Section: Cardiology

Systematic Review

EXPLORING THE RELATIONSHIP BETWEEN EARLY WHITE BLOOD CELL COUNT AND LEFT VENTRICULAR EJECTION FRACTION IN PATIENTS WITH ST-ELEVATION MYOCARDIAL INFARCTION: A SYSTEMATIC REVIEW

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Abstract

Background: The role of the white blood cell (WBC) count in acute myocardial infarction (AMI) has gained attention because of its association with adverse outcomes. This systematic review explored the relationship between WBC count, left ventricular ejection fraction (LVEF), and clinical outcomes in patients with ST-segment elevation myocardial infarction (STEMI). **Material & Methods:** A comprehensive literature search was conducted across electronic databases to identify studies from their inception. The inclusion criteria included studies on individuals diagnosed with STEMI aged 18-45, utilising various study designs. Five studies were included: randomised trials, prospective studies, pooled data studies, cross-sectional studies, and cohort studies. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were followed to ensure transparent reporting. **Results:** This review included 3,693 patients from diverse studies. Findings from the EVOLVE study indicated that elevated leukocyte and neutrophil counts were associated with larger infarct sizes and reduced left ventricular (LV) systolic function. A prospective study demonstrated an independent association between WBC count and mortality in STEMI and non-STEMI patients. Pooled TIMI 10A and 10 B trial analyses revealed correlations between WBC count and adverse clinical outcomes, thrombolytic resistance, and compromised microvascular perfusion. A retrospective study linked elevated WBC count with reduced LVEF in patients with STEMI. Another prospective study identified the neutrophil count as a robust predictor of long-term outcomes. **Conclusion:** This systematic review provides comprehensive insights into WBC count, LVEF, and clinical outcomes in patients with STEMI. The identified associations highlight the potential of WBC parameters, particularly the neutrophil count, for risk stratification and prognosis.

INTRODUCTION

In recent years, evidence has emerged that substantiates the involvement of inflammation in initiating atherosclerosis and the pathogenesis of coronary thrombosis.[1,2] Numerous studies have demonstrated that elevated levels of specific inflammatory markers in individuals with acute coronary syndrome (ACS) correlate with an increased occurrence of cardiovascular complications and increased rates of both short- and long-term mortality.[3-5] Nevertheless, the widespread availability of these markers is limited, their cost is prohibitive, and prompt accessibility of results is not customary. Consequently, their practical utility in routine clinical practice is constrained.[4]

Inflammation is a significant risk factor for cardiovascular events. Studies have indicated that individuals with elevated white blood cell (WBC) counts are more prone to acute myocardial infarction (AMI) and face an increased risk of

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adverse events during acute episodes. Despite an unclear understanding of the underlying mechanisms, various hypotheses have been proposed, including a leukocyte-mediated hypercoagulable state, leukocyte-mediated no-reflow, and indirect cardiotoxicity mediated by proinflammatory cytokines.[1,3]

Multiple studies have indicated that an elevated white blood cell (WBC) count is associated with a heightened prevalence of cardiovascular disease and overall mortality in the general population.5 Recent investigations have confirmed the prognostic significance of WBC as a predictor for the onset of heart failure and mortality in both the short- and long-term periods after ACS, particularly following acute myocardial infarction (AMI). However, limited data on unselected populations subject to the contemporary definition of AMI and comprehensive long-term follow-up are available in the literature.[5-9]

The manifestation of ventricular systolic dysfunction during Acute Coronary Syndrome (ACS) is well documented and has been identified as a crucial clinical factor leading to unfavourable outcomes.[10–12] Notably, left ventricular ejection fraction (LVEF), assessed using echocardiography, is a valuable tool for delineating left ventricular systolic dysfunction (LVSD). Furthermore, evaluation of LVEF at any point during hospitalisation has been suggested as a practical predictor of survival in patients with ACS. Specifically, LVEF < 40% is indicative of impaired ventricular systolic function and is a significant determinant of mortality related to ST-segment elevation myocardial infarction (STEMI).[11,13–15] Reduced LVEF, resulting from contractile function disruption, is strongly associated with adverse clinical outcomes such as sustained ventricular arrhythmias, mortality, and hospital readmission with heart failure in patients experiencing cardiovascular events, including acute myocardial infarction and STEMI.[10–13,15]

The progression of STEMI may be substantially influenced by the distribution of obesity and serum parameters indicative of cardiovascular risk, likely in correlation with impaired systolic function.[15] Therefore, investigating the determinants of reduced LVEF following ACS could be beneficial in preventing STEMI progression and improving prognosis. However, the existing literature lacks clarity concerning the relationship between LVEF as a measure of ventricular systolic function, upon-admission serum parameters, and body mass index (BMI) in STEMI.[14,15]

There is ample evidence indicating that an elevation in baseline white blood cell (WBC) count is linked to higher in-hospital and short-term mortality among patients with unstable angina or acute myocardial infarction.[4-7] The WBC response to acute myocardial infarction involves an increase in neutrophil and monocyte counts and a reduction in lymphocyte count.[16,17] Previous studies did not collect WBC count differentials, leaving it unknown which specific subset of leukocytes is most strongly correlated with an increased risk of adverse outcomes. Although increased monocyte counts have been associated with cardiac pump failure and death, their predictive value has not been compared with that of other WBC subtypes. Moreover, previous studies have not explored the relationship between the WBC count and left ventricular ejection fraction. Additionally, it is unclear whether WBC subtypes provide additional prognostic information when combined with other inflammatory markers, such as C-reactive protein.[16,17]

MATERIALS AND METHODS

Data Collection

A comprehensive search was conducted across electronic databases, including PubMed, MEDLINE, Embase, and Cochrane Library, using a predefined set of keywords and Medical Subject Headings (MeSH) terms. The search focused on studies published from inception to the present, exploring the association between WBC count and LVEF in patients with ST-segment elevation myocardial infarction.

Eligibility Criteria

The inclusion criteria were studies addressing angiographic characteristics of individuals aged 18–45 years diagnosed with ST-elevated myocardial infarction. Relevant study types included retrospective observational studies, clinical trials, and case-control studies. Owing to limited evidence, we selected all relevant studies that assessed the association between WBC count and LVEF.

Data Extraction

Two independent reviewers thoroughly screened titles and abstracts to determine their eligibility. Full-text articles that met the predefined inclusion criteria were subjected to comprehensive data extraction using a standardised form. The extracted data included study design, sample size, participant demographics, angiographic findings, and distinctive characteristics observed in the angiographic profiles of young adults diagnosed with ST-Elevation Myocardial Infarction (STEMI).

Data Synthesis and Analysis

The extracted data were synthesised to identify common themes and trends in WBC and leukocyte counts, clinical profiles, and associations with LVEF.

Reporting

The systematic review adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure transparency and completeness in reporting the review process and findings.

Ethical Considerations

Ethical approval was not required as this study involved the analysis of previously published data. However, adherence to ethical standards and patient

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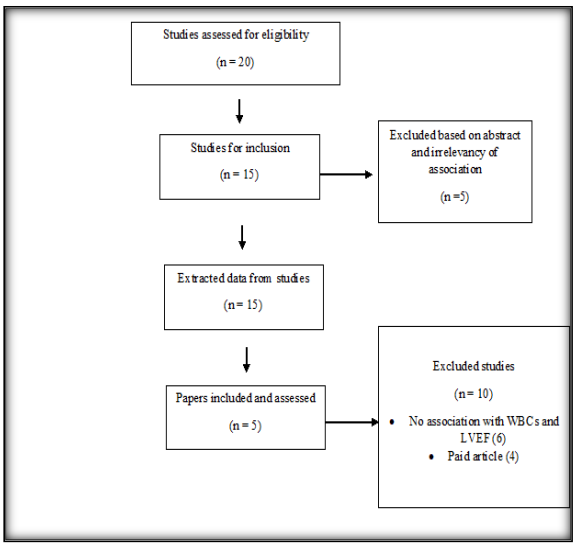
confidentiality were maintained throughout the review process.

CONSORT FLOW FOR SELECTION OF STUDIES



RESULTS

Five studies were included, of which we recorded one randomised, double-blind, placebo-controlled study, a prospective study, a pooled data study from the Thrombolysis in Myocardial Infarction (TIMI) 10A trial, a cross-sectional study, and a cohort study that included data from a prospective observational trial. Including data from all five studies, we included 3693 patients from all studies included in the systematic review.[18-22]

Data from the EVOLVE study

This analytical study included 363 patients, constituting 73% of patients enrolled in the EVOLVE study. These patients had white cell counts within 24 hours of admission and underwent primary percutaneous coronary intervention (PCI) and follow-up single-photon emission computed tomography (SPECT) imaging. Total leukocyte and neutrophil counts were mildly elevated upon admission and gradually decreased following primary percutaneous coronary intervention (PCI). In contrast, the lymphocyte count appears to remain relatively stable after ST-segment elevation myocardial infarction (STEMI).[18]

The associations between total and differential leukocyte counts before and after percutaneous coronary intervention (PCI) and myocardial infarct size were evaluated using correlation analyses. Baseline total leukocyte and neutrophil counts correlated poorly with day five infarct size. However, total leukocyte and neutrophil count after 24 h demonstrated stronger associations with infarct size assessed on both day 5 (correlation coefficient (r) of 0.34 and 0.37, respectively, both $p < 0.001$) and day 30 (r of 0.34 and 0.35, respectively, both $p < 0.001$). A significant inverse correlation was observed with left ventricular (LV) systolic function. The neutrophil/lymphocyte ratio assessed 24 h after admission also correlated with infarct size, although there was a trend for a weaker association than the neutrophil count ($p = 0.12$). The total leukocyte and neutrophil counts at 24 h were additionally classified as elevated or within normal levels.[18]

Compared to patients with normal leukocyte or neutrophil counts, those with elevated levels exhibited significantly larger infarct sizes (12.5% vs. 5% and 13.5% vs. 5%, respectively; $p < 0.001$). In a subgroup of patients who underwent single-photon emission computed tomography (SPECT) imaging on the day of admission ($n = 78$), the myocardial salvage index was significantly reduced in patients with elevated leukocyte ($45 \pm 27\%$ vs $65 \pm 34\%$, $p < 0.01$) and neutrophil ($43 \pm 28\%$ vs $67 \pm 33\%$, $p < 0.002$) counts after percutaneous coronary intervention (PCI).[18]

At 24 h, the total leukocyte and neutrophil counts were notably higher in the patients who experienced adverse cardiac events. Kaplan-Meier analysis demonstrated significantly reduced 6-month event-free survival in patients within the highest neutrophil quartile compared to those in the lowest quartile (quartile 1, 19%; quartile 2, 20%; quartile 3, 23%; quartile 4, 45%; log-rank $p < 0.001$). No significant relationship was observed between baseline haematological indices and clinical outcomes. When categorised as a binary variable, a robust association was identified between elevated leukocyte or neutrophil count and the risk of adverse cardiac events at 180 days. This association remained independent of other crucial clinical predictors available at presentation, including age, sex, diabetes, hypertension, smoking history, pre- and post-procedural TIMI flow grades, and peak plasma creatine kinase levels (leukocyte count: Hazard Ratio (HR) 2.5, 95% confidence interval 1.5 to 4.0, $p < 0.001$; neutrophil count: HR 2.2, 95% confidence interval 1.4 to 3.6, $p = 0.001$).[18]

Clinical implications

Elevated leukocyte and neutrophil counts following primary percutaneous coronary intervention (PCI) are associated with adverse clinical outcomes in patients diagnosed with ST-segment elevation myocardial infarction (STEMIs).

A direct correlation exists between leukocyte count, myocardial infarct size, and left ventricular (LV) function as determined by single-photon emission computed tomography (SPECT) imaging.

High leukocyte and neutrophil counts after the procedure were independent predictors of cardiovascular outcomes in this patient population.

Consecutive prospective study among patients with STEMI

A prospective study was conducted on 1118 patients admitted with AMI between 2000 and 2003. Upon admission, patients were categorised based on the recorded electrocardiogram (ECG) ST segment changes. This classification resulted in two groups: 569 patients with non-ST-segment elevation

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myocardial infarction (non-STEMI) and 549 patients with ST-segment elevation myocardial infarction (STEMI). The therapeutic regimens were determined based on stratification.

Patient characteristics

The white blood cell (WBC) count ranged from 3.1 to 35 × 103 cells/mL. The median WBC count for the population was 9.8 × 103 cells/mL, with an interquartile range of 7.8 to 12.5 × 103 cells/mL.

In the non-ST-segment Elevation Myocardial Infarction (non-STEMI) group, 351 patients (62.9%) had WBC1, 176 (30.9%) had WBC2, and 35 (6.2%) had WBC3. The mean age of the patients was 70 (12.1) years, and 65% were men. The proportion of patients with diabetes mellitus, Killip class >2, and troponin I levels >1 ng/mL showed a monotonic increase from WBC1 to WBC3. Additionally, the percentage of men showed an inverse relationship with the WBC categories. A comparison of this study with the EVOLVE trial showed that patients with non-STEMI were also prone to developing atherosclerotic disease. However, the prevalence of low LVEF is higher in patients with STEMI.[19]

STEMI group distribution

In the ST-segment elevation myocardial infarction (STEMI) population, the distribution according to the WBC category was as follows: 228 patients (41.5%) had WBC1, 239 (43.5%) had WBC2, and 82 (14.9%) had WBC3. The mean age of the patients was 65±13 years, and 72.9% were men. For this type of Acute Myocardial Infarction (AMI), the proportion of active smokers, Killip class >2 at admission, heart rate >100 beats per minute, systolic arterial pressure <100 mmHg, an episode of sustained ventricular tachycardia/ventricular fibrillation in the first 24 hours, number of leads with ST-segment elevation, and appearance of new Q waves exhibited a proportional increase from WBC1 to WBC3. In contrast, the relationship was inversely proportional to the proportion of patients aged > 65 years, those with a history of ischemic heart disease, and those with electrocardiographic criteria for reperfusion.[19]

Mortality and WBC count among patients

During the follow-up period, 214 deaths were recorded, which accounted for 19.1% of the total population. Among these, 105 (18.5%) occurred in patients with non-ST-segment elevation myocardial infarction (non-STEMI), and 109 (19.9%) occurred in patients with ST-segment elevation myocardial infarction (STEMI).[19]

In the overall group, the conclusive multivariate model indicated that the adjusted risk of death, when compared to category WBC1, was 2.22 (95% CI: 1.35-3.63; p = 0.002) and 2.07 (95% CI: 1.13-3.76; p = 0.017) times higher in categories WBC2 and WBC3, respectively. Further analysis of the functional form of the variable revealed that the risk of death associated with WBC count was just above 10×10^3 cells/mL.

This study demonstrated that WBC count assessed within the initial hours of AMI serves as a prognostic indicator of long-term mortality in the early risk stratification of patients with ST-segment Elevation Myocardial Infarction (STEMI) and non-ST-segment Elevation Myocardial Infarction (non-STEMI). This predictive capacity persisted independently of the other variables recognised for their prognostic significance. The existing literature has accumulated a growing wealth of information that substantiates the prognostic significance of inflammatory markers across a broad clinical spectrum of atherosclerotic diseases. This extends from their involvement in plaque pathogenesis to their utility in quantifying the inflammatory response during Acute Myocardial Infarction (AMI).[19]

Pooled analysis of TIMI 10A and 10B

The data were aggregated from the thrombolysis in myocardial infarction (TIMI) 10A and 10 B trials. The TIMI 10A trial involved a nonrandomised, open-label, dose-escalation study with eight ascending doses of tenectaplase (TNK), a mutant of recombinant tissue plasminogen activator (5, 7.5, 10, 15, 20, 30, 40, and 50 mg IV over 5 s), conducted in 113 patients. TIMI 10 B was a randomised trial comprising 880 patients that compared 30, 40, and 50 mg of TNK with front-loaded recombinant tissue plasminogen activator (rt-PA). Angiography was performed at 60, 75, and 90 min after thrombolytic administration.[20]

Patient characteristics

The white blood cell (WBC) count ranges from 3.5 to 75.7 × 109/L, with a median of 10.4 × 109 /L and an interquartile interval ranging from 8.4 to 12.9 × 109/L. Smokers had a higher WBC count than non-smokers did. Patients with a history of prior acute myocardial infarction (AMI), previous angina, anterior infarctions, and those previously treated with aspirin and beta-blockers exhibited a significantly lower WBC count. Additionally, an elevated WBC count was correlated with an increased baseline platelet count (correlation coefficient (r) = 0.22, p < 0.001) and increased hematocrit (r = 0.17, p < 0.001).[20]

Correlation and Impact of WBC Count on Clinical Outcomes.

The mortality rate increased in patients with elevated white blood cell (WBC) counts (p < 0.03). When considered a continuous variable, WBC count tended to be higher in individuals who died within 30 days (p < 0.2). The occurrence of new congestive heart failure (CHF) or shock was associated with a higher WBC count (p < 0.001). Conversely, the development of recurrent acute myocardial infarction (AMI) showed no significant association with WBC count. Combining the clinical endpoints (death, recurrent myocardial infarction, CHF, and shock) revealed a higher frequency of patients with an elevated WBC count (p < 0.005). A moderate positive correlation was observed between WBC count and infarct size, as measured by the maximum creatine kinase (CK) level (correlation coefficient (r) = 0.13, p < 0.001). The increase in CK after

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thrombolytic administration also correlated with WBC count ($r = 0.13$, $p < 0.001$). In a multivariate model considering various factors, including TIMI flow grade, TIMI myocardial perfusion grade, anterior MI location, baseline and maximum CK levels, baseline hematocrit, platelet count, beta-blocker use, time from symptom onset to treatment, prior MI, age, sex, and smoking status, WBC count was independently associated with the development of new CHF and death.[20]

Correlation of early WBC rise and STEMI

The findings from the pooled analysis validated previous observations linking elevated white blood cell (WBC) count to adverse clinical outcomes in acute myocardial infarction (MI). Furthermore, this analysis delves into the underlying pathophysiology of this association and provides several important insights. First, an increase in WBC count is linked to resistance to thrombolytic therapy, as evidenced by the lower rates of coronary patency 60 and 90 min after thrombolytic administration and an elevated thrombus burden in individuals with a patent infarct-related artery. This resistance remains independent of symptom duration, a factor previously associated with thromboresistance. Second, elevated WBC counts are associated with compromised microvascular perfusion, as indicated by a reduction in myocardial perfusion grade. Third, elevated WBC count has emerged as a robust predictor of subsequent congestive heart failure (CHF), irrespective of epicardial or microvascular coronary blood flow.

The association between an elevated WBC count reduced epicardial patency, and increased thrombus formation at the site of the ruptured plaque suggests that an elevated WBC count may serve as a marker of a hypercoagulable or thromboresistant state.

Association of High Leucocyte Count with left ventricular systolic dysfunction in STEMI patients

Patient characteristics of the STEMI population

A recent retrospective cross-sectional study enrolled 200 patients (54 female patients), all of whom had experienced ST-segment elevation myocardial infarction (STEMI), with an average age of 62 years (standard deviation [SD], 12 years). The patients were categorised into four groups based on their left ventricular ejection fraction (LVEF): 35 subjects (17.5%) exhibited normal systolic function (LVEF 50–70%), 48 subjects (24.0%) had mild reduction (mildly reduced LVEF 40–49%), 94 subjects (47%) demonstrated moderate reduction (moderately reduced LVEF 30–39%), and 23 patients (11.5%) presented with severe systolic dysfunction (severely reduced LVEF < 30%).

Correlation of WBC with STEMI

The Kruskal–Wallis post hoc test revealed that the serum WBC and neutrophil percentages, as well as the neutrophil-to-lymphocyte ratio (NLR), among STEMI patients with severely reduced LVEF levels (< 30%) (median = 12,900/m3, 83%, and 5.47, respectively) were significantly higher than those in the normal LVEF group (50–70%) (median = 10,200/m3, 70.00%, and 2.92, respectively) ($p < 0.05$). Additionally, the WBC count of patients in the severely reduced LVEF group was significantly higher than that in the mildly reduced LVEF group (median = 10,050/m3) ($p < 0.05$).[21]

Furthermore, patients with severely reduced LVEF had a significantly elevated neutrophil count compared with patients in the moderately reduced LVEF category (median = 75%) ($p < 0.05$). However, the total lymphocyte count was lower among the patients in the lowest (severely reduced) LVEF category (median = 15%) than that of the patients in the normal and moderately reduced LVEF groups (median = 25% and 21%, respectively) ($p = 0.033$).[21]

This study directly correlated WBC count with LVEF functioning, where an elevated leukocyte count was observed to be higher in patients with low LVEF. In addition, compared with normal individuals, there was a significant difference of 50-70% in LVEF functioning.

Elevated neutrophil and mortality among early AMI patients

A prospective study examined the predictive value of WBC subtypes for long-term outcomes in 1037 patients with acute myocardial infarction (AMI). Each patient underwent assessments for total WBC, neutrophil, monocyte, and lymphocyte counts and high-sensitivity C-reactive protein (CRP) levels. The median follow-up duration was 23 (6–42) months.[22]

Upon separate analysis, baseline total WBC (HR 2.2, 95% CI 1.5–3.3; $p < 0.0001$), neutrophil count (HR 2.7, 95% CI 1.8–4.1; $p < 0.0001$), and monocyte (HR 1.9, 95% CI 1.3–2.8; $p = 0.001$) counts in the upper quartile and lower quartile lymphocyte count (HR 1.5, 95% CI 1.1–2.3; $p = 0.03$) were independent predictors of mortality. In comparing nested models, adding other WBC data did not enhance the model based on the neutrophil count. Conversely, incorporating the neutrophil count into models based on the total WBC count ($p = 0.01$), monocyte count ($p < 0.0001$), and lymphocyte count ($p < 0.0001$) improved the predictive capability of these models. Even after adjusting for left ventricular systolic function and CRP level, neutrophil count in the upper quartile (≥9800/μL) remained a robust independent predictor of mortality (HR 2.2, 95% CI 1.6–3.0; $p < 0.0001$).

Nevertheless, neutrophil count was the most reliable predictor of long-term outcomes among all the WBC subtypes. The heightened risk of long-term mortality linked to an elevated neutrophil count remains independent of well-established clinical predictors of adverse outcomes in patients with acute myocardial infarction, including left ventricular systolic function. Moreover, increased neutrophil count independently predicted subsequent heart failure. The escalation of baseline WBC count in patients with acute coronary syndromes has been demonstrated to be a straightforward indicator of poor prognosis.

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DISCUSSION

In recent years, the association between inflammation, atherosclerosis, and coronary thrombosis has gained significant attention in cardiovascular research.[1,2] Specific inflammatory markers, although correlated with adverse cardiovascular events and mortality, pose practical limitations in routine clinical use.[3-5] White blood cell (WBC) count, reflecting a systemic inflammatory response, has emerged as a potential prognostic indicator, particularly in acute myocardial infarction (AMI).[4-7] This systematic review aims to elucidate the relationship between WBC count, left ventricular ejection fraction (LVEF), and clinical outcomes in patients with ST-segment elevation myocardial infarction (STEMI).

WBC Count, Inflammation, and Cardiovascular Risk

Elevated WBC counts have been consistently associated with increased cardiovascular risk, implicating a potential role in the pathogenesis of AMI.[5-9] This review consolidates evidence from diverse studies, demonstrating that an elevated WBC count is linked to adverse clinical outcomes, including long-term mortality, heart failure, and recurrent cardiovascular events.[18-22] The correlation between increased WBC count and larger infarct sizes, compromised microvascular perfusion, and resistance to thrombolytic therapy further underscores its multifaceted involvement in AMI pathophysiology.[18-20]

LVEF as a Predictor of Adverse Outcomes

Reduced LVEF, indicative of ventricular systolic dysfunction, has long been recognised as a critical factor in adverse outcomes following AMI.[10-15] In particular, LVEF < 40% is associated with increased mortality in STEMI.11 The review emphasises the importance of LVEF as a practical predictor of survival and explores the determinants of reduced LVEF in the context of STEMI.[14-15] Understanding these factors is crucial for preventing STEMI progression and improving prognosis.

Association Between WBC Count and LVEF

A systematic review highlighted a significant correlation between elevated WBC counts and reduced LVEF in STEMI patients.21 Patients with severely reduced LVEF (<30%) exhibited higher WBC and neutrophil counts, indicating a potential link between inflammation and impaired ventricular systolic function.21 However, this review emphasises the need for further investigation into the intricate relationship between on-admission serum parameters, BMI, and LVEF in STEMI, as the current literature lacks clarity.[14-15]

Existing evidence suggests that assessing the prognostic value of dyslipidaemia, particularly hypertriglyceridemia or hypercholesterolaemia, in Acute Coronary Syndrome (ACS) may be intricate because of the paradoxical relationships observed between triglyceride and total cholesterol levels, left ventricular ejection fraction (LVEF), and ACS in both the current and prior studies. Notably, the results obtained in our study, which indicate elevated white blood cell (WBC) counts, increased neutrophil percentages, and a higher Neutrophil-to-Lymphocyte Ratio (NLR) among individuals likely to have severely impaired systolic function, align closely with the findings of previous studies.[22-24] Consistent with earlier reports, an association between heightened WBC counts, specifically elevated neutrophil counts and NLR, and an increased risk of adverse clinical outcomes, including cardiac events and mortality, has been demonstrated in patients with ACS, particularly in those with ST-segment elevation myocardial infarction (STEMI). This underscores the potential significance of inflammatory markers, particularly WBC subtypes, as valuable indicators of clinical prognosis in patients with ACS, particularly those with severe systolic dysfunction. The intricate interplay between dyslipidemia, inflammatory markers, and ventricular function highlights the complexity of cardiovascular risk assessment in ACS. The paradoxical relationships observed may require a more nuanced understanding of underlying mechanisms. Future research efforts should focus on unravelling these complexities to refine risk stratification strategies and improve the management of individuals presenting with ACS, considering lipid profiles and inflammatory markers in the context of ventricular function.[25-28]

Predictive Value of Neutrophil Count

Among various WBC subtypes, neutrophil count is a robust predictor of long-term outcomes in AMI patients, independent of established clinical predictors and left ventricular systolic function.22 The elevated neutrophil count is associated with increased mortality and an independent predictor of subsequent heart failure, highlighting its clinical relevance in risk stratification.[22]

Clinical Implications and Future Directions

The findings of this systematic review had several clinical implications. Elevated WBC and neutrophil counts following primary percutaneous coronary intervention (PCI) are associated with adverse clinical outcomes in STEMI patients.[18] Incorporating WBC parameters, particularly neutrophil count, in predictive models enhances their prognostic capabilities.[22] However, further research is needed to unravel the mechanistic details behind these associations and explore potential therapeutic interventions targeting inflammation to improve outcomes in AMI patients.

CONCLUSION

In conclusion, this systematic review comprehensively explains the intricate interplay between inflammation, WBC count, LVEF, and

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clinical outcomes in AMI. The identified correlations and predictive values underscore the potential utility of these parameters in risk stratification and prognosis, paving the way for future research and therapeutic strategies to manage patients with AMI.

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