Haematological Manifestations in Chronic Obstructive Lung Disease in Relation To FEV1

KEYWORDS

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ABSTRACT Chronic obstructive pulmonary disease (COPD) is a complex disease characterized by airflow limitation resulting from airway inflammation, parenchymal destruction and the development of emphysema. About 15-30% of COPD patients have anemia and the occurrence of polycythaemia is only 6% . Anaemia is related to depressed exercise capacity along with functional dyspnea. This is a significant reason for depressed functional capacity and for low quality and standard of life. Forced Expiratory Volume in one second (FEV1) is an objective measurement, viewed as the most accurate predictor of severity of airway obstruction. This study was conducted to detect the haematological manifestations in relation to FEVI in COPD Patients. Results from the study showed Patients with decreased FEV1, having prolonged duration of illness and increasing grades of dyspnea had high risk for anemia.

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a complex disease characterized by airflow limitation resulting from airway inflammation, parenchymal destruction and the development of emphysema. COPD results from inflammatory mechanisms, the **"SPILL-OVER"** of inflammatory mediators like IL6, IL-8, and TNF- leads to systemic inflammation and also initiates or worsens comorbid diseases. So the comorbidities complicate the management of COPD and need to be evaluated carefully. Diseases with higher morbidity in COPD are associated with an increased risk of hospital admissions, mortality and healthcare costs. According to World Health Organization, in 2020 COPD will become the 3 rd leading cause of death.

According to a study, about 15-30% of COPD patients have anemia and this is noticed especially in patients with severe disease, and the occurrence of polycythaemia is only 6% . Anaemia is related to depressed exercise capacity along with functional dyspnea. This is a significant reason for depressed functional capacity and for low quality and standard of life.

Forced Expiratory Volume in one second (FEV1) is an objective measurement, viewed as the most accurate predictor of severity of airway obstruction. The advantage of FEV1 is that it requires lesser effort to measure and can be carried out in all stages of COPD patients. COPD progression can be assessed by serial measurements of FEV1. In this study an effort is made to assess the hematological manifestations in COPD Patients and the relationship to FEV1.

OBJECTIVES OF THE STUDY

To study the Haematological manifestations in relation to FEV1 in 60 cases of Chronic Obstructive Pulmonary Disease.

MATERIALS AND METHODS
SOURCE OF DATA

All patients who presented with history of cough, sputum, breathlessness or wheezing of more than 3 months duration to the Medical Outpatient Department or admitted in the medical wards of Coimbatore Medical College Hospital were subjected to pre and post-bronchodilator Pulmonary Function Testing. Those patients whose post-bronchodilator FEV1/FVC was less than 0.7 were included in this study. This study period was from AUGUST 2015 to JULY 2016.

Design of Study : Observational Clinical study

Period : AUGUST 2015 to JULY 2016

Sample size : 60 Patients

Ethical Committee Approval : Obtained

Consent : Informed consent was obtained

INCLUSION CRITERIA

Both in-patients and out-patients were included in the study.

Both new and previously diagnosed cases were included in

the study.

Patients with post-bronchodilator FEV1 / FVC < 0.7.

EXCLUSION CRITERIA
Patients with systemic illness like Diabetes, Coronary artery heart disease, Cardiac failure, renal failure, Liver diseases, Malignancy, Collagen vascular disease.

Patients with history of present or past pulmonary tuberculosis

Patients with other lung diseases like interstitial lung disease, Bronchiectasis, Pneumonia, Lung abscess.

Patients were subjected to the following investigations:

Complete Haemogram

Peripheral smear

Blood urea, serum creatinine

Blood sugar

Spirometry (pre and post bronchodilator therapy)

Sputum for gram stain and AFB

Chest X-ray PA view

Urine: Albumin, Sugar

ECG in all leads

STATISTICAL METHODS:
The collected data was analysed with SPSS 16.0 version. To describe about the data descriptive statistics frequency analysis, percentage analysis, mean and S.D were used. To associate the various clinical variables Chi-Square test was done. In the above statistical tool the probability value .05 is considered as significant level.

RESULTS
Sixty cases were studied and the following observation and analysis were made.

TABLE 1: SEX DISTRIBUTION

SEX	NUMBER OF PATIENTS	PERCENT
Male	48	80
Female	12	20
Total	60	100

Out of the 60 cases studied, 48 Patients **(80%)** were Males and 12 Patients **(20%)** were Females.

TABLE 2: AGE DISTRIBUTION

AGE GROUP	NUMBER OF PATIENTS	PERCENT
31 to 40 yrs	1	2
41 to 50 yrs	28	47
51 to 60 yrs	21	35
61 to 70 yrs	10	17

Majority of the patients were in the age group of **41-50 years**.

Minimum age being 38 years and Maximum age being 68 years.

TABLE 3.DURATION OF ILLNESS

DURATION OF ILLNESS	NUMBER OF PATIENTS	PERCENT
0-5 yrs	17	28
6 to 10 yrs	28	47
> 10 yrs	15	25

Majority of patients, i.e. 28 patients **(47 %)** had duration of illness 6-10 years, 15 patients **(25%)** had duration of illness of >10 years and 17 patients **(28%)** had duration of illness 0-5 years.

TABLE:4 PLACE OF LIVING

PLACE OF LIVING	NUMBER OF PATIENTS	PERCENT
Urban	48	80
Rural	12	20

48 Patients **(80%)** were living in urban areas whereas **12** Patients **(20%)**

were living in rural area.

TABLE: 5 BODY MASS INDEX

BODY MASS INDEX	NUMBER OF PATIENTS	PERCENT
< 18	15	25
18 to 23	36	60
23 to 24.9	6	10
> 25	3	5

Majority of Patients **(36%)** had BMI within normal limits (18-23kg /sqcm).

TABLE 6: SMOKING HABITS AMONG THE PATIENTS STUDIED

SMOKING	NUMBER OF PATIENTS	PERCENT
Yes	34	57
No	26	43

Out of 60 patients, 34 patients (57%) had history of smoking.

TABLE 7: SMOKING PACK YEARS

PACK YEARS	NUMBER OF PATIENTS	PERCENT
NIL	26	43
20 TO 30	6	10
31 TO 40	18	30
41 TO 50	6	10

51 TO 60	4	7

In the present study duration of smoking ranged from 20 to 60 Pack years. Majority had **31-40 pack years** of duration of exposure.

TABLE 8: OCCUPATIONAL EXPOSURE – COTTON MILL WORKERS

COTTON MILL WORKER	NUMBER OF PATIENTS	PERCENT
Yes	35	58
No	25	42

Out of 60 patients, only 35 patients (58%) had history of occupational exposure. 10 patients had history of exposure for <10 years and 25 patients had history of exposure for >10 years.

TABLE 9: ENVIRONMENTAL TOBACCO SMOKE EXPOSURE

ETS	NUMBER OF PATIENTS	PERCENT
YES	23	38
NO	37	62

History of exposure to environmental tobacco smoke was present in 23 patients. Most of the patients, i.e. 20 patients had history of environmental tobacco smoke exposure for >3 hours, only 3 patients had history of exposure for <3 hours in a day.

TABLE 10: BIO MASS FUEL EXPOSURE

BIO MASS FUEL EXPOSURE	NUMBER OF PATIENTS	PERCENT
YES	7	12
NO	53	88

Out of 60 patients, 7 female patients had history of biomass fuel usage and exposure whereas all 48 male patients (80%) did not have biomass fuel exposure.
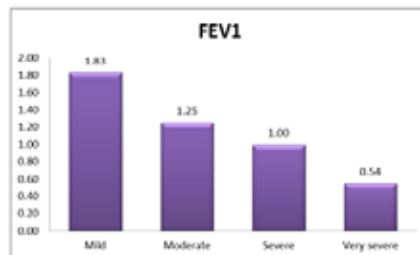
TABLE 11: m MRC GRADING

m MRC GRADING	NUMBER OF PATIENTS	PERCENT
1	8	13
2	25	42
3	19	32
4	8	13

TABLE 12:FEV1 OF THE PATIENTS STUDIED

FEV 1	NUMBER OF PATIENTS	Mean
Mild	21	1.82
Moderate	23	1.24
Severe	9	0.99
Very Severe	7	0.54

CHART 1: FEV1 OF THE PATIENTS STUDIED

Post bronchodilator FEV1 results shows that 21 patients (35%) had mild disease with mean value of 1.83, 23 patients (38%) had moderate disease with mean value of 1.25, 9 patients (15%) had severe disease with mean value of 1.00 and 7 patients (11%) had very severe disease with mean value of 0.54.

TABLE 13: GOLD SEVERITY OF COPD

GOLD SEVERITY OF COPD	NUMBER OF PATIENTS	PERCENT
Mild	21	35
Moderate	23	38
Severe	9	15
Very severe	7	11

Post bronchodilator FEV1 results shows that 21 patients (35%) had mild disease, 23 patients (38%) had moderate disease, 9 patients (15%) had severe disease and 7 patient (11%) had very severe disease

Table 14: CHEST X RAY OF THE PATIENTS STUDIED

CHEST X RAY	NUMBER OF PATIENTS	PERCENT
NORMAL	5	8
BRONCHITIS	15	25
EMPHYSEMA	24	40
EMPHYSEMA + BRONCHITIS	16	27

Chest X-ray showed chronic bronchitis in 15 patients, chronic bronchitis with emphysema in 16 patients, emphysema in 24 patients and was normal in 5 patients.

Table 15: PERIPHERAL SMEAR OF THE PATIENTS STUDIED

PERIPHERAL SMEAR	NUMBER OF PATIENTS	PERCENT
NORMAL	28	47
NORMOCYTIC NORMO CHROMIC	24	40
MICROCYTIC HYPO CHROMIC	8	13

Peripheral smear was normal in 28 patients, 24 patients had normocytic normochromic anemia and 8 patients had

microcytic hypochromic anemia.

Table 16: HAEMOGLOBIN OF THE PATIENTS STUDIED

GOLD CRITERIA STAGING	NUMBER OF PATIENTS	MEAN HB gm%
Mild	21	12.8
Moderate	23	11.4
Severe	9	10.3
Very severe	7	9

21 Patients with mild disease had mean haemoglobin value of 12.8, moderate disease had 11.4, severe disease had 10.3 and very severe disease had value of 9.

TABLE 17: MEAN CORPUSCULAR VOLUME OF THE PATIENTS STUDIED

GOLD CRITERIA STAGING	NUMBER OF PATIENTS	MEAN MCV
Mild	21	84.9
Moderate	23	87.1
Severe	9	88.8
Very severe	7	88.9

21 Patients in mild disease had mean MCV value of 84.9, moderate disease had 87.1, severe disease had 88.8 and very severe disease had value of 88.9.

TABLE 18: MEAN CORPUSCULAR HAEMOGLOBIN OF THE PATIENTS STUDIED

GOLD CRITERIA STAGING	NUMBER OF PATIENTS	MEAN MCH
Mild	21	29.1
Moderate	23	29.4
Severe	9	29.5
Very severe	7	29.1

21 patients in mild disease had mean MCH value of 29.1, moderate disease had 29.4, severe disease had 29.5, very severe disease had 29.1.

TABLE 19: MEAN CORPUSCULAR HAEMOGLOBIN CONCENTRATION OF THE PATIENTS STUDIED

GOLD CRITERIA STAGING	NUMBER OF PATIENTS	MEAN MCHC
Mild	21	33
Moderate	23	32.9
Severe	9	32.6
Very severe	7	33.6

21 patients in mild disease had mean MCHC value of 33,

moderate disease had 32.9, severe disease had 32.6, and very severe disease had 33.6.

TABLE 20: HAEMATOCRIT OF THE PATIENTS STUDIED

GOLD CRITERIA STAGING	NUMBER OF PATIENTS	MEAN HCT
Mild	21	42.3
Moderate	23	43.5
Severe	9	44.2
Very severe	7	43.7

21 patients in mild disease had haematocrit value of 42.3, moderate disease had 43.5, severe disease had 44.2, very severe disease had 43.7.

TABLE 21: DURATION OF ILLNESS vs HAEMOGLOBIN

DURATION OF ILLNESS	HAEMOGLOBIN	
	ANEMIA	NORMAL
0-5 yrs	12	5
6 -10 yrs	16	12
>10 yrs	13	2

Haemoglobin of the patient was compared with duration of illness. Patient with duration of illness more than 6-10yrs had 57% risk for anemia and duration of illness more than 10yrs had 87% risk for anemia.

TABLE 22: COMPARISON OF SMOKING WITH HAEMOGLOBIN

SMOKING	HAEMOGLOBIN	
	ANAEMIA	NORMAL
YES	25	9
NO	16	10

Haemoglobin of the patient was compared with smoking. Among the patients with smoking 73% had anemia and in non-smokers 61% had anemia. Although this association was considerable but it was not statistically significant with P value of 0.322

TABLE 23: COMPARISON OF OCCUPATIONAL EXPOSURE –COTTON MILL WORKERS WITH HAEMOGLOBIN

| COTTON MILL WORKER	HAEMOGLOBIN	
	ANAEMIA	NORMAL
YES	25	10
NO	16	9

Haemoglobin of the patient was compared with mill workers. Among the mill workers 71% had anaemia and 64% in non –mill workers. Although this association was considerable but it was not statistically significant.

TABLE 24: m MRC GRADING vs HAEMOGLOBIN

m MRC GRADING	HAEMOGLOBIN	
	ANEMIC	NORMAL
1	6	2
2	19	6
3	17	2
4	8	0

Haemoglobin of the patient was compared with m MRC grading.Patients with increased grades of dyspnea had more risk for anemia and vice versa.

CHART 2:COMPARISON OF FEV1 WITH HAEMOGLOBIN
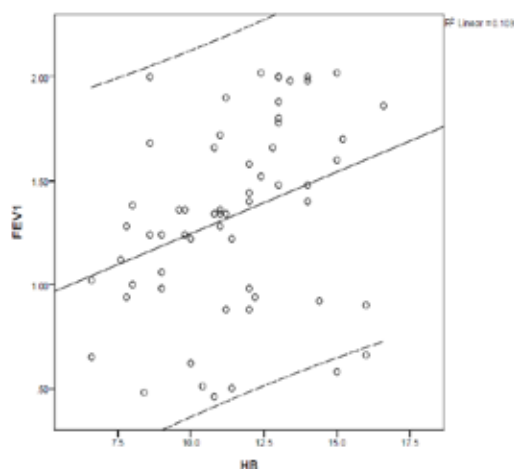
There is significant positive correlation between FEV1 and Haemoglobin with r=0.322 at P = 0.12 < 0.05 Level.

DISCUSSION

This clinical observational study was undertaken to investigate the pattern and magnitude of hematological parameters in the relationship with the severity of the disease. The study consisted of 60 subjects, among them 21 Patients had mild COPD, 23 Patients with moderate COPD, 9 Patients had severe COPD and 7 Patients had very severe COPD.

All the individuals in different groups were subjected to detailed history and physical examination. Lung function parameters were assessed with the help of spirometer. All patients underwent haematological parameters with particular reference to Hb%, MCV, MCH, MCHC, HAEMATOCRIT, PERIPHERAL SMEAR along with routine tests.

The age of the patients being studied ranged between 30 yrs to 70 yrs and the majority of the patients were in the age group of **41-50 years**.

In our study, out of 60 patients 48 (80%) were males and 12 (20%) were females. The male:female ratio of this study was **4:1**.

In our study, the duration of illness was more in patients with severe COPD as compared to the mild and moder-

ate COPD group. This shows that the severity of COPD increases with the duration of illness.

In our study Post bronchodilator FEV1 results showed that 21 patients **(35%)** had GOLD CRITERIA of mild disease who had a mean of 1.82, 23 patients **(38%)** had moderate disease who had a mean of 1.24, 9 patients **(15%)** had severe disease who had a mean of 0.99 and 7 patient **(11%)** had very severe disease who had a mean of 0.54.

In our study out of 60 (100%) patients studied chest x ray shows chronic bronchitis in 15 patients, chronic bronchitis with emphysema in 16 patients , emphysema in 24 patients and was normal in 5 patients

Among the patients 57% were smokers. 71% of male patients had a history of smoking for 5yrs or more. Among smokers 73% had anemia and in non-smokers 61% had anemia.

In our study 56% of patients had anemia. Among them 70% had normocytic normochromic anemia and the remaining 30% had microcytic hypochromic anemia.

The prevalence of anemia was more common with increased duration of illness. Duration of illness 6-10 yrs had 57% risk for anemia and > 10 yrs had 87% risk of anemia.

The prevalence of anemia was more common in cottton mill workers with 71% and 64% in non –mill workers.

The prevalence of anemia was more common in patients with m MRC grade 3 and 4 dyspnoea.

In our study the fall in FEV1 was associated with fall in haemoglobin percentage and vice versa.

CONCLUSION

Patients with decreased FEV1, having prolonged duration of illness and increasing grades of dyspnea had high risk for anemia. Patients with exposure to cotton mill dust and with the history of smoking had increased risk for anemia, but its association was not statistically significant.

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