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## **Original Research**

# Correlation between red cell distribution width and acute exacerbation of chronic obstructive pulmonary disease

<sup>1</sup>Prason Kant, <sup>2</sup>Sanjay Singh

<sup>1</sup>Assistant Professor, Department of Pulmonary Medicine, Mayo Institute of Medical Sciences Gadia, Barabanki, Uttar Pradesh, India;

<sup>2</sup>Associate Professor, Department of Pulmonary Medicine, Career Institute of Medical Sciences and Hospital, Lucknow, Uttar Pradesh, India

#### ABSTRACT:

**Background:** Chronic obstructive pulmonary disease, or COPD, is a chronic respiratory disease that affects the lungs and makes it difficult to breathe. The present study was conducted to assess the correlation between red cell distribution width (RDW) with acute exacerbation of chronic obstructive pulmonary disease. **Materials & Methods:** 126 COPD patients of both genders were selected. The estimation of RDW, RBC count and CBC was done. **Results:** There were 38 AECOPD males and 20 females and 40 stable COPD males and 18 females. In AECOPD and stable COPD, symptoms were breathlessness in 42 and 24, cough in 37 and 21, expectoration in 32 and 34, wheezing in 48and 25 and chest painin 51 and 37 respectively. Smokers were 34 and 20, non-smokers were 10 and 8 and ex- smokers were 14 and 30. mMRC grade1 was seen in 4 and 0, 2 in 8 and 12, 3 in 14 and 38 and 4 in 32 and 8. GOLD stageA was seen in 2 and 4, B in 6 and 8, C in 12 and 20 and D in 38 and 26. RDW was 10%-20% in 41 and 38 and 21%-30% in 17 and 20 respectively. The difference was significant (P< 0.05). The mean RDW was significantly higher in death(19.5%) as compared to survived patients (17.2%). **Conclusion:** In AECOPD compared to stable COPD, the mean red cell distribution width on the day of illness presentation was considerably greater. Patients having a large red cell distribution width upon admission had a worse chance of surviving. **Key words:** Chronic obstructive pulmonary disease, red cell distribution, smokers

**Corresponding Author:** Prason Kant, Assistant Professor, Department of Pulmonary Medicine, Mayo Institute of Medical Sciences Gadia, Barabanki, Uttar Pradesh, India

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#### **INTRODUCTION**

Chronic obstructive pulmonary disease, or COPD, is a chronic respiratory disease that affects the lungs and makes it difficult to breathe.<sup>1</sup> It is a progressive condition that typically worsens over time. COPD is a term that encompasses several lung diseases, with the most common ones being chronic bronchitis and emphysema.<sup>2</sup>The primary cause of COPD is cigarette smoking. Long-term exposure to other irritants such as air pollution, chemical fumes, and dust can also contribute to the development of COPD.<sup>3</sup> In rare cases, a genetic condition called alpha-1 antitrypsin deficiency can lead to COPD.COPD symptoms include chronic cough, increased production of mucus, shortness of breath (dyspnea), wheezing, and chest tightness. These symptoms typically worsen over time and can significantly impact a person's quality of life.4

Acute exacerbations of COPD (AECOPD) are considered the most significant clinical occurrences in

the history of the disease, with in-hospital death rates of 2.5%, 7.25%, 7.4%, and 12%. Red blood cells (erythrocytes) can vary in size and volume, which can be measured using a test called the red cell distribution width (RDW).<sup>5</sup> Every cell in your body receives oxygen from your lungs through red blood cells. To develop, reproduce, and maintain health, cells require oxygen. A medical issue may be present if red blood cells are larger than usual.<sup>6</sup>The present study was conducted to assess the correlation between red cell distribution width (RDW) with acute exacerbation of chronic obstructive pulmonary disease.

#### **MATERIALS & METHODS**

The present study consisted of 126 COPD patients of both genders. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. The venous blood sample was collected from the

anticubital vein of the study subjects. The blood samples were analyzed on the same day within 3 hours of collection. The estimation of RDW, RBC count and CBC was done. RDW-CV was calculated from standard deviation and MCV by the formula. RDW-CV (%) = 1 SD of RBC volume / MCV x 100%.Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

#### RESULTS

#### **Table I Distribution of patients**

Gender	AECOPD (58)	Stable COPD(58)
Male	38	40
Female	20	18

Table I shows that there were 38 AECOPD males and 20 females and 40 stable COPD males and 18 females.

Table II Assessment of parameters								
	Parameters	Variables	AECOPD	Stable COPD	P value			
	Symptoms	Breathlessness	42	24	0.05			
		Cough	37	21				
		Expectoration	32	34				
		Wheezing	48	25				
		Chest pain	51	37				
	Smoking	Smokers	34	20	0.02			
	_	Non- smoker	10	8				
		Ex- smoker	14	30				
	mMRC grade	0	0	0	0.01			
		1	4	0				
		2	8	12				
		3	14	38				
		4	32	8				
	GOLD stage	А	2	4	0.04			
		В	6	8				
		С	12	20				
		D	38	26				
	RDW%	10%-20%	41	38	0.03			
		21%-30%	17	20				

Table II shows that in AECOPD and stable COPD, symptoms were breathlessness in 42 and 24, cough in 37 and 21, expectoration in 32 and 34, wheezing in 48 and 25 and chest pain in 51 and 37 respectively. Smokers were 34 and 20, non-smokers were 10 and 8 and ex- smokers were 14 and 30. mMRC grade1 was seen in 4 and 0, 2 in 8 and 12, 3 in 14 and 38 and 4 in 32 and 8. GOLD stageA was seen in 2 and 4, B in 6 and 8, C in 12 and 20 and D in 38 and 26. RDW was 10%-20% in 41 and 38 and 21%-30% in 17 and 20 respectively. The difference was significant (P < 0.05).

 Table III Association between RDW and outcome in AECOPDpatients

RDW	AECOPD	Stable COPD
Mean	19.5	17.2
SD	0.82	2.4

Table III, graph I shows that mean RDW was significantly higher in death(19.5%) as compared to survived patients (17.2%).



Graph I Association between RDW and outcome in AECOPD patients

#### DISCUSSION

COPD is a persistent, progressive airflow limitation associated with enhanced chronic inflammatory response in the airways.<sup>7,8</sup> Chronic obstructive pulmonary disease is the third leading cause of death worldwide; COPD led to 3.84 million deaths in 2019, a toll expected to reach 4.4 million yearly by 2040.<sup>9,10</sup>COPD is diagnosed through a combination of medical history, physical examination, lung function tests (spirometry), and imaging studies like chest Xrays or CT scans. Early diagnosis is important for effective management.<sup>11,12</sup>The present study was conducted to assess the correlation between red cell distribution width (RDW) with acute exacerbation of chronic obstructive pulmonary disease.

We found that there were 38 AECOPD males and 20 females and 40 stable COPD males and 18 females. Seyhan et al<sup>13</sup>studied the prognostic value of RDW in patients with COPD and compared the value of this measurement with cardiac, respiratory, and hematological status. In the overall patients, the RDW level had a mean value of 15.1 ± 2.4. RDW was positively correlated with C-reactive protein (CRP) (p = 0.008, r = 0.21), right ventricular dysfunction (RVD) (p < 0.001, r = 0.25), and pulmonary arterial hypertension (PAH) (p = 0.03, r = 0.14). Variables (p< 0.1) included in the univariate survival analysis were forced expiratory volume in 1 second (FEV1% predicted), RDW levels, age, PaCO2, albumin and CRP levels, presence of CVD, presence of anemia, presence of RVD, and presence of PAH. Subsequent multivariate analysis suggested that RDW levels (1.12; 95% CI, 1.01 to 1.24; p = 0.01), and the presence of RVD (2.6; 95% CI, 1.19 to 5.8; p = 0.01) were independently related to mortality.

We observed that in AECOPD and stable COPD, symptoms were breathlessness in 42 and 24, cough in 37 and 21, expectoration in 32 and 34, wheezing in 48and 25 and chest painin 51 and 37 respectively. Smokers were 34 and 20, non-smokers were 10 and 8 and ex- smokers were 14 and 30. mMRC grade1 was seen in 4 and 0, 2 in 8 and 12, 3 in 14 and 38 and 4 in 32 and 8. GOLD stageA was seen in 2 and 4, B in 6 and 8, C in 12 and 20 and D in 38 and 26. RDW was 10%-20% in 41 and 38 and 21%-30% in 17 and 20 respectively. We found that the mean RDW was significantly higher in death(19.5%) as compared to survived patients (17.2%). Tertemiz et al<sup>14</sup>investigated the relationship of RDW with chronic obstructive pulmonary disease (COPD) stages, BODE index and survival in COPD patients. The mean age of the patients was  $65.6 \pm 9.6$  years. Distribution of the COPD stages of the patients were stage 1: 16%, stage 2: 52%, stage 3: 26%, stage 4: 6%. RDW was found significantly different between stages. The highest RDW was observed in the very severe stage (p < 0.001). Median of BODE index was 1 (0–3). As the BODE index increased RDW also increased (p < 0.001). When the patients were grouped according to the laboratory upper limit of RDW, survival rate was 31% in the RDW >14.3% group and 75% in the RDW <14.3% group.

The limitation of the study is the small sample size.

#### CONCLUSION

Authors found that in AECOPD compared to stable COPD, the mean red cell distribution width on the day of illness presentation was considerably greater. Patients having a large red cell distribution width upon admission had a worse chance of surviving.

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