

# Maternal Anemia and Perinatal Outcome

Emre Karaşahin, Seyit Temel Ceyhan, Ümit Göktolga, Uğur Keskin, İskender Başer

Gülhane Military Medical Academy, Department of Obstetrics and Gynecology, Ankara

## Abstract

**Objective:** Maternal anemia during pregnancy is reported to be associated with fetal complications such as intrauterine growth restriction, preterm birth, low birth weight, and maternal complications such as preeclampsia and eclampsia. The purpose of our study was to investigate perinatal complications associated with maternal anemia.

**Methods:** The mean Hgb concentration in G1 was 7.63 ( $\pm$  0.34) gr/dl, in G2 it was 11.82 ( $\pm$  1.23). Preterm birth rate in G1 was 9.9% (n:16) while it was 3.2% (n:5) in G2. Preeclampsia was found as 8.6% (n:14) in G1 and 3.2% (n:5) in G2. 14 (8.6%) intrauterine growth restriction cases were present in G1, while 7 (%4.3) cases were present in G2. While G1 had a single case of placental ablation, G2 had no cases of ablation. No cases of eclampsia was reported in neither group. Neonatal Care Unit admission was 13.6% n:22 in G1 and 8.2% (n:13) in G2. Preeclampsia and preterm labor rates were significantly higher in anemic group statistically.

**Results:** 162 pregnant women with 2. trimester hemoglobin (Hgb) levels equal or under 8 gr/dL (Group 1:G1) and 160 pregnant women with 2. trimester Hgb levels equal or over 10 gr/dL (Group 2:G2) were included in our study. Data were collected retrospectively from the patient files. Preterm birth, preeclampsia, eclampsia, intrauterine growth restriction and admission to neonatal intensive care unit records were investigated.

**Conclusion:** Preconceptional evaluation along with a planned pregnancy is important in decreasing the frequency of maternal anemia. Larger study groups are necessary to evaluate the association of maternal anemia and perinatal outcomes. Diagnosis and treatment of maternal anemia is important to minimize the perinatal complications.

**Keywords:** Pregnancy, anemia, preeclampsia, eclampsia, intrauterine growth restriction.

## Maternal Anemi ve Perinatal Sonuçlar

**Amaç:** Gebelikte maternal aneminin intrauterin gelişme geriliğinin, preterm doğum, düşük doğum ağırlığı gibi fetal; preeklampsi, eklampsi gibi maternal komplikasyonlar ile ilişkili olabileceği bildirilmektedir. Çalışmamızın amacı maternal anemi saptanan gebelerdeki perinatal komplikasyon sıklığını araştırmaktır.

**Yöntem:** Çalışmaya 2. trimesterde hemoglobin düzeyi 8 gr/dl altında olan 162 gebe (Grup 1) ve hemoglobin düzeyi 10 gr/dl'nin üzerinde 160 gebe (Grup 2) dahil edildi. Veriler retrospektif olarak hasta takip kartları ve dosyalardan elde edildi. Preterm doğum, preeklampsi, eklampsi, intrauterin gelişme geriliği ve yeni doğan ünitesine kabul oranları incelendi.

**Bulgular:** Grup 1'de ortalama Hg konsantrasyonu 7.63 ( $\pm$  0.34) gr/dl, Grup 2'de 11.82 ( $\pm$  1.23) olarak saptandı. Preterm doğum oranı Grup 1'de %9.9 (n:16) iken Grup 2'de %3.2 (n:5) idi. Eklampsi oranı Grup 1'de % 8.6 (n:14) iken, Grup 2'de % 3.2 (n:5) idi. Intrauterin gelişme geriliği Grup 1'de 14 iken (%8.6), Grup 2'de ise 7 (%4.3) idi. Grup 1'de sadece 1 olguda plasenta dekolmanı (ablatio) ortaya çıkarken, Grup 2'de plasenta dekolmanı izlenmedi. Yine her iki grupta eklampsi gözlenmedi. Yeni doğan ünitesinde takip oranı ise Grup 1'de %13.6 iken (n:22), Grup 2'de ise %8.2 (n:13) idi. Anemik olan grupta preeklampsi ve preterm eylem gelişimi istatistiksel olarak anlamlı derecede farklı idi.

**Sonuç:** Prekonsepsiyonel değerlendirme ile birlikte uygun bir gebelik planlanması maternal aneminin sıklığının azaltılmasında önemlidir. Maternal anemi düzeyi ve perinatal sonuçların ilişkisini incelemek için daha büyük gruplara gereksinim vardır. Antenatal takipler sırasında maternal aneminin tespiti ve tedavisi, perinatal komplikasyonların en aza indirilmesi için önemlidir.

**Anahtar Sözcükler:** Gebelik, anemi, preeklampsi, eklampsi, intrauterin gelişme geriliği.

## Introduction

In pregnancy, and especially in developing countries, one of the most encountered problems is the maternal anemia. The prevalence of anemia during pregnancy period has been reported between 35 – 100% in various studies.<sup>1</sup> There are various opinions on the maternal and perinatal effects of anemia. World Health Organization (WHO) stated that the 20% of the maternal mortalities have been influenced by anemia.<sup>2</sup> When the maternal changes during the pregnancy have been observed, maternal cardiac output is seen to increase by 50% to provide the necessary placental blood flow to support fetal development. For this, plasma volume needs to be increased. This increase in plasma volume arises as the dilutional anemia of the pregnancy.<sup>3,4</sup> This anemia especially arises during the early pregnancy and continues until term. The association of maternal anemia during pregnancy with fetal intrauterine growth restriction and low birth weight, and maternal preeclampsia and eclampsia has been proposed.<sup>5,7</sup> Various studies showed no association with bad perinatal outcome.<sup>8</sup> The purpose of our study is to evaluate the effects of anemia on the perinatal complications on our population.

## Methods

This study included 162 pregnant women with 2 nd trimester Hgb levels  $\leq$  8 gr/dL (G1) and 160 women with 2nd trimester Hgb levels  $\geq$  10 gr/dL (G2) who have followed in the antenatal care unit of our tertiary center, Gulhane Military Medical Academy, between January 2003 and December 2006. Data have been acquired retrospectively from the patient files. Multiple pregnancies and patients who had pregestational systemic diseases (hypertension, diabetes mellitus, renal disease etc.) have been excluded from the study group. In the center where this study was conducted, every pregnant women is started on oral and/or oral iron

supplementation at the 2nd trimester according to the routine antenatal follow up protocols.

In this study we evaluated the preterm labor, preeclampsia, eclampsia, intrauterine growth restriction and neonatal care unit admission rates of the anemic and non anemic mothers. SPSS 13.0 for Windows was used for the statistical analysis. Defining statistics were mean  $\pm$  standart deviation. For comparing the 2 groups' preterm labor, preeclampsia, eclampsia and neonatal intensive care unit admission rates Chi square test was used. A p value under 0.05 was considered significant.

## Results

The demographics of the two groups are shown at table 1. Mean Hgb concentrations of G1 and G2 were 7.63 ( $\pm$  0.34) gr/dL, and 11.82 ( $\pm$  1.23) gr/dL. G1 had a normal delivery rate of 69.8% (n:113), and cesarean rate was 30.2% (n:49). Normal delivery rate of G2 was 72.5% (n:116), and cesarean rate was 27.5% (n:44). Preterm delivery rates of G1 and G2 were 9.9% (n:16) and 3.2% (n:5) respectively, (p:0.02). Preeclampsia rates of G1 and G2 were 8.6% (n:14) and 3.2% (n:5) respectively (p:0.05). During antenatal follow up, G1 and G2 had 14 (8.6%) and 7 (4.3%) intrauterine growth restriction cases respectively, (p: 0.17). 18 (11%) and 17 (10.6%) cases in G1 and G2 respectively were found to have meconium in their amniotic fluid, (p:0.51). G1 had 1 case of placental ablation while G2 had no placental ablation cases. Neither of the groups had eclampsia. Neonatal intensive care unit admissions for G1 and G2 were 13.6% (n:22) and % 8.2 (n:13) respectively (p: 0.15) (Table 2).

## Discussion

We evaluated the maternal adaptation to pregnancy and perinatal outcomes of pregnant women who had anemia in the 2nd trimester of pregnancy. Our results show that preeclampsia

**Table 1.** Demographic features of the patients groups which anemic and non- anemic during second trimester.

	Group 1 (Anemic) n: 162		Group 2 (Non- anemic) n: 160		p
	Mean	Standart deviation	Mean	Standart deviation	
Age (year)	28.3	4.1	27.6	3.8	AD*
BMI	23.6	2.6	23.2	2.4	AD*
Hg concentration (g/dl)	7.63	0.34	11.82	1.23	<0.05
	n	%	n	%	p
Smoking	32	19.8	27	16.8	AD*
Delivery					
Abdominal	49	30.2	44	27.5	AD*
Vajinal	113	69.8	116	72.5	AD*

\*NS: Non- Significant. (p< 0,05 was accepted as statistically significant)

**Table 2.** Perinatal outcomes of the patients groups which anemic and non- anemic during second trimester.

	Group 1 n: 162		Group 2 n: 160		p
	n	%	n	%	
Preterm Birth	16	9.9	5	3.2	0.02
Preeclampsia	14	8.6	5	3.2	0.05
IUGR	14	8.6	7	4.3	0.17
Meconium in amniotic fluid	18	11.1	17	10.6	0.51
Follow Up in Neonatal Unit	22	13.6	13	8.2	0.15

and preterm birth rates are higher in the anemic group than the normal hemoglobin group. Although intrauterine growth restriction, neonatal care unit admission and meconium stained amniotic fluid rates were higher in the anemic group than the normal group, there were no statistical significance.

Lone FW et al studied 626 pregnant women and found that preterm birth risk was 4 times, low birth weight risk was 1.9 times, low APGAR score was 1.8 times and intrauterine fetal death was 3.7 times more common in anemic pregnant women compared to non anemics.<sup>9</sup>

Levy A et al. in their retrospective study, evaluated the preterm birth and birth weights of the anemic pregnant women and determined the maternal anemia as an independent risk factor

for preterm birth and low birth weight, no association was found with bad perinatal outcome in their study.<sup>8</sup> Bondevik GT et al. in their case control study on 1400 pregnant women, used the first antenatal visit hematocrit levels as parameter, and concluded that low birth weight and preterm birth rates were significantly higher when the maternal hematocrit was under 24%.<sup>10</sup>

Malhotra M et al grouped 447 pregnant women into 4 groups according to their anemia levels, compared them for maternal and perinatal outcome and postpartum complications. They reported that severe anemia increased the risk for low birth weight, and mild anemia had the best maternal and perinatal outcome.<sup>11</sup> Murphy JF et al indicated to the association between higher hemoglobin levels, preterm birth and low birth weight.<sup>12</sup> Some studies

reported increased hematocrit levels associated with fetal growth restriction and increased preterm birth rates.<sup>13-14</sup>

Patra S et al reported the maternal and perinatal outcomes of 130 severely anemic pregnant women who had 5 gr/dl or lower hemoglobin. The hemoglobin levels were acquired at the 3<sup>rd</sup> trimester and 81 % of their population were multiparas. Pregnancy intervals for multiparas was found to be 16. 5-/+ 0.5 months, and following outcomes were reported: preterm birth rate 69.2%, preeclampsia 17%, eclampsia 4%, placental ablation 3%, fetal distress 23%, low birth weight 24.6 % and neonatal death rate 35%.<sup>15</sup> They concluded that especially in multiparas when the pregnancy intervals were short and nutritional support was insufficient, pregnancy complications associated with maternal anemia were more commonly encountered.

## Conclusion

Appropriate pregnancy planning and pre-conceptional evaluation is important to decrease maternal anemia. The diagnosis and treatment of maternal anemia in the antenatal follow up is critical to minimize perinatal complications. Our study showed a significant association between anemia and preterm birth and preeclampsia, still larger studies with more cases showing this association with are required.

## References

1. World Health Organization. The prevalence of anemia in women: a tabulation of available information. 2nd ed. Geneva, Switzerland; 1992.
2. Abor Zahr C and Rayston E. Maternal mortality: a global fact book. WHO. Geneva, Switzerland; 1991.
3. Hytten F, Paintin DB. Increase in plasma volume during normal pregnancy. *J Obstet Gynaecol* 1963; 70: 402-27.
4. Steer PJ. Maternal hemoglobin concentration and birth weight. *Am J Clin Nutr* 2000; 71: 1285-7.
5. Huisman A, Aarnoudse JG. Increased 2nd trimester hemoglobin concentration in pregnancies later complicated by hypertension and growth retardation. Early evidence of a reduced plasma volume. *Acta Obstet Gynecol Scand* 1986; 65: 605-8.
6. Murphy JF, O'Riordan J, Newcombe RG, Coles EC, Pearson JF. Relation of haemoglobin levels in first and second trimesters to outcome of pregnancy. *Lancet* 1986; 1: 992-5.
7. Stephansson O, Dickman PW, Johansson A, Cnattingius S. Maternal hemoglobin concentration during pregnancy and risk of stillbirth. *JAMA* 2000; 284: 2611-7.
8. 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. *Eur J Obstet Gynecol Reprod Biol* 2005; 122: 182-6.
9. Lone FW, Qureshi RN, Emmanuel F. Maternal anaemia and its impact on perinatal outcome in a tertiary care hospital in Pakistan. *East Mediterr Health J* 2004; 10: 801-7.
10. Bondevik GT, Lie RT, Ulstein M, Kvale G. Maternal hematological status and risk of low birth weight and preterm delivery in Nepal. *Acta Obstet Gynecol Scand* 2001; 80: 402-8.
11. Malhotra M, Sharma JB, Batra S, Sharma S, Murthy NS, Arora R. Maternal and perinatal outcome in varying degrees of anemia. *Int J Gynaecol Obstet* 2002; 79: 93-100.
12. Murphy JF, O'Riordan J, Newcombe RG, Coles EC, Pearson JF. Relation of haemoglobin levels in first and second trimesters to outcome of pregnancy. *Lancet* 1986; 1: 992-5.
13. Lu ZM, Goldenberg RL, Cliver SP, Cutter G, Blankson M. The relationship between maternal hematocrit and pregnancy outcome. *Obstet Gynecol* 1991; 77: 190-4.
14. Blankson ML, Goldenberg RL, Cutter G, Cliver SP. The relationship between maternal hematocrit and pregnancy outcome: blackwhite differences. *J Natl Med Assoc* 1993; 85: 130-4.
15. Patra S, Pasrija S, Trivedi S, Puri M. Maternal and perinatal outcome in patients with severe anemia in pregnancy. *Int J Gynaecol Obstet* 2005; 91: 164-5.