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The Relationship of Blood Eosinophils Levels with Degree of Exacerbation in COPD Patient at Usu General Hospital

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ABSTRACT

Introduction: During acute exacerbations of chronic obstructive pulmonary disease (COPD), blood eosinophil count has the potential to predict treatment response. Nevertheless, there hasn't been enough research done to determine whether blood eosinophil numbers in a stable state can forecast an eosinophilic exacerbation.

Methods: This study was a retrospective cohort analysis performed July-August 2022 to July-August 2023. Subject were 44 COPD patients who were treated at the outpatient clinic. Blood samples measured blood eosinophil levels. We determined an absolute cut-off point for blood eosinophil count at stable COPD in order to identify the rate of exacerbation.

Results: Based on the Kruskal-Walli's test, there was a significant relationship between blood eosinophils and the level of exacerbations in COPD patients (p value = 0.003).

Conclusion: We established a relationship between the rate of exacerbation and blood eosinophil counts during stable COPD. The rate of exacerbation and eosinophil counts showed a strong positive relationship. Our findings should be confirmed by prospective and further research in different populations.

Keywords

Blood, Eosinophilia, Exacerbation, COPD, GOLD

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INTRODUCTION

One of the leading causes of morbidity and death worldwide is chronic obstructive pulmonary disease (COPD). The prevalence is often directly to the prevalence of tobacco smoking, occupational and air pollution as an important risk for COPD.[1] According to research, COPD patients experience an earlier onset of comorbidities and an increase in morbidity as they age.[2]

Blood eosinophils are an important biomarker that varies substantially over COPD patients, blood eosinophils are considered as an biomarker for determining therapy. Blood eosinophil count has also been recognized as an important biomarker for identifying patients at risk for excacerbation and treatment with ICS.[1,3]

Both intrinsic and extrinsic factors, including drugs, allergies, obesity, and smoking, can affect blood eosinophil levels. It is unknown, therefore, if blood eosinophil fluctuations in COPD patients are comparable. Moreover, there are no studies that show blood eosinophils over time and how they reflect changes in severity of status in COPD disease.[4-6]

When used in conjunction with LABA, ICS improves lung function, overall health, and lowers exacerbations more than either medication alone does in patients experiencing moderate to severe COPD exacerbations.[3,4]

METHODS

This study was a retrospective cohort analysis performed June-August 2022 to June-August 2023 using medical records. Population is all COPD Patient at the Polyclinic USU General Hospital based on history taking, physical examination and supporting examination. The sampels were 44 COPD patient.

Inclusion criteria is patients diagnosed with COPD (age >40 years), received inhaler therapy, and who blood eosinophils were examined. Exclusion criteria in this study is patient who do not have complete medical record data, patient with a history of allergies, parasitic infection, autoimmune and other atopic disease, patient who use therapy such as biological agents and immunotherapy. Blood samples measured blood eosinophil levels. We determined an absolute cut-off point for blood eosinophil count at stable COPD in order to identify the rate of exacerbation.

Univariate analysis is conduct to describe the characteristics of the research subjects. Categorical data will be assessed using a proportion (%) while numerical data will be served as mean or standard deviation (SD) if the data is normally distributed. If the data is not normally distributed, we use the median and interquartiles. To assess whether the data is normally distributed or not, we conduct the Kolmogorov Smirnov test and consider it as normal distributed if p value > 0.05. Bivariate analysis to access the relationship between blood eosinophil levels and exacerbation levels in COPD Patient using ANOVA, as a substitute for non parametric statistics with Kruskal Wallis test.

RESULTS

Based on 44 subjects, we can be seen the 34 patients were male (77.3%) and 10 patients were female (22.7%). The subject age group consisted of 11 patients aged 40-60 years (25%) and 33 patients aged >60 (75%). There were 5 patient (11.4%) without comorbidities and 39 patients (88.6%) with a comorbidities with 10 patients (22,7%) having a history of Diabetes mellitus, 12 patients (27,3%) having hypertension, 14 patients with CHF (31.8%) and having Cancer as 3 patients (6,8%).

Table 1. Frequency distribution of research subjects

Subject Characteristic	Frequency	Percentage
Sex		
Male	34	77.3
Female	10	22.7
Ages		
40-60	11	25
>60	33	75
Comorbidites		
Diabetes Mellitus	10	22.7
Hypertension	12	27.3
CHF	14	31.8
Cancer	3	6.8
No comorbidities	5	11.4

In this study, there were 24 subjects with eosinophils <100 (54.5%), 8 people (18.2%) with eosinophils 100-300 and 12 people (27.3%) with eosinophils >300.

Table 2. Characteristic of Absolute Blood Eosinophil Subjects

Subject Characteristic	Frequency	Percentage
Eosinophil		
<100	24	54.5
100-300	8	18.2
>300	12	17.3

The results of this study showed that there were 12 subjects with no exacerbation (27.2%), 5 people (11.3%)

with mild exacerbation, with moderate as many as 9 people (20,5%) and severe exacerbation as many as 18 people (41%).

Table 3. Characteristic of Degree of Exacerbation Subjects

Subject Characteristic	Frequency	Percentage
Exacerbation		
No	12	27.2
Mild	5	11.3
Moderate	9	20.5
Severe	18	41.0

The results of this study showed that 8 subjects wits eosinophils <100 (33.3%) had no exacerbations, 1 person had mild exacerbation (4.16%), 1 person had moderate exacerbation (4.16%) and 14 people (58.3%) had severe exacerbation. Subjects with eosinophils 100-300 with no exacrebations were 1 person (12.5%), with mild exacerbation were 1 person (12.5%), with moderate exacerbation were 4 people (50.0%) and with severe exacerbations were 2 people (25.0%). Subject with eosinophils >300 with no exacrebations were 3 people (25%), with mild exacerbation were 3 people (25%), with moderate exacerbation were 4 people (33.3%) and with severe exacerbations were 2 people (16.7%). Based on the Kruskal-Wallis test, the p value was 0.003 ($p<0.05$), so there was a significant relationship between blood eosinophils and the level of exacerbations in COPD Patients.

Table 4. The Relationship between Eosinophil and Degree of Exacerbation

		Exacerbation				*p value*
		No	Mild	Moderate	Severe	
Eosinophil	<100	8(33.3%)	1(4.1%)	1(4.1%)	14(58%)	0.003*
	100-300	1(12.5%)	1(12.5%)	4(50%)	2(25%)	
	>300	3(25%)	3 (25%)	4(33%)	2(16.7%)	

*Kruskal Wallis Test

DISCUSSION

According to GOLD the incidence of COPD increases frequently with increasing age.[1,7] This is in line with the results of basic health research, where the prevalence of COPD increases with increasing age, namely increasing at the age of 56 years and over. The study's findings demonstrated that the majority of subjects were men (77%). This is in accordance with epidemiological research in Germany on 2,741 subjects. Men constituted the majority of sufferers (59%) with an average age of 65 years in the study.[8-12] These results are consistent with the characteristics of the study's subjects where 33 people (75%) were aged >60 years. This tendency is possible because in Indonesia the majority of smokers are men. This tendency to smoke is a COPD risk factor, although there are several cases in non-smokers.[12-16] One of the factors that plays a role in increasing the incidence of COPD is the high smoking habit, especially in men over the age of 18 years (65-75%). This is in accordance with the theory which states that age is a risk factor for COPD. The lack of access to health services for women is one of the causes of the low proportion. Likewise, there is a labeling of COPD in men so that doctors are less alert in diagnosing this disease in women.[1,17]

A study conducted to look at therapy problems in COPD patients found that female patients had a tendency to fail to use inhaler therapy.[18,19] This research shows that hypertension and Congestive Heart Failure (CHF) are the most common comorbidities in COPD.[2] Hypertension itself is an agreed comorbidity for COPD. The direct impact is not yet understood but it is suspected that disruption of the respiratory tract causes disruption of heart function and oxygen exchange. This encourages the release of inflammatory mediators which have an effect on heart remodeling. This condition results in Congestive Heart Failure (CHF) and blood vessel response as hypertension.[1,2]

The Global Initiative for Chronic Obstructive Lung Disease (GOLD) itself has classified hypertension and CHF as comorbidities that must be understood and controlled by clinicians. Ischemic heart disease is a

comorbidity that is often found in COPD patients. There is no difference between the management of ischemic heart disease in COPD patients and those without COPD.[1,2] Other diseases that can affect the leukocyte count besides infection are neoplastic and inflammatory diseases. The inflammatory process that occurs in patients with COPD and other comorbidities involving inflammatory cells will affect the count of leukocyte types.[15,16]

Eosinophils are influenced by immune cells that are appropriate to the conditions in the body. Eosinophils can move to the lungs, where the mechanism is not yet clearly understood. Eosinophils are found in the respiratory tract, tissues and circulation in COPD sufferers, during periods of stability and exacerbations.[6] Subject in a previous study found an average annual exacerbation in a rate of 2.4 year per year, which found eosinophil counts and the quantity of exacerbations shown a strong correlation (p=0.005).[1]

Previous research by Kang et al in 2021 stated that there was a significant positive correlation in the number of eosinophils between stable COPD. Based on a blood eosinophil count >2%, 300 cells/milliliter is the optimal cut-off value for a stable blood eosinophil count in order to predict eosinophilic COPD exacerbations (sensitivity 45.8% and specificity 80.9%).[14] Jose et al conducted a study regarding the risk of COPD exacerbation which could be predicted using the BODE index. In this study, it was said that the average time a patient was first hospitalized due to an exacerbation according to the results of the BODE score was a score of 0-2 (7.9 years), a score of 3-4 (5.7 years), a score of 5-6 (3, 4 years) and a score of 7-10 (1.3 years) since the diagnosis was made. Meanwhile, the average time for patients to be admitted to the emergency department due to COPD exacerbation based on the BODE score is score 0-2 (6.7 years), score 3-4 (3.6 years), score 5-6 (2 years), score 7-10 (8 months) since the diagnosis was made.[20-23]

The relationship between eosinophilic COPD inflammation, its dynamics and the risk of exacerbation remains controversial.[13] According to Schuman et al., blood eosinophil levels fluctuate during the course of COPD, and phenotype is hard to ascertain from a single measurement. Nonetheless, Kim et al. found that blood eosinophils at a particular moment were a reliable indicator of enduring eosinophilia during the subsequent year, suggesting the long-term stability of blood eosinophilic inflammation in people.[24]

CONCLUSION

There was a significant relationship between blood eosinophils and the level of exacerbations in COPD Patients.

DECLARATIONS

This study was approved by Ethical Committee of Universitas Sumatera Utara, Medan, Indonesia, on Agustus 23, 2023. No : 911/KEPK/USU/2023. The sampels provided the consent to participated in the study.

CONSENT FOR PUBLICATION

The Authors agree to publication in Journal of Society Medicine.

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COMPETING INTERESTS

The authors declare that there is no conflict of interest in this report.

AUTHORS' CONTRIBUTIONS

All authors are responsible for conceptualization, manuscript preparation, manuscript editing, and manuscript assurance.

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