



## Research Article

# The Importance of Hemogram Parameters in Family Medicine for Coronary Artery Disease

Suleyman Ozsari,<sup>1</sup> Emine Ozsari<sup>2</sup>

<sup>1</sup>Department of Family Medicine, Ankara University Faculty of Medicine, Ankara, Turkey

<sup>2</sup>Department of Chest Disease, Abant İzzet Universty Faculty of Medicine, Ankara, Turkey

### Abstract

**Objectives:** The present study was an investigation of the relationship between the hemogram parameters of mean platelet volume (MPV), neutrophil-to-lymphocyte ratio (NLR) and platelet-to-lymphocyte ratio (PLR), and the severity of stenosis observed in patients with coronary artery disease (CAD).

**Methods:** A total of 240 patients, 163 with CAD (85 male, 78 female) and 77 controls with no stenosis were included in the study. Patients were divided into 3 groups based on their Gensini score.

**Results:** It was determined that the mean MPV of the severe stenosis group and the mean NLR of the severe stenosis group were statistically significantly higher than in the control group ( $p=0.023$ ,  $p=0.014$ ).

**Conclusion:** This study established an association between the Gensini score and the MPV, NLR, and PLR for the first time. The aim of this research was to assist with the early diagnosis of cardiovascular diseases. Regular recording and analysis of the MPV, NLR, and PLR of patients by family physicians can increase early detection and treatment, thereby decreasing morbidity and mortality.

**Keywords:** Cardiovascular disease, family medicine, Gensini, laboratory, prevention

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Cardiovascular disease (CVD) is the leading cause of mortality in the adult population worldwide. Among global deaths due to non-communicable diseases, ischemic heart disease is the largest category (12.6%).<sup>[1]</sup> Atherosclerosis is the cause of 99% of coronary artery diseases. Endothelial vasomotor dysfunction plays a role in the initial pathogenesis of atherosclerosis.<sup>[2]</sup>

It has been suggested that hemogram parameters, such as mean platelet volume (MPV), the neutrophil-to-lymphocyte ratio (NLR) and the platelet-to-lymphocyte ratio (PLR), can be used as disease activation indicators in inflammatory diseases. They have been accepted as markers of inflammation in various diseases.<sup>[3-5]</sup> MPV refers to the activation and production rate of platelets. An increased

MPV has been reported in stable coronary artery disease and acute myocardial infarction.<sup>[3]</sup> NLR is a chronic inflammatory marker. It can be used as an indicator in predicting cardiovascular events and mortality. PLR has been shown to be an independent risk factor for chronic inflammation and is more sensitive than NLR.<sup>[6,7]</sup>

Early diagnosis is the most important factor in disease treatment, and family medicine is the most important unit in the early diagnosis of disease due to its accessibility and as an initial point of contact. Family physicians, as preventive and curative doctors, treat each encounter with an individual as an opportunity to develop good health and to protect from illness, and they play an important role in the prevention of cardiovascular diseases. MPV, NLR, and

**Address for correspondence:** Suleyman Ozsari, MD. Department of Family Medicine, Ankara University Faculty of Medicine, Ankara, Turkey

**Phone:** +90 555 395 62 02 **E-mail:** beyhekim06@gmail.com

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PLR are hemogram parameters that can be obtained easily and inexpensively, and can be measured in primary care services.

This study was an investigation of the relationship between the hemogram parameters of MPV, NLR, and PLR, and the severity of stenosis in patients with coronary artery disease (CAD).

## Methods

A total of 240 participants, 163 patients with CAD (85 male, 78 female) and 77 controls with no stenosis (37 male, 43 female) were included in the study. This research was conducted at the Ankara University cardiology department and the family medicine clinic. The coronary angiography and interventional cardiology laboratories used the latest generation flat-panel coronary angiography device and selective coronary angiography was performed with a femoral approach using Judkins catheters. Coronary angiography was interpreted using the Gensini score to assess the severity of CAD. Patients were divided into groups based on the degree of coronary artery stenosis: no stenosis (score: 0), mild stenosis (score: 1-20), and severe stenosis (score: >20).<sup>[8]</sup> A complete blood count was performed, and the white blood cell (WBC), MPV, neutrophil, and lymphocyte counts were noted. The NLR and PLR of the patients were calculated using these parameters.

The ethics committee approved this study (decision number: 04-122-16).

## Statistical Analysis

The data were analyzed using SPSS for Windows, Version 16.0 (SPSS Inc., Chicago, IL, USA) software. Definitive values were expressed as mean (SD). Normal distribution of continuous variables was determined with the Kolmogorov-Smirnov test. The Mann-Whitney U test was used to compare nonhomogeneous distributed variables. Correlation analysis was conducted using the Spearman correlation test. A p value <0.05 was considered statistically significant.

## Results

A total of 240 participants, 80 patients with CAD and severe stenosis (48 male, 32 female), and 83 patients with CAD and mild stenosis (37 male, 46 female), and 77 controls with no stenosis (37 male, 43 female) were included in the study. The characteristics of the study group are summarized in Table 1.

The mean NLR of the control group, the mild stenosis group, and the severe stenosis CAD patients was 2.19%, 2.37%, and 2.94%, respectively. The NLR of the mild stenosis group

**Table 1.** General characteristics and laboratory data of the study group

	Study participants (n=240)
Age (years)	
No stenosis	57.9 (22-89)
Mild stenosis	60.4 (27-85)
Severe stenosis	62.8 (40-88)
Gender	
Male (%)	
No stenosis	35 (45)
Mild stenosis	37 (44)
Severe stenosis	48 (60)
Female (%)	
No stenosis	42 (55)
Mild stenosis	46 (56)
Severe stenosis	32 (40)
Hb (gr/dL)	
No stenosis	13.8 (1.47)
Mild stenosis	13.9 (1.7)
Severe stenosis	14.4 (1.85)
NLR (%)	
No stenosis	2.19 (1.08)
Mild stenosis	2.37 (0.95)
Severe stenosis	2.94 (2.3)
PLR (%)	
No stenosis	119.1 (38.1)
Mild stenosis	128.1 (46)
Severe stenosis	131.7 (102)
WBC (K/uL)	
No stenosis	7.2 (7.2)
Mild stenosis	7.83 (1.85)
Severe stenosis	8.72 (3)
MPV (fL)	
No stenosis	8.12 (0.8)
Mild stenosis	8.19 (0.76)
Severe stenosis	8.54 (1.06)

Hb: Hemoglobin; MPV: Mean platelet volume; NLR: Neutrophil-to-lymphocyte ratio; PLR: Platelet-to-lymphocyte ratio.

was significantly higher than that of the control group (p=0.045). The NLR of the severe stenosis group was significantly higher than that of the control group (p=0.014). The NLR of the severe stenosis group was not significantly higher than that of the mild stenosis group (p=0.397). The mean PLR of the control group, the mild stenosis group, and the severe stenosis CAD group was 119.1%, 128.1%, and 131.7%, respectively. There was no statistically significant difference in PLR between the control group and the mild stenosis group (p=0.315), the control group and the severe stenosis group (p=0.646), or the mild stenosis group and the severe stenosis group (p=0.187). The mean MPV of

the control group, the mild stenosis group, and the severe stenosis CAD patients was 8.12 fL, 8.19 fL and 8.54 fL, respectively. The MPV of the mild stenosis group was not significantly higher than that of the control group ( $p=0.992$ ). The MPV of the severe stenosis group was significantly higher than that of the control group ( $p=0.023$ ). The MPV of the severe stenosis group was significantly higher than that of the mild stenosis group ( $p=0.017$ ).

## Discussion

The chronic inflammatory response is a critical element in the pathogenesis of atherosclerosis<sup>[9]</sup>, which is associated with the production of platelets and lymphocytes. MPV, NLR, and PLR are simple, inexpensive, and easily obtained parameters using hemogram results that can be used as disease activation indicators in inflammatory diseases.<sup>[3-5]</sup> Platelets and their activity have an important role in the initiation of atherosclerotic lesions and coronary thrombus formation. Larger platelets are enzymatically and metabolically more active and have a greater potential thrombotic ability than smaller platelets. MPV refers to the activation and production rate of platelets. Increased MPV has been reported in stable coronary artery disease and acute myocardial infarction.<sup>[6]</sup> In our study, we found that the mean MPV of the severe stenosis group was statistically significantly higher than that of the mild stenosis group and the control group. WBC count is an independent predictor of cardiovascular events and mortality. NLR is a biomarker that can identify individuals at risk for vascular events.<sup>[7]</sup> It can be used as a marker in predicting cardiovascular events and mortality. In our study, we found that the mean NLR of the mild stenosis group and of the severe stenosis group was statistically significantly higher than that of the control group. PLR has been shown to be an independent risk factor for chronic inflammation and is more sensitive than NLR.<sup>[8]</sup> PLR may act as an effective biomarker to predict CVD and the risk of future CVD events.<sup>[10]</sup> In our study, we found that as the mean PLR increased, the stenosis grade also increased. The mean PLR level in the control group was lower than in the patient group, but there was no statistical significance.

Worldwide, ischemic heart disease is the leading cause of death due to noncommunicable diseases (12.6%).<sup>[11]</sup> CVD is expected to remain the foremost cause of death for many years. In recent years, the importance of preventive health care and the increasing awareness of public health have led to an increase in mortality due to CVD in developing countries.<sup>[11]</sup> It is predicted that a longer life expectancy will lead to a further increase in mortality rates due to CVD and an increase in the financial burden of these diseases. It is estimated that CVD will lead to \$7 trillion in losses world-

wide, especially in low- and middle-income countries, between 2011 and 2025. The annual cost of top-level preventive healthcare is only about \$11.2 billion.<sup>[12]</sup> As a result of improvements in preventive medicine and treatment services, lifespan and causes of death in Turkey are similar to those seen in developed countries. The socioeconomic development of the country has led to a financial burden in terms of managing public health. Early intervention can not only improve prognosis, but also reduce costs. The aim of our study was to increase awareness of individuals at risk for CVD, especially in the scope of preventive medicine, and to develop an accessible means for primary care physicians to obtain reliable data in this effort.

Family physicians can make a significant contribution to the early diagnosis of CVD and reducing the associated morbidity and mortality by charting the MPV, NLR, and PLR parameters for patients they see routinely, identifying increases and decreases, and directing patients to cardiology clinics in the early stages of disease.

## Conclusion

For the first time, it has been demonstrated that there is an association between the Gensini score and the MPV, NLR, and PLR, and that a combination of MPV-NLR and the Gensini score is effective in predicting CVD events.

## Disclosures

**Ethics Committee Approval:** The study was approved by the Local Ethics Committee.

**Peer-review:** Externally peer-reviewed.

**Conflict of Interest:** None declared.

**Authorship contributions:** Concept – E.O.; Design – E.O.; Supervision – E.O.; Materials – S.O.; Data collection &/or processing – S.O.; Analysis and/or interpretation – S.O.; Literature search – S.O.; Writing – E.O.; Critical review – E.O.

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