

# Etiology of Anemia in Adult Males in a South Indian Tertiary Care Hospital: A Clinical Study

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## Abstract

**Objective:** Anaemia is a prevalent health condition with various etiological factors, contributing significantly to morbidity and mortality. This study investigates the causes of anaemia in adult male patients admitted to a tertiary care hospital in South India, with a focus on understanding the prevalence of different aetiologies and their impact on public health.

**Methods:** This was a descriptive cross-sectional study conducted over a period of 18 months. A total of 75 male patients diagnosed with anaemia were included. Detailed clinical histories were obtained, followed by comprehensive laboratory investigations, including complete blood count (CBC), serum iron studies, vitamin B12 and folic acid levels, stool occult blood test (SOBT), endoscopy, and bone marrow aspiration.

**Results:** The majority of patients were aged between 51-60 years (32.0%). Iron deficiency anaemia (IDA) was the most common aetiology, found in 37.3% of patients, followed by haematological malignancies (28.0%) and vitamin B12 deficiency (17.3%). Gastrointestinal (GI) malignancies were identified in 16.0% of cases. Peripheral smear examinations revealed microcytic hypochromic RBCs in 53.3% of cases. Endoscopic findings were normal in 82.6% of patients, and bone marrow examination revealed megaloblastic erythroid hyperplasia in 37.1% of cases.

**Conclusions:** The study highlights iron deficiency anaemia as the leading cause of anaemia in adult males in our patient cohort, followed by haematological malignancies and vitamin B12 deficiency. Public health initiatives should focus on improving nutrition, early diagnosis, and management of anaemia, particularly in middle-aged and older male populations. Further studies are needed to explore the multifactorial aetiology and long-term outcomes of anaemia in this demographic.

**Keywords:** Anemia, Males, South India, Iron Deficiency.

## Introduction

Anaemia, a condition marked by insufficient red blood cells or hemoglobin, is a widespread global

health issue with significant implications for public health. It is a major contributor to morbidity and mortality, especially in low- and middle-income

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countries, where it disproportionately affects vulnerable populations.<sup>1</sup> The causes of anaemia are multifactorial and can vary by age, sex, and socio-economic factors.<sup>2</sup> In developed countries, common causes include anaemia of chronic disease (ACD), iron deficiency anaemia (IDA), renal anaemia, and vitamin B12 or folic acid deficiencies.<sup>3,4</sup> However, in developing nations, anaemia is often linked to nutritional deficiencies, parasitic infections, and chronic illnesses, which complicates the diagnostic process.<sup>5</sup> Several common causes of anaemia include iron deficiency, haematological malignancies, vitamin B12 and folic acid deficiencies, as well as gastrointestinal (GI) malignancies and chronic kidney disease (CKD).<sup>6</sup>

In India, anaemia continues to remain a critical health challenge, with a high prevalence across both genders, though its causes are not always clearly identified.<sup>7</sup> The incidence of anemia in adult Indian males is estimated to range between 25% and 30%. It is predominantly associated with dietary deficiencies, especially iron, and is commonly observed in individuals with chronic illnesses.<sup>8,9</sup> In the clinical setting, the diagnosis of anaemia typically involves a combination of laboratory tests, including complete blood count (CBC), iron studies, and vitamin and mineral level assessments. Bone marrow aspiration may be used to further investigate haematological causes of anaemia, providing valuable insights into the underlying mechanisms.<sup>10</sup> While various studies have focused on anaemia across different populations, there is limited research on the specific aetiologies of anaemia in adult males in the South Indian region.<sup>11</sup> This lack of detailed data hampers the development of effective public health strategies aimed at addressing anaemia in this group.

Therefore, the aim of this study was to identify and analyze the aetiological factors contributing to anaemia in male patients admitted to a tertiary medical center in Tamilnadu which could inform future interventions that address the public health burden of anaemia in this demographic.

## Methods

### *Study Design*

This study was a descriptive cross-sectional investigation conducted over 18 months, from

[August 2022 ] to [September 2024] at a tertiary care institution located in South India. The study aimed to evaluate the aetiology of anaemia in adult male patients using a comprehensive diagnostic approach that included clinical evaluation, laboratory testing, and advanced diagnostic procedures such as bone marrow aspiration. The study was conducted in compliance with ethical standards, and informed consent was obtained from all participants.

### *Sample Size Calculation*

According to the study by Oliver Didzun et al., the prevalence of anaemia among men was estimated to be 23.2%.<sup>12</sup> Using this estimate (p), a precision of 10% (d) and a confidence level of 95% (Z = 1.96), the sample size was calculated using the formula  $n = Z^2 * p * (1 - p) / d^2$  which is used for cross-sectional studies similar to the current study. A 10% non-response rate was expected - therefore the final sample size was adjusted to 75.

### *Study Population*

The study included male patients who were diagnosed with anaemia based on blood tests including low haemoglobin levels and were admitted to the hospital during the study period. Only patients who consented to participate were included. Exclusion criteria included female patients, individuals with a history of gastrointestinal malignancies or chronic kidney disease, and those with established diagnoses of haematological disorders or other conditions that could clearly explain anaemia. Participants were selected using a convenience sampling method, ensuring that all individuals who met the inclusion criteria and agreed to participate were included. Demographic and clinical data were collected from all subjects upon admission. Ethical clearance for the study was obtained from the Institutional Ethics Committee of our institution.

### *Methods of Data Collection*

After obtaining informed consent, patient data were collected through structured interviews, including medical history, lifestyle factors, and socioeconomic status. A clinical examination was conducted, and blood samples were taken for laboratory testing. Tests included a Complete Blood Count (CBC) and peripheral smear to classify anaemia

and detect abnormalities, iron studies to diagnose iron deficiency anaemia (IDA), and measurements of vitamin B12 and folate levels to identify deficiencies. Bone marrow aspiration was performed in selected cases to assess for haematological disorders, and endoscopic investigations (GI scopy and colonoscopy) were done to check for gastrointestinal causes of anaemia. All results were documented for further analysis.

#### *Statistical Analysis*

Data collected from patient interviews and diagnostic tests were entered into Microsoft Excel and then analyzed using SPSS software (Version 27.0). Continuous variables were presented as means and standard deviations (SD), while categorical variables were expressed as frequencies and percentages. Visual representations of data, including bar charts.

## **Results**

#### *Demographic and Clinical Characteristics*

The study included 75 male patients, with an age range from 18 to 80 years. The majority of patients were in the age group of 51-60 years (32.0%), followed by those under 30 years of age (21.3%). A significant portion (20.0%) of patients were between the ages of 31 and 40, and 13.3% were in the 41-50 and over 61 age groups (**Table 1**). These findings suggest that anaemia is a condition that affects individuals across all age groups, with a notable prevalence in middle-aged men.

#### *Haematological Parameters*

The mean haemoglobin level among the patients was 6.87 g/dL, which is indicative of severe anaemia. Other haematological parameters such as serum ferritin ( $105.35 \pm 48.11$ ), transferrin saturation ( $27.52 \pm 7.51\%$ ), and TIBC ( $368.88 \pm 96.03$ ) suggest that iron deficiency played a significant role in the anaemia observed in this study population (**Table 2**). Other causes were also identified as described in the Diagnostic Impressions section.

#### *Peripheral Smear Findings*

The distribution of patients based on peripheral smear findings revealed that the most common abnormality observed was microcytic hypochromic

red blood cells (RBCs), found in 40 patients, which accounted for 53.3% of the study population. The second most frequent finding was dimorphic RBCs, seen in 10 patients (13.3%). Other notable abnormalities included macrocytic RBCs (5.3%), and increased counts with predominant blast cells or myeloid lineage, each found in 3 patients (4.0%). Plasma cells were identified in 3 patients (4.0%), and rouleaux formation with plasma cells was observed in 2 patients (2.7%). Additionally, normocytic RBCs with plasma cells, lymphocytosis with smudge cells, and normocytic normochromic RBCs were noted in 2 patients each (2.7%). Lymphocytosis with basophilia, marked lymphocytosis, and megaloblastic anaemia were the least common findings, each observed in only 1 patient (1.3%). This distribution underscores the varied hematological abnormalities associated with anaemia in the study population, with a predominance of microcytic hypochromic anaemia.

#### *Stool Occult Blood Test (SOBT) and Endoscopic Findings*

The majority of patients (86.7%) showed negative results on the stool occult blood test, suggesting that gastrointestinal bleeding was not a major contributor to anaemia in this cohort. Only 13.3% of patients tested positive for occult blood, which may point to underlying gastrointestinal issues that require further investigation.

The distribution of patients based on gastrointestinal endoscopy findings showed that 57 of the 75 patients (82.6%) had a normal endoscopic examination. Sigmoid growth was observed in 6 patients, accounting for 8.7% of the population. Caecal and fundus growth were each identified in 2 patients (2.9% each). Gastric growth and prepyloric ulcer were each observed in 1 patient (1.4%). These findings suggest that most of the patients did not show significant abnormalities on endoscopic examination, with a small proportion exhibiting various types of growth in the gastrointestinal tract.

#### *Bone Marrow Findings*

Bone marrow aspiration was performed on a subset of patients, and the majority (37.1%) exhibited megaloblastic erythroid hyperplasia, which is commonly associated with vitamin B12 or folate deficiencies. Other findings included increased plasma cells (20.0%) and mature myeloid

lymphocytosis (11.4%). These results highlight the potential role of both nutritional deficiencies and haematological disorders in the aetiology of anaemia in this cohort (Table 3).

#### Diagnostic Impressions

As shown in Table 4, analysis of the final diagnosis that was made for the patients in our cohort indicated that 37.3% of patients had iron deficiency anaemia (IDA), followed by 28.0% with haematological malignancies. Vitamin B12 deficiency was identified in 17.3% of patients, and gastrointestinal malignancies were suspected in 16.0% of patients. Folic acid deficiency was found in a very small number of patients (2.7%).

**Table 1: Age range of enrolled patients**

		No of Patients	Percentage
AGE	< 30	16	21.3%
	31-40	15	20%
	41-50	10	13.3%
	51-60	24	32%
	> 61	10	13.3%

**Table 2: Haematology parameters of enrolled patients**

Parameter	Mean $\pm$ SD
CBC-Hb	6.87 $\pm$ 1.36
S. Ferritin	105.35 $\pm$ 48.11
Transferrin Saturation	27.52% $\pm$ 7.51%
TIBC	368.88 $\pm$ 96.03
Vitamin B12	267.95 $\pm$ 136.58
Folic Acid	7.47 $\pm$ 2.25

**Table 3: Distribution of patients based on bone marrow findings**

Bone Marrow Findings	No. of Patients	Percentage
Megaloblast erythroid	13	37.1%
> 20% Plasma cell	7	20.0%
Mature myeloid lymphocytosis	4	11.4%
Mature lymphocytosis with no blast cell	3	8.6%
Myeloblast cell	3	8.6%
Lymph node biopsy - RS cell with lymphocytosis	2	5.7%

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Dysplasia cell	1	2.9%
Hypercellular marrow	1	2.9%
Predominantly blast cell	1	2.9%

**Table 4: Distribution of patients based on impression**

Impression	No. of Patients	Percentage
IDA (Iron Deficiency Anaemia)	28	37.3%
Haematological malignancy	21	28.0%
Vitamin B12 deficiency	13	17.3%
GI malignancy	12	16.0%
Folic acid deficiency	2	2.7%

#### Discussion

Anaemia is a multifactorial condition recognized to be an emerging public health challenge and its aetiology can vary significantly across populations.<sup>13</sup> In this study, the most common cause of anaemia in male patients was iron deficiency, which is consistent with findings from similar studies both nationally as well as in South India.<sup>14,15</sup> The prevalence of iron deficiency anaemia (IDA) highlights the importance of ensuring adequate dietary intake of iron, as well as addressing other contributing factors such as gastrointestinal bleeding or malabsorption.

The second most common cause of anaemia in this cohort was haematological malignancy, which accounts for a significant proportion of cases in older adults. A previous study conducted in Haryana also indicated that hematological and solid tissue malignancies may be a significant cause of anemia in adult males.<sup>16</sup> The presence of megaloblastic erythroid hyperplasia in the bone marrow, along with elevated plasma cells, suggests that nutritional deficiencies, particularly vitamin B12 and folate, were also contributing factors. Further investigation into the nutritional status of patients in this region is needed, as deficiencies in these essential vitamins are common in populations with limited access to diverse foods.

Despite the prevalence of iron deficiency, other causes such as vitamin B12 deficiency, gastrointestinal malignancies, and haematological disorders should

not be overlooked. The study's findings underscore the importance of a comprehensive diagnostic approach that includes both laboratory and clinical evaluations, as well as advanced tests such as bone marrow aspiration and endoscopy.

In terms of public health implications, this study suggests the need for increased awareness and screening for anaemia, particularly in middle-aged and older male populations. Public health initiatives should focus on improving nutrition, promoting early diagnosis, and providing appropriate treatments for conditions like IDA and vitamin B12 deficiency.

### Conclusion

In conclusion, the study provides valuable insights into the aetiology of anaemia in male patients in South India, with iron deficiency anaemia emerging as the most common cause. Haematological malignancies, vitamin B12 deficiency, and gastrointestinal malignancies also contribute significantly to the overall burden of anaemia. Public health strategies should aim to address these factors through improved nutrition, early detection, and targeted interventions.

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**Informed Consent:** All patients in this study were enrolled after their full and informed consent which was provided by them after a study information sheet was read by/read to them.

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