CBC Differential of COPD Exacerbation

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Abstract

Complete blood count parameters provide novel inflammatory markers. We aimed to assess any differences in these novel inflammatory markers between case and control and according to exacerbation severity in patients with acute exacerbation of chronic obstructive pulmonary disease.

Method: This a case control study was conducted at Marjan medical city among patients Previously diagnosed as COPD and admitted to the hospital with acute exacerbation were enrolled into the study. Complete blood count parameters were performed for both cases and control and compared among two groups by student T test. The severity of disease was measured by FEV1 and correlated with Complete blood count parameters to find any association by SPSS version 23.

Result: Of 50 cases, 58% (29) of cases had Peripheral blood eosinophil ≥2. The mean white blood cell count, total Lymphocyte count, total neutrophil count, Neutrophil/lymphocyte ratio, hematocrit and mean platelet volume were significantly higher in case than control, but only white blood cell correlated with FEV1.

Conclusion: In acute exacerbation, some of the complete blood count markers show a significant increase. These findings may be crucial for evaluation of acute exacerbation, determine the severity of exacerbation and treatment response during follow-up of the patient.

Keywords: *Chronic obstructive pulmonary disease (COPD), acute exacerbation, Complete blood count (CBC), hemoglobin, platelet count.*

Introduction

Chronic obstructive pulmonary disease (COPD) affects more than two hundred million people and it is currently the world's third leading cause of death (as of the sixth in 1990), also COPD mortality rates was predicted to raise[1, 2]. COPD adds greatly to healthcare costs, due to regular hospitalization, loss of productivity and disability[3]. Acute exacerbations of Chronic obstructive pulmonary disease, described as worsening of baseline dyspnoea, cough and/or sputum, are an important component of the disease's natural history [4]. Acute exacerbations of COPD is accompanied with raise risk of later exacerbations, deterioration of coexisting medical diseases, poor health and physical activity, impairment of respiratory function and, finally, increase mortality [5] Owing to their Acute exacerbations of COPD variability and lack of usable laboratory diagnostic testing, Acute exacerbations of COPD is mostly diagnosed on the basis of a medical gestalt, which is subjective and variable inside and between physicians. In copmlete blood count (CBC) there were various parameters can be calculated and excellent to assesses the Acute exacerbations of COPD based on it. Studies done in different parts of the world has shown the association of CBC parameters with COPD. This study was conducted to find out the role of CBC parameters in acute exacerbation COPD.

Patients and Methods

Case-control study conducted between the first of December,2019 and the first of March, 2020 among patients with approved diagnosis of Acute exacerbations of COPD and attendees to emergency unit and respiratory outpatient clinic or admitted to general word and intensive care unit of Marjan medical city/ Iraq. History

of malignancy or haematologic disorder. The study excluded patients with systematic or autoimmune disorder, thyroid disease, liver cirrhosis, heart failure, history of gastrointestinal or other hemorrhage, renal disease, blood transfusion in the last 4 months, patients less than 50 years, patients diagnosed with pneumonia, COPD without exacerbation and mislabeled asthmatics (never-smokers with or without obstructive spirometry). Complete blood count parameters were performed for both cases and control and the severity of disease was measured by FEV1 and student T test, chi-square test and correlation test were used by SPSS version 23.

Result

A total of 100 participants were enrolled in this study, 50 participants with approved diagnosis of acute exacerbation of COPD and 50 health control participants. The mean ±SD of participants was 64.1±7.1 years and there were 49 female and 51 males. The two groups were homogenous in term of age and gender (p=0.058 ,0.72 respectively), table -1-.

Table -1- Demographic characteristic of studied groups.

Variable		Participants		Total	P value
		Control	Case		
Age	Mean±SD	62.8± 6.3	65.5± 7.7	64.1±7.1	0.058*
Gender	Female NO(%)	29 (58%)	20(40%)	49	0.072**
	Male NO (%)	21(42%)	30(60%)	51	

*Student T test, ** Chi-square test, significant ≤0.05.

FEV1 measurement for cases shown that, 14(28%) case had FEV1 between 80-50 %, 23(46%) case had FEV1 between 30-50% and 13(26%) case had FEV1 below 30%, figure -1-.

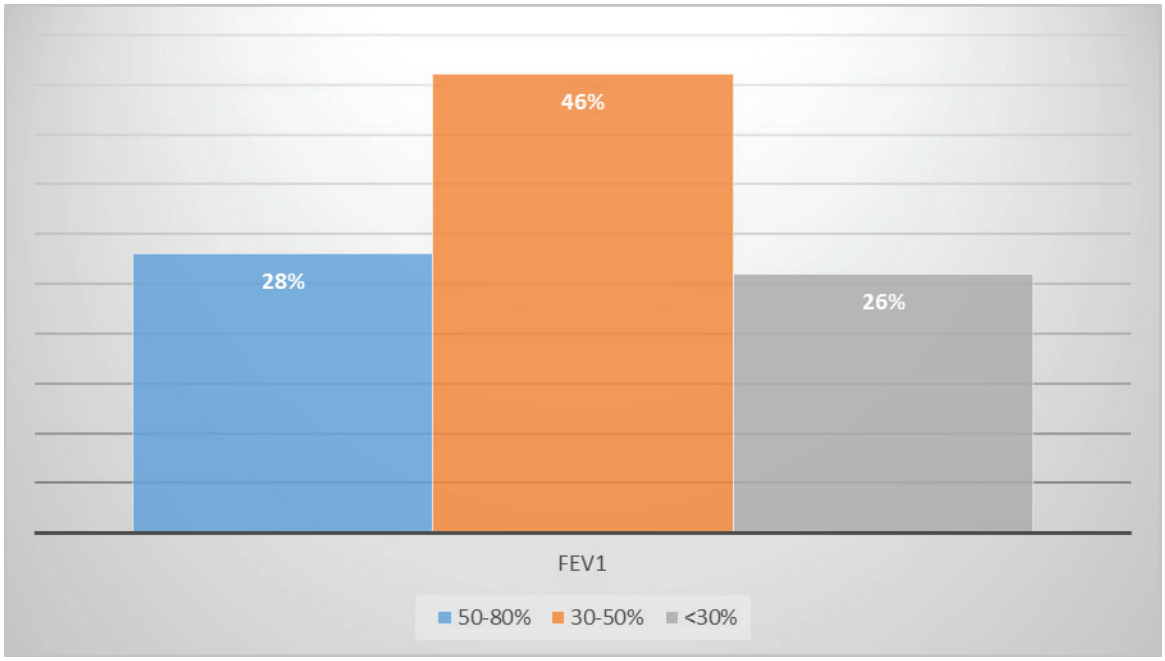

Figure -1- FEV1 assessment for case with COPD.

The mean WBC was significantly higher in case than control (10.9 vs 7.33 10^3/ µL, p<0.001). also, total Lymphocyte count, total neutrophil count and NLR were significantly higher in case than control (p=0.008, <0.001, 0.034 respectively), Red blood indices for both group shown, hematocrit was significantly higher in case than control (41.7 vs 38.1%) with p=0.013, MCV show no significant difference between two groups (p=0.54), MCHC for case was significantly lower than control(31.7 vs 34.2 g/dl) with p=0.038 and RDW% shown no significant difference between two group(p 0.117). The mean platelet count in case was lower than control but the difference in mean between case and control was not significant(p=0.107). the mean platelet volume was significantly higher in case than control (8.1 vs 6.51) with p <0.001, table -2-.

Table -2- Difference in CBC parameters between two groups.

Variables	Participants		P VALUE
	Control Mean ±SD	Case Mean ±SD	
WBC in 103/ µL	7.33 ±2	10.9 ±5.1	<0.001*
Total lymphocyte count	2.67 ±1.4	3.9 ±2.9	0.008*
Total neutrophil count	4.32± 1.8	7.1 ±3.8	<0.001*
NLR	1.98± 1.1	2.7± 2.2	0.034*
HCT %	38.1± 5.9	41.7± 7.9	0.013*
MCV in fL	82.4± 8.9	80.6 ±18.5	0.54*
MCHC in g/dl	34.2± 7.5	31.7 ±3.3	0.038*
RDW %	13.8 ±1.4	14.7 ±3.8	0.117*
Platelet count in 103/ µL	298.9 ±133.8	262.3± 85.5	0.107*
Mean platelet volume in fL	6.51 ±1.6	8.1 ±1.9	<0.001*

*Student T test, significant ≤0.05. WBC: white blood cell count, NLR: Neutrophil/lymphocyte ratio, HCT: Hematocrit, MCV: Mean corpuscular volume, MCHC: mean corpuscular hemoglobin concentration, RDW: Red Cell Distribution Width.

The correlation test shown that there was a negative moderate correlation between FEV1 and WBC count (p <0.001), other parameters shown no correlation, table -3-.

Table -3- Correlation of FEV1 with CBC parameters.

Variables	FEV1	
	R	P value
WBC in 103/ µL	-0.48	<0.001*
Total lymphocyte count	-0.21	0.12
Total neutrophil count	-0.16	0.25
NLR	0.05	0.71
HCT %	-0.18	0.21
MCV in fL	-0.13	0.33
MCHC in g/dl	0.1	0.44
RDW %	-0.04	0.76
Platelet count in 103/ µL	-0.19	0.18
Mean platelet volume in fL	-0.015	0.91

R correlation coefficient *Correlation test is significant at 0.01. WBC: white blood cell count, NLR: Neutrophil/lymphocyte ratio, HCT: Hematocrit, MCV: Mean corpuscular volume, MCHC: mean corpuscular hemoglobin concentration, RDW: Red Cell Distribution Width

Discussion: There have been several studies on the acute exacerbation of COPD over the last decade with the goal of creating tailored and more efficient therapeutic options, or altering current strategies. COPD clinical presentations are the product of endotypes showing the pathobiological processes performed by exposome, That is, combined cigarette smoking exposure, air pollution, diseases, food and allergens, and genome based exposure[6, 7]. In this study we examined several CBC biomarkers in patients with acute exacerbation of COPD. Our findings as well as current knowledge point to the use of multiple biomarkers in the assessment, follow-up patients and to determine patient response. In this study, 60% of cases with AECOPD were males, and the mean age was 65.5 years. These features are in line to those of COPD patients in a general population like in the Israel and in the Netherlands. Increased in white blood cell count has been revealed in COPD patients[8]. this study showed higher mean of WBC in cases than control and the difference was statistically significant, where WBC count had negative correlation with severity of acute exacerbation of COPD. Similar to study finding, Nepal study [9] and Greece study [10] also showed significant increase in WBC among AECOPD patients. In the last few years the NLR has been used as a marker to tested among patients with stable COPD or during acute exacerbation of COPD. The current study found that the mean NLR was significantly higher in case than control. Other studies like Turkey study [11] That studied in-patient records of 269 COPD cases with stable disease and among acute exacerbations, as well as 50 health controls matching sex and age. The mean±SD level of NLR in controls was 1.71±0.65, in stable COPD was 2.59±1.79 and in AECOPD was 4.28±4.12 with a substantial difference in NLR values. Other Korean Studies[12] that prospectively assessed the NLR in 59 acute exacerbation of COPD patients, 61 stable COPD patients and 28 controls. NLR levels in patients with acute exacerbation of COPD were substantially higher than in those with stable COPD and controls. Regarding

red blood indexes: COPD has long been known to cause polycythemia secondary to erythrocytosis triggered by hypoxia present in advanced COPD cases [13]. Also acidosis may cause polycythemia, whether due to metabolic lactic acidosis or due to chronic respiratory insufficiency [14], However, some studies have shown that some patients with COPD have anemia, rather than erythrocytosis [15, 16]. Our result shown that HCT was significantly higher in case than control but the two mean were lies in normal range. On the contrary, multiple theories were proposed: these findings were obtained either from patients with COPD at various stages of the disease and varies age, or from patients undergoing various forms of therapy. In addition various types of tests used, some of them being very old, which makes it difficult to compare the findings. In the current study the mean RDW was marginally higher but statistically no difference between case and control was found. Elevated RDW has been related to the inflammatory process of chronic disorders and it is well known that inflammation induces erythrocyte membrane degradation and decreases red cell lifespan. Other Studies had shown that RDW increases significantly with increase COPD severity [17, 18]. It was also seen that RDW elevation is becoming more prevalent as the COPD stage advanced [57], We hypothesized that the explanation of this could lie in that RDW variation merely reflected the consistency of erythrocyte size and shape rather than the oxygen-carrying capacity. Mean platelet count (MPC) in acute exacerbation of COPD patients was comparatively less than in control and the difference was no significant in current study. This was in line of Poland study[19] that conclude the COPD has no effect on the platelet count in humans. In contrast to this, Elevated levels of platelets in patients with stable COPD have previously been found to be more prevalent [20], correlated with increasing airflow obstruction [21], all-cause mortality [22], And could be a platelet activation surrogate. In the Croatian study of 109 patients with stable COPD the number of platelets was considerably higher than that of 51 controls subject [20] . also many Studies had shown significant increase in the platelet count in acute exacerbation of COPD[20, 23]. A widely performed clinical assay, platelet count may be a biomarker for moderately serious COPD symptoms [23]. Certainly, this may be, at least in part, because of the small number of patients in our sample and Poland study. These Conflicting reports necessitates conduction of more research at this point. The mean platelet volume (MPV) shows the severity of inflammation and as inflammation plays an important role in acute exacerbation of COPD so this biomarker can used in evaluation of such patients. According to current study, there were statistical significance among acute exacerbation of COPD patients and control, with higher mean was in cases but the two mean were within normal range. Other studies in various parts of the world have shown that MPV values in acute exacerbation of COPD patients are significantly lower like in in Egyptian studies [24], Turkey study [25]and Indian study [26] and explain that because of systemic inflammation observed during the exacerbation of COPD, overproduction of inflammatory mediators such as CRP, tumor necrosis factor-α, and other proinflammatory cytokines takes place[27, 28] . This results in the suppression of platelet size because of an interference with megakaryopoiesis and the subsequent release of small-size platelets from the bone marrow [29, 30]. this variation between study may be due to that our study not excluded the smoker and as Cigarette smoking was proved to be associated with an increased MPV[24]. This was supported by our finding. In current study, we failed to find any correlation between MPV and FEV_1 this in line of other studies, like Greece study [10], Croatian study[20] and Turkey study [25] that noted, MPV did not correlate with any indices of COPD severity.

Conclusion

Chronic obstructive pulmonary disease is quite common in our country and acute exacerbations are also very common. Though inflammatory markers are readily available, some are not cost-effective and other tests like culture takes time. CBC is easily available and it parameters like WBC, NRL, HCT, MCHC and MPV.

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Conflict of Interest: None to declare.

Ethical Clearance: All experimental protocols were approved under the college of medicine and all experiments were carried out in accordance with approved guidelines.

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