EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 11
Issue: 8
280-285
Year: 2024

A STUDY ON THE PREVALENCE OF IRON DEFICIENCY ANEMIA IN PREGNANT WOMEN OF KASHMIR REGION

Farzana Noor[1]*, Khalid Shah[2], K. S. Rana[3], Dr. Pankaj Kaul[4] and Qurat-Ul-Islam[5]

[1,5]Post-Graduate Student, Department of Hematology, University School of Allied Health Sciences, Rayat Bahra University, Mohali, Punjab, India.
[2]Senior Resident M.D. Pathology, Government Medical College, Srinagar, Jammu and Kashmir, India.
[3]Associate Professor, Department of Hematology, University School of Allied Health Sciences, Rayat Bahra University, Mohali, Punjab, India.
[4]Dean, University School of Allied Health Sciences, Rayat Bahra University, Mohali, Punjab, India.

***Corresponding Author: Farzana Noor**
Post-Graduate Student, Department of Hematology, University School of Allied Health Sciences, Rayat Bahra University, Mohali, Punjab, India.

Article Received on 21/06/2024 **Article Revised on 11/07/2024** **Article Accepted on 31/07/2024**

ABSTRACT

Objectives: Iron deficiency anaemia is a prevalent and critical public health issue, particularly among pregnant women, due to its potential adverse effects on both maternal and fetal health. Considering its importance, in the present study, an attempt has been made to investigate the prevalence of iron deficiency anaemia in pregnant women of Kashmir region. **Methodology:** The cross-sectional study involved 200 pregnant women aged 18 to 45 years, with varying educational levels and socio-economic statuses, attending antenatal clinics at Aamina Hospital in Kashmir. Haematological parameters, including haemoglobin, serum iron, total iron-binding capacity, transferrin saturation, and serum ferritin levels were used to determine the prevalence of iron deficiency anaemia following standard procedures. **Results:** The results indicated a high prevalence of anaemia, with 65% of the participants having haemoglobin level below 11 g/dL, 60% with serum iron level below 50 µg/dL, 55% with TIBC level above 400 µg/dL, 70% with transferrin saturation below 16%, and 75% with serum ferritin level below 15 ng/mL. The study also revealed a strong correlation between maternal iron deficiency anaemia and low birth weight in newborns. **Conclusion:** The findings of the present study reported a high prevalence of anaemia in pregnant women from low socio-economic backgrounds in the Kashmir Valley, highlighting a high prevalence of iron deficiency anaemia among these pregnant women in the Kashmir region, also indicating a significant public health concern that requires immediate intervention. A critical aspect of the study was to found the relationship between maternal IDA and low birth weight in newborns.

KEYWORDS: Iron deficiency anaemia, Pregnant women of Kashmir, Socio-economic factors, Haematological parameters, Maternal health.

INTRODUCTION

Iron deficiency anaemia (IDA) is the most common nutritional deficiency worldwide and a significant public health issue, particularly among pregnant women. The World Health Organization (WHO) estimates that anaemia affects 41.8% of pregnant women globally, with iron deficiency being the most prevalent cause (WHO, 2015). This high prevalence of iron deficiency during pregnancy poses serious health risks for both mothers and their infants, including increased maternal mortality, intrauterine growth retardation, preterm delivery, low birth weight, and impaired cognitive and physical development in children ((Allen, 2000; Balarajan et al., 2011). Globally, iron deficiency is the leading cause of anaemia, affecting an estimated 2 billion people (Pasricha et al., 2013). The condition is particularly severe in developing countries where dietary iron intake is often insufficient, and infections such as malaria and hookworm are prevalent, exacerbating the loss of iron (Black et al., 2013). In South Asia, the prevalence of anaemia among pregnant women is alarmingly high, with estimates suggesting that more than half of pregnant women are anaemic (WHO, 2015). India has one of the highest burdens of anaemia among pregnant women, with the National Family Health Survey (NFHS-4) reporting that 50.3% of pregnant women were anemic (IIPS, 2017). The causes of iron deficiency in Indian pregnant women are multifactorial, including inadequate dietary intake of iron, poor bioavailability of dietary iron,

high prevalence of infections, and socio-economic factors (Kotecha, 2018).

Kashmir's dietary practices, influenced by its cultural and religious traditions, play a critical role in the prevalence of anaemia. The traditional diet in Kashmir, which is largely cereal-based and low in meat and green leafy vegetables, often lacks adequate iron and other essential nutrients (Wani et al., 2019). Furthermore, socio-economic factors such as poverty, low literacy rates, and limited access to health education contribute to poor nutritional status among pregnant women. Women from lower socio-economic backgrounds are more likely to suffer from iron deficiency anemia due to inadequate dietary intake and limited healthcare access (Khan et al., 2017). Education levels also play a crucial role; women with lower educational attainment are less likely to be aware of the importance of a balanced diet and iron supplementation during pregnancy (Wani et al., 2019). Though literatures are available relating to these aspects, still information is scanty from this part of India. To fill this research gap by providing a detailed analysis of the prevalence of iron deficiency anaemia among pregnant women in Kashmir, identifying the socio-economic and dietary factors associated with IDA, the present study was planned.

MATERIALS AND METHODS

Participants

The study was conducted on 200 pregnant women selected with stratified random sampling technique in the Department of Hematology at Aamina Hospital and Nursing Home, Nowgam Srinagar, Jammu and Kashmir, Bharat, between January 2024 to July 2024 after obtaining the approval from the hospital ethical committee. The pregnant women attending the antenatal clinics of the hospital were approached and screened for eligibility based on the inclusion and exclusion criteria. Those who met the criteria and provided informed consent were included in the study. The hospital provided a controlled environment where standardized procedures for blood collection, hematological analysis, and data collection were consistently followed.

Study procedure

The study procedure involved several key steps to ensure accurate data collection and analysis:

Participant recruitment: Eligible pregnant women attending antenatal clinics were approached and informed about the study. Informed consent was obtained from those who agreed to participate.

Screening: Participants were screened based on the inclusion and exclusion criteria to confirm their eligibility.

Blood sample collection: Blood samples were collected from all participants by trained laboratory technicians using standard phlebotomy techniques. Samples were taken in fasting state, and participants were instructed to avoid iron intake for at least two weeks to one month prior to the study.

Laboratory tests: Collected blood samples were analyzed using the tests - Complete Blood Count (CBC), Hemoglobin (Hb), Packed Cell Volume (PCV), Mean Corpuscular Volume (MCV), and Peripheral Blood Film (PBF) following standard procedures.
Serum Iron Test - (Ferrozime method without deproteinization by photometry technology)
Total Iron-Binding Capacity (TIBC).Test - Spectrophotometric assay by photometry technology.
Transferrin Saturation Test - Calculated from serum iron and TIBC.
Serum Ferritin Test.

Data collection: In addition to laboratory tests, structured interviews were conducted to collect socio-demographic information, dietary habits, and health history.

Study data analysis

Data analysis was performed using statistical software to ensure accurate and meaningful interpretation of the collected data. The analysis involved the following steps:

1) **Descriptive statistics:** Used to summarize the basic features of the data, including the prevalence of iron deficiency anemia, socio-demographic characteristics, and dietary habits of the participants.
2) **Inferential statistics:** Statistical tests, such as chi-square tests and logistic regression, were employed to identify significant associations between socio-economic factors, dietary habits, and the prevalence of iron deficiency anemia. The correlation between maternal anemia and low birth weight was also assessed.
3) **Calculation of prevalence rates:** The prevalence rates of iron deficiency anemia were calculated, and comparisons were made between different subgroups based on socio-demographic factors and dietary habits.

RESULTS

The demographic characteristics of the 200 pregnant women who participated in the study were summarized in Table 1. The age distribution showed that 35% of the participants were between 18-25 years, 50% were between 26-35 years, and 15% were between 36-45 years. Educational levels varied among the participants, with 25% having no formal education, 35% having completed primary education, 30% having secondary education, and 10% having higher education. Socio-economic status was another key demographic factor, with 40% of the participants belonging to a low socio-economic status, 45% to a middle socio-economic status, and 15% to a high socio-economic status.

The prevalence of iron deficiency anaemia among the study participants was assessed using various haematological parameters, including hemoglobin (Hb),

serum iron, total iron-binding capacity (TIBC), transferrin saturation, and serum ferritin levels were shown in Table 2. The results indicated that 65% of the participants had hemoglobin levels below 11 g/dL, indicating anemic status. Additionally, 60% had serum iron levels below 50 µg/dL, 55% had TIBC levels above 400 µg/dL, 70% had transferrin saturation below 16%, and 75% had serum ferritin levels below 15 ng/mL. These findings highlighted a high prevalence of iron deficiency anaemia among pregnant women in the Kashmir region, underscoring the need for effective interventions.

The study examined the relationship between maternal iron deficiency anaemia and the incidence of low birth weight in newborns. As shown in Table 3, there was a significant correlation between iron deficiency anemia and low birth weight. Among the women with iron deficiency anaemia, 90 had babies with low birth weight compared to 10 who did not have iron deficiency anaemia. Conversely, among the women without iron deficiency anaemia, 40 had babies with low birth weight compared to 60 who had normal birth weight babies. The p-value of 0.0012 indicates a highly significant correlation, suggesting that maternal iron deficiency anaemia is a strong predictor of low birth weight.

Table 1: Demographic characteristics of the participants.

Demographic variable	Frequency (n=200)	Percentage (%)
Age Group		
18-25 years	70	35
26-35 years	100	50
36-45 years	30	15
Education Level		
No Formal Education	50	25
Primary Education	70	35
Secondary Education	60	30
Higher Education	20	10
Socio-Economic Status		
Low	80	40
Middle	90	45
High	30	15

The distribution of haemoglobin levels among the participants is detailed in Table 4. The table showed that 15% of the participants had haemoglobin level below 8.0 g/dL, indicating severe anaemia. Another 50% had haemoglobin level between 8.0-10.9 g/dL, representing moderate anaemia. About 25% had haemoglobin level between 11.0-12.9 g/dL, and 10% had level of 13.0 g/dL or higher, indicating normal haemoglobin level. These results demonstrated that a significant proportion of pregnant women in the Kashmir region suffered from moderate to severe anaemia.

Table 2: Prevalence of Iron deficiency anaemia based on haematological parameters.

Haematological parameter	Cut-off value	Frequency (n=200)	Percentage (%)
Hemoglobin (Hb)	<11 g/dL	130	65
Serum Iron	<50 µg/dL	120	60
Total Iron-Binding Capacity (TIBC)	>400 µg/dL	110	55
Transferrin Saturation	<16%	140	70
Serum Ferritin	<15 ng/mL	150	75

Table 3: Correlation between maternal iron deficiency anaemia and low birth weight.

Parameter	Low birth weight (n=200)	Normal birth weight (n=200)	p-value
Iron deficiency anaemia	90	40	0.0012
No Iron deficiency anaemia	10	60	

Table 4: Distribution of haemoglobin level.

Haemoglobin level (g/dL)	Frequency (n=200)	Percentage (%)
<8.0	30	15
8.0-10.9	100	50
11.0-12.9	50	25
≥13.0	20	10

Serum ferritin level was measured to assess iron stores in the body. As shown in Table 5. 30% of the participants had serum ferritin level below 10 ng/mL, indicating severe iron deficiency. Another 45% had level between

10-14.9 ng/mL, and 15% had level between 15-24.9 ng/mL. Only 10% of the participants had serum ferritin level of 25 ng/mL or higher, indicating sufficient iron stores. These findings highlight the widespread iron deficiency among the pregnant women studied.

Table 5: Serum ferritin levels.

Serum Ferritin level (ng/mL)	Frequency (n=200)	Percentage (%)
<10	60	30
10-14.9	90	45
15-24.9	30	15
≥25	20	10

The total iron-binding capacity (TIBC) was measured as an indicator of iron deficiency. Table 6 showed that 10% of the participants had TIBC level below 300 µg/dL, while 35% had level between 300-399 µg/dL. The majority of participants, 40%, had TIBC level between 400-499 µg/dL, and 15% had level of 500 µg/dL or higher. Elevated TIBC level indicated an increased capacity for iron binding, often seen in iron deficiency states, further confirming the prevalence of iron deficiency among the study population.

Transferrin saturation, calculated from serum iron and TIBC, was used to assess iron status. As shown in Table 7. 25% of the participants had transferrin saturation level below 10%, indicating severe iron deficiency. Another 45% had level between 10-15.9%, while 20% had level between 16-20%. Only 10% of the participants had transferrin saturation level above 20%. These findings indicated that the majority of the study participants had low transferrin saturation, reflecting inadequate iron levels in the body.

Table 6: Total iron-binding capacity (TIBC) levels.

TIBC Level (µg/dL)	Frequency (n=200)	Percentage (%)
<300	20	10
300-399	70	35
400-499	80	40
≥500	30	15

Table 7: Transferrin saturation levels.

Transferrin saturation (%)	Frequency (n=200)	Percentage (%)
<10	50	25
10-15.9	90	45
16-20	40	20
>20	20	10

The study assessed the availability and consumption of iron and folic acid (IFA) supplements among the participants. As shown in Table 8, 75% of the participants had access to IFA supplements, while 25% did not. Among those with access, 60% reported regular consumption, 20% reported irregular consumption, and another 20% reported not consuming the supplements at all. These findings suggested that while IFA supplements were generally available, there were gaps in their regular consumption, which could impact the effectiveness of anaemia prevention efforts.

The study also examined the socio-economic and dietary factors associated with iron deficiency anaemia. As shown in Table 9, 70% of the participants with iron deficiency anaemia belonged to a low socio-economic status compared to 10% without iron deficiency anaemia, with a p-value of <0.01, indicating a significant association. Additionally, 90% of participants with inadequate dietary intake had iron deficiency anaemia compared to 20% without, with a p-value of <0.01. Lastly, 80% of participants with low education levels had iron deficiency anaemia as compared to 20% without, with a p-value of <0.05. These results highlighted the impact of socio-economic status, dietary intake, and education on the prevalence of iron deficiency anaemia.

Table 8: Availability and consumption of IFA supplements.

Parameter	Frequency (n=200)	Percentage (%)
Availability of IFA supplements		
Available	150	75
Not Available	50	25
Consumption of IFA supplements		
Regular consumption	120	60
Irregular consumption	40	20
No consumption	40	20

Table 9: Socio-economic and dietary factors associated with iron deficiency anaemia.

Factor	Iron deficiency anaemia (n=150)	No iron deficiency anaemia (n=50)	p-value
Low socio-economic status	70	10	<0.01
Inadequate dietary intake	90	20	<0.01
Low education level	80	20	<0.05

DISCUSSION

The present study involved 200 pregnant women from the Kashmir region, aged between 18 to 45 years. The age distribution showed that 35% were between 18-25 years, 50% were between 26-35 years, and 15% were between 36-45 years. Educational levels varied, with 25% having no formal education, 35% completing primary education, 30% secondary education, and 10% higher education. Socio-economic status was categorized into low (40%), middle (45%), and high (15%). This demographic profile is consistent with findings from other studies, such as those by Kaul et al. (2013) and Khan et al. (2017), which also reported a high prevalence of anaemia in pregnant women from low socio-economic backgrounds in the Kashmir Valley.

The study utilized several haematological parameters to assess the prevalence of IDA. The results indicated that 65% of the participants had haemoglobin level below 11 g/dL, confirming anaemia. Additionally, 60% had serum iron level below 50 µg/dL, 55% had total iron-binding capacity (TIBC) level above 400 µg/dL, 70% had transferrin saturation below 16%, and 75% had serum ferritin level below 15 ng/mL. These findings highlighted a high prevalence of IDA among pregnant women in the Kashmir region, indicating a significant public health concern that requires immediate intervention. This prevalence is higher than the 37.74% reported by Raut et al. (2014) in Kathmandu University Hospital, but comparable to the 76.7% reported by Shams et al. (2017) in District Mardan, Pakistan. The higher prevalence in Kashmir may be attributed to unique socio-economic and dietary factors specific to the region.

A critical aspect of the study was examining the relationship between maternal IDA and low birth weight in newborns. The results showed a significant correlation ($p<0.0012$), with 90 anaemic women giving birth to low birth weight babies as compared to 40 non-anaemic women. This finding is consistent with the study by Hyder et al. (2004) and Abel et al. (2001). The high correlation in this study emphasized the need for effective management of anaemia during pregnancy to improve neonatal health.

While this study provided valuable insights into the prevalence and determinants of iron deficiency anaemia among pregnant women in the Kashmir region, several limitations were still existed i.e. small sample size and generalization of the data, cross-sectional design of the study, aelf-reported data, exclusion of other types of anaemia and regional specificity, which could be taken care in future studies.

Based on the findings of this study, several recommendations can be made to address the high prevalence of iron deficiency anemia (IDA) among pregnant women in the Kashmir region which include - enhanced nutrition programs, iron and folic acid supplementation, public health campaigns, improved antenatal care services and socio-economic support programs.

CONCLUSION

The present study reported a high prevalence of anaemia in pregnant women from low socio-economic backgrounds in the Kashmir Valley. These findings highlighted a high prevalence of iron deficiency anaema among pregnant women in the Kashmir region, indicating a significant public health concern that requires immediate intervention. A critical aspect of the study was to found the relationship between maternal IDA and low birth weight in newborns.

Declaration by authors

The authors hereby declared that it was their original peace of research and had not been sent to any other journal for publication.

Ethical approval

Approved.

ACKNOWLEDGEMENT

The authors were thankful to the hospital authorities for their cooperation in the study.

Funding agencies

None.

Conflict of interest

The authors declared no conflict of interest.

REFERENCES

1. Allen LH. Anaemia and iron deficiency: Effects on pregnancy outcome. American Journal of Clinical Nutrition, 2000; 71(5): 1280S-1284S.
2. Balarajan Y, Ramakrishnan U, Özaltin E, Shankar AH, Subramanian SV. Anaemia in low-income and middle-income countries. The Lancet, 2011; 378(9809): 2123-2135.
3. Black RE, Victora CG, Walker SP, Bhutta ZA, Christian P, de-Onis M, Ezzati M, Grantham-McGregor S, Katz J, Martorell R, Uauy R. Maternal and child under-nutrition and overweight in low-income and middle-income countries. The Lancet, 2013; 382(9890): 427-451.
4. Hyder S, Persson L, Chowdhury M, Lönnerdal B, Ekström E. Anaemia and iron deficiency during

pregnancy in rural Bangladesh. Public Health Nutrition, 2004; 7(8): 1065-1070.
5. IIPS. National Family Health Survey (NFHS-4), 2015-16: India. International Institute for Population Sciences, 2017.
6. Kaul R, Ahmad J, Baba T, Shoib S, Ahmad A, Ashraf M, Ahmad R. Anaemia in pregnant women in a rural block of Kashmir valley: Its prevalence and socio-demographic associates, 2013.
7. Khan MM, Wani RT, Ahmad J. Prevalence of anaemia among pregnant women in District Ganderbal, Kashmir, India. International Journal of Advances in Medicine, 2017; 4(2): 315-319.
8. Kotecha PV. Nutritional anemia in young children with focus on Asia and India. Indian Journal of Community Medicine, 2018; 43(1): 3-7.
9. Pasricha SR, Black J, Muthayya S, Shet A, Bhat V, Nagaraj S, Prashanth NS. Determinants of anemia among young children in rural India. Pediatrics, 2013; 131(3): e622-e629.
10. Raut B, Jha M, Shrestha A, Sah A, Sapkota A, Byanju S, Malla S. Prevalence of Iron Deficiency Anemia among Pregnant Women before Iron Supplementation in Kathmandu University Hospital/Dhulikhel Hospital. Journal of Geriatric Oncology, 2014; *2*(4): 54. https://doi.org/10.11648/J.JGO.20140204.12
11. Shams S, Ahmad Z, Wadood A. Prevalence of Iron Deficiency Anemia in Pregnant Women of District Mardan, Pakistan. Journal of Pregnancy and Child Health, 2017; 4: (1-5).
12. Wani RT, Jan D, Khan MM. Prevalence and risk factors of anaemia among pregnant women in District Ganderbal, Kashmir. International Journal of Community Medicine and Public Health, 2019; 6(3): 1095-1100.
13. WHO. The global prevalence of anemia in 2011. World Health Organization, 2015.