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CORRELATION BETWEEN PLATELET TO LYMPHOCYTE RATIO AND CORONARY ARTERY NARROWING

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ABSTRACT

Coronary Heart Disease (CHD) is one of the most common diseases of the cardiovascular system, characterized by atherosclerotic lesions. Atherosclerotic vascular processes are multifactorial. One of the factors is the process of inflammation. Platelet to Lymphocyte Ratio (PLR) is a marker that predicts the atherosclerotic coronary burden. The purpose of this research was to determine the correlation between platelet to lymphocyte ratio and coronary artery narrowing in CHD patients. This research was an analytical observation with a cross-sectional design, conducted on 54 patients with CHD who underwent angiography at the Adam Malik Hospital, Medan in February–October 2016. We examined platelet count, absolute lymphocyte count and percentage of coronary artery narrowing and coronary artery narrowing in CHD patients. There is a weak correlation between platelet to lymphocyte ratio and coronary artery narrowing in CHD patients ($r=0.276$). The result of the statistic test showed no significant correlation of platelet to lymphocyte ratio and coronary artery narrowing patients ($p=0.043$). In this study there is a weak correlation between platelet to lymphocyte ratio and coronary artery narrowing in CHD patients.

Key words: Coronary heart disease, platelet to lymphocyte ratio, coronary artery narrowing

INTRODUCTION

Cardiovascular disease is currently the leading cause of death. One of the most common cardiovascular diseases is Coronary Heart Disease (CHD). Coronary heart disease is a coronary artery disease, where luminal narrowing occurs as a result of fat accumulation in blood vessel walls. Coronary blood vessels are the blood vessels that supply oxygen and nutrients to the heart muscle.¹

Atherosclerosis is a process that could involve multiple blood vessels of various forms. ²Although the epicardial coronary artery looks normal, the intra-mural coronary arteries and arterioles often exhibit narrowing, fibrosis, fibrinoid necrosis and intima hypertrophy. Immune endothelial damage by immune, fibroblast stimulation, collagen deposition and increased platelet-derived production can decrease the endothelial response to thrombosis, inflammation and vasodilation.³

Coronary heart disease shows an increase every year, especially with the presence of diagnostic facilities and units of intensive care of CHD.² Coronary heart disease is a disease caused by narrowing of the coronary arteries due to atherosclerosis or spasm, or a combination of both.⁴

The death rate caused by Coronary Heart Disease is 50 million average worldwide, while in developing countries there are 39 million. The American Heart Association (AHA)

in 2004 estimated the prevalence of coronary heart disease in the United States around 13.2 million. WHO in 2002 estimated that around the world every year 3.8 million males and 3.4 million females died from CHD.⁵ In Indonesia, the prevalence of death due to CHD is as much as 100,000 - 499,999 people.⁶

The high levels of total plasma cholesterol, arterial hypertension and smoking habits are the three major risk factors for CHD.⁶ The cause of CAD is not known, but it is generally recognized that various factors play an essential role in the occurrence of CHD.⁷ Coronary heart disease can be detected by noninvasive or invasive diagnostic examination. The test can be done with various instruments. Starting from simple devices such as Electrocardiography (ECG), and treadmill to sophisticated Multi-Slice Computed Tomography (MS-CT), an examination performed on cardiac catheterization. The cardiac catheterization procedure aims to evaluate the anatomy of coronary arteries called the Coronary Angiograph action. Cardiac catheterization is a procedure performed to detect blockage in the coronary arteries of the heart with the highest level of accuracy.⁴

Low lymphocytes have been shown to be associated with worse cardiovascular conditions in coronary heart disease and chronic heart failure. In the Nikolsky *et al.* study, in the case of chronic inflammation, the number of lymphocytes decreased due to increased lymphocyte apoptosis. Lymphocytes are a better immune response

while neutrophils cause destructive inflammatory reactions. Long-lasting inflammatory conditions lead to an increased proliferation in megakaryocytic series and relative thrombocytosis.⁷⁻⁹

Platelet to Lymphocyte Ratio (PLR) is a marker that predicts coronary atherosclerotic load. Previously, PLR is useful predicting poor prognosis in the cancer population, and predicting critical limb ischemia in peripheral arterial disease.¹⁰ Platelet to Lymphocyte Ratio (PLR) is a hematologic parameter for inflammatory and prothrombotic status, which shows association with poor prognosis in heart disease patients. Yuksel *et al.* found that the PLR was independently associated with the severity of coronary atherosclerosis. The patient with a high PLR (>111) is predicted to have greater atherosclerotic severity.¹¹ The purpose of this study was to determine the correlation between platelet to lymphocyte ratio and coronary artery narrowing in patients with coronary heart disease.

METHODS

The study was an analytical observational with a cross-sectional design, conducted on fifty-four patients with CHD who underwent angiography at the Adam Malik Hospital Medan in February - August 2016 who met the study criteria. Fifty-four CHD, grouped into 27 patients with CHD ≥ 70% and 27 patients CHD < 70%. CHD was established by physical clinical, examination and ECG and aged > 18 years. Exclusion criteria were patients <18 years old, heart valve deformity, chronic heart failure, malignancy, autoimmune disease, infectious diseases, using steroids.

Ethical clearance was obtained from the Research Committee of Medical Field Medical Faculty of North Sumatera University at the Adam Malik Hospital Medan. Informed consent was requested in written form from the patients. Then the data from history and examination were recorded in a special status of research. Blood samples were taken from the median cubital vein, 3 mL of venous blood was inserted into a K2EDTA vacutainer. Platelet count, lymphocyte count were done by using Sysmex XN-1000 Hematoanalyzer. Percentage of coronary artery narrowing was done by angiography

Data analysis was performed using SPSS version 19 program to determine the correlation between platelet to lymphocyte ratio and coronary artery narrowing in CHD patients. Pearson correlation test was used if the data were normally distributed and Spearman's rho test if not normally distributed.

RESULT AND DISCUSSION

Subjects characteristics are presented in Table 1. Most subjects were males (68.51%). There was a significant difference between males and females (p<0.05). There was no significant difference in age between patients with CHD <70% and patients with CHD ≥ 70% (p>0.05).

The mean platelet count in patients with CHD ≥ 70% was higher than patients with CHD < 70%. Unpaired T-test results showed a significant difference in mean platelet count in patients with CHD ≥ 70% and CHD<70 % (p<0.05). The mean absolute lymphocyte count in

patients with CHD ≥ 70% was lower than in patients with CHD <70%. Unpaired T-test results showed no significant difference in absolute lymphocyte count among patients with CHD ≥ 70% and CHD<70 % (p>0.05). The median of platelet to lymphocyte ratio in patients with CHD ≥ 70% was higher than patients with CHD <70%. Mann-Whitney U test results showed a significant difference in platelet to lymphocyte ratio in patients with CHD ≥ 70% and CHD <70 % (p<0.05) (Table 2).

Spearman' s rho test results showed a weak correlation between platelet to lymphocyte ratio and coronary artery narrowing (r= 0.276, p=0.043).

Spearman' s rho test results showed no correlation between platelet to lymphocyte ratio and coronary artery narrowing in patients with CHD ≥ 70% (r=0.054, p=0.789).

Table 1. Subject characteristics based on gender and age

| Variables | n | Mean(SD) | p-value |
|-------------|----|--------------|---------|
| Gender | | | |
| Male | 37 | | |
| Female | 17 | | 0.042 |
| Age (years) | | | 0.955 |
| CHD<70% | | 55 (11.22) | |
| CHD≥70% | | 55.74 (7.55) | 0.955 |

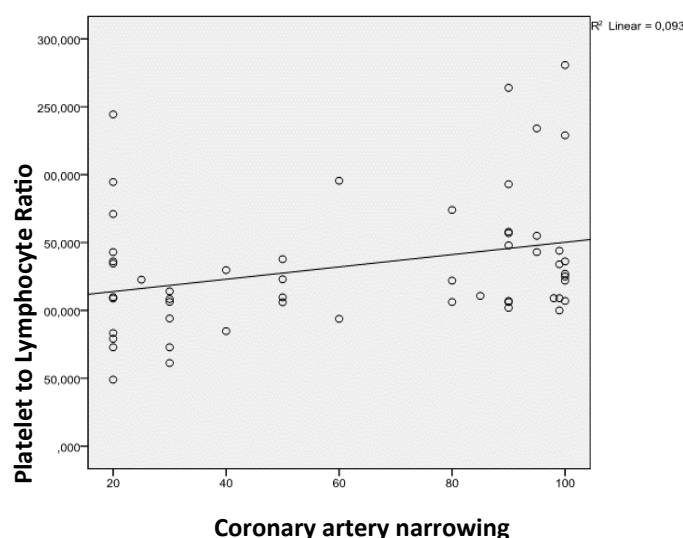


Figure 1. Correlation between platelet to lymphocyte and coronary artery narrowing in patients with CHD

Spearman' s rho test results showed no correlation between platelet to lymphocyte ratio and coronary artery narrowing in patients with CHD <70% (r=-0.040, p=0.842).

Coronary heart disease is a condition where there is narrowing, blocking or abnormalities of coronary blood vessels. This narrowing or blockage can stop the flow of blood vessels to the heart muscle and is often characterized by pain. A more severe condition, is that the ability of the heart to pump blood will be lost, so the

Table 2. Subject characteristics based on platelet count, absolute lymphocyte count, platelet to lymphocyte ratio

| Variables | CHD<70% Mean(SD) | CHD≥70% Mean(SD) | p |
|------------------------------|---------------------|---------------------|--------|
| Platelet count | 254.48(76.46) | 302.04(66.15) | 0.018* |
| Absolute lymphocyte count | 2.35(0.87) | 2.16(0.50) | 0.327* |
| | Median(SD) | Median(SD) | |
| Platelet to lymphocyte ratio | 109.61(43.91) | 134.00(50.54) | 0.019^ |

Unpaired T-test, ^Mann-Whitney U Test

control system of heart rhythm will be disrupted and can lead to death.^{12,13}

Previous studies had shown an increased relationship between platelet counts and high risk in cardiovascular disease patients with CHD and in healthy adults.¹²

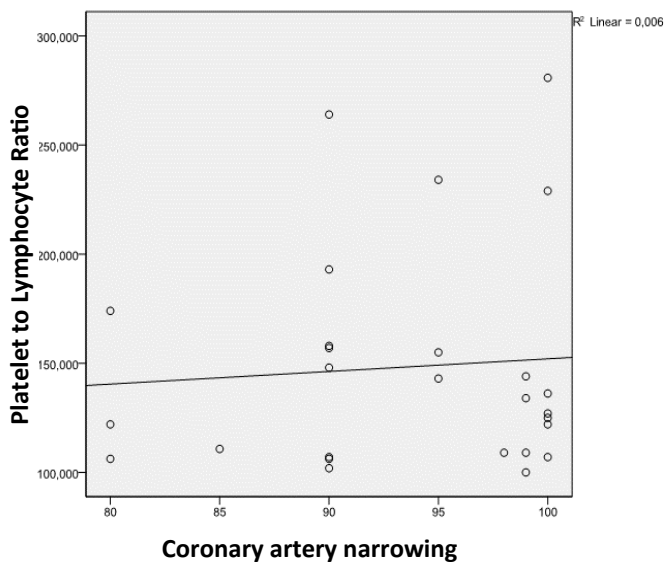


Figure 2. Correlation platelet to lymphocyte ratio and coronary artery

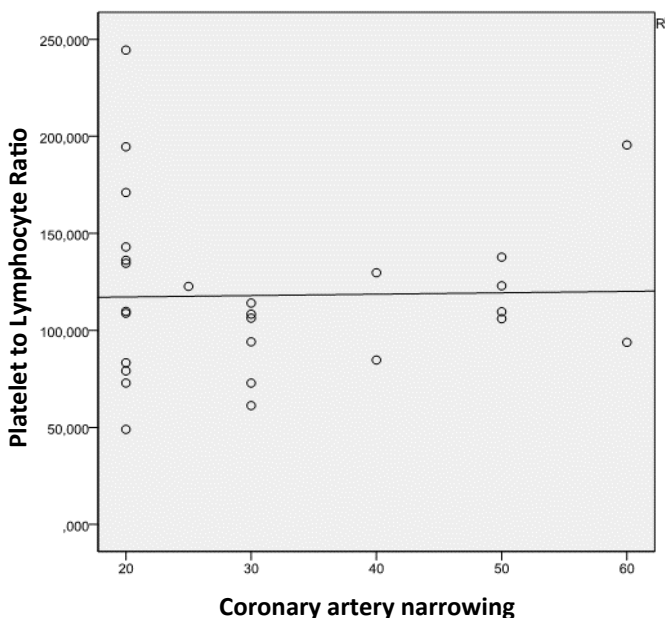


Figure 3. Correlation between platelet to lymphocyte ratio and coronary artery narrowing in patients with CHD <70

Madjid *et al.* study showed that the number of platelets, and aggregates within normal limits was not related to the incidence of CHD.^{14,15} Khandekar *et al.* found significant increases in platelet count, Mean Platelet Volume (MPV) and Platelet Distribution Width (PDW) in patients with unstable angina or acute myocardial infarction, compared with stable CHD patients and healthy control patients. The role of platelets in the pathogenesis of CHD was seen primarily because of their function, and interactions in plasma and tissue.¹⁶

A prospective study by Azab *et al.* found that 1,037 patients with acute myocardial infarction showed that an increase in the number of White Blood Count (WBC), monocytes and the number of neutrophils and low lymphocyte counts were independent predictors of all causes of death.¹⁷

In this research, the mean of platelet count in patients with CHD ≥ 70% was higher than patients with CHD < 70%, statistical test results showed a significant difference of mean platelet count in patients with CHD ≥ 70% and CHD < 70% (p< 0.05). The mean absolute lymphocyte count in patients CHD ≥ 70% was lower than patients CHD < 70%, statistically test result showed a significant difference in absolute lymphocyte count in patients with CHD ≥ 70% and CHD < 70% (p >0.05).

In this study, there was a weak correlation between platelet to lymphocyte ratio and coronary artery narrowing in patients with CHD (r=0.276, p=0.043).

The median of platelet to lymphocyte ratio in patients with CHD ≥ 70% was higher than in patients with CHD <70%, statistically test result showed a significant difference in platelet to lymphocyte ratio in patients with CHD ≥70% and CHD <70% (p <0.05).

CONCLUSION AND SUGGESTION

In this study a weak correlation between platelet to lymphocyte ratio and coronary artery narrowing was found in patients with CHD.

A further research is needed with different methods, longer time and more rigorous sample selection so that the investigation is more representative. Still other necessary inflammatory markers such as CRP, IL-6, TNF-α and others, are other limitations of this study.

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