

Role of Neutrophil-Lymphocyte Ratio and other Inflammatory Markers in Cardiovascular Diseases

Moataz Ali Hassan Ali, Ghada Ebrahim Mohammed, Islam Hussein Hassan Hussein Tahooun*

Department of Cardiology, Faculty of Medicine, Zagazig University, Egypt

*Corresponding author: Islam Hussein Hassan Hussein Tahooun,

Mobile: (+20) 01060692292, E-mail: islam.tahooun1911@gmail.com

ABSTRACT

A complex and highly conserved set of cellular and molecular processes, inflammation. The carefully controlled process of inflammation, commonly referred to as "the fire inside," is necessary for host defence and tissue regeneration. Inflammation has evolved to help with survival and is generally beneficial. Yet, persistent and chronically activated inflammation can be dangerous, increasing tissue damage and shortening longevity. Maladaptive reactions include atherosclerosis and rheumatologic disease. Atherosclerosis was formerly believed to be a disease of passive cholesterol deposition in the subendothelial zone, despite evidence discovered by Virchow more than a century ago suggesting inflammatory white cells play a part in atherogenesis. The present review aimed to evaluate the contribution of neutrophil-lymphocyte ratio (NLR) and other inflammatory markers to cardiovascular disease.

Keywords: Neutrophil-lymphocyte ratio, Inflammatory markers, Cardiovascular disease, Review, Zagazig University.

INTRODUCTION

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Neutrophil-lymphocyte ratio (NLR)

The NLR is computed by dividing the total lymphocyte count by the total neutrophil count. Physiologic stress increases neutrophils while decreasing lymphocytes. The NLR is more sensitive than either change alone since it includes both ⁽¹⁾.

Effect of physiologic stress on the NLR:

$$\uparrow \uparrow \text{NLR} = \frac{\uparrow \text{Neutrophils}}{\downarrow \text{Lymphocytes}}$$

Catecholamines and endogenous cortisol may be the main NLR drivers. It is well known that higher cortisol levels raise neutrophil counts while lowering lymphocyte counts. Similarly, endogenous catecholamines, such as

epinephrine, can result in lymphopenia and leukocytosis. It's also likely that cytokines and other hormones are involved ⁽¹⁾.

NLR is therefore not just a sign of infection or inflammation. Every physiological stressor can raise the NLR (e.g., hypovolemic shock). With short-term physiologic stress (6 hours), NLR increases quickly. NLR may be a better indicator of acute stress due to its quick response time than labs that take longer to react (such as those measuring anaemia or white blood cell count, for example) ⁽²⁾.

Calculation and rough reference range as demonstrated below, NLR can be estimated using absolute cell counts or percentages:

Calculation of NLR:

$$\text{NLR} = \frac{\text{Absolute \# Neutrophils}}{\text{Absolute \# Lymphocytes}} = \frac{\text{Relative \% Neutrophils}}{\text{Relative \% Lymphocytes}}$$

The clinical environment influences the interpretation of NLR. To give you a concept of what to make of this:

- A typical NLR is between 1 and 3.
- A NLR of 6 to 9 denotes moderate stress (e.g., a patient with uncomplicated appendicitis).
- Critically ill individuals frequently possess an NLR of 9 or more (sometimes approaching 100) ⁽¹⁾.

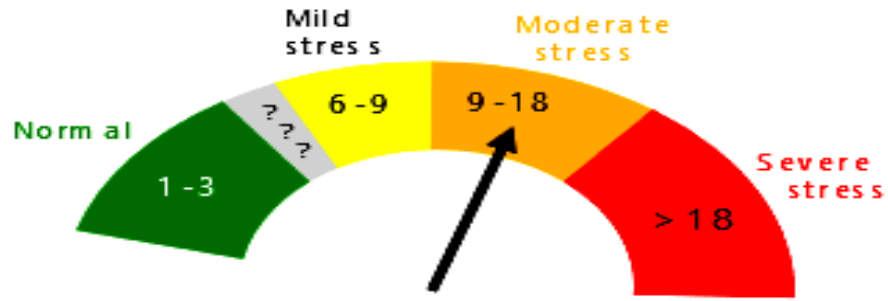


Figure (1): NLR Stress -o-meter ⁽⁴⁾.

Importance of NLR:

NLR has recently / microvascular issues. NLR and urine albumin and protein were revealed to be closely related ⁽³⁾.

Other Inflammatory Markers' Involvement in Cardiovascular Disease:

1. Platelet-lymphocyte-ratio:

A complete blood count can be used to compute the platelet to lymphocyte ratio (PLR), which is a mixed reflection of two opposing thrombotic/inflammatory

pathways. The PLR was initially used to forecast the prognosis of neoplastic diseases as a systemic inflammatory biomarker. Recently, PLR has been employed as an indicator in a number of cardiovascular disorders ⁽⁵⁾.

Several studies have linked poor cardiovascular outcomes to higher platelet and lower lymphocyte numbers. Increased PLR may therefore be more accurate at predicting severe unfavourable CV events than each measure by itself ⁽⁵⁾.

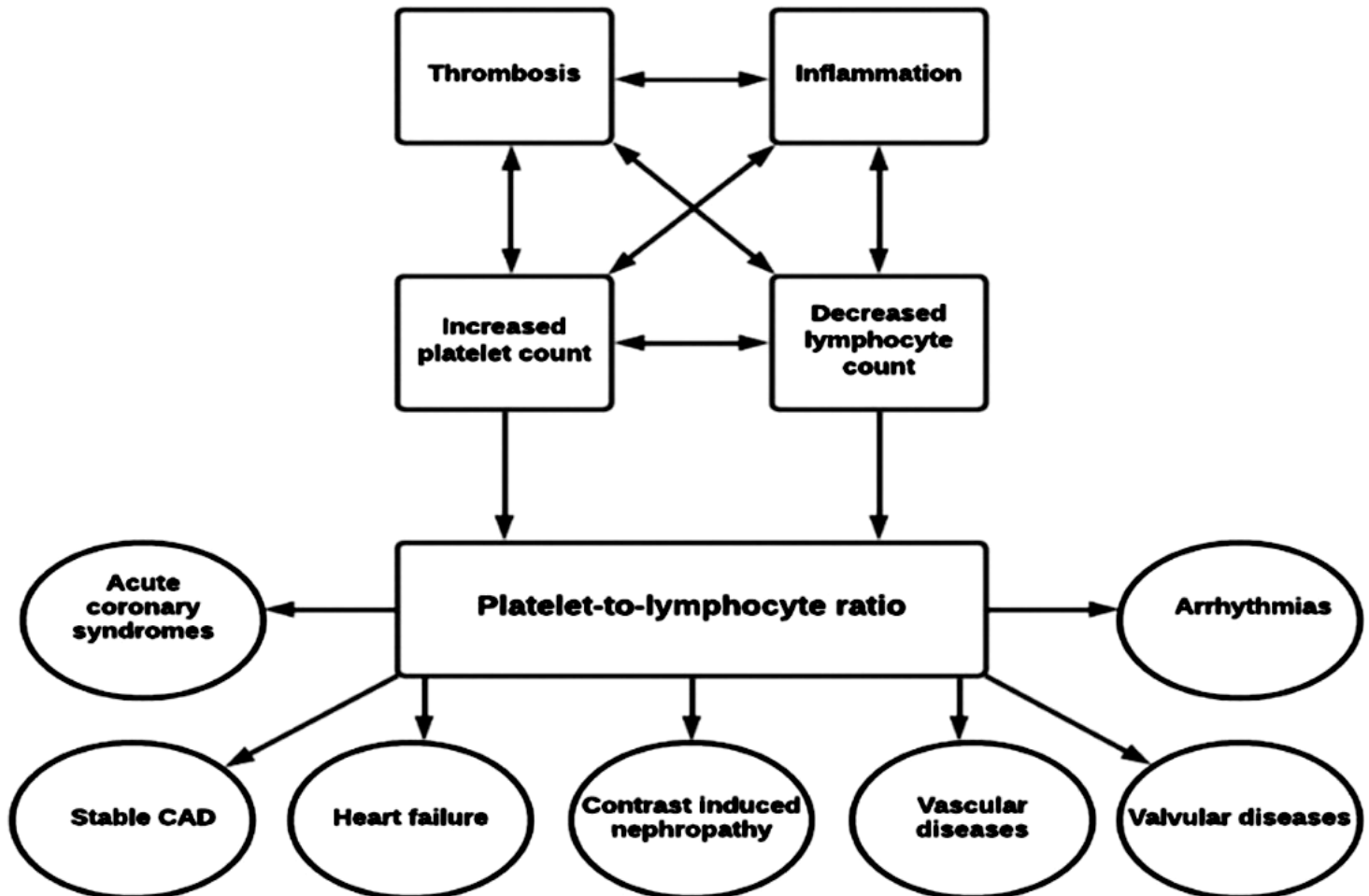


Figure (2): Many cardiovascular events and the platelet to lymphocyte ratio (PLR): pathophysiological mechanisms ⁽⁵⁾.

In the study **Hudzik *et al.*** ⁽⁶⁾ for patients with acute coronary syndrome, PLR showed a good prognostic value for both in-hospital and late death.

2. C-reactive protein (CRP):

A new and clinically useful indicator of increased cardiovascular risk is CRP. This is a compelling argument since atherosclerosis is characterised by chronic arterial inflammation, and it supports the idea that circulating inflammatory markers may be used to detect subclinical atherosclerosis before acute events take place ⁽⁷⁾.

Several studies ⁽⁸⁻¹⁴⁾ have concentrated on identifying persons at high risk for cardiovascular disease using the inflammatory marker high-sensitivity C-reactive protein (hsCRP). Both healthy people and those with acute coronary syndromes can use hsCRP as an independent predictor of their future risk of cardiovascular events, according to a number of prospective studies. Additionally, hsCRP may assist identify patients who would otherwise be missed by lipid screening alone because persons with low to medium levels of low-density lipoprotein cholesterol have 50% of all cardiovascular events. About the initial defence against cardiovascular disease, hsCRP could therefore be employed as a supplement to global risk assessment.

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