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Case Report | International Journal of Medical Case Reports

# Anemia in Pregnancy : Risk Factors to Comprehensive Management

**Abitmer Gultom[1], Lamtiur Oktavia[2], Frisca Ronauli Batubara[3]**

[2]Department of Obstetrics and Gynecology, Faculty of Medicine, Universitas Kristen Indonesia, Jakarta, Indonesia.
[2]Undergraduate Program, Faculty of Medicine, Universitas Kristen Indonesia, Jakarta, Indonesia.
[3]Department of Physiology, Faculty of Medicine, Universitas Kristen Indonesia, Jakarta, Indonesia.

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## ABSTRACT

**Background:**
Anemia in pregnancy remains a major contributor to maternal and perinatal morbidity, particularly in low- and middle-income settings. In late gestation, even mild anemia may become clinically important because maternal hematologic reserve is reduced at a time when delivery-related blood loss and operative intervention may be imminent. This report highlights the importance of diagnosing third-trimester anemia in a patient with additional obstetric risk factors.

**Case Report:**
A 36-year-old multigravida woman (G3P2) at 36–37 weeks of gestation was admitted with third-trimester anemia, persistent oblique lie, a short interpregnancy interval, and a history of two previous cesarean deliveries. On admission, she was hemodynamically stable, and cardiotocography showed a reassuring category I fetal heart rate pattern. Laboratory evaluation demonstrated mild anemia, with hemoglobin 10.4 g/dL and hematocrit 33%. Because of persistent malpresentation in the context of two prior cesarean sections and near-term pregnancy a repeat cesarean delivery was planned The postoperative course was favorable. Hemoglobin remained at 10.1 g/dL after surgery and 10.0 g/dL on postoperative day 1. There was no evidence of hemorrhagic complications or need for blood transfusion. Uterine involution was found to be adequate and maternal recovery was satisfactory. Patient was discharged in stable condition.

**Conclusion:**
This case underscores that even mild third-trimester anemia warrants careful evaluation when combined with advanced maternal age, multiparity, short interpregnancy interval and anticipated operative delivery. Timely admission, close maternal as well as fetal monitoring and close postoperative surveillance can support favorable outcomes while minimizing the risks associated with antepartum anemia.

***Keywords: Cesarean Section, Fetal Monitoring, Iron-Deficiency Anemia, Pregnancy, Risk Factors***



## INTRODUCTION

Anemia in pregnancy remains one of the most common medical problems encountered in routine obstetric practice. It continues to be a significant contributor to maternal as well as perinatal morbidity worldwide. Globally, anemia is known to affect a significant proportion of pregnant women. This burden is particularly high in low- and middle-income countries. In pregnancy, anemia is generally defined as a hemoglobin concentration of less than 11 g/dL in the first and third trimesters and less than 10.5 g/dL in second trimester.[1] This definition is clinically important because normal pregnancy is accompanied by a physiologic expansion of plasma volume that exceeds the rise in red cell mass, resulting in hemodilution. Although this physiologic change may lower hemoglobin concentration, it should not obscure the identification of clinically significant anemia, particularly in the later weeks of gestation when maternal hematologic reserve becomes increasingly important for labor, operative delivery, and tolerance of blood loss. Because of its high prevalence and its potential to adversely affect both mother and fetus, anemia in pregnancy remains a condition of major public health and clinical relevance.[2]

The etiology of anemia in pregnancy is multifactorial, although iron deficiency is by far the most common cause. Pregnancy imposes significant iron demands which is needed to support expansion of maternal erythrocyte mass, placental development and fetal growth. This increased demand makes iron deficiency particularly likely when pre-pregnancy stores are inadequate or dietary intake is insufficient. Several maternal factors have been associated with an increased likelihood of anemia, including advanced maternal age, multiparity, short interpregnancy interval and inadequate antenatal follow-up visits.

**Dr Abitmer Gultom**
Department of Obstetrics and Gynecology, Faculty of Medicine, Universitas Kristen Indonesia, Jakarta, Indonesia.

These risk factors are especially relevant in the third trimester, when iron requirements peak and the consequences of untreated anemia become more immediate in relation to delivery planning. Importantly, iron deficiency in pregnancy may exist along a spectrum ranging from depleted iron stores without overt anemia to established iron deficiency anemia, and the clinical expression may be modified by the timing of presentation and the presence of coexisting maternal risk factors.[3]

The clinical significance of maternal anemia extends well beyond an abnormal laboratory value. For the mother, anemia has been associated with fatigue, reduced functional capacity, lowered immunity, increased risk of need for blood transfusion. Systematic review evidence from low- and middle-income countries has shown that maternal anemia is associated with significantly increased risks of low birth weight, preterm delivery, and perinatal mortality, thereby highlighting its consequences across the maternal-fetal unit rather than in the mother alone. These consequences become particularly important in late pregnancy, when clinical decisions regarding hospitalization, timing of delivery, route of birth, and optimization of maternal condition must often be made over a short period. Thus, third-trimester anemia is not merely a biochemical diagnosis; it is a clinically meaningful condition that may directly influence obstetric management and perinatal outcome.[4]

Early recognition and proper management of anemia is therefore essential components of antenatal care. Oral iron remains first-line therapy in most cases because it is inexpensive, widely available, and effective when adherence is adequate; however, gastrointestinal intolerance, poor absorption, late gestational presentation, or moderate-to-severe anemia may limit its usefulness in some patients. In such circumstances, intravenous iron may provide a more rapid correction of iron deficit, while transfusion is reserved for selected patients with severe anemia, active bleeding, hemodynamic instability, or urgent peripartum need. Meta-analytic evidence has further shown that prenatal iron use improves maternal hematologic indices and is associated with a reduced risk of maternal anemia and low-birth-weight infants. Nevertheless, treatment of anemia in pregnancy should not be viewed as supplementation alone; it must include identification of risk factors, assessment of severity, close maternal and fetal monitoring, and individualized planning for delivery based on gestational age, obstetric indications, and anticipated blood loss.[5]

Despite the availability of guidelines and broad epidemiologic evidence, an important gap remains between general recommendations and the practical bedside management of women who present with anemia in late pregnancy together with additional obstetric risk factors. Much of the literature focuses on prevalence, prevention, or treatment efficacy, whereas fewer reports clearly illustrate how third-trimester anemia is approached in real-world clinical settings when clinicians must simultaneously address maternal stabilization, fetal surveillance, etiology-based treatment, and safe delivery planning. This gap is particularly relevant in women of advanced maternal age and with multiparity, in whom anemia may coexist with increased obstetric complexity. In that context, well-documented case reports remain valuable because they provide clinically grounded examples of decision-making that are often not captured in larger studies. The present case report was therefore undertaken to describe the evaluation and comprehensive management of third-trimester anemia in pregnancy, with emphasis on risk-factor recognition, diagnostic assessment, maternal-fetal monitoring, and delivery planning.

By presenting the course and management of this patient, this report seeks to add practical evidence to the existing literature and to reinforce the importance of individualized, timely, and integrated care in preventing adverse maternal and perinatal outcomes.

## CASE REPORT

A multigravida woman, gravida 3 para 2, at 36–37 weeks of gestation was admitted with anemia in pregnancy and persistent oblique lie in the setting of a short interpregnancy interval and two previous cesarean deliveries. She had no history of hypertension, diabetes mellitus, cardiac disease, asthma, or drug allergy. Antenatal screening for hepatitis B, syphilis, and human immunodeficiency virus was nonreactive.

On admission patient was conscious and hemodynamically stable. Blood pressure measurement was 131/93 mmHg, pulse rate of 73 beats/minute and respiratory rate of 18 breaths/minute. She was afebrile with a recorded temperature of 36.7°C at admission. Oxygen saturation was found to be of 98% on room air. General examination was found to be unremarkable. Obstetric examination showed a gravid abdomen with presence of linea nigra and striae gravidarum. There was presence of abdominal scars belonging to previous cesarean sections. Fundal height was 31 cm, corresponding to three fingerbreadths below the xiphoid process, and abdominal circumference was 93 cm. On Leopold's manoeuvres, the uterine fundus contained a soft breech pole, the fetal back was palpated on the maternal left side, the presenting part was hard and ballotable, and the presenting part had not yet entered the pelvic inlet, consistent with oblique lie. Cardiotocography documented a baseline fetal heart rate of 140 beats/minute with normal variability and was interpreted in the record as category I (Figure 1).

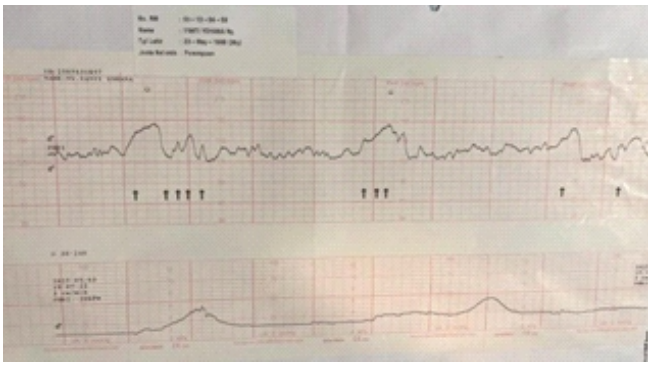

Figure 1. Cardiotocography Examination Results

Admission laboratory investigations showed hemoglobin 10.4 g/dL, hematocrit 33%, leukocyte count 9.9 × $10^3$/µL, platelet count 299 × $10^3$/µL, bleeding time 2 minutes, clotting time 14 minutes, prothrombin time 16 seconds, and blood glucose 79 mg/dL. In view of term pregnancy with previous two cesarean sections, anemia, short interpregnancy interval, and persistent oblique lie, repeat cesarean section was planned for the day after admission. She received intravenous paracetamol and prophylactic ceftriaxone 1 hour before surgery.

During the immediate postoperative period she remained stable but complained of pain at the surgical site. Lactation had not yet started. She was able to turn from side to side but had not passed stool or flatus. A urinary catheter was in situ and urine output was approximately 500 mL by evening. Vital signs were stable. Obstetric examination revealed lochia rubra. Palpation of abdomen showed, a firm uterus and fundal height one fingerbreadth below the umbilicus level. Hemoglobin was 10.1 g/dL, hematocrit 32%, leukocyte count 12.6 × $10^3$/µL, and platelet count 262 × $10^3$/µL. She received

intravenous fluids with oxytocin, ceftriaxone, analgesics, vitamin supplementation, and routine postoperative monitoring.

On postoperative day 1, she continued to have incisional pain. Breast milk had not fully come in, although early breastfeeding had been initiated. She could roll over and sit, but was not yet ambulatory, and had not passed stool or flatus. Morning urine output through the catheter was 100 mL. Examination showed lochia rubra, a firm uterus, and fundal height two fingerbreadths below the umbilicus. Hemoglobin was 10.0 g/dL, hematocrit 32%, leukocyte count 11.8 × $10^3/\mu L$, and platelet count 296 × $10^3/\mu L$. Oral antibiotics, analgesics, domperidone, hematinic supplementation, and supportive therapy were added.

By postoperative day 2, her pain had decreased, lactation had begun in small amounts, and she was able to ambulate. She had passed flatus, although bowel movement had not yet occurred. The catheter had been removed. She remained clinically stable, with a firm, well-contracted uterus and persistent lochia rubra. Dressing change and breast care instruction were provided, and she was subsequently discharged in satisfactory condition on postoperative follow-up with advice for outpatient review.

## DISCUSSION

In this case presence of risk factors for occurrence of third-trimester anemia such as advanced maternal age, multiparity, history of prior cesarean delivery and a short interpregnancy interval were of particular importance. The patient was 36 years old, G3P2A0, with two previous cesarean sections and an interpregnancy interval of less than 2 years. Presence of these factors in this case made her background obstetric profile particularly relevant to the development of anemia near term. Although this patient's hemoglobin level was only mildly reduced, these cumulative risk factors suggest that her anemia was not an isolated laboratory abnormality but rather part of a broader pattern of maternal depletion and increased hematologic demand during pregnancy.

A second important point is that mild anemia late in pregnancy should still be regarded as clinically meaningful because population-level studies consistently demonstrate increased maternal and neonatal risk across the spectrum of hemoglobin reduction. Rahman MM et al[6], in a systematic review and meta-analysis from low- and middle-income countries, found that maternal anemia was associated with higher risks of low birth weight, preterm birth, perinatal mortality, and neonatal mortality. Likewise, Chen Y et al[7] showed in a large prospective cohort that even mild maternal anemia in early pregnancy was associated with increased risks of preterm birth, low birth weight, and small-for-gestational-age neonates, with risk increasing as anemia became more severe. In the present case, however, fetal surveillance was reassuring, cardiotocography was category 1, and the pregnancy reached late preterm to early term without documented fetal growth restriction or neonatal instability. This favorable course should not be interpreted as evidence that the anemia was clinically unimportant; rather, it suggests that timely admission, close monitoring, and the relatively modest degree of hemoglobin reduction may have limited short-term adverse consequences. The case therefore reinforces an important discussion point for publication: anemia modifies risk in a probabilistic way, and a good individual outcome does not diminish the public health or clinical significance of the condition.

The delivery course in this patient also deserves emphasis because the indication for cesarean section was primarily obstetric, namely oblique lie in a woman with two previous cesarean deliveries, while anemia acted as an important modifier of perioperative risk rather than the sole indication for operative delivery. Drukker L et al [8] reported that iron-deficiency anemia at admission for labor and delivery was associated with increased cesarean section and other adverse maternal and neonatal outcomes. In parallel, Butwick AJ et al[9] showed that predelivery anemia, particularly hemoglobin values between 10 and 10.9 g/dL or lower, strongly increased the odds of severe postpartum anemia after cesarean delivery. Against this background, the present patient's postoperative course is notable for its relative stability: hemoglobin decreased only slightly from 10.4 g/dL preoperatively to 10.1 g/dL and 10.0 g/dL on follow-up, the uterus remained firm, no major hemorrhagic event was documented, and transfusion was not required. These findings support the view that careful delivery planning, active uterotonic management, and structured postoperative surveillance can mitigate the added vulnerability imposed by antepartum anemia. In other words, this case illustrates that anemia should sharpen intrapartum and postoperative preparedness, even when the final maternal and neonatal outcomes are favorable.

However, anemia in pregnancy should be investigated thoroughly before starting management. This matters because the differential diagnosis of anemia in pregnancy is broader than iron deficiency alone, and confirmation can guide the intensity and route of therapy. Resseguier AS et al[10] found that first-trimester blood-count data can help predict third-trimester iron-deficiency anemia and suggested systematic early complete blood count screening, whereas Judistiani RTD et al[11] showed that first-trimester ferritin performed better than soluble transferrin receptor and hepcidin in predicting third-trimester anemia. The implication for the present report is twofold: first, serial hemoglobin monitoring was clinically useful and helped confirm stability around delivery; second, the absence of ferritin or red-cell indices should be acknowledged as a limitation, because earlier biochemical risk stratification might have enabled more targeted antenatal iron correction before the patient reached the late third trimester.

Finally, the therapeutic course in this case was reasonable for a hemodynamically stable patient with mild anemia, but the literature suggests that earlier or more intensive iron replacement may be advantageous in selected patients, especially when delivery is approaching or when operative delivery is anticipated. Khalafallah A et al[12] demonstrated in a randomized trial that intravenous iron improved hemoglobin response and iron stores more effectively than oral iron in moderate iron-deficiency anemia of pregnancy. Lewkowitz AK et al[13], in the IVIDA trial, likewise showed that intravenous iron reduced the rate of anemia at admission for delivery. In a late-pregnancy comparison that is especially relevant to this case, Oskovi-Kaplan ZA et al [14] found that correction of third-trimester anemia with intravenous ferric carboxymaltose reduced maternal morbidity and postpartum transfusion, although neonatal outcomes were similar. More recent randomized evidence from Derman RJ et al [15] showed that single-dose intravenous iron improved attainment of maternal nonanemic status at delivery and reduced low birth weight compared with oral iron, while Afolabi BB et al [16] reported that intravenous iron was safe and more effective than oral iron in reducing iron deficiency among pregnant women in Nigeria. In the present patient, because hemoglobin remained around 10 g/dL, surgery was completed without major blood loss, and postpartum recovery was stable, oral iron-containing therapy with follow-up was appropriate. Nevertheless, this case supports a broader clinical message: earlier identification of risk factors and biochemical confirmation of iron deficiency could permit correction

before term, potentially improving hematologic reserve before cesarean delivery and further reducing postpartum vulnerability.

## CONCLUSION

Anemia in pregnancy is a significant problem and has the potential to cause serious complications for both, mother as well as fetus. Risk factors for occurrence of anemia in pregnancy include maternal age more than 35 years and inadequate dietary intake of iron, vitamin B12 and folate. Routine screening during antenatal care and adequate laboratory evaluation are important for early diagnosis of anemia in pregnant women. Management of anemia in pregnancy must be comprehensive and individualized, The comprehensive management of anemia in pregnancy include correction of cause, iron supplementation in cases of iron deficiency anemia and appropriate delivery planning. An appropriate and integrated approach plays an important role in reducing the risk of maternal as well as perinatal morbidity and mortality thereby improving overall pregnancy outcomes.

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**Author Contribution :AG-**contributed to patient management, data collection, and manuscript drafting. **LO-**Participated in data interpretation, literature review, and critical manuscript revision**. FRB-S**upervised the study, coordinated data analysis, and approved the final manuscript.

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