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Original Research Article

Prevalence of anemia and its association with dyspnea in chronic lung disease: A pilot observational study

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Abstract

Background: Anemia is a frequently underrecognized comorbidity in chronic lung disease (CLD) and may exacerbate dyspnea. This pilot study aimed to evaluate the prevalence of anemia and its association with dyspnea severity, systemic inflammation, and functional exercise capacity in patients with CLD.

Materials and Methods: A cross-sectional observational study was conducted among 22 adult patients with confirmed CLD (COPD, ILD, or bronchiectasis). Hemoglobin levels, C-reactive protein (CRP), and erythrocyte sedimentation rate (ESR) were measured. Dyspnea was assessed using the modified Medical Research Council (mMRC) scale, and functional status via the 6-minute walk test (6MWT). Statistical tests included chi-square, t-tests, and Spearman's correlation.

Results: Anemia was observed in 54.5% of patients. The anemic group had significantly lower hemoglobin levels (10.2 ± 1.1 vs. 13.6 ± 0.9 g/dL, $p < 0.001$), higher mMRC scores (3.2 ± 0.8 vs. 2.1 ± 0.6, $p = 0.03$), elevated CRP (18.4 ± 5.7 vs. 9.2 ± 3.2 mg/L, $p = 0.004$), and ESR (45.3 ± 9.6 vs. 28.4 ± 10.1 mm/hr, $p = 0.002$), and reduced 6MWT distances (276 ± 48 vs. 370 ± 56 m, $p = 0.002$). Hemoglobin inversely correlated with mMRC ($r = –0.57$), CRP ($r = –0.54$), and ESR ($r = –0.51$), and positively with 6MWT ($r = 0.59$).

Conclusion: Anemia is prevalent in CLD and is associated with increased dyspnea, systemic inflammation, and impaired functional capacity. Routine assessment of hemoglobin and inflammatory markers may enhance clinical management.

Keywords: Chronic lung disease, Anemia, Dyspnea, Modified medical research council scale, 6-minute walk test (6MWT), C-reactive protein, Erythrocyte sedimentation rate.

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1. Introduction

Chronic lung diseases (CLDs), including chronic obstructive pulmonary disease (COPD), interstitial lung disease (ILD), and bronchiectasis, are characterized by persistent respiratory symptoms, progressive airflow limitation, and substantial morbidity. These conditions contribute significantly to global respiratory disease burden, leading to frequent hospitalizations, reduced quality of life, and increased healthcare utilization.[1,2]

Among the various symptoms associated with CLDs, dyspnea or shortness of breath remains one of the most distressing and function-limiting. Dyspnea is influenced by physiological impairments, comorbidities, and psychological factors, ultimately driving activity limitation and poor health status.[2,3]

Anemia, a frequently under-recognized comorbidity, exacerbates disease burden by reducing blood oxygen-carrying capacity, worsening hypoxemia, and compounding exercise limitation.[4-7] Several studies demonstrate that anemia in COPD and other CLDs is associated with increased dyspnea severity, reduced exercise tolerance, higher mortality, and poor quality of life.[4-8] Despite this, anemia is rarely included in routine CLD management protocols.

The mechanisms of anemia in CLD are multifactorial. Inflammation-driven anemia of chronic disease (ACD) plays a central role, with interleukin-6–induced hepcidin overproduction impairing iron mobilization and

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erythropoiesis.[6-9] Nutritional deficiencies, chronic hypoxemia, and systemic comorbidities also contribute.

This pilot study aimed to evaluate the prevalence of anemia in CLD patients and explore associations with dyspnea severity, systemic inflammation, and functional exercise capacity. Identifying these links could highlight the importance of integrating anemia screening and management into the comprehensive care of CLD patients.

2. Materials and Methods

2.1. Study design and population

A cross-sectional study was conducted in a tertiary pulmonary clinic on 22 adult patients (>18 years) diagnosed with COPD, ILD, or bronchiectasis. Exclusion criteria included acute exacerbation within the last 4 weeks, blood transfusion within 3 months, or known hematologic/renal disease.

2.2. Data collection

1. Hemoglobin measured using automated haematology analysers.
2. Anemia defined as Hb <13 g/dL (males) and <12 g/dL (females).
3. CRP and ESR were measured to assess inflammation.
4. Dyspnea was graded using the modified MRC scale.
5. Functional capacity was assessed using standard 6MWT protocols.

2.3. Statistical analysis

Continuous variables were compared using independent t-tests, and categorical data via chi-square tests. Correlation analyses were performed using Spearman's rank correlation. A p-value <0.05 was considered significant.

3. Results

This table summarizes the demographic and baseline clinical features of the study cohort, including diagnosis type, hemoglobin, dyspnea scores, inflammatory markers, and exercise capacity.(**Table 1**)

Table 1: Baseline demographic and clinical characteristics of the study population (n = 22)

Variable	Value
Mean Age (years)	62.1 ± 8.4
Male:Female	14:8
Diagnosis – COPD / ILD / Bronchiectasis	12 / 6 / 4
Mean Hemoglobin (g/dL)	11.9 ± 1.9
Anemia Prevalence	12 (54.5%)
Mean mMRC Score	2.7 ± 0.9
Mean CRP (mg/L)	14.2 ± 6.8
Mean ESR (mm/hr)	38.0 ± 12.5
Mean 6MWT Distance (m)	316 ± 61

This table demonstrates significant associations of anemia with lower hemoglobin, worse dyspnea, higher systemic inflammation, and reduced exercise capacity.(**Table 2**)

Table 2: Comparison of clinical and functional parameters between anemic and non-anemic patients

Parameter	Anemic (n=12)	Non-Anemic (n=10)	p-value
Hemoglobin (g/dL)	10.2 ± 1.1	13.6 ± 0.9	<0.001
mMRC Score	3.2 ± 0.8	2.1 ± 0.6	0.03
CRP (mg/L)	18.4 ± 5.7	9.2 ± 3.2	0.004
ESR (mm/hr)	45.3 ± 9.6	28.4 ± 10.1	0.002
6MWT Distance (m)	276 ± 48	370 ± 56	0.002

This table highlights that anemia prevalence increased with advancing dyspnea severity, being most common in mMRC grades 3 and 4.(**Table 3**)

Table 3: Distribution of anemia across mMRC dyspnea grades

mMRC Grade	Total Patients	Anemic Patients	Prevalence (%)
0	1	0	0%
1	3	1	33.3%
2	7	2	28.6%
3	6	5	83.3%
4	5	4	80.0%

Table 4: Distribution of chronic lung diseases and anemia status in the study population

Diagnosis	Total Patients (n=22)	Patients with Anemia (n=12)	Prevalence of Anemia (%)
COPD	12 (54.5%)	7	58.3%
ILD	6 (27.3%)	3	50.0%
Bronchiectasis	4 (18.2%)	2	50.0%
Total	22 (100%)	12	54.5%

This new table shows the breakdown of anemia prevalence across COPD, ILD, and bronchiectasis, providing disease-specific context.(**Table 4**)

As shown in **Table 4**, COPD was the most common diagnosis, followed by ILD and bronchiectasis. Anemia was prevalent across all groups, affecting more than half of COPD patients and 50% of both ILD and bronchiectasis patients. This distribution emphasizes that anemia is a shared comorbidity across different types of chronic lung disease, not restricted to a single diagnostic group.

2.4. Correlation analysis

1. Hemoglobin vs. mMRC: r = –0.57, p = 0.006
2. Hemoglobin vs. CRP: r = –0.54, p = 0.01
3. Hemoglobin vs. ESR: r = –0.51, p = 0.012
4. Hemoglobin vs. 6MWT distance: r = 0.59, p = 0.005

4. Discussion

Our study demonstrated a high prevalence of anemia in patients with chronic lung diseases, which is higher than rates reported in many previous COPD-only cohorts. This likely reflects the inclusion of patients with interstitial lung disease and bronchiectasis, conditions where systemic inflammation and nutritional deficiencies may further predispose to anemia. Importantly, our study found that anemia was associated with significantly higher dyspnea scores, elevated inflammatory markers, and reduced functional exercise capacity as measured by the 6-minute walk test. Hemoglobin correlated negatively with dyspnea severity and positively with walking distance, underscoring its direct clinical impact on both symptoms and functional status in this population.

These findings align with earlier studies. John et al. reported that anemia in COPD exacerbates hypoxemia and worsens breathlessness.[1] Mannino et al. found that anemia prevalence in COPD is between 10% and 30% and is linked to increased mortality and hospitalizations.[4] Cote et al. showed that low hemoglobin independently predicted poorer outcomes in COPD,[5] while Halpern et al. demonstrated that anemia is associated with higher costs and mortality.[8] Our results extend these observations to a broader CLD cohort, highlighting that the burden of anemia may be even greater when ILD and bronchiectasis are included.

Mechanistically, our findings of elevated CRP and ESR in anemic patients support the role of systemic inflammation in driving anemia. Ganz and Nemeth described how IL-6–induced hepcidin degrades ferroportin, restricting iron availability and impairing erythropoiesis.[6] Silverberg et al. similarly showed that anemia correction improves systemic outcomes across chronic inflammatory conditions.[9] Agustí and Faner emphasized the contribution of systemic inflammation to COPD comorbidities, including anemia.[10] By demonstrating elevated inflammatory markers in anemic CLD patients, our study provides additional evidence that inflammation-driven anemia of chronic disease plays a key role.

Functionally, our study confirmed that lower hemoglobin is associated with higher dyspnea severity and poorer exercise performance. This supports the work of Ferrari et al., who showed that reduced hemoglobin correlates with diminished exercise tolerance and quality of life,[7] and Casanova et al., who demonstrated that walking distance and desaturation predict long-term mortality.[11] Gáldiz et al. also observed that dyspnea strongly predicts impaired health-related quality of life.[3] Together with these studies, our findings reinforce that hemoglobin is a critical determinant of both symptoms and functional reserve in CLD.

The broader literature emphasizes that COPD is a systemic disease with extrapulmonary manifestations. Agustí and Soriano noted that comorbidities such as anemia, muscle dysfunction, and cachexia share inflammatory pathways.[12] Barnes and Celli described systemic manifestations as key contributors to morbidity.[13] Yohannes and Alexopoulos highlighted the link between anemia, fatigue, and depression in COPD patients.[14] In line with these observations, our study suggests that anemia should not be regarded as a minor laboratory abnormality, but rather as a clinically significant systemic feature of chronic lung disease.

Therapeutically, our findings support routine screening for anemia in CLD management. Silverberg et al. showed that correcting anemia improves outcomes in chronic disease,[9] and Casanova et al. stressed the sensitivity of the 6-minute walk test as a functional measure.[11] Halpin et al. emphasized that GOLD guidelines now recommend systematic assessment and treatment of comorbidities, including anemia.[15] Pulmonary rehabilitation, as highlighted by multiple authors, offers synergistic benefits by combining exercise training with nutritional interventions that may improve hemoglobin levels.[11,13] Our results suggest that integrating anemia screening and targeted interventions into rehabilitation programs could enhance functional outcomes for CLD patients.

In summary, our study adds to the growing evidence that anemia is a prevalent and clinically important comorbidity in chronic lung diseases. It worsens dyspnea, reduces exercise tolerance, and is linked with systemic inflammation. Together with existing literature, these findings argue strongly for incorporating anemia evaluation and management into the standard care of COPD, ILD, and bronchiectasis. Future research should build on our results by testing whether targeted correction of anemia can improve both symptoms and long-term outcomes in these patients, as suggested by Weiss and Goodnough in their review of anemia of chronic disease.[16] Although our study was limited by its small sample size, the statistically significant findings underscore the need for larger studies. As noted by Casanova et al., functional measures such as the 6-minute walk test are highly sensitive indicators of morbidity in chronic lung disease and may benefit from comprehensive evaluation that includes anemia status.[11]

5. Conclusion

This pilot observational study highlights anemia as a highly prevalent and clinically important comorbidity in patients with chronic lung diseases, including COPD, ILD, and bronchiectasis. In our cohort, anemia was significantly associated with greater dyspnea severity, higher systemic inflammation, and reduced exercise capacity on the 6-minute walk test. These findings emphasize that anemia is not a trivial finding but a key contributor to symptom burden and functional limitation in chronic lung disease. Despite this, routine screening for hemoglobin levels and markers of inflammation is not commonly integrated into standard management protocols. By demonstrating statistically significant associations even in a small sample, our study underscores the importance of recognizing and addressing

anemia in clinical practice. Larger, multicenter studies are needed to validate these results and to guide the incorporation of anemia assessment and treatment into comprehensive chronic lung disease care.

6. Source of Funding

None.

7. Conflict of Interest

None.

8. References

1. John M, Hoernig S, Doehner W, Okonko DD, Witt C, Anker SD. Anemia and inflammation in chronic obstructive pulmonary disease. *Chest*. 2005;127(3):825–9.
2. Boutou AK, Shrikrishna D, Tanner RJ, Smith C, Kelly JL, Ward SP, et al. Lung function indices for predicting mortality in COPD. *Eur Respir J*. 2013;42(3):616–25.
3. Tallón-Aguilar L, Pérez-Andrés M, López-Porras M. Quilotórax bilateral tras cirugía tiroideaBilateral Chylothorax After Thyroid Surgery. *Arch Bronconeumología*. 2010;46(9):564–5.
4. Mannino DM, Thorn D, Swensen A, Holguin F. Prevalence and outcomes of anemia in individuals with COPD. *Eur Respir J*. 2008;32(4):962–9.
5. Cote C, Zilberberg MD, Mody SH, Dordelly LJ, Celli B. Haemoglobin level and its clinical impact in a cohort of patients with COPD. *Eur Respir J*. 2007;29(5):923–9.
6. Ganz T, Nemeth E. Hepcidin and iron homeostasis. *Biochim Biophys Acta Mol Cell Res*. 2012;1823(9):1434–43
7. Ferrari M, Manea L, Anton K. Anemia and hemoglobin serum levels are associated with exercise capacity and quality of life in chronic obstructive pulmonary disease. *BMC Pulm Med.* 2015;15:58.
8. Halpern MT, Zilberberg MD, Schmier JK. Anemia, costs and mortality in Chronic Obstructive Pulmonary Disease. *Cost Eff Resour Alloc*. 2006;4:17.
9. Silverberg DS, Wexler D, Iaina A, Schwartz D. Correction of anemia in patients with chronic diseases. *Int J Cardiol*. 2001;80(1):1–7.
10. Agustí A, Faner R. Systemic inflammation and comorbidities in chronic obstructive pulmonary disease. *Proc Am Thorac Soc.* 2012 May;9(2):43-6.
11. Casanova C, Cote C, Marin JM, Pinto-Plata V, de Torres JP, Aguirre-Jaíme A, et al. Distance and oxygen desaturation during the 6-min walk test as predictors of long-term mortality in patients with COPD. *Chest.* 2008;134(4):746–52.
12. Agustí A, Soriano JB. COPD as a systemic disease. *COPD*. 2008;5(2):133–8.
13. Barnes PJ, Celli BR. Systemic manifestations and comorbidities of COPD. *Eur Respir J*. 2009;33(5):1165–85.
14. Yohannes AM, Alexopoulos GS. Depression and anxiety in patients with COPD. *Eur Respir Rev.* 2014;23(133):345–9.
15. Halpin DMG, Celli BR, Criner GJ, Frith P, Varela LMV, Salvi S. The The GOLD Summit on chronic obstructive pulmonary disease in low- and middle-income countries. *Int J Tuberc Lung Dis*. 2019;23(11):1131–41.
16. Weiss G, Goodnough LT. Anemia of chronic disease. *N Engl J Med*. 2005;352(10):1011–23.

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