**Obstetrics;** *Maternal-Fetal Medicine and Perinatology*

# Sixth-Month Perinatal Outcomes of Anemic Pregnancies

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**OBJECTIVE:** In this study, we retrospectively compare the outcomes of anemia in 3rd trimester pregnant women who applied to our clinic, in terms of maternal factors and its fetal effects, in 0 and 6th months.

**STUDY DESIGN:** 139 cases admitted to our clinic during December 2010 - May 2012 due to pregnancy in their 3rd trimester and were diagnosed with anemia and whose records were available were included in the study. The pregnant women were divided into two groups according to their hemoglobin (Hb) levels; hemoglobin levels below 11 g/dL formed the anemia group (AG Hb<11 g/dL) and those above were the non-anemia group (NAG Hb ›11 g/dL). Maternal age, occupation, number of live births, Hb and hematocrit (Hct) levels, mode of delivery, labor time, and head circumference, weight and height of infants at birth and 6th month were compared.

**RESULTS:** Anemia was determined in 69 pregnant women (49.6%). No significant difference among the groups in terms of age and parity was detected. Anemia was found to be higher in housewife mothers (p=0.0001). No difference in terms of birth weight and height was detected among the babies of mothers of the two groups, but the head circumference of the babies from anemic mothers were determined to be significantly lower (p= 0.0001). In terms of the 6th month outcomes; weight, height and head circumference of babies from anemic mothers were found to be significantly lower (p=0.0001). Risk analysis has determined a negative correlation between anemia and fetal development at 6th month.

**CONCLUSION:** There is a negative correlation between anemia and preterm delivery week, fetal development and small head circumference at birth. Therefore maternal candidates with high rates of anemia such as housewives should be closely monitored during pregnancy and in the postpartum period for fetal development.

**Keywords:** Anemia, Pregnancy, Perinatal outcome

## Introduction

The prevalence of anemia in the world is around 25-50%. About half of the anemic women over the world are pregnant women and most common anemia in pregnant women is iron deficiency anemia.[1,2] Iron deficiency prevalence in developed countries is stated to be about 25.01%.[3] Iron deficiency anemia in pregnant women is more common in low-income countries, and reaches a rate of 50%. In these regions iron deficiency anemia mainly appears to be a nutritional problem.[4] A high parity rate with frequent pregnancies and short intervals is also a factor in developing countries.[5] Fetus hypoxia and trophoblastic invasive disorder due to anemia impairs placental development. Abnormal placental development impairs fetal development and can cause serious problems in new born and child. Accordingly, perinatal mortality, perinatal morbidity, preterm birth and low birth weight rates increase in developing countries.[7,8,9]

Anemic mothers' infants have higher risk of developing iron deficiency.[5] Some studies show a relation between maternal iron deficiency anemia and infant's iron stores and this relation affects infant's cerebral development adversely.[3] Poor physical and mental development, deterioration of cognitive functions and diminished learning capacity can emerge at later ages in these infants.[10-11] Maternal mortality and morbidity in-

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creases in anemic woman due to loss of excessive blood during delivery. According to some studies, serum hemoglobin and ferritin levels decrease in last trimester and there is positive correlation between birth weight and hemoglobin levels. As a result; to achieve a normal pregnancy and better birth outcomes, maintaining normal hemoglobin levels during pregnancy is essential.[4]

This study aims to examine the prevalence of anemia in pregnant women, anemia's relation with factors such as mother's age, parity, occupation and possible effects of anemia on infant development.

## Material and Method

139 cases out of 285 admitted to our obstetrics & gynecology polyclinic during December 2010-May 2012 due to pregnancy in their 3rd trimester were included in the study. The remaining cases were excluded due to incomplete records. The data on the patients were obtained from computer records and the patients themselves. The pregnant women were divided into two groups according to their hemoglobin (Hb) levels; hemoglobin levels below 11 g/dL formed the anemia group (AG Hb<11 g/dL) and those above were the non-anemia group (NAG Hb›11 g/dL). Maternal age, occupation, number of live births, Hb and Hct levels, mode of delivery, labor time, and head circumferences, weight and height of infants at birth and 6th month were compared. Informed consent was obtained from all participants.

Blood sample collection: Blood samples were obtained in the morning following an overnight fasting. Ten milliliters of blood were drawn from the antecubital vein of each subject by applying minimal tourniquet force. Approximately 2 ml of blood, which was used for the complete blood count, was drawn into a vacutainer tube containing 0.04 ml of 7.5% K3

salt of ethylene-diamine-tetra acetic acid (EDTA). The blood samples were collected only for the purpose of this study and analyzed the same day.

Biochemical analysis: A complete blood count was performed on the same day by a CELL-DYN 3700 SL analyzer (Abbott Diagnostics, Chicago, USA).

### Statistical analysis

All analyses were conducted using SPSS 15.00 (SPSS for Windows 15.00, Chicago, IL, USA). Continuous variables were expressed as mean ± standard deviation (S.D.). Parameter comparisons were performed using the Student's t-test. Pearson correlation tests were used for correlation analyses. For all statistical analysis, $p < 0.05$ was considered as significant.

## Results

Anemia was determined at 69 out of 139 (49.6%) patients who contributed to study. Average age was 26.81±6.19 years in AG and 25.7±3.58 in NAG. In AG; hemoglobin, MCV, HCT levels were 9.97±0.73, 72.28±5.79, 31±1.59, and in NAG; 12.46 ±0.95, 79.30±4.77, 36.65±2.84 respectively, and statistically significant differences were determined between the two groups for all three parameters (p=0.0001, p=0.0001, p=0.0001). There was no significant statistical difference between the groups in terms of parity (p=0.342). When compared by occupation, anemia in housewives was found to be significantly higher (p=0.0001). Pregnancy duration in anemic mothers was 38.69±1.52 weeks, 39.17±0.94 in NAG and anemia had a no significant effect on delivery week (p=0.30). Considering the mode of delivery; it was found out that anemia had no effect vaginal delivery or caesarean section (p=0.354). Data on the information given above is available at table 1. Results of the data comparisons for anemia's effect on infants are summarized at table 2.

*Table 1: Clinical characteristics of anemic and non-anemic patients*
*Data are expressed as means ± standard deviation (SD), or numbers and percentages*

| Characteristics | | Anemia (n =69) | No-anemia (n = 70) | P value |
|---|---|---|---|---|
| Maternal Age  (mean±SD) | | 26.81±6.19 | 25.7±3.58 | p=0.312 |
| Hb  (g/dL) | | 9.97±0.73 | 12.46±0.95 | p=0.0001 |
| MCV | | 72.28±5.79 | 79.30±4.77 | p=0.0001 |
| Hct | | 31±1.59 | 36.65±2.84 | p=0.0001 |
| Parity | 1 | 34 (49.3%) | 37 (52.9%) | p=0.342 |
| | 2-4 | 33 (48.0%) | 33 (47.1%) | |
| | >4 | 2 (2.9%) | 0 | |
| Mode of Delivery | C/S | 37 (53.6%) | 43 (61.4%) | p=0.354 |
| | Vaginal | 32 (46.4%) | 27 (38.6%) | |
| Mother's Occupation | Housewife | 51 (73.0%) | 35 (7.1%) | p=0.0001 |
| | Employed | 18 (27.0%) | 65 (92.9%) | |
| Gestational Age | | 38.69± 1.52 | 39.17±0.94 | p=0.3 |

*Table 2: Comparison of the data for infants from anemic and non-anemic mothers*

| | | Anemic Mother | Non-anemic Mother | P value |
|---|---|---|---|---|
| Gender | Male | 34 (49.3%) | 32   (45.7%) | p=0.612 |
| | Female | 35 (50.7%) | 38   (54.3%) | |
| Birth | Weight | 3271.74±548.56 | 3375.14± 367.36 | p=0.195 |
| | Height | 49.77±2.47 | 50.07±0.25 | p=0.315 |
| | Head circumference | 34.64±0.69 | 35.11±0.36 | p=0.0001 |
| 6th  month | Weight | 7495.80±708.13 | 8130±312.41 | p=0.0001 |
| | Height | 66.41±2.05 | 68.76±1.30 | p=0.0001 |
| | Head circumference | 43.39±0.92 | 43.99±0.79 | p=0.0001 |

With reference to these results; in AG newborns weight, height, head circumference averages are 3271.74±548.56, 49.77±2.47, 34.64±0.69, and in NAG newborns 3375.14± 367.36, 50.07±0.25, 35.11±0.36 respectively. Statistically there is no difference between the groups for weight (p=0.195) and height (p=0.315). Although there is a correlation between anemia and birth weight, there is no significant statistical difference (p=0.193, r=0.186). A significant statistical difference was seen for head circumference values (p=0.0001).

Regarding the effect of anemia on neonatal development; infants' weight at the end of 6 months was 7495.80±708.13 for AG, and 8130±312.41 for NAG groups, displaying a statistically significant difference (p=0.0001). A negative correlation was established between anemia and 6th month weight values (p=0.977, r=-0.505). The height values were 66.41±2.05 for AG, and 68.76±1.30 for NAG; displaying a significance (p=0.0001). A negative correlation was determined between anemia and the 6th month height values (p=0.0001, r=-0.567). Head circumference values were 43.39±0.92 in AG, and 43.99±0.79 in NAG and difference was significant (p=0.0001). Negative correlation was determined between anemia and the 6th month head circumference (p=0.0001, r=-0.331).

## Discussion

According to studies; maternal iron deficiency anemia is associated with socio-economic status.[5,7,12] In this study, we have determined that mothers with anemia are often housewives (73%), in contrast among non anemic mothers only 7.1% were housewives. This leads us to believe that working improves the socio-economic status of the women favorably affects their life standards. In this study, in terms of etiology of anemia, the comparison of maternal age and number of live births between the groups displayed no statistically significant difference. Similar results were reported by Adam et al.[8] In another study; anemia prevalence was higher in mothers having 2 or less children.[13]

When we look into the effect of anemia on delivery week; presence of anemia has a negative effect on low gestational age and there is a statistically significant difference between the groups. There are different views in literature on this issue. For example; while studies of Xiong et al.[15] Zhang et al.[9] and Hamalainen et al. do not report a correlation among anemia, preterm delivery and birth weight, Levy et al.[14] on the other hand express that preterm delivery ratio is increased in anemic pregnancies.

Results of this study show that anemia has no effect on infant's birth weight and height, but infants' from anemic mothers had smaller head circumferences. There are different studies in literature on the effects of anemia on birth weight. In some studies, it has been stated that anemic pregnant women's infants' birth weights were insufficient and was related to intrauterine growth retardation. Contrary to this; Xiong et al.[15] stated that anemia had no adverse effect on perinatal results, such as infant's birth weight. Shoberia et al.[4] and Ren et al.[17] did not find statistically significant difference between hemoglobin level at third trimester and birth weight. The different results in literature may be due to Hg level variations in different weeks of pregnancy. In a normal pregnancy; plasma volume and red cell mass increases. In 2nd trimester; plasma volume increase is relatively faster than the red cell mass elevation and this causes a dilutional state. Hemoglobin level measurements are low; starting from 1st trimester, in 2nd trimester and the early stages of the 3rd trimester.[18] However; in the 3rd trimester, the plasma volume reaches a plateau, while the red cell mass keeps increasing, which ends the diluted state and the Hg level values are higher.[15] If anemia is diagnosed independently from pregnancy week, it may cause different pregnancy outcomes to be associated to Hg levels and hence lead to different results.

In our study; the 6th month height, weight and head circumference of infants from anemic mothers were compared to the same 6th month parameters of infants from non-anemic mothers, and we observed that values for infants from anemic

mothers were lower and the difference was statistically significant. Anemia development is more frequent in infants of anemic mothers. These findings show that; since the iron deficiency anemia is mostly related to nutrition status, and if the nutritional habits of the mother do not change, it will continue through the lactating period and effect the growth and development of the infant. Iron deposits of anemic mothers must be assessed after delivery and supplemented with iron, if necessary, and the mothers should be advised on nutrition,[18,19,20,21]

We believe that the growth and development of infants from anemic mothers should be monitored regularly. As part of the iron therapy program, implemented by the Ministry of Health in Turkey, involving iron supplement beginning in the 4th month, and a blood hemoglobin level control program between 9th and 12th months, the blood hemoglobin level control month for infants from anemic mothers should be scheduled to an earlier date.

As a conclusion; maternal iron deficiency is a common problem in all developing countries, and there are different views about its effects on perinatal outcomes. However; there is a consensus in literature that it has long-term effects on the newborns and has possible implications of neurodevelopmental and cognitive problems in the following years. At this point; considering the short and long term effects of maternal iron deficiency anemia on the infant, it is essential that infants born from anemic mothers are treated and their mental and physical development should be monitored closely. Basic aim should be to prevent anemia during the reproductive period, if possible before a pregnancy, which would cost less and be easier.

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## Anemik Gebelerde 6 Aylık Perinatal Sonuçlar

**AMAÇ:** Kliniğimize başvuran üçüncü trimester gebelerdeki aneminin, anneye ait faktörler ve bebek üzerindeki etkilerini 0 ve 6. ay sonuçlarını retrospektif olarak karşılaştırmaktır.

**GEREÇ VE YÖNTEM:** Aralık 2010 - Mayıs 2012 tarihleri arasında gebelik nedeniyle kliniğimize başvuran ve 3. trimesterde olan, anemi tanısı konan ve bilgilerine ulaşılan 139 olgu çalışmaya dahil edildi. Gebeler Hemoglobin düzeyine göre <11 (Anemi group - AG) ve 11> olanlar (non- anemi group- NAG) olarak iki gruba ayrıldı. Annenin yaşı, mesleği, yaşayan çocuk sayıları, hemoglobin ve hematokrit değerleri, doğum şekli, doğum zamanı, bebeğin doğum ve 6. aydaki kilo, boy ve baş çevreleri karşılaştırıldı.

**BULGULAR:** 69 gebede (%49,6) anemi saptandı. Gruplar arasında yaş, parite açısından anlamlı fark bulunmadı (p>0,05). Ev hanımı annelerde anemi daha yüksek bulundu (p<0,05). Her iki gruptaki annelerin bebeklerinde doğum kilo ve boyları arasında fark tespit edilmedi ancak anemik annelerin bebeklerinin baş çevresi anlamlı olarak daha düşük tespit edildi (p=0,0001). 6. ay sonuçları açısından kilo, boy ve baş çevreleri anemik olan annelerin bebeklerinde anlamlı daha düşük bulundu (p=0,0001). Risk analizinde 6. aydaki bebek gelişimi ile anemi arasında negatif korelasyon saptandı.

**SONUÇ:** Anemi ile erken doğum haftası, doğumda düşük baş çevresi ve bebeğin gelişimi ile negatif korelasyon bulunmuştur. Bu nedenle aneminin yüksek oranda görüldüğü ev hanımı anne adayları hem gebelik süresince hem de doğum sonrası bebeğin gelişimi açısından yakından takip edilmelidir.

**Anahtar Kelimeler:** Anemi, Gebelik, Perinatal sonuçlar

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