Original Article

Prevalence of Anaemia in Chronic Obstructive Pulmonary Disease Patients of Low Socioeconomic Status and its Clinical Correlates: A Cross Sectional Study

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Abstract

Background: Chronic obstructive pulmonary disease (COPD) has multiple comorbidities including anaemia. Low socioeconomic status may affect the disease due to poor nutrition and limited health care access. The primary Objective is to determine the prevalence of anaemia in chronic obstructive pulmonary disease (COPD) patients of low socio-economic status visiting a tertiary care centre in Sitapur. The secondary objectives are to determine the clinic-demographic factors associated with anaemia in COPD and to assess the different types of anaemia (morphologically) associated with anaemia in COPD. **Material and Methods:** This cross-sectional observational study included 245 COPD patients from a tertiary care hospital. Anaemia was defined using WHO criteria. Data were collected on age, gender, BMI, GOLD stage, GOLD treatment category, STAR category, smoking status, diabetes, hypertension, and BODE index. Statistical analysis was done using chi-square and t-tests. **Results:** Anaemia was found in 45.3% (111/245) of patients. Among these, normocytic normochromic anaemia was seen in 48.6%, microcytic hypochromic anaemia in 45.1%, and macrocytic anaemia in 6.3%. Statistically significant associations were observed with age group ($p = 0.048$), lower BMI ($p = 0.022$), and higher BODE index ($p = 0.040$). No significant associations were found with gender, smoking, diabetes, hypertension, GOLD staging, GOLD treatment category, or STAR category. **Conclusion:** Anaemia is prevalent among COPD patients of low socioeconomic status and is significantly associated with increasing age, low BMI, and greater morbidity as indicated by BODE index. The most common morphological pattern observed was normocytic normochromic anaemia, followed by microcytic hypochromic and macrocytic types. Routine screening and treatment of anaemia should be integrated into COPD management protocols.

Keywords: Anaemia, COPD, GOLD staging, Socioeconomic status, Cross-sectional study.

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Introduction

Chronic obstructive pulmonary disease (COPD) has been a pressing health issue all around the globe, contributing significantly to the overall disease burden and ranking as one of the top causes of death.[1] It is primarily characterized by chronic respiratory symptoms and a progressive decline in airflow that is not fully reversible.[2] it is noteworthy that the clinical impact of COPD is not limited to the lungs. COPD often coexists with numerous systemic complications, including anaemia.[3]

Anaemia is a significant comorbidity in COPD and is associated with several adverse clinical outcomes. It has shown to reduce exercise capacity and functional status, resulting in increased dyspnea.[4] There is an increased the risk of hospitalization in COPD likely by reducing physiological reserve and by increasing comorbid burden.[5] Anaemic COPD patients have shown to have a poorer score on quality-of-life assessment instruments.[6] Ultimately anaemia has also shown to increase the mortality in COPD.[7]

Socioeconomic status (ses) is a crucial determinant of both COPD and anaemia. Individuals from lower SES are more exposed to risk factors such as malnutrition, poor living conditions, indoor air pollution and delayed healthcare access. All these factors contribute to both COPD as well as anaemia.[8,9] Malnutrition along with micro nutrient deficiencies, both being common in lower socioeconomic

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groups, contribute to anaemia and to compromise of respiratory muscle function.[10] Financial barriers along with limited healthcare seeking behaviour lead to underdiagnosis and undertreatment of anaemia in these patients.[11]

Understanding the prevalence and impact of anaemia in COPD patients from lower socioeconomic strata is therefore critical, as this subgroup is particularly vulnerable and often underrepresented in clinical research. Addressing anaemia in this population may provide opportunities to improve functional status, reduce hospitalizations, and enhance overall quality of life.[12,13]

Materials and Methods

Study Design and Participants: This cross-sectional study was conducted at a tertiary care teaching hospital in Sitapur district, Uttar Pradesh, India over a period of 18 months. The study included 245 confirmed COPD patients (cases).

Inclusion Criteria

- Adults aged ≥ 40 years
- Patients with clinicoradiological features suggestive of COPD and post bronchodilator FEV1/FVC < 0.7
- Patients belonging to lower socioeconomic strata as per modified BG Prasad Socio-economic scale
- Willing to provide informed consent

Exclusion Criteria

- Patients lower than 40 years old.
- Patients with pneumonia or tuberculosis in addition to COPD.
- Patients with diseases like asthma, asthma COPD overlap, liver diseases, cardiac diseases or any such diseases (on the basis of history or clinical assessment) that may cause anaemia.
- Patients not belonging to lower socioeconomic strata.
- Patients with conditions like muscle dystrophy that may affect spirometry results.
- Patients who did not provide written informed consent for the study.
- Patients with conditions where spirometery is contraindicated like recent eye, thoracic or abdominal surgery; recent myocardial infarction, uncontrolled hypertension, recent CVA, cerebral or abdominal aneurysm

Data Collection: Information was collected in a preformed, pretested, and semi-structured questionnaire by the interview technique. The questionnaire included information regarding the socio-demographic details. Parameters of spirometry, red blood cell indices and peripheral blood smears were obtained for each patient.

Multiple tools were applied. These tools included MMRC scale, CAT score ,6 min walk test, BODE index, GOLD staging, GOLD treatment group, modified BG Prasad scale, STAR Classification

Statistical Analysis

Data from all participants were systematically recorded and entered into Microsoft Excel spreadsheets before statistical processing. Analysis was performed using SPSS version 26. Descriptive statistics were used to summarize socio-demographic and clinical variables, presented as frequencies and percentages. Associations between categorical variables were assessed using the Chi-square test. A p-value less than 0.05 was considered indicative of statistical significance.

Results

In our study a total of 245 patients were studied. Out those subjects 111 (45.3%) had anaemia while the rest 134 (54.7%) did not have anaemia.

Table 1: Distribution of different morphological types of anaemia in subjects

Type of anaemia	Number of subjects	% Of anaemic subjects
Microcytic anaemia	54	48.6
Normocytic anaemia	50	45.1
Macrocytic anaemia	7	6.3

[Table 1] represents the distribution of different morphological patterns of anaemia Microcytic anaemia was seen to be most prevalent among the subjects at 45.3% of total anaemic subjects while macrocytic anaemia was the least prevalent, contributing only 6.3% to the total pool of anaemic subjects.

Table 2: Sociodemographic factors in association with anaemia in COPD patients

Factor	Category	Anaemia present	Anaemia absent	Total subjects	Chi square	P value
Gender	Female	19	34	53	1.98	0.159
	Male	92	100	192		
Age group	40-50	12	26	38	7.89	0.048
	51-60	35	47	82		
	61-70	30	38	68		
	>70	34	23	57		
Smoking status	Non smoker	17	30	47	1.53	0.216
	smoker	94	104	198		
BMI	<18.5	23	10	33	9.60	0.022
	18.5-22.9	76	103	179		
	23-24.9	10	17	26		
	>25	2	4	6		

[Table 2] represents sociodemographic factors associated with anaemia in COPD patients.

Increasing age group showed a statistically significant association (P value = 0.048) with anaemia in COPD patients

and decreasing BMI showed a statistically significant association (P value = 0.022) with anaemia in COPD patients. No significant associations were found between gender (P value = 0.159) and smoking status (P value = 0.216) with anaemia in COPD patients.

Table 3: anaemia in relation to various clinical categories in COPD patients

Factor	category	Anaemia present	Anaemia absent	Total subjects	Chi square	P value
GOLD treatment category	Category A	28	38	66	0.371	0.831
	Category B	56	63	119		
	Category E	27	33	60		
GOLD grading	GOLD 1	22	34	56	5.238	0.155
	GOLD 2	29	45	74		
	GOLD 3	55	47	102		
	GOLD 4	5	8	13		
STAR staging	1	46	55	101	2.32	0.508
	2	41	40	81		
	3	19	32	51		
	4	5	7	12		
BODE index	0-2	26	48	74	8.30	0.040
	3-4	31	42	73		
	5-6	35	33	68		
	7-10	19	11	30		
Hypertension	Present	24	37	61	0.867	0.352
	Absent	87	97	184		
Diabetes	Present	17	13	30	1.296	0.255
	Absent	94	121	215		

[Table 3] represents anaemia in relation to various clinical categories in COPD patients.

Statistically significant relation was observed between increasing BODE index (P value= 0.040) and anaemia in COPD patients. While no significant association was found between anaemia and GOLD treatment category (P value = 0.831), GOLD grading (P value = 0.155), STAR category (P value = 0.508), Hypertension (P value = 0.352) or Diabetes (P value = 0.255).

Discussion

This cross-sectional study explored an under-evaluated dimension of COPD, anaemia, in an understudied demography of lower socioeconomic status population—among patients attending a tertiary care centre in Sitapur, Uttar Pradesh, India. The findings suggest that there is a high prevalence of anaemia in COPD patients of lower socioeconomic. The higher anaemia prevalence in the current study may be due to the inclusion of only patients of lower socioeconomic status where poor dietary diversity and restricted access to healthcare may have played a role.[14]

In the current study the most predominant type of anaemia was microcytic anaemia followed by normocytic anaemia. This goes in line with findings of Parveen et al,[15] but is different from the findings of Manandhar et al,[16] who found normocytic normochromic anaemia to be more common in COPD patients. One reason for this difference in our study could be selective inclusion of lower socioeconomic subjects only where nutritional deficiencies may play a significant role.

In this study, anaemia prevalence among COPD patients was evaluated across four age groups: 40–50, 51–60, 61–70, and >70 years. Statistical analysis using the Chi-square test revealed a significant association between age and anaemia status ($\chi^2 = 7.89$, $p = 0.048$), indicating that anaemia rates vary meaningfully with increasing age. Aging is associated with several physiological and pathological changes that predispose individuals to anaemia, including chronic inflammation, reduced marrow responsiveness, and nutritional deficiencies.[16,17] All these compounded with COPD may contribute to the statistical association.[13]

In this study, a significant association was found between BMI category and anaemia status (p = 0.022), with a clear inverse trend: anaemia was most prevalent in underweight patients (69.7%) and decreased with increasing BMI. This suggests that lower BMI is strongly associated with a higher risk of anaemia among COPD patients. Poor nutrition,[18] coupled with chronic inflammation and reduced erythropoietin levels may have contributed to this.[5]

The present study revealed a statistically significant association between anaemia and the BODE index in patients with chronic obstructive pulmonary disease (COPD), with a chi-square value of 8.30 and a p-value of 0.040. This suggested that as the BODE index increases—indicating greater severity of disease—there is a higher prevalence of anaemia among patients. This trend may reflect the cumulative burden of systemic inflammation, hypoxia, and reduced nutritional status in more advanced disease stages.[19] While correcting anaemia alone may not reverse the course of COPD, it may enhance exercise tolerance, quality of life, and reduce healthcare utilization.[20]

Interestingly, in the COPD patients no significant statistical associations were found between anaemia and sociodemographic factors such as gender or smoking habit, chronic illnesses like hypertension or diabetes, and clinical tools like GOLD staging, GOLD treatment category or STAR staging. This supports the idea that anaemia should be evaluated irrespective of these factors in COPD patients.

In conclusion, our study emphasizes the intertwined relationship between anaemia, lower socioeconomic status, and COPD. There is a clear need to adopt a holistic approach that incorporates diagnosis, assessment and management of

anaemia into the management of chronic respiratory diseases, particularly in settings with lower socioeconomic status and limited access to health care services.

Conclusion

The findings of this research highlighted a significant burden of anaemia in COPD patients in the lower socioeconomic strata, with the prevalence of anaemia being 45.3%. The most prevalent type of anaemia was microcytic anaemia (48.6%) followed by normocytic anaemia (45.1%) while macrocytic anaemia being only 6.3%. in COPD patients statistically significant associations were observed with advancing age, lower body mass index and higher BODE index scores. Hence anaemia is a common and clinically important comorbidity in COPD patients especially in those from low socioeconomic backgrounds. Its presence is linked to more sever disease and poorer physical performance, independent of lung function parameters. Correcting anaemia in may lead to significant improvements in patient well-being, reduction of hospitalization and potentially slow disease progression.

Limitations: As a cross-sectional, single-centre study, causal relationships could not be established. The study features self-reported variables including smoking history, comorbid conditions etc. due to which the study could not be immune to recall bias and reporting bias. The study also could not include laboratory measurements such as serum ferritin, serum iron, vitamin B12,folate or C-reactive protein levels important for determining the aetiology of anaemia which could have strengthened the understanding of underlying mechanisms for anaemia.

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Conflicts of interest

There are no conflicts of interest.

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