

Clinical Assessment of the Diagnostic Utility of Leukocyte Parameters in the Patients with Acute Myocardial Infarction

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Conflict of interest: Nil

Abstract

Aim: To evaluate the diagnostic potential of leukocyte parameters in the patients with acute myocardial infection.

Methodology: 200 patients were enrolled in this study which were sub-grouped into group A and B. In group A, 100 were healthy individuals diagnosed with hypertension and in group B, 100 patients were included who were admitted to Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India Blood sampling was performed from the ulnar vein in the first hour and on the 7th day after hospitalization. CBC was performed as well as erythrocyte sedimentation rate (ESR) was performed. Leukocytic parameters and their ratios, in particular the levels of leukocytes, lymphocytes, neutrophils, ESR, as well as the ratios of N/L and PLT/L were studied.

Results: Comparing the parameters of the CBC between the two groups, it was established that the level of leukocytes was significantly higher in the group of patients with AMI than in the group A. There was significant difference in the absolute number of lymphocytes and granulocytes between the groups A and B: in the AMI group, there was a significantly lower lymphocyte count and higher granulocytes. The N/L ratio and PLT/L ratio differed between both the groups and were highest in the patients with AMI.

Conclusion: A significant relation between leukocytic parameters such as lymphocytes, granulocytes, N/L ratio and PLT/L ratio in patients having acute myocardial infarction was found.

Keywords: Acute Myocardial Infarction, Leukocytes, CBC.

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Introduction

Acute myocardial infarction (MI), also known as Heart attack, is a clinical syndrome that results from occlusion of a coronary artery, with resultant death of cardiac myocytes in the region supplied by that artery. It is the irreversible damage of myocardial tissue caused by prolonged ischaemia and hypoxia. Myocardial

infarction is a major cause of death and disability worldwide. Myocardial infarction may be a minor event in a lifelong chronic disease, it may even go undetected, but it may also be a major catastrophic event leading to sudden death or severe hemodynamic deterioration.

Myocardial cell death can be recognized by the appearance in the blood of different proteins released into the circulation from the damaged myocytes: myoglobin, cardiac troponin T and I, CK, LDH, as well as many others. [1] Myocardial infarction is diagnosed when blood levels of sensitive and specific biomarkers such as cardiac troponin or creatinine kinase myocardial band (CKMB) are increased in the clinical setting of acute myocardial ischemia. [2]

During unstable periods of coronary atherosclerosis with activated inflammation in the vascular wall, patients may develop a myocardial infarction. Inflammation is a key feature of coronary atherosclerosis and its clinical manifestations. The leukocyte count is a marker of inflammation that is widely available in clinical practice. Leukocytosis has been consistently shown to be an independent risk factor and prognostic indicator of future cardiovascular outcomes, regardless of disease status. The leukocyte count is inexpensive, reliable, easy to interpret, and ordered routinely in inpatient and outpatient settings.

Materials and methods:

200 patients were enrolled in this study which were sub-grouped into group A and B. In group A, 100 were healthy

individuals diagnosed with hypertension and in group B, 100 patients were included who were admitted to Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India.

Blood sampling was performed from the ulnar vein in the first hour and on the 7th day after hospitalization. CBC was performed as well as erythrocyte sedimentation rate (ESR) was performed. Leukocytic parameters and their ratios, in particular the levels of leukocytes, lymphocytes, neutrophils, ESR, as well as the ratios of N/L and PLT/L were studied.

Results:

In group A, 56 were males and 44 were females and in group B, 63 were males and 37 were females. A mean age of the patients of group B was (58.42±14.72) years old while in group A, the mean age was (54.77±17.43). Comparing the parameters of the CBC between the two groups, it was established that the level of leukocytes was significantly higher in the group of patients with AMI than in the group A. There was significant difference in the absolute number of lymphocytes and granulocytes between the groups A and B: in the AMI group, there was a significantly lower lymphocyte count and higher granulocytes. The N/L ratio and PLT/L ratio differed between both the groups and were highest in the patients with AMI.

Table 1: Comparison of CBC parameters between the patients with hypertension (Group A) and AMI (Group B)

Parameters	Group A (n=100)	Group B (n=100)	P value
Age, years	48.77±17.43	58.42±14.72	0.01
Men, n (%)	56 (56%)	63 (63%)	-
WBC, 10 ⁹ /L	5.89±0.44	9.42±0.65	<0.001
Lymphocytes, 10 ⁹ /L	2.55±0.43	1.68±0.47	0.023
Monocytes, 10 ⁹ /L	0.84±0.31	0.47±0.12	<0.001
Granulocytes, 10 ⁹ /L	4.01±0.42	7.68±0.89	<0.001
N/L ratio	2.21±0.56	6.00±0.85	<0.001
PLT/L ratio	122.41±8.25	168.58±13.04	0.001
ESR, mm/hour	8.24±1.02	11.97±0.87	<0.05

Table 2: Comparison of CBC parameters in the AMI patients at the time of hospitalization and on the 7th day after MI

Parameters	Day 1	Day 7
WBC, 10 ⁹ /L	9.42±0.65	7.86±0.43
Lymphocytes, 10 ⁹ /L	1.68±0.47	2.31±0.56
Monocytes, 10 ⁹ /L	0.47±0.12	0.84±0.21
Granulocytes, 10 ⁹ /L	7.68±0.89	5.43±0.34
N/L ratio	6.00±0.85	3.20±0.55
PLT/L ratio	168.58±13.04	142.47±16.8
ESR, mm/hour	11.97±0.87	20.98±1.88

The difference in leukocytic parameters was significantly observed at the time of admission and at the day 7 after admission. Lymphocyte counts were significantly increased as well as granulocytes and PLT/L ratio were decreased after 7 days of admission.

Discussion:

Cardiovascular disease (CVD) is the leading cause of death in the Western world. [4] One of its most insidious forms is coronary heart disease (CHD) due to atherosclerosis. [5] Various types of inflammatory cells, including monocytes, lymphocytes, eosinophils, and neutrophils, have been implicated in CHD. [6]

Correlation of the leukocyte count with CHD and investigations into the utility of the leukocyte count as a risk factor and prognostic indicator in patients with CHD are consistent with the current concept that atherosclerosis is an inflammatory disease [5]. According to this concept, monocytes are recruited from the peripheral blood into the vessel wall after endothelial injury. The recruited monocytes differentiate into macrophages that phagocytose lipids and secrete metalloproteinase enzymes, such as elastase and collagenase, within the atherosclerotic lesion [5, 7].

In addition, neutrophils and mast cells that also secrete or induce degradative proteases begin to accumulate in the plaque [8, 9]. Over time, the recruitment and accumulation of

inflammatory cells increase the lipid and inflammatory cell content of the plaque and cause extensive neovascularization of involved adventitia and intima [10]. The atherosclerotic plaque becomes more vulnerable to rupture, leading to cardiovascular events. When plaque rupture does occur, it is usually followed immediately by mural or occlusive coronary thrombosis and dynamic vasoconstriction on exposed intimal tissue in or near areas of luminal inflammation [11].

Neutrophils can affect platelet function by direct adhesion or by secretory factors. In contrast, the number of lymphocytes in AMI tends to decrease. We were able to confirm this pattern when comparing patients with AMI and healthy volunteers, at the same time there were no differences in the group of patients with stable coronary heart disease. This can be explained by the fact that the decrease in the number of lymphocytes is associated with physiological stress, which leads to increased cortisol levels and activates the process of apoptosis in the lymphocytes [12].

Conclusion:

A significant relation between leukocytic parameters such as lymphocytes, granulocytes, N/L ratio and PLT/L ratio in patients having acute myocardial infarction was found. Levels of leukocytic parameters are commonly available and informative markers that provide additional information about the processes

of inflammation during the acute phase of myocardial infarction.

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