

# The role of neutrophil-lymphocyte ratio in patients with chronic obstructive pulmonary disease in Babylon province

*El papel de la relación neutrófilos-linfocitos en pacientes con enfermedad pulmonar obstructiva crónica en la provincia de Babilonia*

 Ahmed Hussein Jasim ORCID: 0000-0002-6198-7641. Assistant prof. Dr. college of medicine, University of Babylon, Babylon/Iraq [med.ahmed.hus@uobabylon.edu.iq](mailto:med.ahmed.hus@uobabylon.edu.iq).

Received/Recibido: 04/21/2021 Accepted/Aceptado: 05/15/2021 Published/Publicado: 06/10/2021  
DOI: <http://doi.org/10.5281/zenodo.5651253>

## Abstract

**Introduction:** Chronic obstructive pulmonary disease (COPD) is a complex illness, associated with many comorbidities, it is usually misdiagnosed and underrated, the aim of study is to regulate whether neutrophil lymphocyte ratio (NLR) can be used in diagnosis of COPD. **Method:** Comparative cross sectional study, the data was conducted between 1 December 2019 and 1 March 2020 among patients with approved diagnosis of AECOPD and attendees to emergency unit and respiratory outpatient clinic or admitted to general ward and intensive care unit. The attendees to emergency unit and respiratory outpatient clinic or admitted to general ward and intensive care unit were asked to participate in this study and sample size of 79 patients were included in this study. Other 79 healthy persons they attended emergency unit as relative to patients were selected as the control group. **Results:** Comparative cross sectional study of 79 patients with COPD and 79 patients normal, mean  $\pm$  SD of age ( $66 \pm 10$ ) years old and N/L ratio ( $5.9 \pm 4.8$ ), according to fig (1); (45.57%) of patients with COPD have sever FEV1 and (30.38%) of patients have moderate FEV1. In addition, fig (2) show 73% of patients in current study are males and 27% are females with 71% are old age (more than 60 years old). There is significant difference between NLR of patients with COPD and normal patients, increase in NLR occur in patients with COPD. **Conclusion:** NLR may beneficial inflammation predictor in diagnosis COPD and its acute exacerbation.

**Keywords:** Babylon province; chronic obstructive pulmonary disease; neutrophil-lymphocyte ratio.

## Resumen

**Introducción:** La Enfermedad Pulmonar Obstructiva Crónica (EPOC) es una enfermedad compleja, asociada a muchas comorbilidades, usualmente es mal diagnosticada y subestimada, el objetivo del estudio es regular si el cociente de linfocitos neutrófilos (NLR) se puede utilizar en el diagnóstico de la EPOC. **Método:** Estudio transversal comparativo, los datos se realizaron entre el 1 de diciembre de 2019 y el 1 de marzo de 2020 entre pacientes con diagnóstico aprobado de AECOPD y asistentes a unidad de urgencias y ambulatorio respiratorio o ingresados en unidad general de palabra y cuidados intensivos. Se solicitó la participación en este estudio a los asistentes a la unidad de urgencias y al ambulatorio respiratorio o ingresados en la unidad de cuidados intensivos y de palabra general y se incluyó en este estudio un tamaño de muestra de 79 pacientes. Otras 79 personas sanas atendidas en la unidad de urgencias en relación con los pacientes fueron seleccionadas como grupo de control. **Resultados:** Estudio transversal comparativo de 79 pacientes con EPOC y 79 pacientes normales, media  $\pm$  DE de edad ( $66 \pm 10$ ) años y relación N / L ( $5,9 \pm 4,8$ ), según figura 1; (45,57%) de los pacientes con EPOC tienen un FEV1 severo y (30,38%) de los pacientes tienen un FEV1 moderado. Además, la figura 2 muestra que el 73% de los pacientes en el estudio actual son hombres y el 27% son mujeres y el 71% son ancianos (más de 60 años). Existe una diferencia significativa entre el NLR de los pacientes con EPOC y los pacientes normales, el aumento del NLR se produce en los pacientes con EPOC. **Conclusión:** la NLR puede ser un predictor de inflamación beneficioso en el diagnóstico de EPOC y su exacerbación aguda.

**Palabras clave:** provincia de Babilonia; enfermedad pulmonar obstructiva crónica; relación neutrófilos-linfocitos.

**C**hronic obstructive pulmonary disease (COPD) is a complex illness, associated with many comorbidities, it is usually misdiagnosed and underrated. Extra than 3 million individuals international die yearly from COPD, that make this illness a major problems in community, the main cause of COPD is cigarette smoking, (15-20%) of smokers have COPD and while other patients have genetic problems like (alfa1-antitrypsin insufficiency) and other patients have not genetic problem like (air pollution)<sup>1</sup>. Chronic and permanent obstruction of airflow are the main features of disease<sup>2</sup>. Chronic inflammation, oxidative stress and protease-antiprotease inequality are the main pathological mechanisms occur in COPD, so the symptoms of COPD occur either locally (pulmonary) or systemically<sup>3</sup>. Management of COPD include short-acting  $\beta_2$ -agonist or short-acting muscarinic antagonists, this make forced expiratory volume in one second (FEV1) get better and symptoms also get better, but long-acting  $\beta_2$ - agonists and long-acting muscarinic antagonists make lung function improve<sup>1</sup>. Systemic inflammation documented as a risk factors in patients with COPD, these risk factors increase hospitalization and increase mortality<sup>4</sup>. In COPD patients when comparing with normal person there is increase in white blood cells (WBC), C-reactive protein (CRP), fibrinogen (Fbg) and decrease in count of lymphocyte<sup>4-7</sup>. Current studies stated that neutrophil-lymphocyte ratio (NLR) could use as indicator of inflammation especially in COPD and coronary artery illness<sup>8</sup>. NLR is low-cost and possible indicator in evaluating the malignancy severity and in appendicitis like bacteremia<sup>9,10</sup>. The aim of study is to improve that NLR could use as indicator of inflammation especially in COPD.

**T**he data collection was conducted between 1 December 2019 and 1 March 2020 among patients with approved diagnosis of AECOPD and attendees to emergency unit and respiratory outpatient clinic or admitted to general word and intensive care unit of Marjan medical city/ Iraq. A consecutive sample of patients with approved diagnosis of AECOPD by based on Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines<sup>11</sup>, during the period of data collection was adopted. The attendees to emergency unit and respiratory outpatient clinic or admitted to general word and intensive care unit were asked to participate in this study and sample size of 79 patients were included. Other 79 healthy volunteers it in the same age and gender and who

be present emergency unit as relative to patients were selected as the control group.

**Laboratory test:** Both groups (case and control) age and gender were required than sent for CBC. All laboratory measurements were made at morning between 08:00–12:00 am, using standardized methods at the Marjan medical city laboratory. collected (5cc) of venous blood by venipuncture from patients and normal individuals, put this sample in a plane tube and not add anticoagulant, post centrifugation for 10 minutes and examined the serum was arranged. An electronic hematology analyzer (Siemens ADVIA® 2120i System, Siemens Healthcare Diagnostics and Japan) determined hematological parameters as complete blood count. The CBC parameters: total lymphocyte count, neutrophil count, mean corpuscular hemoglobin concentration (MCHC), hematocrit (HCT), mean corpuscular volume (MCV), platelet count and mean platelet volume (MPV), red cell distribution width (RDW) were assessed.

**Spirometry test:** Spirometry performed according to the recommendations of the American Thoracic Society guidelines<sup>[12]</sup>. Statistical analysis done by used SPSS22, frequency and percentage for categorical variables and mean  $\pm$  SD for continuous variables. Fischer exact test for show association of categorical variables and t-test for difference of means of continues variables, ROC curve for sensitivity and specificity cut-off point of N/L ratio. P-value less than 0.05 considered significant.

Comparative cross sectional study of 79 patients with COPD and 79 patients normal, mean  $\pm$  SD of age (66 $\pm$ 10) years old and N/L ratio (5.9 $\pm$ 4.8), according to fig 1; (45.57%) of patients with COPD have sever FEV1 and (30.38%) of patients have moderate FEV1. In addition, fig 2 show 73% of patients in current study are males and 27% are females with 71% are old age (more than 60 years old).

**Fig 1: FEV1 distribution of patients with COPD.**

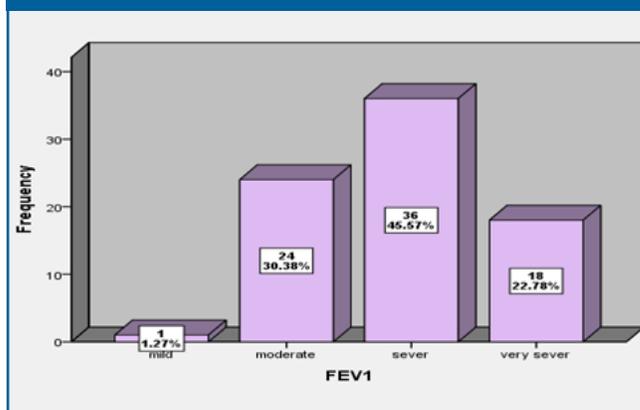


Fig 2: gender distribution of patients with COPD.

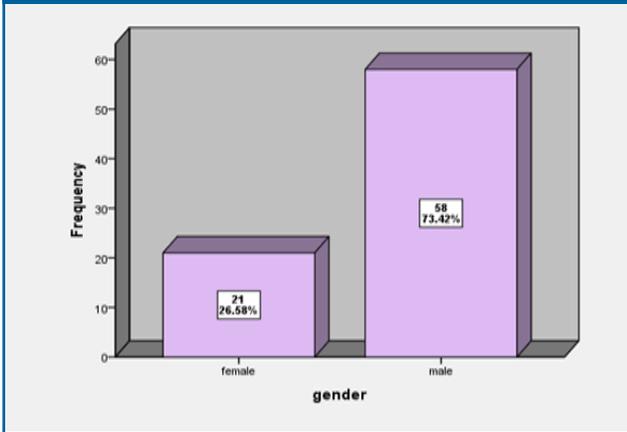
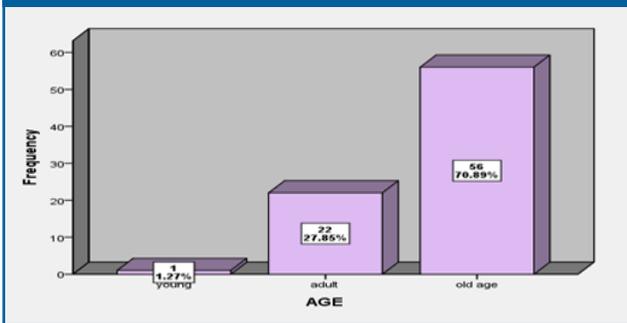


Fig 3: age distribution of patients with COPD.



According to table 1, there is significant difference between N/L ratio of patients with COPD and normal patients, the ratio increase in patients with COPD.

**Table 1: difference between neutrophil / lymphocyte in patients with COPD and normal patients.**

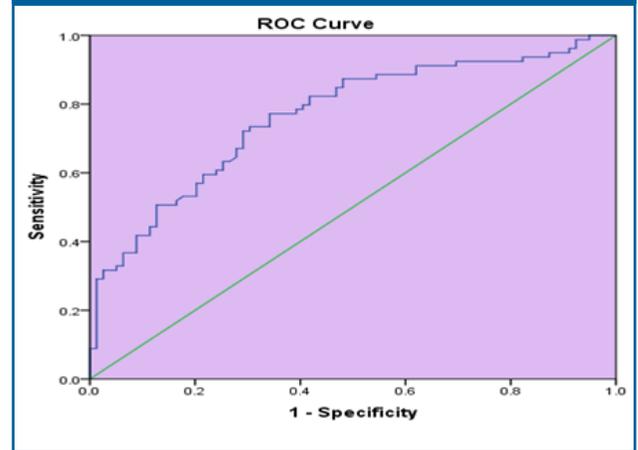
	group	N	Mean	Std. Deviation	P-value
N/L	case	79	6.91	7.5	0.0001
	control	79	2.69	2.22	

P-value  $\leq$  0.05 (significant).

According to fig 4 very sensitive and specific cutoff point of N/L ration is (2.7), so more than it considered high ratio.

Area Under the Curve 0.76, N/L ratio (2.7) with sensitivity 76% and specificity 66%

Fig 4: Roc curve for sensitivity and specificity cutoff point of N/L ratio.



## Discussion

Parameters that simply assessable and non-invasive which might mirror general inflammation has been studied. WBC, neutrophil counts and CRP are still the utmost regularly maker of infection in everyday clinical practice. In spite of numerous cytokines, endothelin-1 besides copeptin appear hopeful outcomes in evaluation of risk of infection but these parameters have disadvantaged by confirmation, price, and availability. In numerous stressful actions, there is increase in neutrophil count and low count of lymphocyte. Demargination, late apoptosis of neutrophils lead to neutrophilia. Lymphocytes margination, rearrangement and faster apoptosis are the chief reasons of lymphocytopenia in communicable illness<sup>13</sup>. Lymphocytopenia has revealed encouraged consequence in the bacteremia valuation in communicable disease<sup>14</sup>. Newly, NLR discovered as hopeful and simple indicator in numerous clinical conditions<sup>15,16</sup>. NRL is low-cost and freely obtainable indicator providing an extra benefit in expecting period of hospitalization and mortality rate. Current study show that NLR is simple and accruable marker in evaluation and diagnosis of bacteremia and COPD, also another study stated that NLR is highly sensitive in the diagnosis patient5s with community-acquired pneumonia<sup>17,18</sup>. In current study, there is significant difference between patients with COPD and normal patients in NLR, it is increase in COPD patients, (2.7) and more considered high NLR, this is similar to other study state that cut-off values determined 3.2 for NLR<sup>19,20</sup>, this is like to other study revealed that NLR more than (3.4) would be a better predictor of inflammation. NLR may be a beneficial inflammation predictor in COPD patients<sup>21</sup>.

NLR may be a beneficial inflammation predictor in COPD and acute exacerbation of COPD.

No conflict of Interest Disclosure.

## References

1. GOLD committee. Global Initiative for Chronic Obstructive Lung Disease (GOLD 2019). 2019;2-14.
2. Yao C, Liu X, Tang Z. Prognostic role of neutrophil-lymphocyte ratio and platelet-lymphocyte ratio for hospital mortality in patients with AECOPD. *Int J Chron Obstruct Pulmon Dis*. 2017;12:2285-90.
3. Sidhaye VK, Nishida K, Martinez FJ. Precision medicine in COPD: where are we and where do we need to go? *Eur Respir Rev*. 2018;27:180022.
4. Kalemci S, Akin F, Sarihan A, Sahin C, Zeybek A, Yilmaz N. Relationship between hematological parameters and severity of chronic obstructive pulmonary disease. *Pol Arch Intern Med*. 2018;128:171-7.
5. Agustí A, Sin DD. Biomarkers in COPD. *Clin Chest Med*. 2014;35:131-41.
6. Koç I, Karataş ZA, Mandollu E, Mermer A, Kaya A, Dokme A, et al. Importance of mean platelet volume in patients with chronic obstructive pulmonary disease. *Gaziantep Med J*. 2014;20:294-8.
7. Kim TH, Oh DK, Oh YM, Lee SW, Lee S Do, Lee JS. Fibrinogen as a potential biomarker for clinical phenotype in patients with chronic obstructive pulmonary disease. *J Thorac Dis*. 2018;10:5260-8.
8. Günay E, Ulasli Sarinc S, Akar O, Ahsen A, Günay S, Koyuncu T, et al. Neutrophil-to-lymphocyte ratio in chronic obstructive pulmonary disease: a retrospective study. *Inflammation*. 2014; 37: 374-80.
9. Jung SK, Rhee DY, Lee WJ, Woo SH, Seol SH, Kim DH, Choi SP. Neutrophil-to-lymphocyte count ratio is associated with perforated appendicitis in elderly patients of emergency department. *Aging Clin Exp Res*. 2017 Jun;29(3):529-536.
10. deJager CP, van Wijk PT, Mathoera RB, de Jongh-Leuvenink J, van der Poll T, Wever PC. Lymphocytopenia and neutrophil-lymphocyte count ratio predict bacteremia better than conventional infection markers in an emergency care unit. *Crit Care* 2010; 14: R192.
11. Rodriguez-Roisin, R., Rabe, K. F., Vestbo, J., Vogelmeier, C. & Agustí, A. Global Initiative for Chronic Obstructive Lung Disease (GOLD) 20th Anniversary: A brief history of time. *European Respiratory Journal*, 2017, 50.
12. Graham BL, Steenbruggen I, Miller MR, et al. Standardization of Spirometry 2019 Update. An Official American Thoracic Society and European Respiratory Society Technical Statement. *Am J Respir Crit Care Med*. 2019;200(8):e70-e88.
13. Unsinger J, Kazama H, McDonough JS, Hotchkiss RS, Ferguson TA. Differential lymphopenia-induced homeostatic proliferation for CD4+ and CD8+ T cells following septic injury. *J Leukoc Biol*. 2009; 85: 382-390.
14. Wyllie DH, Bowler IC, Peto TE. Bacteraemia prediction in emergency medical admissions: role of C reactive protein. *J Clin Pathol* 2005; 58: 352-6.
15. Gibson PH, Croal BL, Cuthbertson BH, Small GR, Ifezuliye AI, Gibson G, et al. Preoperative neutrophil-lymphocyte ratio and outcome from coronary artery bypass grafting. *Am Heart J*. 2007; 154: 995-1002.
16. Sarraf KM, Belcher E, Raevsky E, Nicholson AG, Goldstraw P, Lim E. Neutrophil/lymphocyte ratio and its association with survival after complete resection in non-small cell lung cancer. *J Thorac Cardiovasc Surg*. 2009; 137: 425-8.
17. Honda T, Uehara T, Matsumoto G, Arai S, Sugano M. Neutrophil left shift and white blood cell count as markers of bacterial infection. *Clin Chim Acta*. 2016 Jun 1;457:46-53.
18. Zhang H, Xia H, Zhang L, Zhang B, Yue D, Wang C. Clinical significance of preoperative neutrophil-lymphocyte vs platelet-lymphocyte ratio in primary operable patients with non-small cell lung cancer. *Am J Surg*. 2015 Sep;210(3):526-35.
19. Tasoglu I, Sert D, Colak N, Uzun A, Songur M, Ecevit A. Neutrophil-Lymphocyte Ratio and the Platelet-Lymphocyte Ratio Predict the Limb Survival in Critical Limb Ischemia. *Clin Appl Thromb Hemost* 2013; 20: 645-650.
20. Kurtipek E, Bekci TT, Kesli R, Sami SS, Terzi Y. The role of neutrophil-lymphocyte ratio and platelet-lymphocyte ratio in exacerbation of chronic obstructive pulmonary disease. *J Pak Med Assoc*. 2015 Dec;65(12):1283-7.
21. Bilir B, Altıntaş N, Aydın M, Oran M, Özsu S, Tutar Ü. The Predictive Role of Neutrophil to Lymphocyte ratio in Chronic Obstructive Pulmonary Disease. *Eur J Gen Med*. 2016;13(2):105-10.