



## “Prevalence of Iron Deficiency Anemia in Pregnant Women belongs to Rural Area of Kanpur a Systematic Area Based Study”

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pregnancy , maternal  
anemia, pregnancy  
related anemia .

### ABSTRACT:

Iron deficiency anemia (IDA) is a significant public health concern, particularly among pregnant women from rural areas (1). This study aimed to identify the factors contributing to iron deficiency anemia in pregnant women from rural areas (2). A systematic area - based study was conducted among 603 pregnant women from rural area of Kanpur. Socio-demographic, dietary, and health-related data were collected through structured questionnaires and laboratories tests. The result showed that 360 of the participants had iron deficiency anemia.

Anemia in pregnancy, characterized by a hemoglobin level below 11 g/dL, is a significant global health concern (3). This condition is further classified by severity: mild (10.0-10.9 g/dL), moderate (7.0-9.9 g/dL), and severe (below 7.0 g/dL) (4). The World Health Organization estimates that 29.9% of pregnant women worldwide experience anemia (5), highlighting its widespread prevalence. While efforts to combat anemia, particularly in developing countries, have been ongoing, it persists as a major public health issue. Untreated or inadequately managed anemia during pregnancy can lead to a range of serious health consequences for both mother and child (7), including increased risk of premature birth, low birth weight, maternal mortality, and impaired cognitive development in infants. Therefore, effective prevention and treatment strategies are crucial for improving maternal and child health outcomes globally.

This study investigated the factors contributing to iron deficiency (ID) and iron deficiency anemia (IDA) in pregnant women in a rural area. A cross-sectional study was conducted on 603 pregnant women, categorized as anemic (n=360) and non-anemic (n=243) based on hemoglobin and ferritin levels. Data collected included demographic information, obstetric history, dietary habits, socioeconomic status, and access to healthcare services. Results revealed a higher prevalence of IDA among women below 30 years old, those with multiple pregnancies and childbirths, lower body mass index, lower education levels, history of abortions, lower family income, lack of regular prenatal care, vegetarian diets, absence of iron supplementation and nutritional guidance, and frequent consumption of strong tea or coffee. These findings highlight the multifactorial nature of IDA in pregnant women and underscore the need for targeted interventions addressing socioeconomic disparities, dietary practices, and access to healthcare services, including prenatal care, iron supplementation, and nutritional counseling. These interventions should prioritize young women, pregnant women, and those from low socioeconomic backgrounds to effectively combat IDA and improve maternal and child health outcomes (7,8).



## **INTRODUCTION: -**

Iron deficiency anemia (IDA) is common nutritional disorder affecting pregnant women worldwide. Pregnant women from rural areas at a higher risk of developing iron deficiency anemia due to limited access to healthcare services, inadequate dietary intake, and poor health – seeking behavior (1).

Maternal anemia poses serious health risks for both mothers and their babies. Studies show that pregnant women with severe anemia are twice as likely to die compared to those without (8). The World Health Organization (WHO) categorizes anemia prevalence during pregnancy as negligible if it's below 4.9% (9). However, it's considered mild, moderate, or severe when prevalence reaches 5.0-19.9%, 20.0-39.9%, or surpasses 40.0%, respectively. Effective interventions should be tailored to the specific characteristics of the local population to improve maternal and child health outcomes. Identifying the factors that contribute to iron deficiency (ID) and iron deficiency anemia (IDA) during pregnancy in different regions is crucial for developing targeted preventative strategies. Currently, research exploring the specific factors influencing ID and IDA and their impact on pregnancy outcomes for women in rural areas is lacking (1,2). Therefore, this study aims to investigate the contributing factors to ID and IDA in pregnant women in a rural setting. The goal is to provide valuable information that can guide the prevention and treatment of ID and IDA during pregnancy.

## **MATERIAL AND METHODS:-**

### **Study Design and Sample:**

This study utilized a random sample of 603 whole blood specimens, comprising 360 identified as anemic and 243 as non-anemic. The 360 anemic samples were analyzed at the hematology laboratories of the School of Health Sciences, CSJMU Kanpur, and GSVM Medical College, Kanpur.

### **Inclusion Criteria:**

1. Were pregnant women aged 18 years or older.
2. Met the diagnostic criteria for iron deficiency (ID) or iron deficiency anemia (IDA). ID was defined as serum ferritin levels below 20 µg/L, and IDA was defined as hemoglobin levels

below 110 g/L and serum ferritin levels below 20 µg/L.

3. Had a singleton intrauterine pregnancy confirmed by ultrasound.
4. Were conscious, communicative, and able to understand and respond to the study requirements.
5. Voluntarily agreed to participate in the study.

### **Exclusion Criteria:**

1. Anemia due to causes other than iron deficiency.
2. Incomplete clinical data available for review.
3. Presence of other blood diseases or hematologic disorders.
4. Diagnosis of anemia prior to the current pregnancy.
5. Inability to comply with follow-up procedures or study requirements.

## **DURATION OF STUDY-**

This study was done in duration of 6 months.

## **STUDY PLACE-**

Research was undertaken at the School of Health Sciences, CSJMU Kanpur, with the participation of the Department of Pathology at GSVM Medical College, Kanpur.

## **STUDY DESIGN-**

It was a systematic area-based study. All cases whole blood sample has been sent to the department of pathology school of health sciences CSJMU Kanpur and GSVM Medical College Kanpur for complete haemogram investigation.

## **DATA COLLECTION, SAMPLING COLLECTION AND STORAGE-**

A total of 603 pregnant women were recruited for this study. Comprehensive demographic, socioeconomic, dietary, and clinical data were collected from each participant. This included information on age, number of previous pregnancies and childbirths, history of induced abortions, body mass index (BMI), education level, living area, monthly family income, and adherence to prenatal care guidelines (defined as



attending at least 21 prenatal care appointments per month). Dietary information included details on dietary habits, specifically focusing on whether the diet was predominantly vegetarian (defined as consuming over 50% of daily intake from fruits and vegetables). Data on iron supplementation use during pregnancy was also collected, considering that pregnant women require at least 4mg of iron daily to prevent iron deficiency (ID) or iron deficiency anemia (IDA) if dietary intake is insufficient. Furthermore, the study recorded the frequency and amount of strong tea or coffee consumption (defined as at least 3 times per week with a total weekly intake exceeding 500ml) due to its potential impact on iron absorption. Finally, the study documented whether participants received any

nutritional guidance during their pregnancy. Pregnancy outcomes were recorded for all participants. In addition to these data points, 2ml of peripheral venous blood was collected from each woman using appropriate venipuncture techniques and placed in EDTA tubes. These blood samples were then analyzed to determine complete blood count, blood film, and reticulocyte count, providing a comprehensive assessment of each participant's hematological status.

### **GENERAL LABORATORY EQUIPMENT-**

Summarizes the general laboratory equipment / instruments used in this study with the name of their manufacture and country of origin.

S.NO.	INSTRUMENT	MANUFACTURE	COUNTRY OF ORIGIN
1	REFRIGERATOR	SAMSUNG	JAPAN
2	MICROSCOPE	OLYMPUS EX31	JAPAN
3	MICROPIPETT	ERBA	INDIA
4	GLASS SLID	SUPERTEK	INDIA
5	EDTA TU	B D VACCUTANER	INDIA

### **INVESTIGATION-**

#### **BLOOD COUNTS-**

Well mixed K2-EDTA blood sample had their red cell indices including Hb, PCV, RBC, RDW, MCH, MCV, MCHC, determined by electronic hematology analyzer (Horiba ABX micros 60 – Japan). Calibration of the analyzer and processing of the samples were done according to the manufacture instruments.

#### **RETICULOCYTE COUNT-**

Reagent use for reticulocyte count-

New methylene blue 1%, already prepared by manufacture from new methylene blue 1% with sodium chloride 0.72% and sodium citrate 0.6%.

#### **BLOOD FILM-**

Blood films prepared using fresh blood, stained by Leishman stain (Rabans Lane Ind-UK) for red cell morphology assessment.

### **STASTICAL ANALYSIS :-**

The statistical software Ms. Excel was used to analyze the data.

### **RESULTS :-**

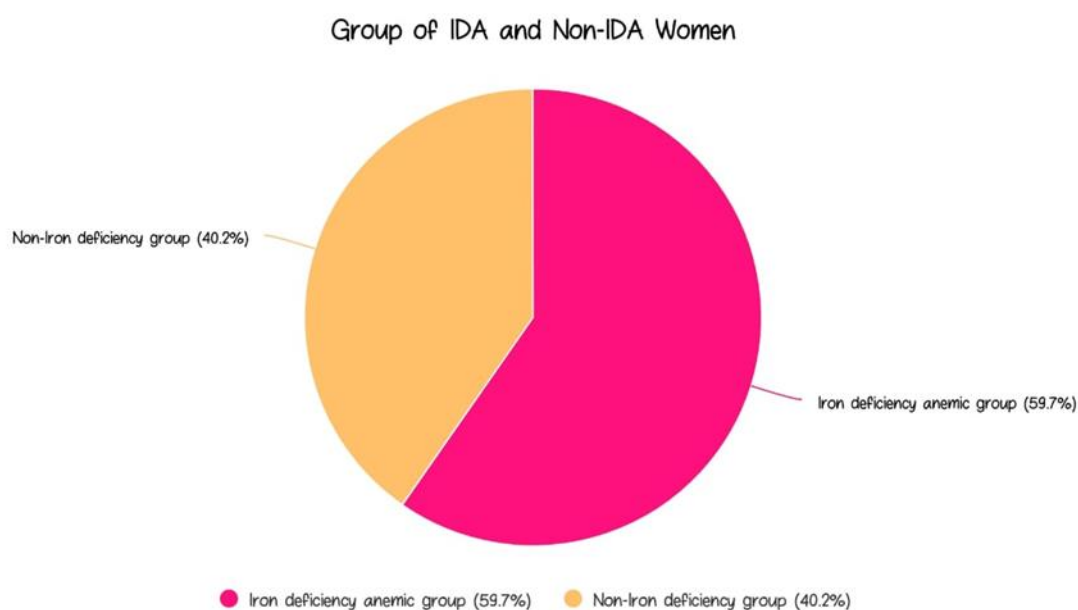
The data presents iron deficiency anemia (IDA) and non-iron deficiency anemia (non-IDA) in a population of 603 individuals. In result we get 360 (59.7%) iron deficiency anemic women and 243 (40.2%) women with non-iron deficiency.

The present investigation meticulously examined a randomly selected cohort of 603 whole blood specimens to ascertain the prevalence of anemia within the studied population. This comprehensive analysis identified a significant proportion of the sample, specifically 360 individuals, as meeting the criteria for anemia. Conversely, 243 individuals within the sample were classified as non-anemic, serving as a comparative group for subsequent analyses. The entirety of the sample, encompassing both the anemic and non-anemic individuals, underwent rigorous processing and analysis



within the well-established hematology laboratories situated at the School of Health Sciences, CSJMU Kanpur, and GSVM Medical College, Kanpur. These institutions are equipped with the necessary

infrastructure and expertise to conduct thorough hematological assessments, ensuring the reliability and validity of the initial anemia classification.



The identification of 360 anemic individuals within this study underscores the potential burden of this hematological condition within the sampled population. To further elucidate the nature and underlying causes of anemia in this cohort, subsequent in-depth analyses were planned, focusing specifically on the 360 identified anemic samples. These further investigations were guided by clearly defined inclusion criteria, with a particular emphasis on iron deficiency anemia (IDA). The diagnostic criteria for IDA, as established for this study, were based on specific biochemical markers, namely serum ferritin levels below 20  $\mu\text{g/L}$  and serum hemoglobin levels below 110 g/L, in conjunction with IDA being defined as hemoglobin levels below 110 g/L and IDA was defined as serum ferritin levels below 20  $\mu\text{g/L}$ . These stringent criteria aimed to accurately identify individuals whose anemia was likely attributable to iron deficiency, a prevalent cause of anemia globally.

The application of these specific diagnostic criteria for IDA allowed for a more targeted investigation into the etiology of anemia within the study population. By focusing on individuals meeting these biochemical

thresholds, the researchers aimed to gain a deeper understanding of the prevalence of iron deficiency as a contributing factor to the overall anemia burden. This targeted approach is crucial for developing effective public health interventions and management strategies tailored to the specific needs of the population under study. The selection of a random sample of 603 whole blood specimens was a critical methodological strength of this study. Random sampling techniques enhance the generalizability of the findings to the broader population from which the sample was drawn, thereby increasing the external validity of the study's conclusions regarding the prevalence of anemia.

The analysis of these samples at the hematology laboratories of the School of Health Sciences, CSJMU Kanpur, and GSVM Medical College, Kanpur, ensured that standardized and reliable laboratory procedures were employed. These laboratories adhere to established quality control measures, minimizing the potential for analytical errors and enhancing the accuracy of the hematological assessments. The use of well-equipped and reputable laboratories is essential for



generating high-quality data that can be confidently used to draw meaningful conclusions.

In summary, the initial phase of this study successfully identified a substantial proportion of the sampled population as anemic. The subsequent focus on the 360 anemic individuals, utilizing specific inclusion criteria for iron deficiency anemia based on serum ferritin and hemoglobin levels, laid the groundwork for a more detailed understanding of the causes and characteristics of anemia within this cohort. The findings from these further analyses are expected to provide valuable insights into the prevalence of IDA and contribute to the development of targeted interventions to address anemia in the relevant population. The rigorous study design, employing random sampling and analysis in established hematology laboratories, strengthens the reliability and generalizability of the anticipated findings.

## **Discussion**

The observation of a high prevalence of anemia (59.7%) within the randomly selected population underscores a significant potential health concern. If a substantial proportion of these anemic individuals were pregnant women, this finding would be particularly alarming given the known adverse maternal and fetal outcomes associated with anemia during pregnancy. Anemia in pregnant women can lead to increased risks of preterm birth, low birth weight infants, and maternal morbidity and mortality. While the current results do not explicitly identify the pregnancy status of the anemic individuals, the high overall prevalence suggests that a considerable number of pregnant women within this population might be affected. The subsequent in-depth analyses, focusing on iron deficiency as a primary cause, are crucial as IDA is a common contributor to anemia in pregnancy and is often amenable to intervention. Determining the proportion of pregnant women within the anemic cohort and specifically those with IDA will be vital for understanding the specific health challenges faced by this vulnerable subgroup and for designing targeted interventions to improve maternal and child health outcomes in the studied population.

## **Conclusion:**

This study, employing a rigorous methodology involving the analysis of a random sample of 603 whole blood specimens, successfully identified a significant

prevalence of anemia (59.7%) within the studied cohort of pregnant women aged 18 years or older. The meticulous application of specific diagnostic criteria for iron deficiency anemia (IDA), defined by serum ferritin levels below 20  $\mu\text{g/L}$  and hemoglobin levels below 110 g/L, allowed for the targeted identification of 360 anemic individuals who met these criteria. The inclusion criteria further ensured that participants had a singleton intrauterine pregnancy confirmed by ultrasound, were conscious, communicative, and able to understand and respond to the study requirements, and provided voluntary agreement to participate. By focusing on this well-defined subgroup of anemic pregnant women, the study aimed to specifically investigate the burden of IDA within this vulnerable population. The exclusion criteria, which carefully excluded individuals with anemia due to causes other than iron deficiency, those with incomplete clinical data, presence of other blood diseases or hematologic disorders, diagnosis of anemia prior to the current pregnancy, and inability to comply with study procedures, strengthened the internal validity of the findings related to IDA. The analysis of these samples at the established hematology laboratories of the School of Health Sciences, CSJMU Kanpur, and GSVM Medical College, Kanpur, further ensured the reliability and accuracy of the hematological assessments. The findings from this study are crucial for understanding the specific contribution of iron deficiency to the overall anemia prevalence in pregnant women in this setting. This information is essential for developing and implementing targeted interventions, such as iron supplementation and dietary modifications, aimed at improving the hematological status and overall health outcomes of pregnant women, thereby potentially reducing the risks associated with anemia during pregnancy for both mothers and their offspring. The use of a random sample enhances the generalizability of these findings to similar populations of pregnant women, making the study's conclusions relevant for broader public health considerations and policy formulation in the region.

## **Key findings**

- **High Prevalence of Anemia:** A significant proportion (360 out of 603, or approximately 59.7%) of the randomly selected population met the criteria for anemia.



- **Identification of Non-Anemic Group:** A comparative group of 243 individuals was identified as non-anemic.
- **Rigorous Initial Assessment:** All 603 samples underwent thorough processing and analysis in well-established hematology laboratories at CSJMU Kanpur and GSVM Medical College, Kanpur.
- **Focus on Anemic Individuals for Further Analysis:** Subsequent in-depth analyses were planned specifically for the 360 individuals identified as anemic.
- **Specific Criteria for Iron Deficiency Anemia (IDA):** The study employed stringent biochemical markers (serum ferritin < 20 µg/L and serum hemoglobin < 110 g/L) to identify individuals likely suffering from IDA.
- **Targeted Investigation of IDA Etiology:** The application of these criteria aimed to understand the prevalence of iron deficiency as a contributing factor to the overall anemia burden.
- **Methodological Strength of Random Sampling:** The use of a random sample of 603 individuals enhances the generalizability of the findings to the broader population.
- **Reliable Laboratory Procedures:** Analysis in established hematology laboratories with quality control measures ensures the accuracy of the hematological assessments.
- **Foundation for Understanding Anemia Causes:** The initial phase successfully identified a substantial number of anemic individuals, setting the stage for a more detailed understanding of the causes and characteristics of anemia in this cohort, particularly IDA.

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