Advanced Medical Journal, Vol.10, No.4, P.128-134,2025 https://doi.org/10.56056/amj.2025.407

# Risk Factors and Adverse Perinatal Outcomes of Anemia in Zakho Maternity Hospital

**Saraa Faiz Abdulrahman* Shahla Kareem Alalaf** Fatima Kamal Khalid*****

## Abstract

**Background and objectives**: Maternal anemia pose significant challenges to perinatal health globally. The current study was conducted to investigate the association between severity of anemia in pregnant women and adverse perinatal outcomes.

**Methods:** A comparative descriptive study was conducted in Zakho Maternity Hospital, Zakho City, Kurdistan Region, Iraq from May 2022 to May 2023 involving 500 women during labor. The sample size included 253 anemic (Hemoglobin <11 g/dl) and 247 non-anemic pregnant women (Hemoglobin ≥11 g/dl). Demographic character, mode of delivery and perinatal outcomes were compared between both groups.

**Results:** Among the 253 anemic women during labor involved in the study, 56.0% had mild, 42.4% had moderate, and 1.6% had severe anemia. Higher parity increased anemia risk (P<0.000), Among mothers with moderate anemia, 47.2% were multiparous compared to 26.4% primigravida. Similarly, among those with severe anemia, 42.8% were multiparous compared to 0% primigravida. Anemia was associated with extreme maternal age (<20 and >35 years) and rural housing (p<0.001), although work status had no significant impact (p=0.292). Maternal anemia correlated with poorer Apgar scores, with rates of (75.0%, 9.3%, and 1.4% for severe, moderate, and mild anemia, respectively). More NICU admissions were observed for babies born to mothers with severe anemia (100.0%), followed by moderate (17.8%) and mild (4.9%) anemia. Additionally, more low birth weight cases were observed, with a prevalence of 75.0% in severe anemia followed by moderate (7.5%) and mild anemia (2.1%).

**Conclusion:** A substantial link is there between anemia during pregnancy and maternal characteristics of parity and rural residence. Furthermore, poor perinatal outcomes had significant relation with anemia.

**Keywords:** Anemia, Perinatal outcomes, Pregnancy, Risk factors

*MBCHB, Senior house officer at Zakho Maternity Teaching Hospital. Corresponding author Email: esraafaiz1991@Gmail.com
**MBCHB/ Professor. supervisor and trainer at College of Medicine, Hawler Medical University, Erbil, Kurdistan Region, Iraq. Email: shahla.kareem@hmu.edu.krd
***MBCHB/CABOG, Senior Lecturer at Zakho Medical University, College of Medicine, Zakho City, Kurdistan Region, Iraq. Email: fatima.khalid@uoz.edu.krd

## Introduction

Pregnant women suffering from anemia encounter adverse consequences in terms of maternal and perinatal outcomes.[1] The Global Prevalence of Anemia in Pregnant Women indicated an overall prevalence of 36.8%.[2] The consequences of anemia can extend beyond pregnancy, potentially impacting maternal and child health long-term.[3] Adverse maternal effects encompass fatigue, dizziness, cold extremities, headaches, and breathlessness, particularly during physical activity. Severe anemia may manifest with additional symptoms such as pallor of mucous membranes, skin, and nail beds, rapid heart and breathing rates, postural dizziness, and heightened bruising tendency. Perinatal implications involve lower APGAR scores at five minutes, elevated risk of stillbirth, intrauterine growth restriction, and potential neonatal intensive care unit referrals. Long-term follow-up studies are scarce, limiting our understanding of the full spectrum of consequences and hindering comprehensive intervention strategies.[4] Anemia in pregnancy is rarely caused by a single factor, but rather by a complex interplay of nutritional, socioeconomic, and health-related variables, for instance, it can stem from various factors, including nutrient deficiencies, insufficient dietary intake (or poor nutrient absorption), infections, inflammation, chronic illnesses, and inherited disorders affecting red blood cells. Iron deficiency, often attributed to inadequate dietary iron consumption, stands out as the most prevalent nutritional shortfall causing anemia. Inadequacies in vitamin A, folate, vitamin B12, and riboflavin can also contribute to anemia due to their essential functions in hemoglobin synthesis and/or red blood cell production. Identifying the independent and synergistic effects of these components is still problematic.[5,6] Poverty, restricted access to healthcare, and a lack of nutritional diversity are frequently related with anemia, making it difficult to identify their individual effects.[7] Furthermore, the prevalence and distribution of risk factors for anemia varied greatly among geographical regions, necessitating context-specific prevention and therapy strategies.[8] Establishing a clear causal link between maternal anemia and certain perinatal problems remains difficult. Several studies imply that confounding factors such socioeconomic level, nutritional deficits other than iron, and pre-existing health issues may play a substantial influence.[9] The severity of anemia tends to influence the likelihood of unfavorable consequences. However, research into the particular thresholds and types of anemia (iron deficiency versus other causes) with the highest risk is currently ongoing.[10] Furthermore, the prevalence of anemia and its impact on perinatal outcomes varies greatly among geographic regions, with socioeconomic status and access to healthcare having a significant impact on the observed associations.[8, 11]

**Aim of the study:** The current study was conducted to investigate the association between anemia in pregnant women and adverse perinatal outcomes in Zakho Maternity Hospital, Iraq.

## Patients and Methods

A comparative descriptive study investigating the risk factors and perinatal outcomes associated with anemia in pregnant women at Zakho Maternity Hospital, Kurdistan Region, Iraq was conducted in Labor ward, started from 1st of May 2022 to 1st of May 2023.The study involved 500 women, 253 anemic (Hb < 11 g/dl) and 247 non-anemic (Hb > 11 g/dl). Anemia in pregnancy was defined as Hb-values <11 g/dl, regardless of gestational age, as per WHO guidelines.[12] Anemia also classified in


https://doi.org/10.56056/amj.2025.407

to mild anemia (in which hemoglobin concentration is between 10 g/dl and lower limit of normal) moderate anemia (hemoglobin concentration is 8-10gm /dl) and severe anemia (hemoglobin concentration is 6.5-7.9 gm/dl) as per guidelines.[13] Women with singleton pregnancy, gestational age between 37 and 41 weeks, and willing to participate in the study were included, while women with gestational age less than 37 weeks, twin pregnancy, hemoglobinopathy, and chronic medical disorders who refused to participate were excluded. Written consent has been taken from every patient before participation with ensuring their confidentiality. Detailed information was taken including demographic characteristics like age which is categorized in to (less than 20, 20-35 and more than 35), parity before delivery which is categorized in to (primigravida (P0), primiparous (P1) multiparous (P5) and grand multipara (>P5), occupation which is classified in to (employed, un- employed), residence which is classified in to(urban, rural)and neonatal information were recorded like neonatal viability, alive or dead which also categorized to (fresh or macerated or early neonatal death, which is defined by WHO as neonatal death occurring in the first 7 days of life as per guideline.[14,15] Apgar score which is categorized according to ACOG guideline in to reassuring which is (7-10), moderately abnormal (4-6) and low Apgar score (0-3).[16] Admission to the neonatal intensive care unit (NICU) which is indicated when the Apgar score is less than (6) as per guideline and birth weight which is categorized in to normal (2.5kg - 4kg), low birth weight (1kg>and <2.5kg) and Macrosomic > 4kg. according to guideline.[17,18] This This study, for which the researcher (myself) obtained written consent from patients before collecting their information and clearly explained their rights to accept or refuse participation, received approval from the Ethics and Scientific Committee of the Kurdistan Higher Council of Medical Specialties (No.1391 on August 14, 2022). The data were analyzed using SPSS version 26. The demographic characteristics and neonatal outcomes, being categorical variables, were summarized using frequencies and percentages. The relationship between anemia and categorical perinatal outcomes was assessed through the Freeman-Halton Exact test. A p-value of 0.05 was set as the threshold for statistical significance.

## Results

During the study period, 550 women were selected from labor word according to their Hb level; among whom 253 had anemia and 247 did not. Exclusions included 50 women due to conditions like hemoglobinopathy (thalassemia minor) (number=5), chronic disorders like hypertension (number=15), preterm birth less than 37 weeks (number=20), twin pregnancy(number=3), and women who did not give consent (n=7). Participant characteristics such as age (mean 28±6 years) and range (16-44 years), parity (median 3) and (range 2-5), birth weight (mean 3.2000±380 g), and mean hemoglobin level was 11.35 g/dL, were documented in Tables (1). Anemia severity varied, with 56.0% having mild anemia, 42.4% moderate, and 1.6% severe, as shown in figure (1).

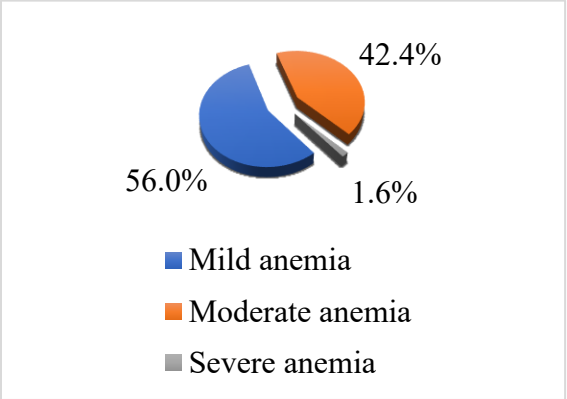


**Figure (1):** Pie chart showing the severity of anemia


https://doi.org/10.56056/amj.2025.407

A comparison between anemic and non-anemic mothers regarding demographic characteristics showed that high Parity increases risk of anemia, multiparity was more significant among mothers with moderate and severe anemia). mothers at extreme of age (less than 20 years and more than 35 years) had statistically significant association with anemia, as well as studied women from urban area was 80% and 20% were from rural areas, the proportion of anemia was higher among women from rural areas and there was no statistical significance between maternal anemia and employment as shown in Table (1 and 2). Parity increases risk of anemia with SD of 3.42 ± 2.07 and p-value P<0.000. Mean age at pregnancy and maternal anemia was 28 ± 6 years (p<0.014). No statistical significance between maternal anemia and employment p-value =0.292. Studied women from urban area was 80% and 20% were from rural areas, the proportion of anemia was higher in women from rural areas with p -value p<0.001.

**Table (1):** Maternal demographic features of studied groups

| Maternal demographic features | | Categorization according to Severity of Anemia | | | | Total (500) | p-value* |
|---|---|---|---|---|---|---|---|
| | | Normal (n=247) | Mild (n=142) | Moderate (n=107) | Severe (n=4) | | |
| Para | Primigravida (P0) | 54(21.9) | 33(23.2) | 13(12.1) | 0(0.0) | 100 | 0.000 |
| | Primi Parous (P1) | 70(28.3) | 31(21.8) | 17(15.9) | 0(0.0) | 118 | |
| | Multi Para (P2-P5) | 106(42.9) | 41(28.9) | 29(27.1) | 1(25.0) | 177 | |
| | Grand Multi Para>P5 | 17(6.9) | 37(26.1) | 48(44.9) | 3(75.0) | 105 | |
| Age /years 28 ± 6 years | <20 | 78(31.6) | 46(32.4) | 38(35.5) | 0(0.0) | 162 | 0.014 |
| | 20-35 years | 76(30.8) | 32(22.5) | 18(16.8) | 0(0.0) | 126 | |
| | >35 years | 93(37.7) | 64(45.1) | 51(47.7) | 4(100.0) | 212 | |
| Occupation | Employed | 26(10.5) | 8(5.6) | 8(7.5) | 0(0.0) | 42 | 0.292 |
| | Unemployed | 221(89.5) | 134(94.6) | 99(92.5) | 4(100.0) | 458 | |
| Residence | Urban | 221(89.5) | 97(68.3) | 79(73.8) | 3(75.0) | 400 | 0.001 |
| | Rural | 26(10.5) | 45(31.7) | 28(26.2) | 1(25.0) | 100 | |

*Freeman-Halton Exact test has been used

In our study, as shown in Table (2), we observed that maternal anemia had a statistically significant association with low Apgar scores, particularly among women with severe anemia, followed by those with moderate and mild anemia (75.0%, 9.3%, and 1.4%, respectively). Admission to the NICU was also significantly higher for babies born to mothers with severe anemia (100.0%), followed by those with moderate (17.8%) and mild anemia (4.9%). Similarly, the incidence of low birth weight was highest among women with severe anemia (75.0%), followed by those with moderate anemia (7.5%) and mild anemia (2.1%). Maternal anemia was significantly associated with low Apgar scores, NICU admissions, low birth weight, and neonatal death with a p-value of less than 0.000.


https://doi.org/10.56056/amj.2025.407

**Table (2):** Perinatal outcome of studied groups

| Perinatal outcome | | Categorization according to Severity of Anemia | | | | Total (500) | p-value* |
|---|---|---|---|---|---|---|---|
| | | Normal (n=247) | Mild (n=142) | Moderate (n=107) | Severe (n=4) | | |
| APGAR Score | Low | 2(0.8) | 2(1.4) | 10(9.3) | 3(75.0) | 17 | 0.000 |
| | Moderately | 4(1.6) | 7(4.9) | 60(56.1) | 1(25.0) | 72 | |
| | Reassuring | 241(97.6) | 133(93.7) | 37(34.6) | 0(0.0) | 411 | |
| Weight (Kg) | <2.5 | 0(0.0) | 3(2.1) | 8(7.5) | 3(75.0) | 14 | 0.000 |
| | 2.5-4 | 228(92.3) | 137(96.5) | 99(92.5) | 1(25.0) | 465 | |
| | > 4 | 19(7.7) | 2(1.4) | 0(0.0) | 0(0.0) | 21 | |
| Admission to NICU | No | 242(98.0) | 135(95.1) | 88(82.2) | 0(0.0) | 465 | 0.000 |
| | Yes | 5(2.0) | 7(4.9) | 19(17.8) | 4(100.0) | 35 | |
| Neonatal Outcome | Alive | 246(99.6) | 142(100.0) | 102(95.3) | 4(100.0) | 494 | 0.003 |
| | Dead | 1(0.4) | 0(0.0) | 5(4.7) | 0(0.0) | 6 | |

*Freeman-Halton Exact test has been used

## Discussion

In our study we investigate the risk factors for anemia and perinatal outcomes of pregnant women with anemia, according to our study out of 253 anemic women, 56.0% were mild, 42.4 %moderate and 1.6 % were severe anemia in contrast to the research done by Barut, in which out of 265 anemic subjects, 22.2% were mild, 38.2% moderate, and 2.1% were severely anemic.[19] Regarding the risk factors of anemia, our study showed that Multiparity was significantly associated with risk of maternal anemia (P<0.000), studies conducted by Alene, show the same results. This is probably connected to economic factors, the inaccessibility of health care facilities, and the lack of knowledge regarding appropriate diet during pregnancy.[20] Our study did not find statistically significant association between employment and maternal anemia in the studied pregnant women, it's against the study that was conducted by Ansari, which found that hemoglobin concentration of employed women to be lower than that of unemployed women.[21] In addition to this study, other study was conducted by Chowdhury, found that the low income group comprised a higher portion of anemic patients compared to the high-income group.[22] The proportion of anemic women in rural areas was higher than urban areas, this variation was statistically highly significant (P<0.001). Similar result was found in study had done by Kassa, which stated that Pregnant women living in urban areas are less likely to be anemic during pregnancy than women in the rural area.[23]According to our study, perinatal outcomes, such as low APGAR score at 5 minutes and intrauterine growth restriction (IUGR), small for gestational age (SGA) babies were statistically highly significant same results found, done by Li Lin.[24] Their results were comparable to our findings. According to our study, the low Apgar score, admission to NICU and low birth weight were mostly found in those women with severe anemia followed by moderate and mild anemia respectively, similarly the study which done by Camara, determined that severe maternal anemia was associated with stillbirths, Low birth weight and neonatal intensive care unit admissions.[25] and according to our study there was no statistically significant association between maternal anemia and still birth, in contrast to the study done by Shi *et al.,* which found that moderate or severe


https://doi.org/10.56056/amj.2025.407

anemia associated with increased risks for stillbirth.[26]

## Conclusions

The study concluded that there is a significant association between anemia during pregnancy and specific risk factors, including maternal parity and rural residence. Moreover, anemia correlates with adverse perinatal outcomes, such as low Apgar scores, low birth weight, and heightened NICU referrals. These findings emphasize the necessity of addressing anemia risk factors and implementing targeted interventions to enhance perinatal outcomes, particularly in vulnerable populations.

## Conflict of interest

The authors declare no conflict of interest.

## References

1. Frayne J and Pinchon D. Anaemia in pregnancy. Aust J Gen Pract. 2019; 48:125.
2. Karami M, Chaleshgar M, Salari N, Akbari H, Mohammadi M. Global Prevalence of Anemia in Pregnant Women: A Comprehensive Systematic Review and Meta-Analysis. Matern Child Health J. 2022 Jul;26(7):1473-1487. doi: 10.1007/s10995-022-03450-1.
3. Victora CG, Christian P, Vidaletti LP, Gatica-Domínguez G, Menon P, Black RE. Maternal and Child Undernutrition Study Group. Maternal and child undernutrition and overweight in low- and middle-income countries. The Lancet. 2020; 395(10222): 1039-1086.
4. Black RE, Victora CG, Walker SP, Bhutta ZA, Christian P, de Onis M, et al. Maternal and child under nutrition and overweight in low- and middle-income countries. The Lancet. 2020; 395(10222): 1039-1086.
5. Stoltzfus RJ, Black MM, Egli IM. Anemia in pregnancy: A global public health challenge with multiple causes. Annu. Rev. Nutr. 2020; 40: 327-353.
6. Peña-Rosas JP, De-Regil LM, Garcia-Casal MN, Dowswell T. Daily oral iron supplementation during pregnancy. Cochrane Database Syst Rev. 2015 Jul 22; 2015(7): CD004736.
7. Suchdev PS, Flores-Ayala S. Anaemia in pregnancy: A global perspective on causes and interventions. BMJ Global Health. 2021; 6(5): e004712.
8. Afolabi OO, Ige OO, Adeoye OO. The association between maternal anemia and perinatal outcomes in different geographical regions: A systematic review and meta-analysis. BMC Pregnancy Childbirth. 2022; 22(1): 1-14.
9. Khan FS, Rahman S, Khan AR. Association of maternal anemia with perinatal outcomes in a tertiary care hospital of Karachi, Pakistan. Int. J. Gynecol. Obstet. 2020;151(2): 220-225.
10. Cogan P, Ng V, Studzinski M. Iron deficiency versus non-iron deficiency anemia in pregnancy: Impact on maternal and neonatal outcomes. Nutrients. 2022;14(17), 3467.
11. World Health Organization. Global Nutrition Report 2022: Transforming food systems for better health and nutrition. 2022. https://globalnutritionreport.org/reports/2022-global-nutrition-report/
12. Achebe MM and Gafter-Gvili A. How I treat anemia in pregnancy: iron, cobalamin, and folate. Blood. 2017; 129: 940–949.
13. Badireddy M, Baradhi K. Chronic anemia. Treasure Island (FL): StatPearls Publishing; 2024Jan. https://www.ncbi.nlm.nih.gov/books/NBK534803/
14. Maraj H, Kumari S. No clarity on the definition of parity: A survey accessing interpretation of the word parity amongst obstetricians and midwives and a literature review. Eur J Obstet Gynecol Reprod Biol. 2021 Aug; 263:15-19.

15. Pathirana J, Muñoz FM, Abbing-Karahagopian V, Bhat N, Harris T, Kapoor A, et al. Neonatal death: Case definition & guidelines for data collection, analysis, and presentation of immunization safety data. Vaccine. 2016;34(49): 6027–6037.
16. American college of obstetricians and Gynecologists. The Apgar score. October 2015. https://www.acog.org/clinical/clinical-guidance/committeeopinion/articles/201510/the-apgar-score/
17. Ray JG, Medcalf KE, Park AL. Association of Newborn Apgar Score with Maternal Admission to the Intensive Care Unit. JAMA Pediatr. 2016;170(1):88–89. doi:10.1001/jamapediatrics.2015.3035/
18. Battaglia FC, Lubchenco LO. A practical classification of newborn infants by weight and gestational age. J Pediatr. 1967 Aug;71(2):159-163.
19. Barut A, Mohamud DO. The association of maternal anaemia with adverse maternal and fetal outcomes in Somali women: a prospective study. BMC Womens Health. 2023; 23(1):193.
20. Addis AK, Mohamed DA. Prevalence of Anemia and Associated Factors among Pregnant Women in an Urban Area of Eastern Ethiopia. Anemia. 2014; 2014:561-567.
21. Baig-Ansari N, Badruddin SH, Karmaliani R, Harris H, Jehan I, Pasha O, et al. Anemia prevalence and risk factors in pregnant women in an urban area of Pakistan. Food Nutr Bull. 2008 Jun; 29(2): 132-139.
22. Chowdhury HA, Ahmed KR, Jebunessa F, Akter J, Hossain S, Shahjahan M. Factors associated with maternal anaemia among pregnant women in Dhaka city. BMC Women's Health. 2015 Sep 22; 15:77.
23. Kassa GM, Muche AA, Berhe AK, Fekadu GA. Prevalence and determinants of anemia among pregnant women in Ethiopia; a systematic review and meta-analysis. BMC Hematol. 2017 Oct 17; 17:17. doi: 10.1186/s12878-017-0090-z/
24. Lin L, Wei Y, Zhu W, Wang C, Su R, Feng H, et al. Gestational diabetes mellitus Prevalence Survey (GPS) study Group. Prevalence, risk factors and associated adverse pregnancy outcomes of anaemia in Chinese pregnant women: a multicenter retrospective study. BMC Pregnancy Childbirth. 2018 Apr 23;18 (1): 111.
25. Camara B, Oluwalana C, Miyahara R, Lush A, Kampmann B, Manneh K, et al. Stillbirths, neonatal morbidity, and mortality in health facility deliveries in urban Gambia. Front Pediatr. 2021; 9: 579922.
26. Shi H, Chen L, Wang Y, Sun M, Guo Y, Ma S, et al. Severity of anemia during pregnancy and adverse maternal and fetal outcomes. JAMA Netw Open. 2022;5(2): e2147046.