Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Types of anaemia in pregnany: A single center study

Mohammad Shabih Haider
shabihhaider007@hotmail.com
Rawalpindi Medical University
Mobina Ahsan Dodhy
Rawalpindi Medical University
Syed Iqbal Haider
Rawalpindi Medical University
Javeria Qaiser
Rawalpindi Medical University
Maliha Batool Bukhari
Polyclinic Hospital
Saadia Muzafar
Watim Medical College

Research Article

Keywords: Anemia, Physiological anaemia in pregnancy, Iron defiency anaemia, B12 and folate deficiency anaemia, hemolytic anaemia, thalassaemia trait

Posted Date: July 14th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-10323322/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: The authors declare no competing interests.

Abstract

Objective: To calculate the frequency of various types of anaemias in pregnancy.

Study Design: It was a cross-sectional study carried out at Department of Pathology, Holy Family Hospital Rawalpindi from November 2024 to October 2025.

Methodology: A total of 45 patients with gestational amenorrhea with Hb less than 12 g/dl were included in the study. Complete blood count (CBC) test was done on Sysmex KX-21 automated haematology analyzer. Peripheral blood was stained with Giemsa stain and examined under microscope to see and report RBC morphology. Serum ferritin was done for confirmation of iron deficiency anaemia. Serum B12 and folate levels were done for confirmation of megaloblastic anaemia. Coombs test was done for confirmation of autoimmune hemolytic anaemia. Hb electrophoresis was done in selective cases to rule out thalassemia trait. Iron defiency anaemia was diagnosed as microcytic hypochromic anaemia with decreased serum ferritin levels. Megaloblastic anaemia was diagnosed as macrocytic anaemia with decreased Serum B12 or folate levels. Autoimmune hemolytic anaemia was diagnosed as anaemia with raised reticulocyte count and positive direct Coombs test. All cases excluding these were labelled as physiological anaemia in pregnancy.

Results: 45 pregnant women were included in the study. Mean age of patients was 28.4 ± 5.5, Mean Hb was 9.8 ± 1.2, Mean RBC were 3.7 ± 0.6, Mean TLC was 8.3 ± 4.0, Mean platelet count was 226 ± 114, mean MCV was 78.9 ± 9.2, mean MCH was 28.0 ± 8.4, mean MCHC was 31.3 ± 3.4, mean retic count was 1.9 ± 0.5, mean serum ferritin levels were 32.9 ± 47.2, mean serum B12 levels were 213.2 ± 49.2, mean folate levels were 6.9 ± 2.5. Iron defiency anemia was present in 19 patients (42%), Vitamin B12 defiency was present in 3 patients (6%) and folate deficiency was present in 3 patients (6%). 2 patients presented with B thalassemia trait (3%). None of the patient presented with autoimmune hemolytic anaemia in our study population. 18 patients (40%) were having physiological anaemia due to dilution.

Conclusion: Iron deficiency anaemia in pregnancy is the most common cause of anaemia in pregnancy in our study population followed by physiological anaemia and then Vitamin B12 and folate deficiency anaemia and B Thalassemia trait. By early detection the morbidity in these patients can be reduced and quality of life can be improved.

Introduction

Anemia is a global public health concern, affecting a significant portion of the population across various age groups, genders, and socioeconomic statuses.(1) It is characterized by a reduction in the number of red blood cells or the hemoglobin concentration in the blood, leading to impaired oxygen transport to tissues and organs.(2) Anemia can result from a wide range of underlying causes, including nutritional deficiencies, chronic diseases, genetic disorders, and blood loss. The classification of anemia is typically based on its underlying cause and the size and color of red blood cells, with the most common types being iron-deficiency anemia, vitamin B12 or folate deficiency anemia, and anemia of chronic disease.(3)

Understanding the prevalence and distribution of different types of anemia within a specific population is crucial for effective diagnosis, treatment, and prevention strategies. This study aims to investigate the frequency and types of anemia in a cohort of patients at a single healthcare center, providing insight into the most common forms of anemia in the region. By examining patient demographics, clinical features, and laboratory data, this study seeks to contribute valuable information to enhance anemia management at the local level and highlight potential areas for intervention.(4)

Anemia during pregnancy is a common condition that can significantly impact maternal and fetal health. It occurs when a pregnant woman has a reduced number of red blood cells or insufficient hemoglobin levels, limiting the blood's ability to carry oxygen to vital organs and tissues. Pregnancy-related anemia is often caused by an increased demand for iron, folate, and other nutrients needed to support the growing fetus and expanding blood volume. The most common type of anemia in pregnancy is iron-deficiency anemia, which arises when there is inadequate iron intake or poor iron absorption. As iron is essential for the production of hemoglobin, its deficiency can lead to fatigue, weakness, and even complications such as preterm birth or low birth weight if left untreated.(5)

In addition to iron deficiency, other forms of anemia can occur during pregnancy, including folate-deficiency anemia and vitamin B12 deficiency anemia. Folate is crucial for the formation of red blood cells, and a lack of it can lead to megaloblastic anemia. Vitamin B12 deficiency, though less common, can also result in similar symptoms. Anemia of chronic disease may also affect pregnant women with preexisting conditions such as autoimmune diseases or infections. The management of anemia during pregnancy typically involves dietary modifications, supplementation with iron and other vitamins, and regular monitoring of hemoglobin levels to ensure maternal and fetal well-being. Early detection and appropriate treatment are essential to prevent adverse outcomes and improve pregnancy outcomes.(6)

Methodology

This cross-sectional study was conducted at the Holy family Hospital Rawalpindi from November 2024 to October 2025, after permission from the Institutional Review Board was taken. Keeping the confidence level at 95%, the margin of error at 5% and taking the total population proportion to pregnant females 3% sample size of 45 was calculated. Non probability purposive sampling was employed.

Inclusion criterion: Pregnant patients with anaemia admitted in Obstetrics and Gynaecology department of Holy Family Hospital were included in the study.

Exclusion criteria: All the admitted patients due to other ailments in Gynaecology and Obstetrics ward of Holy Family were excluded in the study.

Informed written consent was ensured. History and examination was done. In history, presenting complains, past history, trimester of pregnancy, obestrtical history and socioeconomic status were included. In physical examination, pallor, jaundice, kylonikea, liver and spleen were checked.

5ml of venous blood was drawn under aseptic measures and kept in an EDTA vial. After adequate quality control, a blood CP card was obtained from KX-21 automated analyzer. Slides were stained with Giemsa stain, and peripheral blood examination was done under a microscope to rule out pseudo thrombocytopenia, dysplasia and the presence of blast cells. Serum ferritin, B12 and folate levels were done. Coombs test was done to rule out autoimmune homolysis.

Data was analysed on Statistical package for social sciences (SPPS) version 23.00. For analysis of qualitative variables, percentages and frequencies were calculated, whereas for quantitative variables, standard deviation and mean was calculated.

Results

Mean age of patients was 28.4 ± 5.5, Hb was 9.8 ± 1.2, Mean RBC count was 3.7 ± 0.6, Mean TLC count was 8.3 ± 4.0, Mean platelet count was 226 ± 114, mean MCV was 78.9 ± 9.2, mean MCH was 28.0 ± 8.4, mean MCHC was 31.3 ± 3.4, mean retic count was 1.9 ± 0.5, mean Serum ferritin levels were 32.9 ± 47.2, mean Serum B12 levels were 213.2 ± 49.2, mean folate levels were 6.9 ± 2.5. Iron defiency anemia was present in 19 patients (42%), vitamin B12 defiency was present in 3 patients (6%), folate deficiency was present in 3 patients (6%), 2 patients (4%) presented with Thalassemia trait. None of the patient presented with autoimmune hemolytic anaemia in our study population. 18 patients (40%) were having physiological anemia of pregnancy.

Discussion

Anemia is a common hematologic condition encountered during pregnancy and can have significant implications for both maternal and fetal health. The frequency of anemia during pregnancy is influenced by various factors, including the type of anemia, geographic location, dietary patterns, socio-economic status, and access to healthcare. Understanding the different types of anemia that occur during pregnancy is essential for identifying and managing the condition appropriately to reduce the risk of complications.(7)

Iron-deficiency anemia is the most common type of anemia during pregnancy. It occurs when there is insufficient iron to produce hemoglobin, a key component of red blood cells. Pregnancy increases the body's iron requirements due to the expansion of blood volume, fetal growth, and placental development. Studies suggest that up to 50% of pregnant women worldwide may be affected by iron-deficiency anemia, with higher prevalence rates observed in developing countries Our results of 42% are comparable to those studies. (8) (9)

Factors such as poor dietary intake of iron, increased blood volume, and the growing iron needs of the fetus contribute to the high frequency of IDA in pregnant women. Iron supplementation is commonly recommended to prevent and treat iron deficiency, and dietary counseling is often provided to ensure adequate intake of iron-rich foods, such as lean meats, legumes, and fortified cereals.(10)

Folate (vitamin B9) plays a critical role in DNA synthesis and the production of red blood cells. Folate deficiency can lead to megaloblastic anemia, characterized by the presence of abnormally large red blood cells. During pregnancy, the demand for folate increases to support the growing fetus and placental development. Folate deficiency is particularly common in regions where the diet is low in folate-rich foods such as leafy green vegetables, fruits, and fortified grains. The frequency of folate deficiency in our population was 6% which is comparable with other studies. (11, 12)

The folate-deficiency anemia in pregnancy is a significant concern, especially in the first trimester when neural tube defects in the fetus can occur due to insufficient folate intake. As a result, many healthcare providers recommend folic acid supplementation before conception and throughout pregnancy to reduce the risk of folate deficiency and its associated complications.(13)

Vitamin B12 is crucial for the production of red blood cells and the proper functioning of the nervous system. Although vitamin B12 deficiency is less common than iron or folate deficiency, it can occur in pregnancy, particularly in women following a vegetarian or vegan diet, as the primary sources of vitamin B12 are animal-based products. Deficiency in vitamin B12 during pregnancy can lead to megaloblastic anemia and has been associated with an increased risk of preterm birth, low birth weight, and neurological impairment in the fetus.

Research suggests that vitamin B12 deficiency affects a small but significant proportion of pregnant women, with rates varying based on dietary habits and geographical location. Supplementation with vitamin B12 is recommended for pregnant women at risk of deficiency, particularly those with poor dietary intake or malabsorption conditions. In our study population B12 deficiency was found in 3 patients (6%). The study results are comparable to indian study (14).

Hemolytic anemia, which occurs when red blood cells are destroyed prematurely, can be triggered by autoimmune diseases, infections, or inherited conditions such as hereditary spherocytosis. While rare, hemolytic anemia can complicate pregnancy and lead to significant maternal and fetal risks, including preterm birth and fetal anemia. Women with a history of hemolytic anemia may require close surveillance and management, including blood transfusions in severe cases (15). In our study population however none of the patients presented with autoimmune hemolytic anemia.

The global prevalence of anemia during pregnancy is alarmingly high, particularly in low-income and middle-income countries. According to the World Health Organization (WHO), anemia affects approximately 38% of pregnant women worldwide, with the highest rates seen in sub-Saharan Africa and South Asia. Iron deficiency is the leading cause of anemia in pregnancy, but nutritional deficiencies of folate and vitamin B12, as well as hereditary hemoglobinopathies, also contribute to the overall burden. (16)

Maternal anemia is associated with increased risks for adverse pregnancy outcomes, such as preterm birth, low birth weight, fetal growth restriction, and maternal morbidity. Anemia in pregnancy can also negatively impact a woman's quality of life, leading to fatigue, reduced physical capacity, and increased

susceptibility to infections. Therefore, timely screening, diagnosis, and appropriate management of anemia are essential to improve maternal and fetal health.(17)

Conclusion

Anemia during pregnancy is a prevalent and multifactorial condition that can have significant consequences for both maternal and fetal health. Iron-deficiency anemia is the most common type, but deficiencies in folate, vitamin B12, along with hereditary conditions like thalassemia, also contribute to the burden. Early detection through routine screening and appropriate interventions, including nutritional supplementation and managing underlying conditions, are critical to reducing the risks associated with anemia during pregnancy. Increased awareness, especially in high-risk populations, and public health measures to improve nutrition and prenatal care are essential steps toward addressing this widespread issue.

References

1. Kalaivani K (2009) Prevalence & consequences of anaemia in pregnancy. Indian J Med Res 130(5):627–633
2. Obeagu EI, Agreen FC (2023) Anaemia among pregnant women: A review of African pregnant teenagers
3. Ogunbode O, Ogunbode O (2021) Anaemia in pregnancy. Contemporary obstetrics and gynecology for developing countries. :321 – 30
4. Saapiire F, Dogoli R, Mahama S (2022) Adequacy of antenatal care services utilisation and its effect on anaemia in pregnancy. J Nutritional Sci 11:e80
5. Abaane DN, Adokiya MN, Abiiro GA (2023) Factors associated with anaemia in pregnancy: A retrospective cross-sectional study in the Bolgatanga Municipality, northern Ghana. PLoS ONE 18(5):e0286186
6. Kangalgil M, Sahinler A, Kırkbir IB, Ozcelik AO (2021) Associations of maternal characteristics and dietary factors with anemia and iron-deficiency in pregnancy. J Gynecol Obstet Hum Reprod 50(8):102137
7. Noronha JA, Al Khasawneh E, Seshan V, Ramasubramaniam S, Raman S (2012) Anemia in pregnancy-consequences and challenges: a review of literature. J South Asian Federation Obstet Gynecol 4(1):64–70
8. Mishra SK, Marasini S, Gupta BK, Agrawal KK, Gautam N (2018) Prevalence of iron deficiency anemia in anemic patients: A hospital based study. J Univers Coll Med Sci 6(2):41–45
9. Abbas S, Shah MM, Iftikhar M (2024) The Correlation of Red Cell Distribution Width With Peripheral Blood Smear: A Study From a Tertiary Care Hospital in Peshawar. Cureus. ;16(11)
10. Chaurasiya AK, Alam F, Patel AK, Manna S, Singh NK (2022) Iron Deficiency in Anemic Patients: Study in a Tertiary Care Centre. Med Phoenix 6(2):21–24

11. John SE, Azizi K, Hancy A, Twin'omujuni A, Katana D, Shine J et al (2023) The prevalence and risk factors associated with iron, vitamin B12 and folate deficiencies in pregnant women: A cross-sectional study in Mbeya, Tanzania. PLOS Global Public Health 3(4):e0001828
12. Gebremichael B, Roba HS, Getachew A, Tesfaye D, Asmerom H (2023) Folate deficiency among women of reproductive age in Ethiopia: a systematic review and meta-analysis. PLoS ONE 18(5):e0285281
13. Lazar VMA, Rahman S, Chowdhury NH, Hasan T, Akter S, Islam MS et al (2024) Folate deficiency in pregnancy and the risk of preterm birth: A nested case-control study. J global health 14:04120
14. Finkelstein JL, Fothergill A, Krisher JT, Thomas T, Kurpad AV, Dwarkanath P (2021) Maternal vitamin B12 deficiency and perinatal outcomes in southern India. PLoS ONE 16(4):e0248145
15. Maroto A, Martinez-Diago C, Tio G, Sagues M, Borrell A, Bonmati A et al (2022) Autoimmune hemolytic anemia in pregnancy: a challenge for maternal and fetal follow-up. J Maternal-Fetal Neonatal Med 35(5):996–998
16. Karami M, Chaleshgar M, Salari N, Akbari H, Mohammadi M (2022) Global prevalence of anemia in pregnant women: a comprehensive systematic review and meta-analysis. Matern Child Health J 26(7):1473–1487
17. Owais A, Merritt C, Lee C, Bhutta ZA (2021) Anemia among women of reproductive age: an overview of global burden, trends, determinants, and drivers of progress in low-and middle-income countries. Nutrients 13(8):2745

Figures

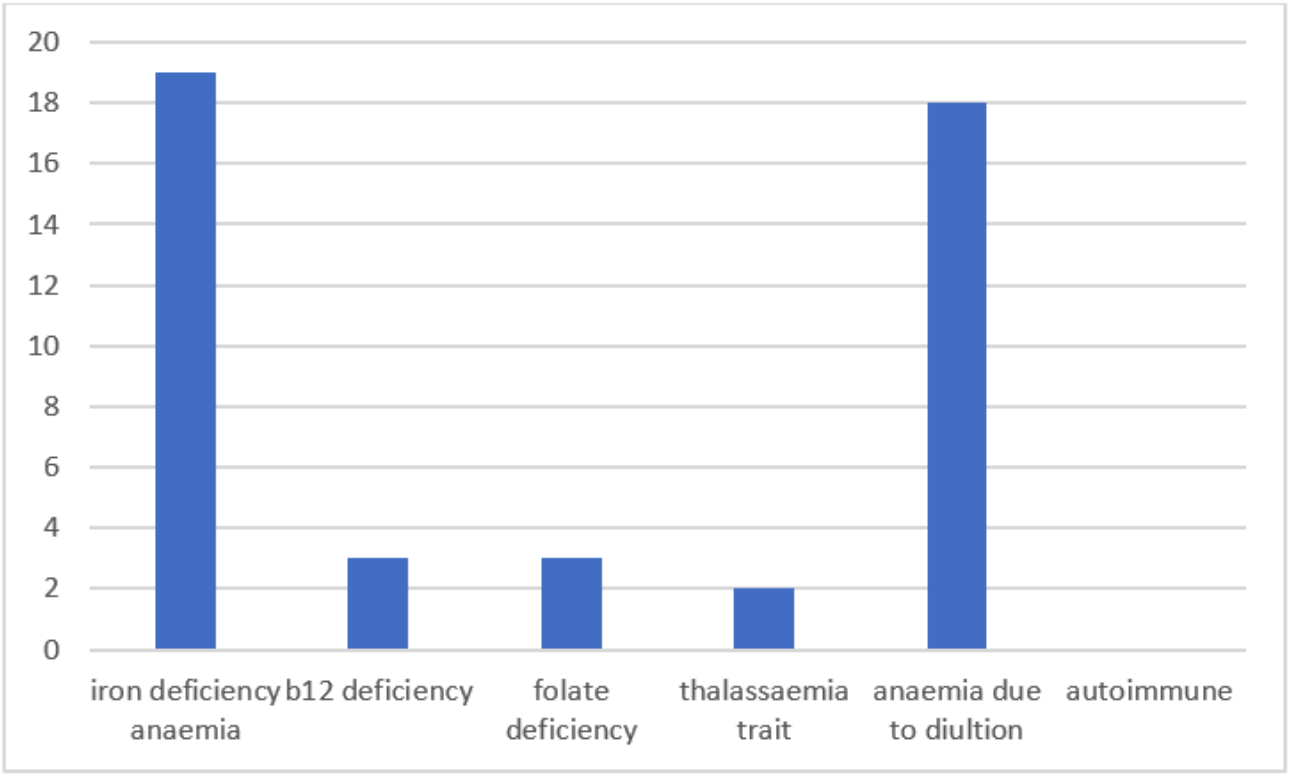


Figure 1

Frequency of various types of anaemias in pregnancy n=45