

Prevalence of Anemia in Patients with COPD and its Impact on Quality of Life

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Abstract: Background: COPD is a common preventable and treatable disease with high global prevalence. Common comorbidities that contribute to the increased risk associated with morbidity and mortality in COPD patients include cardiovascular diseases, diabetes, lung cancer, metabolic syndrome, osteoporosis, gastroesophageal reflux and anemia. The prevalence of anemia in patients with COPD varies from 7.5% to 33%. Objectives: To assess the prevalence of anemia in patients with COPD and its impact on quality of life. Design and Setting: A University hospital based cross sectional study in Lucknow, India. Methods: Fifty Seven patients (54 males and 3 females) with spirometry documented COPD were evaluated for frequency of anemia. Results: A total of 15 cases of anemia were detected giving a frequency of 26.32%. All of these anemic patients were males. Normocytic normochromic type of anemia was present in 13 (86.66%) patients while the rest had microcytic hypochromic type of anemia. Majority of patients were in GOLD stage III and IV with a mean FEV1 32.53 percent of the predicted in anemic COPD patients. The various factors significantly associated with anemia in our study were number of exacerbations of COPD leading to hospitalization and quality of life. Conclusion: Anemia occurs frequently in patients of COPD and is associated with poor quality of life and increased morbidity in the form of number of exacerbations and hospital admissions. Correcting anemia in these patients may improve their clinical outcome.

Keywords: COPD, anemia, hemoglobin level.

1. Introduction

Chronic obstructive pulmonary disease (COPD) is defined as a common, preventable and treatable disease, that is characterized by persistent respiratory symptoms and airflow limitation that is due to airway and/or alveolar abnormalities usually caused by significant exposure to noxious particles or gases.^[1]

COPD often coexists with other diseases (comorbidities) that negatively impact the course of the illness and have a significant impact on prognosis of the patient. The common comorbidities that have been associated with COPD are cardiovascular diseases, lung cancer, osteoporosis, metabolic syndrome, depression, anxiety and anemia.

The prevalence of anemia in patients with COPD is increasing as opposed to polycythemia which occurs less frequently due to vigorous correction of hypoxemia by domiciliary long term oxygen therapy. COPD is a highly symptomatic disease characterized by fatigue, dyspnea, depression, anxiety, etc. Occurrence of anemia in COPD patients further add to the insult as fatigue and dyspnea are the predominant symptoms of anemia itself thereby having a negative impact on patient's health status, quality of life and overall survival.

Many chronic diseases have been known to affect hematopoiesis, which results in shortened RBC survival and sequestration of iron in macrophages thereby resulting in anemia of chronic disease (ACD). COPD is likely to be associated with ACD when considered in relation to the known systemic effects of the disease. ACD leads to increased production of cytokines which mediate the inflammatory response. The exact mechanism of anemia in COPD is not fully understood but is attributed to the underlying systemic inflammation.

In our study we have used Short Form - 36 (SF - 36) questionnaire for quantification of quality of life in COPD patients with anemia and comparing it with non - anemic COPD patients.

2. Methodology

It was a prospective cross sectional study carried out at a tertiary care centre to evaluate the prevalence of anemia in patients with COPD and its impact on quality of life. The duration of study was one year. Anemia was defined according to WHO criteria, hemoglobin level <13g/dl in men and <12g/dl in women.

Fifty seven patients of COPD (confirmed on spirometry as per the GOLD 2017 guidelines) were enrolled after an explicit, written consent. Patient's detailed history was taken, including smoking status, pack year and biomass fuel exposure. Physical examination was conducted to include anthropometric details, routine blood investigations, chest radiograph (postero - anterior view) and a 6 minute walk test.

The spirometry was carried out using Cosmed Spiropalm. Spirometric indices were measured using the best out of three satisfactory performances. The parameters recorded were forced expiratory volume in the first second (FEV1) in liters, forced vital capacity (FVC) in liters and FEV1/FVC ratio.

Patients with impaired mental capacity or with past diagnosis of asthma or those with pre - existing diseases like cancer, thyroid disease, liver disease, chronic kidney disease, Cardiovascular diseases or those with known deficiency of vitamin B12 or folate were excluded from the study.

3. Results

Out of 57 patients enrolled in the study, 15 (26.32%) were found to be anemic and were classified as group I while rest 42 (73.68%) were non - anemic and were classified as group II.

Table 1: Demographic characteristics of patients with COPD (n=57)

Characteristic	Anemic (n=15)	Non - anemic (n=42)	Total	p - value
Age mean (SD)	62.87 (7.39)	61.83 (9.78)	62.11 (9.16)	0.650
Hb mean (SD)	11.42 (1.43)	14.54 (1.20)	13.72 (1.86)	<0.0001
Male (n, %)	15 (100)	39 (92.86)	54 (94.74)	0.288
Religion (n, %)				0.570
Hindu	14 (93.33)	37 (88.10)	51 (89.47)	
Muslim	1 (6.67)	5 (11.90)	6 (10.53)	
Dietary Habits (n, %)				0.865
Vegetarian	10 (66.67)	29 (69.05)	39 (68.42)	
Non - vegetarian	5 (33.33)	13 (30.95)	18 (31.58)	
Anthropometry mean (SD)				
Height (cms)	165.13 (4.49)	161.05 (6.99)		0.040
Weight (kg)	54.63 (12.60)	50.85 (11.62)		0.296
BMI (kg/m ²)	20.01 (4.15)	19.72 (3.97)		0.816
Pack years smoked	26.73 (20.96)	32.29 (20.86)	31.04 (20.80)	0.441

The mean hemoglobin levels in group I (anemic group) was 11.42 g/dl whereas the mean hemoglobin level in group II was 14.54 g/dl.

However there was no significant difference between those with and without anemia in their average age, gender distribution, dietary habits and pack years smoked.

Table 2: Distribution of Study Population according to 6 min Walk Test Distance

Walking Distance	Group I (n=15)		Group II (n=42)		Total (N=57)	
	No.	%	No.	%	No.	%
<50 m	0	0.00	1	2.38	1	1.75
51 - 200 m	7	46.67	11	26.19	18	31.58
201 - 250 m	3	20.00	9	21.43	12	21.05
251 - 300 m	4	26.67	16	38.10	20	35.09
>300 m	1	6.67	5	11.90	6	10.53
	$\chi^2=2.535$ (df=4); p=0.638					

The distance travelled by patients during 6 minute walk test among patients of group I (anemic) was lower as compared to that of group II (non - anemic) patients but however it was not found to be statistically significant.

Table 3: Distribution of Study Population according to mMRC Grade

mMRC Grade	Group I (n=15)		Group II (n=42)		Total (N=57)	
	No.	%	No.	%	No.	%
Grade 1	3	20.00	15	35.71	18	31.58
Grade 2	4	26.67	17	40.48	21	36.84
Grade 3	7	46.67	5	11.90	12	21.05
Grade 4	1	6.67	5	11.90	6	10.53
	$\chi^2=8.069$ (df=3); p=0.045 (Sig)					

The Proportion of patient of Group II was found to be higher as compared to Group I having mMRC Grade 1 (35.71% vs.20.00%), Grade 2 (40.48% vs.26.67%) and Grade 4 (11.90% Vs 6.67%) while proportion of patients of Group I was found to be higher than that of Group II having mMRC Grade 3 (46.67% vs.11.90%). Difference in mMRC grade of patients of Group I and Group II was found to be statistically highly significant.

Table 4: Distribution of Study Population according to Stage of COPD

COPD Stage	Group I (n=15)		Group II (n=42)		Total (N=57)	
	No.	%	No.	%	No.	%
Stage I	0	0.00	1	2.38	1	1.75
Stage II	2	13.33	10	23.81	12	21.05
Stage III	5	33.33	17	40.48	22	38.60
Stage IV	8	53.33	14	33.33	22	38.60
	$\chi^2=2.225$ (df=3); p=0.227					

Though proportion of patients of Group II was higher as compared to Group I among lower grades of COPD i.e. Stage I (2.38% vs.0.00%), Stage II (23.81% vs.13.33%) and Stage III (40.48% vs.33.33%) and proportion of patients of Group I was higher as compared to Group II with COPD Stage IV (53.33% vs.33.33%) but this association was not supported statistically (p=0.227).

Table 5: Distribution of Study Population according to Number of Exacerbations leading to Hospitalization

No. of Exacerbations	Group I (n=15)		Group II (n=42)		Total (N=57)	
	No.	%	No.	%	No.	%
0	4	26.67	44	78.57	37	64.91
1	6	40.00	8	19.04	14	24.56
2	4	26.67	1	2.38	5	8.77
3	1	6.67	0	0.00	1	1.75
	$\chi^2=16.794$ (df=3); p<0.001					

No exacerbations were reported by higher proportion of patients of Group II as compared to Group I (78.57% vs.26.67%), proportion of patients of Group I was higher as compared to Group II having 1exacerbation (40.00% vs.19.04%), 2 exacerbations (26.67% vs.2.38%) and 3 exacerbations (6.67% vs.0.00%). Difference in number of exacerbations among patients of Group I and Group II was found to be statistically significant (p<0.001).

Table 6: Distribution of Study Population according to SF36 Score

Group	No. of patients	Min.	Max.	Median	Mean	S. D.
Group I	15	31.00	46.00	41.00	39.13	4.66
Group II	42	43.00	65.00	54.00	53.98	5.71
Total	57	31.00	65.00	51.00	50.07	8.53

't'=9.040; p<0.0

SF - 36 score of patients of Group II (53.98 ± 5.71) was found to be statistically significantly higher ($p=0.001$) as compared to that of Group I (39.13 ± 4.66). Higher SF - 36 score was indicative of better quality of life in group II patients.

4. Discussion

A total of 57 patients (54 males and 3 females) with COPD documented by spirometry were evaluated for frequency of anemia. A total of 15 cases of anemia were detected. The prevalence of anemia in our study was 26.32%.

The studied patients had a mean (SD) age of 62.11 (9.16) years. This is comparable to mean (SD) age 61 (1) years of subjects studied by Mathias John in 2005 [2]. Anemic patients were significantly older than non - anemic patients; mean (SD) age was 62.87 (7.39) and 61.83 (9.78) years in anemic and non - anemic patients respectively in our study whereas it was 72.8 (9.3) and 69.5 (8.8) years in anemic and non - anemic patients respectively in study by C. Cote [4] which is comparable with our study.

Smokers constituted 86% of the studied patients; smokers constituted 95% of patients in the study by Mathias John. More than 80% of smoker in our study were consuming 26 - 31 pack years of smoking which was equivalent to the smoking burden reported in the studies by C. Cote. There was no positive co - relation between smoking status and anemia in our studied patients which is similar to the studies by C. Cote.

Most of our studied patients were in GOLD stage III and IV where as majority of patients were in GOLD stage III in another study by Mathias John. There was no correlation between lung function test and anemia. Similar results have been shown in the studies conducted by Mathias John [2], C. Cote [4], Marya Zilberberg [5] and Gokul Krishnan [3].

Mean (SD) hemoglobin level in studied patients was 11.42 (1.42) g/dl and 14.54 (1.20) g/dl in anemic and non - anemic patients respectively which is consistent with another study by Mathias John with mean hemoglobin of 11.9 (0.4) g/dl and 14.7 (0.2) g/dl in anemic and non - anemic patients respectively. In the study by C. Cote mean hemoglobin level was 11.8 (1) g/dl and 15 (1.2) g/dl in anemic and non - anemic patients respectively.

The frequency of anemia in our study was 26.32% which is similar to frequency of 21% by Michael Halpern and 23% by John Mathias. There was no significant difference in frequency of anemia with respect to gender consistent with other studies by C. Cote, M. B. Stanbrook, Gokul Krishnan.

The clinical parameter which had significant correlation with anemia in our study were number of exacerbations of COPD leading to hospitalization.; similar results have been seen in studies conducted by Arnaud Chambellan [6].

Anemia was independently associated with reduced exercise capacity as measured by the 6 minute walk distance. The proportions of patients were higher in non - anemic group who completed > 300 metre distance; which is in accordance with the study conducted by C. Cote [4].

Anemia was independently associated with increased dyspnea which was assessed subjectively by the mMRC scale. The proportion of patients of group I (anemic) was found to be higher than that of group II (non - anemic) having mMRC grade 3 (46.67% vs 11.9%). The difference in mMRC grade of patients of group I and group II was found to be statistically highly significant, which is in accordance to the study by C. Cote [4].

The Short Form - 36 (SF - 36) [7] score of patients of group II (non - anemic) (53.98 ± 5.71) was found to be statistically higher ($p= 0.001$) as compared to group I (anemic) (39.13 ± 4.66) which indicates poor quality of life in anemic patients, this was in accordance with the study conducted by Gokul Krishnan [3].

5. Conclusion

Fifty seven patients (54 males and 3 females) with a mean (SD) age of 62.11 (9.16) years having COPD diagnosed by GOLD criteria were evaluated for frequency of anemia.

A total of 15 cases of anemia were detected giving a frequency of 26.32%. All of these anemic patients were males. Normocytic normochromic type of anemia was present in 13 (86.66%) patients while the rest had microcytic hypochromic type of anemia. Majority of patients were in GOLD stage III and IV with a mean FEV1 32.53 percent of the predicted in anemic COPD patients.

The various factors significantly associated with anemia in our study were number of exacerbations of COPD leading to hospitalization, mMRC grade and quality of life.

In conclusion, anemia occurs frequently in patients of COPD and is associated with poor quality of life and increased morbidity in the form of number of exacerbations and hospital admissions. Correcting anemia in these patients may improve their clinical outcome.

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