



Original Article



Association of Complete Blood Cell Count-Derived Inflammatory Indices with the Severity of Coronary Artery Disease in a Young and Middle-Aged Iranian Population

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BRIEF TEXT

Background and Objective

... [1] Coronary artery disease (CAD) is a leading cause of death worldwide, and inflammation plays a key role in its pathogenesis [2]. ... [3]. Atherosclerosis is a multifactorial disease and the main cause of cardiovascular disease, which is the leading cause of death worldwide [4]. ... [5]... [6]... [7]. Recent studies have focused on simple, inexpensive, and promising complete blood count (CBC) parameters [8]. Among these parameters, the neutrophil-to-lymphocyte ratio (NLR) is an indicator of systemic inflammation [9]. Previous studies have demonstrated that NLR is a reliable inflammatory biomarker in the atherosclerotic process and a predictor of clinical outcomes in individuals with various cardiovascular diseases [10]. Additionally, other proposed inflammatory factors, such as high-sensitivity C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR), have also been extensively studied in patients with CAD [11, 12]. This study aimed to investigate the association between CBC-derived inflammatory indices and the angiographic severity of CAD.

Materials and Methods

In this retrospective cross-sectional study, the records of 236 patients (189 men, 47 women) with a mean age of 47.9 ± 5.4 years who underwent elective coronary angiography were reviewed. The severity of CAD was determined using the SYNTAX score. Demographic data, CBC.diff parameters (including NLR and platelet-to-lymphocyte ratio [PLR]), and ESR and CRP levels were collected and analyzed using SPSS (version 16) and appropriate statistical tests.

Results

In the overall analysis, levels of white blood cell (WBC) ($P = 0.046$), neutrophil ($P = 0.002$), NLR ($P = 0.012$), PLR ($P = 0.032$), hematocrit ($P = 0.020$), ESR ($P < 0.001$), and CRP ($P = 0.004$) were all significantly associated with the severity of CAD. These associations were particularly stronger in men and individuals aged > 45 years. In contrast, none of the parameters showed a significant association in the female population, and lymphocyte count, platelet count, and hemoglobin also showed no significant association in the total sample (Tables 1, 2, and 3).

Discussion

In this retrospective cross-sectional study, the association between inflammatory factors and CBC. diff parameters with the severity of CAD

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in 236 patients (80.1% male) with a mean age of 47.9 years were investigated. The main findings revealed significant associations between WBC, neutrophil, NLR, PLR, hematocrit, ESR, and CRP levels with the severity of coronary artery involvement. These associations were notably robust in men and individuals aged > 45 years. Conversely, none of the parameters were significantly associated with the female population. Our discovery of an association between WBC and CAD severity aligns with prior studies [9,13]. As a readily available inflammatory marker, WBC may be as effective as CRP in identifying individuals at risk for cardiovascular disease (CVD) [11,14]. ... [15]. Our findings indicate that neutrophils were a strong predictor of CAD severity. In contrast, lymphocytes alone did not show a significant association, a result consistent with a meta-analysis linking neutrophils to CVD [14]. The NLR was also notable in our study as a composite inflammatory marker, consistent with the findings of Bhat [16] and Lee [17]. PLR was associated with CAD severity in our study. This result aligns with the research of Shahabirabari [18] and Yayla [19], who identified PLR as a valuable prognostic marker in cardiovascular patients. While the association based on gender was not statistically significant in our study, Moosazadeh's research showed higher PLR levels in women [20]. The platelet count alone did not show a significant association with CAD severity in our current study, contradicting the findings of a study by Haybar et al. [21], which reported a positive relationship. The observation that hematocrit was significantly associated with CAD severity is consistent with the Ghandehari study [22]. Elevated hematocrit levels can lead to increased blood viscosity and reduced tissue perfusion, particularly in individuals with atherosclerosis [23]. In this study, ESR emerged as the strongest predictor of CAD severity. This finding aligns with Ceasovschih's study [24]. Despite ESR being an indirect and nonspecific marker of inflammation, its consistent association with disease severity across all age and gender subgroups of men indicates its high utility. Additionally, the significant association of CRP with CAD severity was another finding consistent with several studies [25], [26], [27]. CRP serves not only as a marker of inflammation but also as an active player in the pathogenesis of atherosclerosis, impacting endothelial function, LDL oxidation, and the innate immune response [28]. The lack of a significant association between hemoglobin and CAD severity in our study aligns with DeLuca's findings [29]. While theoretically, hemoglobin levels could influence myocardial oxygenation, the results across various studies have been inconsistent [30].

Conclusion

Simple and cost-effective CBC-derived inflammatory indices, especially ESR, neutrophil count, NLR, and CRP, were significantly correlated with the severity of CAD. They can be used as useful preliminary screening tools to identify high-risk patients and assist in prioritizing coronary angiography.

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Table 1. Frequency Distribution of Participants by Age and Gender Groups

Variables		No. (%)
Gender	Female	47 (19.9)
	Male	189 (80.1)
Age	≤ 45	66 (28)
	> 45	170 (72)
Severity of the disease (SYNTAX)	Mild (< 22)	196 (83)
	Medium (22-32)	31 (13)
	Severe (> 32)	9 (4)

Table 2. Statistical Correlation (*P*value) of the Studied Parameters with the Severity of Coronary Artery Disease

Parameter	Total	Age ≤ 45	Age > 45	Males	Females
WBC	0.046	0.020	0.366	0.137	0.548
Neutrophil	0.002	0.109	0.023	0.002	0.639
Lymphocyte	0.071	0.314	0.164	0.069	0.791
NLR	0.012	0.447	0.063	0.017	0.718
Platelet count	0.109	0.106	0.463	0.131	0.637
PLR	0.032	0.649	0.002	0.185	0.134
Hematocrit	0.020	0.049	0.157	0.006	0.674
Hemoglobin	0.308	0.691	0.489	0.285	0.697
ESR	> 0.001	0.001	> 0.001	> 0.001	0.079
CRP	0.004	0.109	0.049	0.004	0.456

Abbreviations: NLR, neutrophil-to-lymphocyte ratio; CRP, C-reactive protein; ESR, erythrocyte sedimentation rate; PLR, platelet-to-lymphocyte ratio; WBC, white blood cell.

Table 3. Distribution of Coronary Artery Disease Severity Based on Erythrocyte Sedimentation Rate (ESR) Status

Severity of the disease (SYNTAX)	Normal ESR, No. (%)	High ESR, No. (%)	Total, No. (%)
Mild (<22)	143 (73)	53 (27)	196 (100)
Medium (22-32)	19 (61)	12 (39)	31 (100)
Severe (>32)	0 (0)	9 (100)	9 (100)
Total	162 (69)	74 (31)	236 (100)