.5±1.15	8.3±1.3	0.15
Apgar (5th min) (mean±SD)	9.7±0.72	9.6±0.69	0.21
Apgar <7 (5th min) (n)	3	3	1

Table 3. Comparison of mean cord blood Hb and Hct values and neonatal bilirubin values

	Hb≤11 g/dL	Hb≥11.1 g/dL (n:161)	p değeri
Cord blood Hb (g/dL) (mean±SD)	17.49±2.4	18.1±2.4	0.026
Cord blood Hct (%) (mean±SD)	53.3±7.4	55.6±7.2	0.006
Neonatal bilirubin (mg/dL) (mean±SD)	4.9±2.6	5.1±2.5	0.49

Table 4. Comparison of the results of the newborns between the groups with different Hb values and the nonanemic group

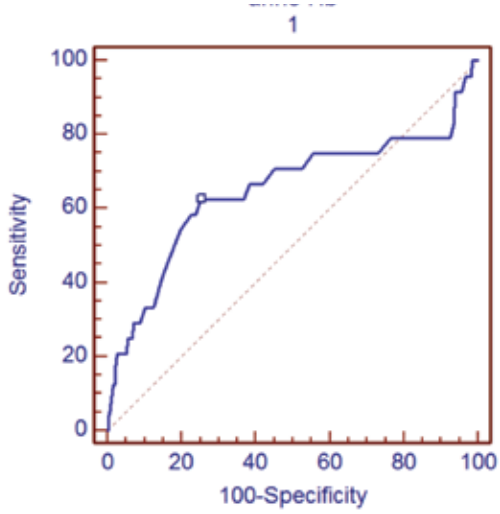
	Hb≥11.1 g/dL (n: 161)	Hb=11-10.1 g/dL (n: 59)	Hb=10-9.1 g/dL (n: 60)	Hb≤9 g/dL (n: 27)
Cesarean section	37 (%22.9)	18 (%30.5)	19 (%31.6)	9 (%33.3)
Birth weight (g)	3 243±621	3 301±455	3 298±617	2 990±863
Low birth weight	%4.3	%3.4	%13.3*	%25.9*
Apgar (5th min)<7	%1.8	%1.7	%3.7	0

p<0.05

Table 5. Comparison of cord blood Hb and Hct values and neonatal bilirubin values between the groups with different Hb values and the nonanemic group

	Hb≥11.1 g/dL (n: 161)	Hb=11-10.1 g/dL (n:59)	Hb=10-9.1 g/dL (n:60)	Hb≤9 g/dL (n:27)
Cord blood Hb (g/dL)	18.1±2.4	17.3±2.2*	17.5±1.8	17.5±3.6
Cord blood Hct (%)	55.6±7.2	52.8±6.7*	53.1±5.6	53.2±11
Neonatal bilirubin (mg/dL)	5.1±2.5	4.9±2	5.1±3.1	4.3±2.7

p<0.05



Picture 1. Roc curve correlating maternal Hb values with presence of low birth weight (AUC 0.65; P= 0.0045)

The rates of LGA were observed to be 4.3%, 3.4%, 13.3% and 25.9% in the groups with a maternal Hb level of ≥11.1 g/dL, 11-10.1 g/dL, 10-9.1 g/dL and Hb ≤ 9 g/dL, respectively.

The increase in the rates of LGA with the decrease in maternal Hb values was significant especially in the two groups with a Hb value below 10 g/dL. Compatible with our findings, Malhotra et al. (13) found that severe anemia was correlated with delivery of LGA baby in the study they performed by dividing anemic mothers into three groups (mild; Hb: 9-10.9 g/dL, moderate; Hb: 7-8.9 g/dL, severe; Hb< 7 g/dL). Kozuki et al. (18) reported that moderate or severe anemia in the mother (<90g/L- or <80g/L) increased the risk of delivery of LGA baby by 53% as a result of a metaanalysis they performed. However, as the same authors stated, the fact that different threshold values were used in the studies examining the effects of maternal anemia on the fetus and newborn makes it difficult to make a joint evaluation.

In case of high maternal Hb level (>12 g/dL or >13 g/dL), birth weight of the newborn has been shown to decrease and the risk of preeclampsia has been shown to increase (19,20). Interestingly, presence of high numbers of hypochromic red cells has been reported to cause to an increase in birth weight by prolonging the pregnancy (21). In addition, mild maternal anemia (Hb: 9-10.9 g/dL) was found to be related with LGA or intrauterine growth retardation, stillbirth or neonatal mortality, induction of delivery or cesarean section with the lowest rate (13). Similarly, LGA was found with the lowest rate (3.4%) in the group with mild maternal anemia (Hb: 10.1-11 g/dL) in our study. Iron or iron+folic acid supplements in the prenatal period prevent iron deficiency and anemia. However, appropriate doses should be determined to prevent hemoconcentration which is a side effect the outcomes of which can not be predicted clearly (22).

In a study performed by El-Farrash et al. (10), Hb, red cell indexes and iron levels were directly proportional with maternal Hb, iron and ferritin levels in babies of the mothers with moderate and severe anemia compared to babies of mothers with normal Hb values. In our group, the mean Hb value was found to be 17,8±2,4 g/dL and the mean Hct value was found to be 54,5%±7, 3 in the chord blood. When Hb values in the cord blood samples of normal and anemic pregnant women were compared, the results in the groups with Hb values of ≥11,1 g/dL, 11-10.1 g/dL, 10-9.1 g/dL and Hb≤ 9 g/dL were found to be 18.1±2.4, 17.3±2.2, 17.5±1.8 and 17,5±3,6 g/dL, respectively. Hematocrit values were found to be 55,6% ±7.2, 52,8±6.7, 53.1%±5.6 and 53.2%±11, respectively. Cord blood Hb and Hct values were significantly lower especially in the group with a maternal Hb value of 10.1-11 g/dL compared to the nonanemic group.

In a study performed in our country, iron deficiency was found in 50% of anemic pregnant women, vitamin B12 deficiency was found in 34.5% and folat deficiency was found in 34,5%. The majority of the anemias (56.5%) are normochromic-normocytic showing mixed anemia (23). The factors for prediction of anemia include low income status, being in the third trimester and having four or more living children. In addition, β-thalassemia carrier status is observed commonly in our country, though it shows regional variance (24). The limitations of our study included the facts that maternal vitamin levels could not be determined, because the study was a retrospective study, the socioeconomical states of the subjects were not recorded and anemic subjects were not evaluated in terms of β-thalassemia carrier status.

In this study, we found that the rate of delivery of a LGA baby was increased and cord blood Hb and Hct values were significantly low in anemic pregnant women. It was also reported that the risk of anemia (OR: 3,68) in the 4-6th months in LGA babies of these mothers was higher compared to the babies with a normal birth weight (OR: 1.81) (25). It was shown that anemic mothers could not achieve adequate iron levels in the first six months after delivery and their babies were anemic (Hb <11 g/dL) in the first year with a rate of 81% (26). Anemic mothers would probably be also anemic in the lactation period. Considering that iron deficiency during infancy affects neurological development negatively, measures should be taken in terms of anemia in these newborns also during infancy (27,28). Anemia should be screened and treated during pregnancy because of its possible negative outcomes.

Conflict of interest: None declared

Kaynaklar

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