CODEN [USA]: IAJPBB ISSN : 2349-7750

INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES

SJIF Impact Factor: 7.187

https://doi.org/10.5281/zenodo.18140337

Available online at: http://www.iajps.com *Research Article*

ASSESSMENT OF IRON DEFICIENCY ANEMIA IN COPD PATIENTS AND EFFECTS OF IRON SUPPLEMENTATION - AN OBSERVATIONAL STUDY

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Abstract:

Background: *Chronic Obstructive Pulmonary Disease (COPD) is a long-term lung disease that often affects overall health. Many COPD patients also suffer from anemia, which reduces the blood's ability to carry oxygen and can worsen breathlessness and tiredness. This problem is often overlooked in routine care.*

Methodology: *This observational study included 60 COPD patients aged 40 years and above. Blood tests were done to check hemoglobin and iron levels. Patients with anemia were further tested to find the type of anemia. Those with iron deficiency anemia received iron supplements for eight weeks, and their blood values were rechecked.*

Results: *Anemia was found in 41.66% of COPD patients. Iron deficiency anemia and anemia of chronic disease were almost equally common. Iron treatment significantly improved hemoglobin and iron levels.*

Conclusion: *Anemia is common in COPD and iron treatment is effective. Regular anemia screening should be part of COPD care.*

Keywords: *COPD, Anemia, Iron deficiency, Iron supplementation, Lung function*

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Please cite this article in ***press Yagvendra Pandey et al., Assessment Of Iron Deficiency Anemia In Copd Patients And Effects Of Iron Supplementation - An Observational Study,*** *Indo Am. J. P. Sci, 2026; 13(01).*

INTRODUCTION:

Chronic Obstructive Pulmonary Disease (COPD) is a respiratory ailment that continues over time and slowly makes it harder for a person to breathe.[1] The main causes of this condition are smoking, air pollution, and long-term inhalation of chemical or dust particles. Being one of the most significant causes of sickness and death globally, it is a disease that has a huge impact not only on patients and their families but also on the health care system. The common symptoms seen in patients with COPD are breathlessness, coughing with sputum, feeling of heaviness in the chest, and lack of energy.[2] Progression of the disease leads to frequent hospitalizations and constant needs for help in doing even the simplest day-to-day activities. Lately, the medical community has started recognizing COPD not only as a lung disorder but also as a condition that affects the entire body.[3]

In addition to harming the lungs, COPD comes with a lot of other health issues which are called comorbidities. They consist of heart disorders, diabetes, osteoporosis, depression, and blood-related disorders. One of the most common and yet underrated conditions is anemia. Anemia is a condition in which the hemoglobin level in the blood is low leading to a decreased capacity of the blood to supply oxygen to the tissues of the body.[4] The connection between COPD and increased red blood cells due to low oxygen levels was the traditional thought process, however, current research has revealed that anemia is in fact much more common.[5] The improvement in oxygen therapy and the infiltration of long-term inflammation in COPD are the factors responsible for this change. Anemia can contribute to breathing difficulties, weakness, and fatigue thus making the life of a patient with COPD more unmanageable.[6] Anemia occurs in COPD due to various factors. The most significant is chronic inflammation that affects iron absorption and production of red blood cells. Besides that, poor diet, frequent infections, long-term use of medications, and chronic diseases are also factors that lead to anemia. Patients with COPD usually exhibit two main types of anemia: iron deficiency anemia and anemia of chronic disease.[7] Iron deficiency anemia happens when there is not enough iron in the body to produce hemoglobin, while anemia of chronic disease is the result of prolonged inflammation. Both types of anemia have the same impact on the body, i.e., they reduce oxygen delivery and may thus enhance lung symptoms, decrease exercise tolerance, and negatively affect the quality of life in patients with COPD.[8]

Anemia, despite its impact, often goes unnoticed in routine management of COPD. A lot of patients just receive treatment for respiratory symptoms, leaving the underlying anemia untreated. Research indicates that anemia correction especially iron deficiency increases the level of hemoglobin, decreases the feeling of breathlessness, and also improves the strength and well-being of patients.[9] On the other hand, evidence regarding the prevalence of anemia and the importance of iron supplementation in COPD patients is very scarce, especially in the Indian demographic. Thus, the present study is aimed at the assessment of iron-deficiency anemia in COPD patients and the evaluation of iron supplementation effects on blood parameters with an objective to enhance comprehensive COPD care.[10]

MATERIALS AND METHODS:

Study Design and Setting : This observational study was conducted over a period of six months in the Department of General Medicine of a tertiary care teaching hospital in Agra, India.

Study Population : A total of 60 patients diagnosed with COPD were enrolled using a universal sampling method.

Inclusion Criteria

1. Both male and female patients.
2. Patients aged 40 years and above with clinical and radiological findings suggestive of COPD.
3. Patients with spirometry-confirmed COPD.
4. Participants willing to provide informed consent and comply with study procedures.

Exclusion Criteria

1. Patients with severe systemic disease, including:
o History of malignancy.
o Renal failure.
o Heart failure.
o Bronchial asthma.
2. Recent history of blood transfusion within the past three months.
3. Immunosuppressed patients or those who tested HIV positive.
4. Patients unable to perform spirometry.
5. Patients who dropped out during the study period.

Complete study process : This observational study was conducted over six months in a tertiary care hospital to assess iron deficiency anemia in patients with chronic obstructive pulmonary disease (COPD). Sixty spirometry-confirmed COPD patients aged 40 years and above were enrolled after obtaining informed consent. Demographic data, clinical details, and spirometric values were recorded. Hemoglobin estimation was performed for all patients, and anemic patients underwent iron profile analysis to classify anemia type. Patients diagnosed with iron deficiency anemia received oral iron supplementation for eight weeks. Pre- and post-treatment hemoglobin and serum ferritin levels were compared using

appropriate statistical tests to evaluate treatment effectiveness.

Classification of Anemia

- **Iron Deficiency Anemia (IDA):** Low ferritin, low serum iron, increased TIBC
- **Anemia of Chronic Disease (ACD):** Normal/increased ferritin, low serum iron

Intervention : Patients diagnosed with IDA received oral iron supplementation (ferrous sulfate 100 mg/day) for 8 weeks.

Statistical Analysis : Data were analyzed using SPSS version 22. Descriptive statistics were used. Chi-square test, one-way ANOVA, and paired t-test were applied where appropriate. A p-value <0.05 was considered statistically significant.

RESULTS:

Table 1: Demographic Characteristics and Baseline Clinical Parameters of Study Population

Parameter	Mean ± SD / Value
Age (years)	52
Weight (kg)	54.78
Height (cm)	156.36
Body Mass Index (kg/m²)	22.4
FEV_1 (%)	50.85

Table 1 shows the basic details of the 60 COPD patients included in the study. The average age was 52 years. Mean body weight was 54.78 kg and mean height was 156.36 cm. The average body mass index was 22.4 kg/m². Mean lung function (FEV_1) was 50.85%, indicating moderate airflow limitation.

Table 2: Age Distribution and Severity of Airway Obstruction

Age Group (years)	No. of Patients (%)	Mean FEV_1 (%) ± SD
41–50	26 (43.33%)	70.25 ± 12.64
51–60	22 (36.67%)	66.45 ± 15.67
61–70	12 (20.00%)	64.25 ± 13.45
ANOVA p-value		0.2922 (NS)

Table 2 explains how lung function varied across different age groups. Most patients were aged 41–50 years (43.33%), followed by 51–60 years (36.67%). Mean FEV_1 values slightly decreased with age, from 70.25% to 64.25%, but this difference was not statistically significant (p = 0.2922).

Table 3: Prevalence of Anemia and Its Association with Gender and COPD Severity

Parameter	Anemic n (%)	Non-anemic n (%)	p-value
Overall prevalence	25 (41.66%)	35 (58.33%)	—
Gender			
Male	14 (56%)	13 (37.14%)	NS
Female	11 (44%)	22 (62.85%)	NS
COPD Severity			
Mild	15 (60%)	12 (34.28%)	
Moderate	10 (39.9%)	13 (37.14%)	0.009
Severe	0 (0%)	10 (28.57%)	

Table 3 shows that 25 out of 60 COPD patients (41.66%) were anemic, while 35 (58.33%) were non-anemic. Anemia was more common in males (56%). A significant association was observed between anemia and COPD severity, especially in mild and moderate stages (p = 0.009).

Table 4: Association Between BMI and Severity of Airway Obstruction in Non-Anemic COPD Patients

Severity of Airway Obstruction	Mean BMI (kg/m²) ± SD
Mild	23.96 ± 1.20
Moderate	22.16 ± 3.28
Severe	17.04 ± 1.27

Table 4 demonstrates the relationship between BMI status and COPD severity in non-anemic patients. Mean BMI decreased as disease severity increased, from 23.96 kg/m² in mild cases to 17.04 kg/m² in severe cases. This suggests that worsening COPD is associated with poorer nutritional status.

Table 5: Distribution of Anemia Type and Its Association with Pulmonary Function in COPD Patients

Anemia Type	Number of Patients (n)	Mean FEV_1 (%) ± SD	p-value
Anemia of Chronic Disease (ACD)	13	50.85 ± 11.56	
Iron Deficiency Anemia (IDA)	12	54.80 ± 8.80	0.757 (NS)

Table 5 presents the types of anemia observed in COPD patients. Anemia of chronic disease was found in 13 patients, while iron deficiency anemia was present in 12 patients. Mean FEV_1 was slightly higher in iron deficiency anemia (54.80%) than ACD (50.85%), with no significant difference (p = 0.757).

Table 6: Effect of Iron Supplementation in Iron Deficiency Anemia Patients

Parameter	Pre-treatment	Post-treatment	p-value
Hemoglobin (g/dL)	<9.0	<11.61	
Serum Ferritin (ng/mL)	76.03	129.2	<0.0001

Table 6 shows the effect of iron treatment in iron-deficient COPD patients. Hemoglobin levels improved from less than 9.0 g/dL before treatment to less than 11.61 g/dL after treatment. Serum ferritin levels increased from 76.03 ng/mL to 129.2 ng/mL, showing significant improvement (p < 0.0001).

DISCUSSION:

Our COPD patients were mostly middle-aged (mean 52 years) with near-normal nutrition (BMI 22.4 kg/m²) and moderate airflow limitation (FEV_1 50.85%). Still, anemia was common (41.66%, 25/60). This is higher than the 17% anemia reported in the large stable COPD outpatient cohort by Cote et al. (n=683), suggesting our hospital population may have more inflammation or poor reserves. A North-Indian COPD study also reported anemia around 31.6%, closer to our setting, but still lower than our rate—showing anemia burden can vary by region and patient type.[11,12]

In our study, anemia frequency (41.66%) is also higher than many hospital-based estimates. John et al. found anemia in about 23% of hospitalized COPD patients, indicating that even in admitted cases anemia is important, but rates differ across centers and definitions. In Iran, Attaran et al. reported 16.3% anemia (mostly normocytic-normochromic), much lower than ours. Differences may be due to sample size, COPD severity mix, local nutrition, and how anemia/iron deficiency was diagnosed. Overall, our data supports that anemia screening should not be ignored in COPD clinics.[13,14]

We also saw anemia linked with COPD severity (p=0.009), meaning anemia status changed noticeably across mild/moderate/severe categories. Iron-related problems in COPD are increasingly reported: Pizzini et al. discussed iron deficiency and anemia as frequent findings even in "real-life" stable outpatient COPD and related them to clinical burden. In our anemic group, ACD (13) and IDA (12) were almost equal, and lung function difference by anemia type was small (FEV_1 50.85% vs 54.80%, p=0.757). Similar to our results, Silverberg et al. emphasized iron deficiency is often missed in COPD, but correcting it can improve blood markers and symptoms.[15,16]

After iron supplementation, hemoglobin improved from <9.0 g/dL to <11.61 g/dL, and ferritin rose from 76.03 to 129.2 ng/mL (p<0.0001). This matters because better hemoglobin means better oxygen delivery and less "breathing effort." Older physiologic work by Schönhofer et al. showed that raising hemoglobin (via transfusion) can reduce minute ventilation and work of breathing in anemic COPD, supporting the idea that correcting anemia eases respiratory load. Long-term outcome data also supports this importance: Chambellan et al. found hematocrit strongly predicted survival in severe COPD on long-term oxygen therapy.[17,18]

CONCLUSION:

This study shows that anemia is very common in patients with chronic obstructive pulmonary disease (COPD), affecting about 4 out of every 10 patients. Many patients had either iron deficiency anemia or anemia caused by long-standing illness. Anemia was more often seen in patients with more severe lung disease and was linked to poorer overall health. Importantly, giving iron supplements to patients with iron deficiency significantly improved their hemoglobin and iron levels. This means their blood could carry oxygen better, which may help reduce breathlessness and weakness. Regular screening for anemia and timely iron treatment should be included in routine COPD care to improve patient health and quality of life.

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