Abstract

Objective: To assess the relationship between maternal third trimester anemia and hospital stay after delivery.

Materials and Methods: In this retrospective cross-sectional study, 695 women aged 18-42 years were included between January 2016 and June 2016. Obstetric outcomes and fetal outcomes were measured. Statistical analysis was performed using SPSS, version 19.0 (SPSS, Chicago, Illinois).

Results: The prevalence of anemia in this study was 15.2%. The study population was divided into three groups according to hemoglobin (Hb) levels. Group 1 consisted of patients with Hb <8.5 g/dL, group 2 Hb 8.5-11 g/dL, and group 3 Hb >11 g/dL. Higher levels of Hb were associated with shorter stay in hospital (p=0.028). In binary comparison, no significant difference was observed between groups 2 and 3, whereas it was statistically different from group 1. Fetal weight (p=0.562), neonatal intensive care unit admission (p=0.596), APGAR score 1st (p=0.674) and 5th minute (p=0.876), type of delivery (p=0.831), and gestational age (p=0.798) were not statistically different between the groups; however, hospitalization time was significantly different (p=0.028).

Conclusion: Maternal anemia in the third trimester prolongs hospitalization time after delivery. Anemia affects pregnancy and the fetus in the postpartum period in addition to the prenatal period.

Keywords: Anemia, hospitalization, third trimester

Third trimester anemia extends the length of hospital stay after delivery

Üçüncü trimesterdeki anemi doğum sonrası hastanede kalış süresini arttırmaktadır

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**Introduction**

Maternal anemia remains an important public health problem in under-developed and developing countries like ours. The Centers for Disease Control and Prevention suggested that anemia should be defined as hemoglobin levels of less than 11 g/dL (hematocrit less than 33%) in the first and third trimesters and less than 10.5 g/dL (hematocrit less than 32%) in the second trimester\(^1\). The prevalence of anemia among pregnant women seems to differ between countries and even between regions of a country. It is estimated that half of all pregnant worldwide women are anemic\(^2\). The anemia prevalence in different regions of Turkey were reported between 27% and 88%, on an average 50\(^3\).

Anemia is a physiologic result of pregnancy, and to some extent, it may be necessary. The absence of physiologic anemia has been suggested to be associated with stillbirth\(^4,5\). Maternal anemia may have a significant impact on fetal outcome in terms of preterm birth and infant deaths\(^6\). The relationship between low birth weight, preterm birth, small for gestational age, perinatal mortality, neonatal mortality, gestational diabetes, preeclampsia, and mode of delivery according to maternal anemia status has been shown in the literature, yet it is not precisely concluded\(^6\). However, the impact of severity of anemia on obstetric outcomes is controversial. Several studies suggest that only severe anemia leads to poor obstetrics outcomes\(^7\).

The aim of our study was to identify the impact of third trimester hemoglobin values on perinatal outcomes and type and time of delivery.

**Materials and Methods**

The retrospective cross-sectional study was conducted in the obstetrics out-patient clinic in a university-based hospital between January 2016 and April 2016. All data of women who were referred for routine third trimester follow-up were recorded. The inclusion criteria were as follows: age between 18 and 45 years, singleton pregnancy, iron supplementation started around 18\(^\text{th}\) gestational week, gestational age between 28 and 40 weeks during the study period, and at least one complete blood count during the third trimester. The exclusion criteria were history of preterm delivery, elevated risk pregnancy, previous uterine surgery including cesarean section, multiple gestation, any type of chronic systemic disease, and not receiving iron supplementation.

All analyzed data were obtained from the patients’ charts and medical records. Patients were divided into three groups: group 1 consisted of patients with Hb ≤8.5 g/dL, group 2 comprised patients with Hb 8.5–11 g/dL, and group 3 constituted patients with Hb >11 g/dL. The main outcome measures were perinatal and neonatal outcome parameters such as gestational age at delivery, mode of delivery, birth weight and APGAR scores, type of delivery, and duration of hospitalization. Ethics committee approval and informed consent were not taken as it is a retrospective study.

**Statistical Analysis**

Statistical analysis was performed using SPSS, version 19.0 (SPSS, Chicago, Illinois). Due to the normal distribution of all data, ANOVA test was used for the determination of differences between the three groups. The independent sample \(t\)-test was used for to determine differences between the two sexes. Categorical data were assessed using the chi-square test. \(P<0.05\) was considered statistically significant.

**Results**

A total of 695 pregnant women were assessed for eligibility. Among those, 265 patients were excluded due to being lost to follow-up (n=97), multiple pregnancy (n=13), not receiving iron supplementation (n=92), presence of chronic disease (n=73). As a result, 433 patients were included in the final analyses. The mean third trimester hemoglobin level was 11.98±5.44 mg/dL (7-15.2 mg/dL). Anemia prevalence in our study population was 15.2%. The characteristics of the study population are presented in Table 1.

Table 2 represents the comparison of perinatal outcome measures between groups 1, 2, and 3. The only parameter that showed a statistically significant difference between the groups was the duration of hospitalization. The duration of hospitalization was significantly longer in group 1 than in groups 2 and 3 (\(P=0.028\)).

**Discussion**

The aim of our study was to identify the impact of third trimester hemoglobin values on perinatal outcomes and type and time of delivery. According to the results, severe anemia during the third trimester results in increased duration of hospitalization. Otherwise, it has no adverse effects on outcomes. Anemia during the third trimester of pregnancy is defined as Hb less than 11 g/dL or hematocrit less than 33% by the CDC\(^8\) and its prevalence can differ between populations and regions of a country. It is estimated that half of all pregnant worldwide women are anemic\(^2\). The prevalence of anemia among pregnant women seems to differ between countries and even between regions of a country.

**Table 1. Characteristics of the study population**

| Characteristic               | Mean ± SD  | Minimum | Maximum |
|------------------------------|------------|---------|---------|
| Age (year)                   | 28.80±5.36 | 18      | 42      |
| BMI (kg/m\(^2\))            | 27.2±3.21  | 22      | 31      |
| Gestational age (weeks)      | 38±2.31    | 27      | 41      |
| Parity                       | 1.39±0.93  | 1       | 4       |
| Hemoglobin (mg/dL)           | 11.98±1.35 | 7       | 15.2    |

SD: Standard deviation, BMI: Body mass index
Table 2. Comparison of hemoglobin values between the three groups (maternal third trimester hemoglobin level groups as lower 8.5 mg/dL, between 8.5 and 11 mg/dL, upper 11 mg/dL)

|                                | Group 1 (n=24) | Group 2 (n=87) | Group 3 (n=322) | Significance p |
|--------------------------------|----------------|----------------|-----------------|----------------|
| Birth weight, grams<sup>a</sup> | 3357.5±256     | 3203.7±152     | 3110.4±203      | 0.562          |
| Newborn hospitalization, n (%)<sup>b</sup> | 0 (0)          | 7 (8.07)       | 18 (5.59)       | 0.596          |
| Gestational age at birth, weeks<sup>a</sup> | 38.2±6         | 38.3±4         | 38.5±2          | 0.798          |
| APGAR 1<sup>st</sup> minute<sup>a</sup> | 7.6±1.5        | 7.7±2.14       | 7.5±1.78        | 0.510          |
| APGAR 5<sup>th</sup> minute<sup>a</sup> | 9.2±0.23       | 9.1±0.14       | 9.0±0.71        | 0.876          |
| Mode of delivery, n (%)<sup>b</sup>     |                |                |                 |                |
| Vaginal<sup>b</sup> | 13 (54.1)      | 46 (52.8)      | 172 (53.4)      | 0.831          |
| Cesarean section<sup>b</sup> | 11 (45.8)      | 43 (47.1)      | 150 (46.5)      |                |
| Hospital stay, days<sup>a</sup> | 5.2±1.2        | 2.5±1.1        | 2.8±1.4         | 0.028*         |

<sup>a</sup>The significance stems from the differences between group 1 and 2 (p=0.024) and group 1 and group 3 (p=0.043) (bCompared using one-way ANOVA test, bCompared using chi-square test).
Ethics

Ethics Committee Approval: Retrospective study.
Informed Consent: Retrospective study.
Peer-review: External and internal peer-reviewed.

Authorship Contributions
Surgical and Medical Practices: F.S., Y.E.Ş., Concept: B.T., Design: K.K., Data Collection or Processing: B.Y., Analysis or Interpretation: C.A., Literature Search: K.K., B.T., Writing: K.K., Y.E.Ş.

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References
1. Centers for Disease Control (CDC). CDC criteria for anemia in children and childbearing-aged women. MMWR Morb Mortal Wkly Rep 1989;38:400-4.
2. United Nations Administrative Committee on Coordination, Subcommittee on Nutrition, and International Food Policy Research Institute. Second report on the world nutrition situation: a report compiled from information available to the ACC/SCN 1992, Geneva, Switzerland. Washington DC: United Nations International Food Policy Research Institute.
3. Pekcan G, Karaagaoglu N. State of nutrition in Turkey. Nutr Health 2000;14:41-52.
4. Stephansson O, Dickman PW, Johansson A, Cnattingius S. Maternal hemoglobin concentration during pregnancy and risk of stillbirth. JAMA 2000;284:2611-7.
5. Lone FW, Qureshi RN, Emanuel F. Maternal anemia and its impact on perinatal outcome. Trop Med Int Health 2004;9:486-90.
6. Sifakis S, Pharmakides G. Anemia in pregnancy. Ann N Y Acad Sci 2000;900:125-36.
7. Karaoglu L, Pehlivan E, Egti M, Deprem C, Gunes G, Genc MF et al. The prevalence of nutritional anemia in pregnancy in an east Anatolian province, Turkey. BMC Public Health 2010;10:329.
8. Sehgal R, Kriplani A, Vananail P, Maiti L, Kandpal S, Kumar N. Assessment and comparison of pregnancy outcome among anemic and non-anemic primigravida mothers. Indian J Public Health 2016;60:188-94.
9. Yıldız Y, Ö zgül E, Unlu SB, Salman B, Eyi EG. The relationship between third trimester maternal hemoglobin and birth weight/length; results from the tertiary center in Turkey. J Matern Fetal Neonatal Med 2014;27:729-32.
10. Lin RJ, Evans AT, Chused AE, Unterbrink ME. Anemia in general medical inpatients prolongs length of stay and increases 30-day unplanned readmission rate. South Med J 2013;106:316-20.
11. Aban M, Güngören A, Uyard H, Yılmaz N. Grand Multipar Kadınlardaki Riskler. Perinatoloji Dergisi 1991;5:20-2.
12. Preziosi P, Prual A, Galan P, Daouda H, Boureima H, Hercberg S. Effect of iron supplementation on the iron status of pregnant women: consequences for newborns. Am J Clin Nutr 1997;66:1178-82.
13. Pena-Rosas JP, De-Regil LM, Garcia-Casal MN, Dowswell T. Daily oral iron supplementation during pregnancy. Cochrane Database Syst Rev 2015;CD004736.
14. Scholl TO, Hediger ML, Fischer RL, Shearer JW. Anemia vs iron deficiency: increased risk of preterm delivery in a prospective study. Am J Clin Nutr 1992;55:985-8.
15. Sehgal R, Kriplani A, Vanamail P, Maiti L, Kandpal S, Kumar N. Assessment and comparison of pregnancy outcome among anemic and non-anemic primigravida mothers. Indian J Public Health 2016;60:188-94.
16. Van Bogaert LJ. Anemia and pregnancy outcomes in a South African rural population. J Obstet Gynaecol 2007;27:755.