

RESEARCH PAPER

Association of neutrophil to lymphocyte and platelets to lymphocyte ratio with the severity of coronary artery diseases in patients with diabetes mellitus

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Abstract

Background: Evidence indicates an association of inflammatory process with atherosclerosis. Systemic inflammatory markers may point out the association of inflammatory changes with coronary artery diseases.

Aim: to investigate the association of Neutrophil/ Lymphocyte ratio (NLR) and Platelet/Lymphocyte Ratio (PLR) with the severity of coronary artery disease in patients with DM.

Method: We conducted a cross-sectional study of patients with coronary artery disease admitted for coronary angiography in Basra Cardiac Center. The study was done from March 2021 to February 2022. We collected demographic data, past medical history, biochemical tests and complete blood picture with the calculation of NLR and PLR. We reviewed coronary angiography to assess the number of diseased vessels, severity, and complexity of the lesions. The patients were divided into 2 groups; significant ($\geq 70\%$ obstruction) and non-significant CAD ($< 70\%$ obstruction).

Results: the study enrolled 228 (169 males and 59 females) patients with CAD. Significant CAD was found in 188 patients. The NLR was significantly correlated with the presence, extent, and severity of CAD (p-value 0.01, 0.003, 0.001) respectively. The PLR was significantly associated with the severity of CAD (p-value = 0.01), but non-significantly correlated with CAD presence or extent (p-value 0.28, 0.36) respectively. The NLR but not PLR was an independent marker to predict significant CAD in patients with DM.

Conclusion: neutrophil / Lymphocyte ratio was associated with the presence, extent, and severity of significant CAD in diabetic patients. Platelet/Lymphocyte Ratio was only associated with the severity of CAD.

Key words: coronary artery diseases, complete blood picture, NLR, PLR, DM.

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Introduction

Coronary artery disease (CAD) is a major risk globally and is still the first cause of disability and death, despite management advances.¹ The risk of ischaemic heart disease increases in the presence of Diabetes Mellitus

(DM) which has a tremendous impact on human life and well-being.² About 537 million adults, aged 20-79 years, have diabetes in 2021 and expected to be 643 million in 2030 and 783 million in 2045.³ The risk of coronary artery disease double folded with DM independent from other risk factors.⁴ This can be due to lipid metabolism dysregulation, and insulin resistance, causing endothelial cell and vascular smooth muscle, altered platelet function, and abnormal

coagulation.⁵⁻⁷ The presence of other risk factors such as hypertension and obesity would exacerbate the risk of CAD.⁸⁻⁹ Evidence suggests an association between atherosclerosis and chronic low-grade inflammation.⁹ Neutrophils, monocytes, and lymphocytes are involved in all steps of atherosclerosis.^{10,11} Neutrophils participate in the rapture of atherosclerotic plaque through releasing different enzymes, free radicals, and inflammatory factors.^{12,13} Also, neutrophils promote vascular wall and reperfusion injuries by interaction with platelets and endothelial cells.¹⁴⁻¹⁶ Elevated neutrophil counts can correlate with the presence and complexity of coronary atherosclerotic lesions.¹⁷ Lymphocytes have a regulatory and immune response role to stress.^{18,19} The lymphocyte count is inversely correlated with ongoing inflammation, caused by apoptosis.²⁰ Lower lymphocyte counts significantly correlate with the evolution of atherosclerosis.^{21,22} The platelets are crucial inflammatory mediators for atherogenesis.²³ Relative thrombocytosis may result from sustained inflammation that induces platelet synthesis by enhancing megakaryocyte proliferation.²⁴ Activated platelets release chemokines, growth factors, and cytokines resulting in atheroembolic milieu.²⁵ Studies suggest that elevated platelet levels correlate with adverse cardiovascular outcomes.^{26,27} Considering the role of inflammation in DM, the initiation and progression of atherosclerosis are heightened in diabetic patients.^{28, 29} Recently, the Neutrophil-to-lymphocyte ratio (NLR) and platelet-to-lymphocyte ratio (PLR) can be predictive and prognostic parameters in coronary artery disease with higher ratios indicating worse cardiovascular outcomes.^{30,31} However, there are limited studies to assess the collective impact of NLR, PLR, and DM on patients with CAD.

The aim of this study is to investigate the association of NLR and PLR with the severity of coronary artery disease in patients with DM.

Patients and methods

A cross-sectional study was done from March 2021 to February 2022 in Basra Cardiac Center, in Basrah; southern Iraq. We collected the demographic data, past medical history, complete blood picture including measurement of NLR and PLR, and results of the coronary angiography including number of diseased vessels, severity and complexity of the lesions. Also, biochemical tests including RBS, renal function test, and any others available. We enrolled 228 patients with CAD admitted for assessment by invasive coronary angiography study. All patients provided informed consent before enrolment. Blood samples were drawn from all patients at admission and were analyzed by automated analyzers. The NLR and PLR were measured by dividing neutrophil count on lymphocyte count, and platelet count on lymphocyte count respectively. All members of the study population were divided according to the result of the coronary angiography study into 2 groups; significant ($\geq 70\%$ obstruction) and non-significant CAD ($< 70\%$ obstruction). Significant CAD is subdivided into a single vessel (SVCAD), two vessels (DVCAD), and multi-vessel CAD (MVCAD). Further subdivision was done according to severity into critical ($\geq 70\%$ obstruction) and total obstruction (100% obstruction).

Statistical analysis: The data were analyzed using the Statistical Package for the Social Sciences (SPSS) Version 26.0. Categorical variables were summarized as numbers (N) and percentages (%), while continuous variables were summarized as mean $\pm$ standard deviations (M $\pm$

SD). A descriptive analysis was done, and a comparison of proportions was accomplished by using the Chi-Square test. The correlation study was done by Pearson correlation or Spearman correlation. For all tests, a P-value of < 0.05 was identified as statistically significant.

Results

The study enrolled 228 patients with coronary artery disease (males 74.1% and females 25.9%). The mean of age was 56.83 ± 11.54 years. Baseline demographic, biochemical, and hematological parameters are shown in (Table-1).

Table 1. General characteristics of the total patient population

		No. (%) or mean $\pm$ SD
Age (years)		56.83 $\pm$ 11.54
Gender	Male	169 (74.1)
	Female	59 (25.9)
BMI (kg/m ²)		26.94 $\pm$ 3.45
Index admission	Stable CAD	91 (39.9)
	UA	18 (7.9)
	NSTEMI	8 (3.5)
	STEMI	111 (48.7)
Comorbidities	DM	114 (50)
	HTN	138 (60.5)
	IHD	77 (33.8)
	Heart failure	11 (4.8)
	CVA	6 (2.6)
	AF	6 (2.6)
Dyslipidemia		42 (18.4)
Smoking	Smokers	76 (33.3)
	Non smokers	152 (66.7)
Blood pressure (mmHg)	Systolic	140.19 $\pm$ 21.46
	Diastolic	85.98 $\pm$ 11.46
Pulse rate		79.88 $\pm$ 13.43
Hemoglobin level (g/dL)		13.48 $\pm$ 1.75
WBC		10.40 $\pm$ 3.57
Neutrophil count		6.90 $\pm$ 3.45
Lymphocyte count		2.62 $\pm$ 1.28
Platelet count		255.91 $\pm$ 75.87
RBS (mg/dL)		176.97 $\pm$ 80.56
Blood urea (mg/dL)		34.82 $\pm$ 12.79
Serum creatinine (mg/dL)		0.84 $\pm$ 0.22
Duration of hospitalization (days)		1.93 $\pm$ 1.03
Complications during hospitalization	LV Dysfunction	6 (2.6)
	Arrhythmia	3 (1.3)
	No complications	219 (96.1)
Classification of CAD according to significance and extent	Significant CAD	No. (%)
	SVCAD	89 (39.04)
	DVCAD	50(21.93)
	MVCAD	49(21.49)
	Non-significant CAD	40(17.54)

Patients with significant CAD were 188 (82.46%); including 89 (39.04%) SVCAD, 50 (21.93%) DVCAD, and 49 (21.49%) MVCAD.

The distribution of NLR and PLR values in the total patient population is shown in (Figure 1 and Figure 2) respectively.

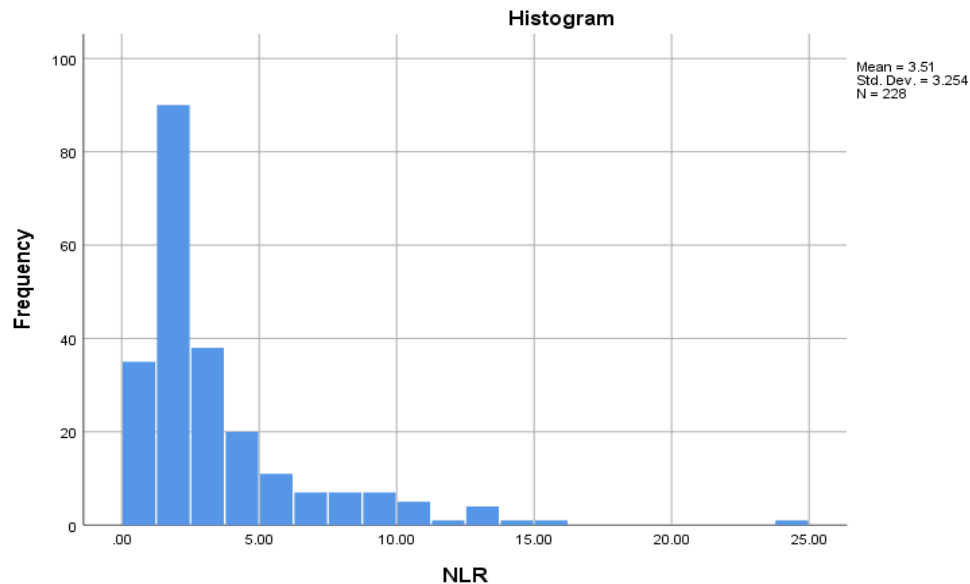


Fig 1. The distribution of NLR value in the total patient population

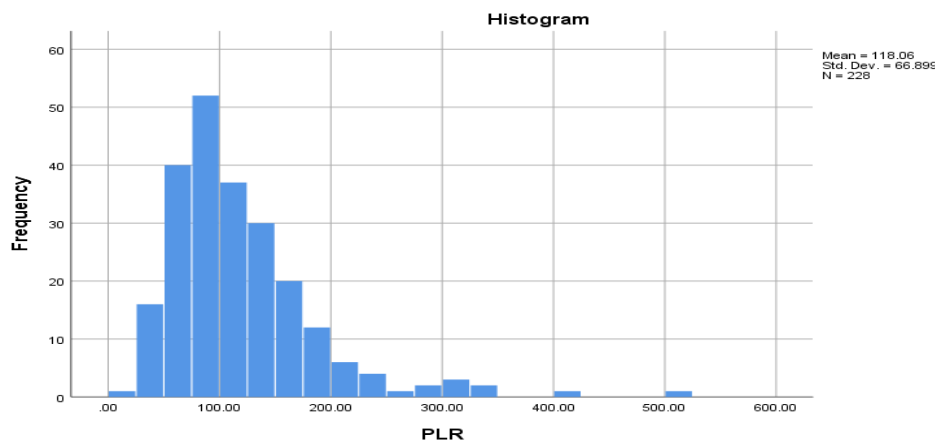


Fig 2. The distribution of PLR value in the total patient population

Comparing the correlation between NLR in patients with significant and non-significant CAD showed a significant correlation with significant obstruction. The association was positive ($r = 0.16$) and p -value = 0.01. There was

a highly significant correlation between the NLR and the extent of CAD. The correlation was positive ($r = 0.19$) and the p -value = 0.003, as shown in Figure-3.

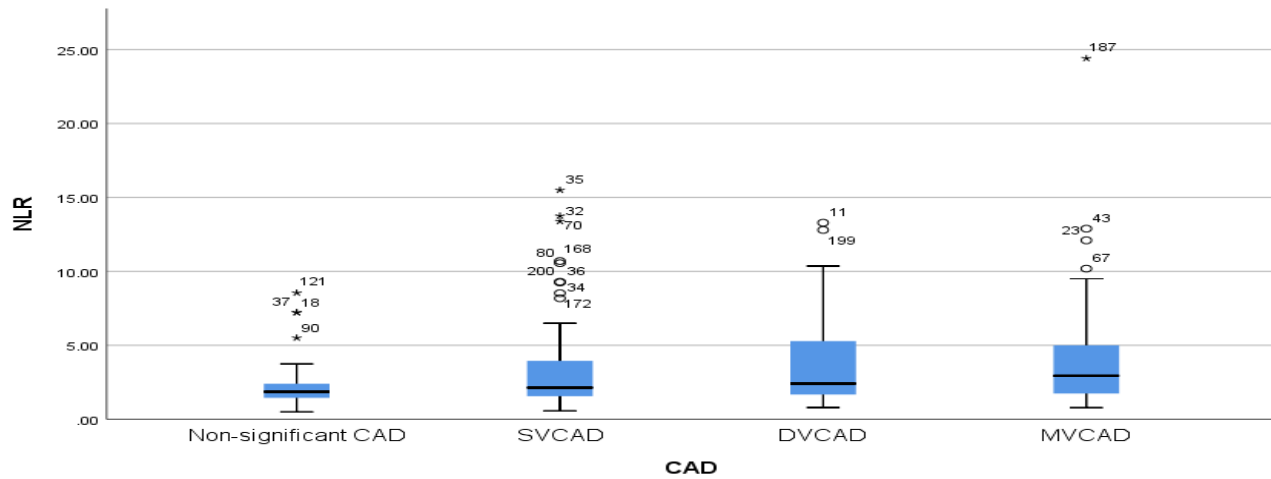


Fig 3. The NLR main distribution according to the number of obstructed coronary arteries

The correlation was highly significant between the NLR and the increasing severity of CAD. The

correlation was positive ($r = 0.33$) and p -value = 0.001, as shown in Figure-4.

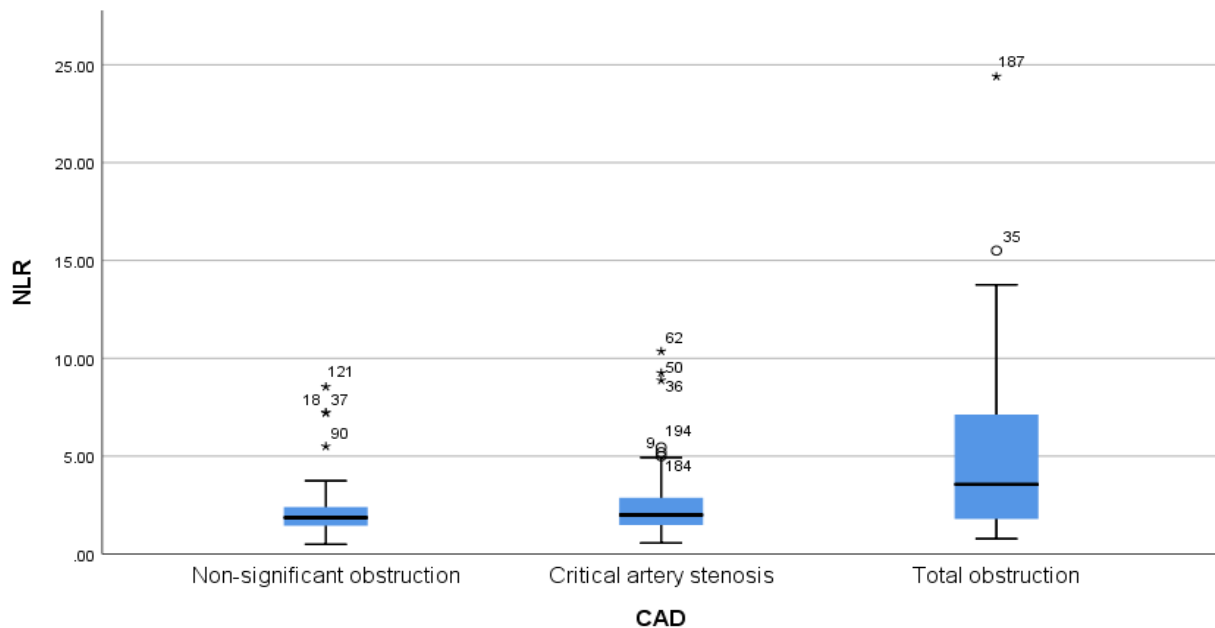


Fig 4. The NLR main distribution according to the severity of coronary artery obstruction

Comparing the correlation between PLR in patients with significant and non-significant CAD showed a non-significant correlation. The correlation was positive ($r = 0.07$) and p -value =

0.28. There was no significant correlation between the PLR and the extent of CAD. The correlation was positive ($r = 0.06$) and the p -value = 0.36, as shown in Figure-5.

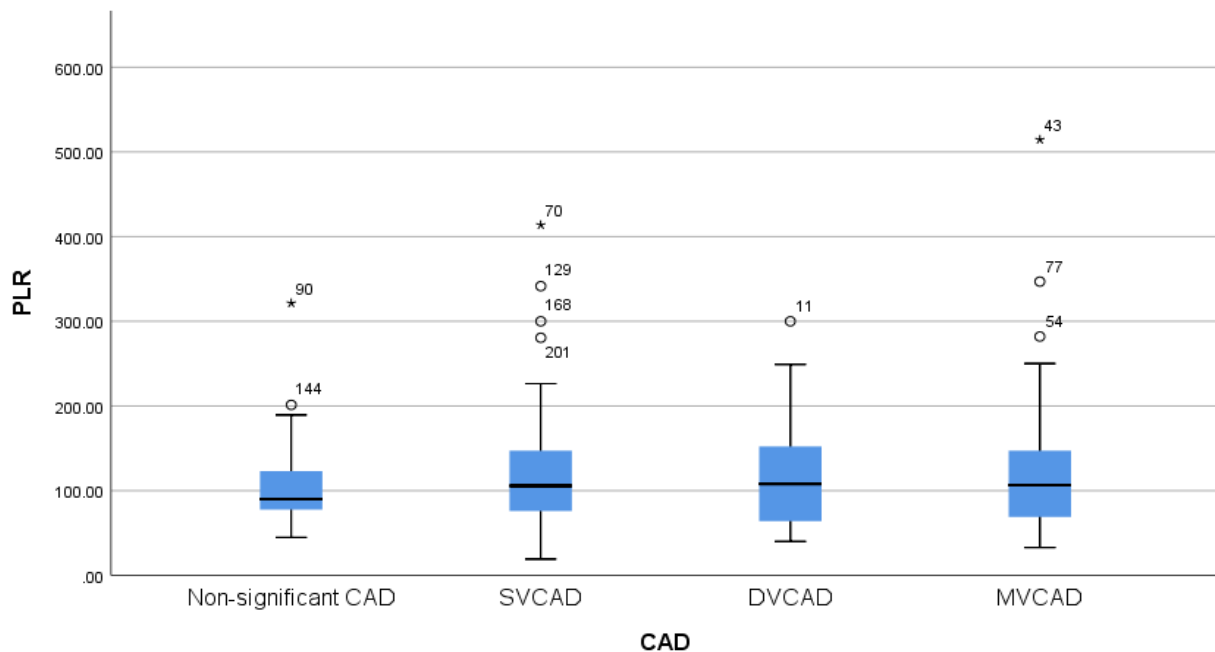


Fig 5. The PLR main distribution according to the number of obstructed coronary arteries

There was a significant correlation between the PLR and increasing severity of CAD. The correlation was positive ($r = 0.15$) and the p-value = 0.01, as shown in Figure-6. In logistic

regression analysis, only NLR was shown to be an independent predictor of significant CAD in patients with DM.

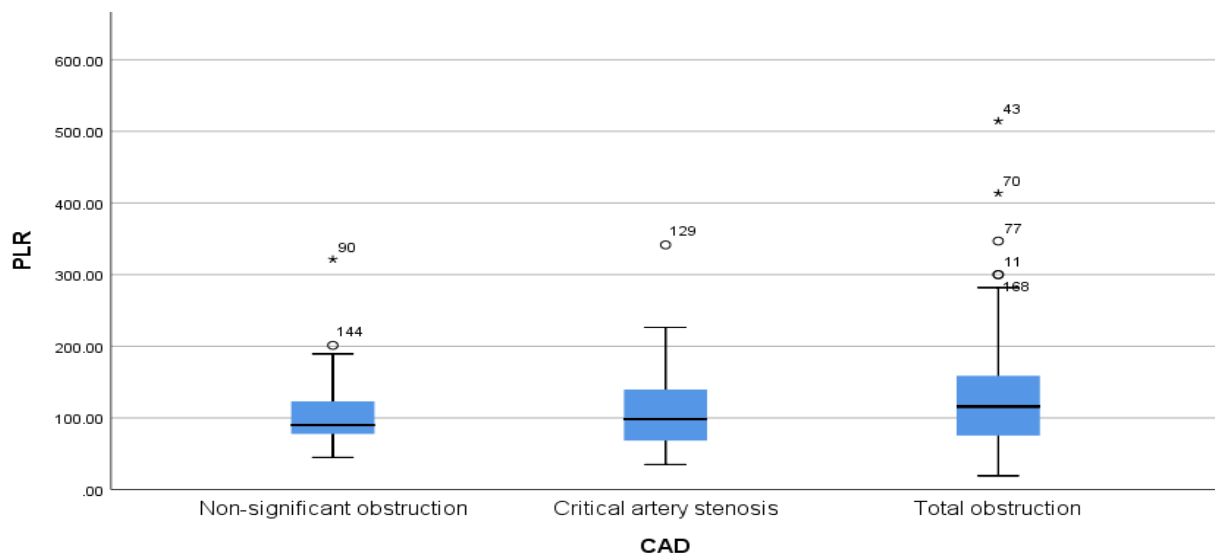


Fig 6. The PLR main distribution according to the severity of coronary artery obstruction

Discussion

The current study showed that NLR was associated with the presence of significant CAD, which is similar to the study conducted by Mayyas FA., et al.³² Regarding the extent of CAD, there was a highly significant correlation between the NLR and the presence of significant multi-vessel CAD which is consistent with previous studies.³³ The present study showed a highly significant correlation between the NLR and the increasing severity of CAD, the same as the result of MS H et al,³⁴ Regarding PLR, this study showed a significant correlation with increasing severity of CAD, a result similar to a study conducted by Reda, et al. but differs from it with respect to presence and extent.³⁵ Recent evidence suggests elevated levels of inflammatory markers (NLR but not PLR) associated with physiologically significant coronary lesions in patients with stable angina.³⁶ The relationship between elevated NLR and unstable atherosclerotic plaques has been identified in asymptomatic coronary artery disease (ACVDS).³⁷ In patients with Kawasaki disease, higher NLR was found to be associated with refractory disease and a higher incidence of coronary artery disease.³⁸ Although inflammatory markers are raised in all types of CAD, the level can be higher in acute coronary syndrome.^{39,40} Furthermore, higher NLR can be a predictor of mortality in ACS patients.⁴¹ Patients with multi-vessel disease and high NLR have higher mortality after a 2-year follow-up.⁴²

In Conclusion, Patients with significant CAD had higher NLR compared to patients with non-significant CAD. Moreover, NLR was correlated with the extent and severity of CAD. The PLR was significantly correlated with the severity, but

not the presence or the extent of CAD. Only NLR was an independent predictor of significant CAD.

References

1. Cannon CP, Battler A, Brindis RG, Cox JL, Ellis SG, Every NR, et al. American College of Cardiology key data elements and definitions for measuring the clinical management and outcomes of patients with acute coronary syndromes: a report of the American College of Cardiology Task Force on Clinical Data Standards (Acute Coronary Syndromes Writing Committee). *J Am Coll Cardiol* 2001; 38: 2114-2130.
2. Mellitus D. Diagnosis and classification of diabetes mellitus. *Diabetes care*. 2005 Jan 1; 28(S37): S5-10.
3. Sun H, Saeedi P, Karuranga S, Pinkepank M, Ogurtsova K, Duncan BB. et al. IDF Diabetes Atlas: Global, regional and country-level diabetes prevalence estimates for 2021 and projections for 2045. *Diabetes research and clinical practice*. 2022 Jan 1; 183:109-119.
4. Emerging Risk Factors Collaboration, Sarwar N, Gao P, Seshasai SR, Gobin R, Kaptoge S, Di Angelantonio E, Ingelsson E, Lawlor DA, Selvin E, Stampfer M, Stehouwer CD, Lewington S, Pennells L, Thompson A, Sattar N, White IR, Ray KK, Danesh J. Diabetes mellitus, fasting blood glucose concentration, and risk of vascular disease: a collaborative meta-analysis of 102 prospective studies. *Lancet* 2010; 375: 2215-2222.
5. Suzuki LA, Poot M, Gerrity RG, Bornfeldt KE. Diabetes accelerates smooth muscle accumulation in lesions of atherosclerosis: lack of direct growth-promoting effects of

- high glucose levels. *Diabetes* 2001; 50(4): 851-860.
6. Williams SB, Cusco JA, Roddy MA, Johnstone MT, Creager MA. Impaired nitric oxide-mediated vasodilation in patients with non-insulin-dependent diabetes mellitus. *J Am Coll Cardiol* 1996; 27(3): 567-574.
 7. Vinik AI, Erbas T, Park TS, Nolan R, Pittenger GL. Platelet dysfunction in type 2 diabetes. *Diabetes Care* 2001; 24(8): 1476-1485.
 8. Moreno PR, Murcia AM, Palacios IF, Leon MN, Bernardi VH, Fuster V, et al. Coronary composition and macrophage infiltration in atherectomy specimens from patients with diabetes mellitus. *Circulation* 2000; 102(18): 2180-2184.
 9. Ross R. Atherosclerosis-an inflammatory disease. *N Engl J Med.* 1999; 340(2):115-126.
 10. Hansson GK. Inflammation, atherosclerosis, and coronary artery disease. *N Engl J Med.* 2005; 352(16):1685-1695.
 11. Horne BD, Anderson JL, John JM, et al. Which white blood cell subtypes predict increased cardiovascular risk? *J Am Coll Cardiol* 2005; 45:1638-1643.
 12. Papa A, Emdin M, Passino C, Michelassi C, Battaglia D, Cocci F. Predictive value of elevated neutrophil-lymphocyte ratio on cardiac mortality in patients with stable coronary artery disease. *Clin Chim Acta.* 2008; 395(1-2): 27-31.
 13. Eriksson EE, Xie X, Werr J, Thoren P, Lindbom L. Direct viewing of atherosclerosis in vivo: plaque invasion by leukocytes is initiated by the endothelial selectins. *FASEB J.* 2001;15(7): 1149-1157.
 14. Gibson PH, Cuthbertson BH, Croal BL, et al. Usefulness of neutrophil/lymphocyte ratio as predictor of new-onset atrial fibrillation after coronary artery bypass grafting. *Am J Cardiol* 2010; 105:186-191.
 15. Maxwell SR, Lip GY. Reperfusion injury: a review of the pathophysiology, clinical manifestations and therapeutic options. *Int J Cardiol* 1997; 58: 95–117.
 16. Sheridan FM, Cole PG, Ramage D. Leukocyte adhesion to the coronary microvasculature during ischemia and reperfusion in an in vivo canine model. *Circulation* 1996; 93:1784-1787.
 17. Kawaguchi H, Mori T, Kawano T, et al. Band neutrophil count and the presence and severity of coronary atherosclerosis. *Am Heart J* 1996; 132: 9-12.
 18. Sahin D, Elbazan Z, Gur M, Yildiz A, Akpinar O, Icen YK, et al. 2013. Neutrophil to lymphocyte ratio is associated with the severity of coronary artery disease in patients with ST-Segment elevation myocardial infarction. *Angiology* 64(6): 23-29.
 19. Varol E, Aksoy F, Bas HA, Ari H, Ozaydin M. 2014. Mean platelet volume is elevated in patients with low high-density lipoprotein cholesterol. *Angiology* 65(8): 733-736.
 20. Núñez J, Miñana G, Bodí V, Núñez E, Sanchis J, Husser O, Llàcer A. Low lymphocyte count and cardiovascular diseases. *Current medicinal chemistry.* 2011 Jul 1; 18(21): 3226-3233
 21. Ommen SR, Gibbons RJ, Hodge DO, Thomson SP. Usefulness of the lymphocyte concentration as a prognostic marker in coronary artery disease. *Am J Cardiol.* 1997; 79(6): 812-814.
 22. Zouridakis EG, Garcia-Moll X, Kaski JC. Usefulness of the blood lymphocyte count in predicting recurrent instability and death in patients with unstable angina pectoris. *Am J Cardiol.* 2000; 86(4): 449-451.

23. Wagner DD, Burger PC. Platelets in inflammation and thrombosis. *Arterioscler Thromb Vasc Biol* 2003; 23:2131-2137.
24. Langer HF and Gawaz M: Platelet-vessel wall interactions in atherosclerotic disease. *Thromb Haemost* 99: 480-486, 2008.
25. Ibanez B, James S, Agewall S, Antunes MJ, Bucciarelli-Ducci C, Bueno H, et al. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: The Task Force for the management of acutemyocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC). *European heart journal*. 2018; 39(2):119-177
26. Sharma KH, Shah KH, Patel I, Patel AK, Chaudhari S. Do circulating blood cell types correlate with modifiable risk factors and outcomes in patients with acute coronary syndrome (ACS)?. *Indian heart journal*. 2015; 67(5):444-451.
27. Nikolsky E, Grines CL, Cox DA, Garcia E, Tchong JE, Sadeghi M, et al. Impact of baseline platelet count in patients undergoing primary percutaneous coronary intervention in acute myocardial infarction (from the CADILLAC trial). *Am J Cardiol* 2007; 99:1055-1061.
28. Lee GK, Lee LC, Chong E, Lee CH, Teo SG, Chia BL, Poh KK. The long-term predictive value of the neutrophil-to-lymphocyte ratio in type 2 diabetic patients presenting with acute myocardial infarction. *QJM* 2012;105: 1075-1082.
29. Lou M, Luo P, Tang R, Peng Y, Yu S, Huang W, He L. Relationship between neutrophil-lymphocyte ratio and insulin resistance in newly diagnosed type 2 diabetes mellitus patients. *BMC Endocr Disord* 2015; 15:9.
30. Besli F, Ilter A, Gungoren F. The Link Between Mean Platelet Volume to Lymphocyte Ratio and Complexity of Coronary Artery Disease. *Angiology*. 2018; 69(4): 358-359.
31. Bressi E, Mangiacapra F, Ricottini E, Cavallari I, Colaioni I, Di Gioia G, et al. Impact of Neutrophil-to-Lymphocyte Ratio and Platelet-toLymphocyte Ratio on 5-Year Clinical Outcomes of Patients with Stable Coronary Artery Disease Undergoing Elective Percutaneous Coronary Intervention. *Journal of cardiovascular translational research*. 2018;11(6):517-523.
32. Mayyas FA, Al-Jarrah MI, Ibrahim KS, Alzoubi KH. Level and significance of plasma myeloperoxidase and the neutrophil to lymphocyte ratio in patients with coronary artery disease. *Experimental and therapeutic medicine*. 2014 Dec 1; 8(6):1951-1957.
33. Sönmez O, Ertaş G, Bacaksız A, Tasal A, Erdoğan E, Asoğlu E, et al. Relation of neutrophil-to-lymphocyte ratio with the presence and complexity of coronary artery disease: an observational study. *Anadolu Kardiyol Derg*. 2013 Nov 1;13(7): 662-667.
34. MS H, HA H, MG M, MS G. Correlation of Neutrophil-Lymphocyte ratio and Mean platelet volume to the severity of coronary atherosclerosis. *Fayoum University Medical Journal*. 2021 Jul 18; 8(3):52-60.
35. Reda AA, Moharram MA, Rasheed AE. Platelet to lymphocyte ratio as a predictor of severity of coronary artery disease. *Menoufia Medical Journal*. 2019 Jan 1; 32(1):167.
36. Xie Y, Cen H, Wang L, et al. Relationships between inflammatory parameters derived

- from complete blood count and quantitative flow ratio in patients with stable coronary artery disease [published online ahead of print, 2023 Aug 25]. *Angiology*. 2023; 33197231197804.
37. Wang X, Chen X, Wang Y, et al. The association of lipoprotein(a) and neutrophil-to-lymphocyte ratio combination with atherosclerotic cardiovascular disease in Chinese patients. *Int J Gen Med*. 2023; 16: 2805-2817.
 38. Arias JS, Villarreal EG, Savorgnan F, Acosta S, Flores S, Loomba RS. The use of neutrophil-lymphocyte ratio for the prediction of refractory disease and coronary artery lesions in patients with Kawasaki disease [published online ahead of print, 2023 Apr 4]. *Cardiol Young*. 2023;1-9.
 39. Dziedzic EA, Gąsior JS, Tuzimek A, Kochman W. Blood count-derived inflammatory markers and acute complications of ischemic heart disease in elderly women. *J Clin Med*. 2023;12(4):1369.
 40. Shumilah AM, Othman AM, Al-Madhagi AK. Accuracy of neutrophil to lymphocyte and monocyte to lymphocyte ratios as new inflammatory markers in acute coronary syndrome. *BMC Cardiovasc Disord*. 2021; 21(1):422.
 41. Dong CH, Wang ZM, Chen SY. Neutrophil to lymphocyte ratio predict mortality and major adverse cardiac events in acute coronary syndrome: A systematic review and meta-analysis. *Clin Biochem*. 2018; 52:131-136.
 42. Xu N, Tang XF, Yao Y, et al. Predictive value of neutrophil to lymphocyte ratio in long-term outcomes of left main and/or three-vessel disease in patients with acute myocardial infarction. *Catheter Cardiovasc Interv*. 2018; 91(S1): 551-557.

نسبة الخلايا البيضاء العادلة - الليمفاوية و نسبة الصفائح الدموية - الخلايا اللمفاوية كعلامات لشدة مرض الشريان التاجي في مرضى السكري

خلفية الدراسة: تشير الأدلة إلى ارتباط العملية الالتهابية بتصلب الشرايين التاجية . قد تشير علامات الالتهاب الجهازية إلى ارتباط التغيرات الالتهابية بأمراض الشريان التاجي.

الهدف: التحقيق في ارتباط نسبة الخلايا البيضاء المعتدلة / الليمفاوية (NLR) ونسبة الصفائح الدموية / الخلايا اللمفاوية (PLR) مع شدة مرض الشريان التاجي في المرضى الذين يعانون من داء السكري

الطريقة: أجرينا دراسة مقطعية للمرضى الذين يعانون من مرض الشريان التاجي الذين تم إدخالهم لتصوير الأوعية التاجية في مركز البصرة للقلب. أجريت الدراسة في الفترة من مارس ٢٠٢١ إلى فبراير ٢٠٢٢. قمنا بجمع البيانات الديموغرافية والتاريخ الطبي السابق والاختبارات الكيميائية الحيوية وصورة الدم الكاملة مع حساب NLR نسبة الخلايا البيضاء المعتدلة الى الخلايا البيضاء اللمفاوية وكذلك نسبة الصفائح الدموية الى الخلايا البيضاء اللمفاوية بالدم PLR. قمنا بمراجعة تصوير الأوعية التاجية لتقييم عدد الأوعية المريضة وشدتها وتعقيدها لدى المرضى المصابين بالسكري ...

النتائج: شملت الدراسة ٢٢٨ (١٦٩ من الذكور و ٥٩ من الإناث) من المرضى الذين يعانون من قصور الشرايين التاجية وداء السكري. تم ملاحظة وجود مرض الشرايين التاجية في ١٨٨ مريضاً. ارتبطت نسبة الخلايا البيضاء المعتدلة الى الخلايا البيضاء اللمفاوية NLR بشكل كبير مع وجود ومدى وشدة تصلب الشرايين التاجية للقلب بينما ارتبطت نسبة الصفائح الدموية الى الخلايا البيضاء اللمفاوية PLR بشكل كبير مع شدة مرض الشريان التاجي ولكن لم يرتبط بشكل كبير مع وجود المرض أو المدى انتشاره في الشرايين التاجية للقلب. كان NLR ولكن ليس PLR علامة مستقلة للتنبؤ بالاصابة بتصلب الشرايين التاجية في المرضى الذين يعانون من السكري.

الاستنتاج: ارتبطت نسبة العدلات / الخلايا الليمفاوية بوجود ومدى وشدة مرض الشرايين التاجية للقلب في مرضى السكري. بينما ارتبطت نسبة الصفائح الدموية / الخلايا اللمفاوية فقط مع شدة مرض الشرايين التاجية .