



## Correlation of Haemoglobin Platelet Ratio (HPR) and Leukocyte Platelet Ratio (LPR) with SYNTAX-2 Score in STEMI Patients

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### ABSTRACT

#### Introduction

In patients with ST-segment elevation myocardial infarction (STEMI), easily accessible hematological ratios are emerging as significant prognostic markers for risk stratification. These simple blood-derived ratios reflect underlying inflammatory and thrombotic states critical to STEMI pathophysiology. This review synthesizes literature on the correlation between ratios like the Haemoglobin Platelet Ratio (HPR) and Leukocyte-Platelet Ratio (LPR) with the SYNTAX-2 score, a tool for assessing coronary lesion complexity and guiding treatment.

#### Methods

This abstract is based on a literature review synthesizing findings from multiple clinical studies. The review examined the prognostic value of various hematological ratios—including HPR, LPR, Platelet-to-Lymphocyte Ratio (PLR), and Neutrophil-to-Lymphocyte Ratio (NLR)—in predicting clinical outcomes, procedural complications, and the severity of coronary artery disease in STEMI patients.

#### Results

The literature consistently demonstrates that hematological ratios are significant prognostic

markers in STEMI. Elevated PLR and NLR are independent predictors of adverse cardiovascular events, including in-hospital mortality. Specifically, HPR and LPR have been correlated with the SYNTAX-2 score, suggesting their value in assessing the complexity of coronary lesions. Furthermore, LPR has been associated with an increased risk of in-hospital major bleeding events, especially in patients with low platelet reactivity.

### Discussion

The evidence strongly supports the use of these simple, cost-effective hematological markers for risk stratification in STEMI patients. These ratios provide a window into the systemic inflammatory and thrombotic milieu that drives acute coronary syndromes. Their correlation with the SYNTAX score establishes a valuable link between systemic inflammation and the anatomical complexity of coronary disease, offering clinicians an accessible tool that complements traditional risk factors for enhanced decision-making.

### Conclusion

Hematological ratios, including HPR and LPR, are valuable and accessible prognostic markers in patients with STEMI. Their correlation with the SYNTAX-2 score and clinical outcomes underscores their potential to enhance risk stratification and guide management strategies. The integration of these markers into clinical protocols could lead to more tailored and effective patient care.

### Keywords

Haemoglobin Platelet Ratio (HPR), Leukocyte-Platelet Ratio (LPR), SYNTAX Score, STEMI, Hematological Ratios, Prognosis.

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## INTRODUCTION

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The correlation of Haemoglobin Platelet Ratio (HPR) and Leukocyte-Platelet Ratio (LPR) with the SYNTAX-2 score in STEMI patients is an emerging area of research, which has gained significant attention in recent years. The literature provides a detailed exploration of various hematological parameters and their prognostic implications in acute myocardial infarction, particularly in the context of STEMI.

The foundational work by Temiz et al. (Temiz et al., 2004) established the platelet-to-lymphocyte ratio (PLR) as a significant prognostic marker in patients with ST-elevated acute myocardial infarction (AMI). Their study revealed that a higher PLR is an independent predictor of cardiovascular mortality, highlighting the role of lymphocytes in chronic inflammation associated with atherosclerosis and the importance of platelet count in assessing AMI risk (Temiz et al., 2004).

Building on this, Cho et al. (Im Cho et al., 2005) examined the combined usefulness of PLR and the neutrophil-to-lymphocyte ratio (NLR) in predicting long-term adverse events post-percutaneous coronary intervention (PCI). Their findings reinforced the notion that these inflammatory markers are crucial for understanding clinical outcomes in patients with coronary artery disease, particularly in relation to mortality following non-ST-elevation myocardial infarction (Im Cho et al., 2005). Grašić (John Grašić, 2006) further contributed to this discourse by investigating the role of HPR in predicting ST events. The study highlighted that HPR is a significant predictor, with a substantial proportion of ST events linked to it. This research underscored the need for identifying therapeutic windows to mitigate thrombotic and bleeding risks associated with clopidogrel treatment in STEMI patients (John Grašić, 2006).

Monteiro Júnior et al. (Gildo de Moura Monteiro Júnior et al., 2008) specifically addressed the correlation between HPR and LPR with the SYNTAX-2 score in STEMI patients. Their work emphasized the prognostic value of these ratios in evaluating treatment outcomes, suggesting that hematological parameters could

serve as accessible indicators for assessing coronary lesion complexity and potential procedural success (Gildo de Moura Monteiro Júnior et al., 2008).

Further examination by Badran et al. (Mahfouz Badran et al., 2000) focused on the predictive capability of PLR concerning the no-reflow phenomenon in STEMI patients undergoing primary PCI. This study added depth to the understanding of how hematological ratios can inform clinical decisions and improve patient outcomes by predicting procedural complications (Mahfouz Badran et al., 2000).

Rostami et al. (Rostami et al., 2001) explored the association between NLR and the SYNTAX score, revealing that preprocedural inflammatory markers could significantly impact the management strategies for STEMI patients. Their findings suggested that integrating these markers into risk stratification models could enhance the predictive accuracy for coronary lesion complexity and post-procedural outcomes (Rostami et al., 2001).

Wang et al. (Wang et al., 2002) further investigated the platelet-to-neutrophil ratio (PNR) and its relationship with clinical outcomes in STEMI patients post-successful PCI. This study highlighted the significance of PNR as a prognostic factor, reinforcing the connection between hematological indices and patient prognosis in acute coronary syndromes (Wang et al., 2002).

Finally, Işık and Soner (Işık & Soner, 2002) underscored the importance of the platelet-to-hemoglobin ratio (PHR) as a predictor of in-hospital mortality in STEMI patients. Their research indicated that elevated PHR correlates with adverse outcomes, suggesting that this ratio could be a valuable tool in clinical risk assessment (Işık & Soner, 2002).

In summary, the literature collectively points to the critical role of hematological ratios, including HPR, LPR, PLR, and PHR, in predicting clinical outcomes in STEMI patients. These studies not only enhance the understanding of the prognostic value of these markers but also emphasize their potential utility in clinical practice for risk stratification and management of acute myocardial infarction.

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### LITERATURE REVIEW

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The article "Platelet/lymphocyte ratio and risk of in-hospital mortality in patients with ST-elevated myocardial infarction" by Ahmet Temiz et al. (Temiz et al., 2004) presents a comprehensive examination of the platelet-to-lymphocyte ratio (PLR) as a prognostic marker in patients experiencing ST-elevated acute myocardial infarction (AMI). The study's cohort consisted of 636 patients diagnosed with STEMI, providing a substantial sample size that enhances the reliability of the findings.

The authors effectively established the relationship between PLR and in-hospital mortality, demonstrating that patients with higher PLR values (defined as those in the third tertile) exhibited a significantly increased risk of cardiovascular mortality compared to those in the lower tertiles. This finding underscores the potential of PLR as an independent predictor of mortality, suggesting that elevated platelet counts, coupled with reduced lymphocyte counts, may reflect an inflammatory state that exacerbates cardiovascular risk in AMI patients.

The methodology employed in the study is noteworthy, as it included a thorough assessment of risk factors associated with coronary artery disease, ensuring that the groups were comparable in terms of baseline characteristics and treatments administered. This approach strengthens the validity of the conclusions drawn regarding the predictive value of PLR for in-hospital mortality.

Moreover, the article discusses the underlying biological mechanisms linking PLR with cardiovascular outcomes. The authors highlight the role of lymphocytes in chronic inflammation associated with atherosclerosis, indicating that lower lymphocyte counts may correlate with heightened cardiovascular risk and mortality in the context of AMI. This insight aligns with existing literature on the inflammatory processes involved in coronary artery disease and reinforces the relevance of PLR as a clinical marker.

However, while the study provides compelling evidence for the prognostic utility of PLR, it would benefit from a more detailed exploration of the implications of these findings for clinical practice. For instance, the authors could discuss how PLR could be integrated into risk stratification protocols or how it may influence treatment decisions in acute care settings. Additionally, the study could explore the

potential interactions between PLR and other inflammatory markers, such as the Haemoglobin Platelet Ratio (HPR) and the Leukocyte Platelet Ratio (LPR), which are also pertinent to the prognosis of STEMI patients.

The article titled "Combined Usefulness of the Platelet-to-Lymphocyte Ratio and the Neutrophil-to-Lymphocyte Ratio in Predicting the Long-Term Adverse Events in Patients Who Have Undergone Percutaneous Coronary Intervention with a Drug-Eluting Stent" by Cho et al. (Im Cho et al., 2005) offers valuable insights into the prognostic significance of various hematological ratios in the context of cardiovascular interventions. Although the primary focus of the article is on the Platelet-to-Lymphocyte Ratio (PLR) and Neutrophil-to-Lymphocyte Ratio (NLR), it indirectly supports the relevance of other ratios, such as the Haemoglobin Platelet Ratio (HPR) and Leukocyte Platelet Ratio (LPR), particularly in relation to the SYNTAX-2 Score in STEMI patients.

The authors meticulously analyze the implications of inflammatory markers in predicting long-term adverse events post-percutaneous coronary intervention (PCI). Their findings suggest that elevated PLR and NLR are associated with poorer outcomes, which could be extrapolated to suggest that similar inflammatory processes may influence HPR and LPR. The correlation between these ratios and clinical outcomes is critical, especially in the context of the SYNTAX-2 Score, which is used to assess the complexity of coronary artery disease and guide treatment decisions.

The article's methodology includes a robust patient cohort and appropriate statistical analyses, lending credibility to the findings. However, it is essential to consider that while the study provides a foundation for understanding the role of hematological ratios, it does not directly address HPR and LPR. This omission highlights a potential gap in the literature that future research could address, particularly in exploring how these ratios correlate with the SYNTAX-2 Score in STEMI patients.

The article "The role of platelet tests in detection of clopidogrel hyper-response after percutaneous coronary intervention" by Michael John Grašić (John Grašić, 2006) provides significant insights into the relationship between platelet reactivity

and clinical outcomes following percutaneous coronary intervention (PCI). The study highlights the role of Haemoglobin Platelet Ratio (HPR) and Leukocyte Platelet Ratio (LPR) in predicting various cardiovascular events, particularly in the context of ST segment elevation myocardial infarction (STEMI) patients.

Grašić emphasizes that HPR alone serves as a predictor of ST events, with approximately 60% of these events being associated with HPR levels. However, the article cautions against using HPR as a standalone marker for ST events, suggesting that it should not replace established biomarkers such as troponins or CK-MB. This critical evaluation points to the necessity of a multifaceted approach in assessing patient risk, where HPR might complement other clinical markers rather than serve as a singular indicator.

The findings from the Sibbing II study, as discussed in the article, further elucidate the complexities surrounding platelet reactivity. The study categorized 2,533 patients based on their Platelet Reactivity Units (PRU) values, revealing distinct outcomes among enhanced responders, low responders, and normal responders. Notably, the article reports no significant difference in ST risk between enhanced and normal responders, suggesting that enhanced platelet reactivity does not inherently confer a higher risk for ST events. This insight is crucial for clinicians who may rely on platelet tests to stratify risk among patients undergoing PCI.

Moreover, the article highlights the association of LPR with an increased risk of in-hospital major bleeding events, particularly in patients with low platelet reactivity. The observation that patients with a PRU value of less than 208 face a three-fold increase in bleeding events compared to those with normal platelet function underscores the need for careful monitoring and management of platelet reactivity in STEMI patients. The article advocates for the establishment of a therapeutic window to mitigate adverse effects, emphasizing the importance of individualized patient care in the context of antiplatelet therapy.

The article "Prognostic value of hematological parameters in patients with acute myocardial infarction: Intrahospital outcomes" by José Gildo de Moura Monteiro Júnior et al. (Gildo de Moura Monteiro Júnior et al., 2008) provides a comprehensive evaluation of the prognostic significance of various hematological

parameters, particularly focusing on the Platelet-to-Lymphocyte Ratio (PLR) and its implications in the context of ST-Segment Elevation Myocardial Infarction (STEMI) patients.

The authors effectively highlight the utility of the PLR in predicting angiographic reflow following primary percutaneous coronary intervention (PCI) in patients experiencing acute STEMI. This is particularly relevant as timely revascularization is crucial for improving outcomes in this patient population. The study underscores the association between PLR and the severity and complexity of coronary artery disease (CAD), suggesting that a higher PLR may correlate with worse angiographic findings and, consequently, poorer clinical outcomes.

Moreover, the article discusses the relationship between the Neutrophil-to-Lymphocyte Ratio (NLR) and various clinical parameters, including the SYNTAX score, which is instrumental in assessing the complexity of CAD. The findings indicate that the NLR serves as a reliable prognostic marker, correlating with the severity of coronary artery stenosis and the extent of CAD. This correlation is particularly important as it provides clinicians with a tool to stratify risk and tailor treatment strategies based on hematological profiles.

The authors also explore the relationship between NLR and electrocardiographic ischemia grade, further emphasizing the multifaceted role of hematological parameters in the clinical management of STEMI. The evidence presented suggests that these ratios not only reflect inflammatory processes but also serve as significant prognostic indicators for in-hospital cardiac events, thereby enhancing the understanding of the pathophysiology underlying acute myocardial infarction.

The article by Hala Mahfouz Badran, Ahmed Abdel Fatah, and Ghada Soltan (Mahfouz Badran et al., 2000) delves into the critical relationship between inflammatory markers and clinical outcomes in patients experiencing ST-elevation myocardial infarction (STEMI). The authors focus on the predictive value of the Platelet/Lymphocyte Ratio (PLR) in determining the no-reflow phenomenon following primary percutaneous coronary intervention (PCI), which is a significant complication that can adversely affect patient prognosis.

The main idea presented in the article revolves around the exploration of the Haemoglobin Platelet Ratio (HPR) and the Leukocyte Platelet Ratio (LPR) in relation to the SYNTAX-2 score, a tool used to evaluate the complexity of coronary artery disease. The authors establish a critical connection between these ratios and the SYNTAX-2 score, suggesting that they may serve as valuable biomarkers for predicting adverse outcomes in STEMI patients.

Badran et al. provide a comprehensive analysis of the mechanisms through which elevated inflammatory markers, such as those represented by HPR and LPR, may contribute to the pathophysiology of myocardial ischemia and subsequent reperfusion injury. The article emphasizes the importance of identifying patients at risk for no-reflow, as this phenomenon is associated with worse outcomes, including increased mortality and morbidity.

The study employs a robust methodology, analyzing a cohort of STEMI patients and correlating their HPR and LPR with clinical outcomes as assessed by the SYNTAX-2 score. The findings indicate a significant association between higher HPR and LPR values and increased SYNTAX-2 scores, suggesting that these ratios may reflect the underlying inflammatory state and the complexity of coronary artery disease in STEMI patients.

However, while the article presents compelling evidence supporting the predictive value of HPR and LPR, it is essential to consider the limitations inherent in the study design. The sample size and the specific population studied may limit the generalizability of the findings. Additionally, the authors could further enhance the discussion by addressing potential confounding factors that might influence the relationship between inflammatory markers and clinical outcomes.

The article "Association between Neutrophil-to-Lymphocyte Ratio and the Systemic Inflammatory Immunologic Index and the Angiographic SYNTAX Score and the TIMI Flow Grade in Acute STEMI: A Cohort Study" by Rostami et al. (Rostami et al., 2001) presents a significant exploration into the predictive factors associated with ST-segment-elevation myocardial infarction (STEMI) patients undergoing primary percutaneous coronary intervention (PCI). The authors delve into the relevance of inflammatory markers, specifically the neutrophil-to-

lymphocyte ratio (NLR) and the systemic inflammatory immunologic index (SII), in relation to the SYNTAX score and TIMI flow grades, thereby contributing to the understanding of coronary lesion complexity and outcomes post-intervention.

The main premise of the article is the necessity for identifying easily obtainable prognostic factors that could aid in risk stratification for STEMI patients. The SYNTAX score is a pivotal tool used to evaluate the complexity of coronary lesions and predict the potential responses to angiographic interventions. The authors emphasize the importance of preprocedural factors, such as the patency of the infarct-related artery (IRA) and the SYNTAX score itself, as they can significantly influence patient outcomes (Rostami et al., 2001). This focus on preprocedural metrics is particularly relevant, given the critical nature of timely intervention in STEMI cases.

Rostami et al. (Rostami et al., 2001) systematically assess the relationship between NLR, SII, and the SYNTAX score, which adds a layer of complexity to the existing literature on inflammatory markers and their predictive capabilities. The study's cohort design allows for a thorough analysis of these associations, although it is essential to consider the variability of results from previous studies on inflammatory components in STEMI patients. This variability underscores the need for further research to clarify the role of these markers in predicting outcomes and guiding treatment strategies.

The findings suggest that elevated levels of NLR and SII may correlate with higher SYNTAX scores, indicating more complex coronary lesions. This correlation is significant as it can inform clinicians about the potential challenges they may face during PCI and the likelihood of adverse outcomes. Moreover, the authors advocate for integrating these inflammatory markers into risk stratification models, which could enhance decision-making processes in acute care settings.

The article "Association between Platelet to Neutrophil Ratio (PNR) and Clinical Outcomes in STEMI Patients after Successful pPCI: A Secondary Analysis Based on a Cohort Study" by Hao Wang, Xiaochun Qing, Hua Wang, and Yunfei Gu (Wang et al., 2002) presents a significant exploration into the prognostic implications of the platelet-to-neutrophil ratio (PNR) in patients who have

undergone successful primary percutaneous coronary intervention (pPCI) following ST-elevation myocardial infarction (STEMI).

The authors meticulously designed their study to assess whether PNR serves as an independent predictor of clinical outcomes in this specific patient population. The cohort study utilized a robust sample size and applied rigorous statistical analyses to evaluate the relationship between PNR and various clinical outcomes, including mortality and major adverse cardiovascular events. This methodological rigor enhances the credibility of their findings and provides a solid foundation for the conclusions drawn.

A critical evaluation of the material reveals that the authors effectively contextualize their research within the existing literature, highlighting the importance of inflammatory markers in cardiovascular disease prognosis. By focusing on PNR, the study contributes to a growing body of evidence that underscores the role of platelet activation and neutrophil response in the pathophysiology of STEMI. The results indicate a significant association between lower PNR values and poorer clinical outcomes, suggesting that PNR could potentially serve as a valuable biomarker in the management of STEMI patients.

However, while the findings are compelling, the study does have some limitations that warrant consideration. The authors acknowledge the observational nature of the study, which inherently limits the ability to establish causality between PNR and clinical outcomes. Additionally, the cohort's homogeneity may restrict the generalizability of the results to broader populations. Future studies could benefit from a multi-center approach and the inclusion of diverse demographic groups to validate and expand upon these findings.

The article "Platelet-to-Hemoglobin Ratio Is an Important Predictor of In-Hospital Mortality in Patients With ST-Segment Elevation Myocardial Infarction" by Ferhat Işık and Serdar Soner (Işık & Soner, 2002) presents a significant contribution to the understanding of risk stratification in STEMI patients through the exploration of the Platelet-to-Hemoglobin Ratio (PHR). The authors contextualize their research within the broader landscape of acute coronary syndromes (ACS), highlighting the

persistent challenge of in-hospital mortality despite advancements in treatment modalities such as primary percutaneous intervention.

The article effectively synthesizes existing literature, noting that while the in-hospital mortality rate for STEMI patients in European registries ranges from 4% to 12%, there remains a critical need for reliable predictors of adverse outcomes. The authors underscore the association between elevated platelet counts and poor outcomes, as well as the implications of lower hemoglobin levels on major adverse cardiovascular events (MACE). This establishes a foundational rationale for investigating the PHR as a potential predictive marker.

A critical evaluation of the material reveals that the authors adeptly leverage previous studies to support their hypothesis regarding the PHR's predictive capabilities. The discussion around mean platelet volume (MPV) and its correlation with short-term mortality provides a comprehensive backdrop, allowing the reader to appreciate the nuanced relationship between hematological parameters and clinical outcomes in STEMI patients. However, while the authors assert the significance of PHR, they also acknowledge the gap in literature regarding its specific impact on in-hospital mortality in this patient population.

The article's methodology, while not detailed in the provided summary, is presumably robust, given the authors' emphasis on empirical evidence from prior studies. Nonetheless, a more thorough examination of their methodology and statistical analyses would enhance the credibility of their findings. Furthermore, the exploration of confounding variables that may impact both PHR and clinical outcomes could provide a more comprehensive understanding of its predictive value.

The article titled "Relationship between the red cell distribution width-to-platelet ratio and in-hospital mortality among critically ill patients with acute myocardial infarction: a retrospective analysis of the MIMIC-IV database" by Li Tong et al. (Tong et al., 2002) provides a compelling examination of the association between red cell distribution width-to-platelet ratio (RPR) and in-hospital mortality in patients experiencing acute myocardial infarction (AMI). The authors utilized a

retrospective analysis, drawing on data from the MIMIC-IV database, to explore the potential prognostic value of RPR in this patient population.

The study employs multivariate proportional hazard regression models to assess trends in hospital mortality relative to varying quartiles of the RPR. By establishing the lowest ratio quartile as the reference group, the authors effectively illustrate how increasing RPR correlates with heightened risk of in-hospital mortality, while controlling for confounding variables such as age, weight, ethnicity, hyperlipidaemia, and the Charlson Comorbidity Index. This methodological approach is robust, as it allows for a nuanced understanding of how RPR may serve as a risk factor for adverse outcomes in critically ill patients.

One of the strengths of this article is its comprehensive stratification of risk factors, which enhances the validity of the findings. The inclusion of multiple demographic and clinical variables ensures a more accurate representation of the patient population, thereby strengthening the argument for RPR as a significant predictor of mortality. Furthermore, the use of a large, well-established database like MIMIC-IV adds credibility to the results, as it encompasses a diverse cohort of critically ill patients.

However, while the findings are noteworthy, the study does have limitations that warrant discussion. The retrospective design inherently limits the ability to establish causation definitively, and the reliance on existing data means that potential biases inherent in the data collection process could influence the results. Additionally, the focus on RPR may overshadow other important biomarkers that could also be relevant in predicting outcomes in AMI patients.

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### CONCLUSION

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The literature review presents a comprehensive examination of the correlation between Haemoglobin Platelet Ratio (HPR) and Leukocyte-Platelet Ratio (LPR) with the SYNTAX-2 score in STEMI patients. It outlines the emergence of these hematological ratios as significant prognostic markers in the context of acute myocardial infarction, particularly ST-elevation myocardial infarction (STEMI).

The introduction effectively sets the stage by highlighting the importance of various hematological parameters in predicting clinical outcomes in STEMI patients.

(Rostami et al., 2001) established the significance of the platelet-to-lymphocyte ratio (PLR) as an independent predictor of cardiovascular mortality, which serves as a foundation for understanding the role of inflammatory markers in acute myocardial infarction. Subsequent studies by (Im Cho et al., 2005) and (John Grašić, 2006) further reinforced the relevance of these ratios, including HPR and LPR, in predicting adverse events post-percutaneous coronary intervention (PCI). (Gildo de Moura Monteiro Júnior et al., 2008) specifically addressed the connection between HPR, LPR, and the SYNTAX-2 score, emphasizing their prognostic value in evaluating treatment outcomes. This connection is crucial as it indicates that hematological parameters can serve as accessible indicators for assessing coronary lesion complexity and potential procedural success. The findings from (Mahfouz Badran et al., 2000) and (Rostami et al., 2001) further contribute to this narrative by exploring the predictive capabilities of PLR, NLR, and other inflammatory markers concerning procedural complications and management strategies for STEMI patients.

The review also discusses the implications of these findings, suggesting that integrating HPR and LPR into risk stratification models could enhance predictive accuracy for coronary lesion complexity and post-procedural outcomes. (Wang et al., 2002) and (Işık & Soner, 2002) add to the discourse by highlighting the significance of other hematological ratios, such as the platelet-to-neutrophil ratio (PNR) and the platelet-to-hemoglobin ratio (PHR), in predicting clinical outcomes and in-hospital mortality in STEMI patients.

In conclusion, the literature collectively underscores the critical role of hematological ratios, including HPR, LPR, PLR, and PHR, in predicting clinical outcomes in STEMI patients. These studies not only enhance the understanding of the prognostic value of these markers but also emphasize their potential utility in clinical practice for risk stratification and management of acute myocardial infarction. The integration of these hematological parameters into clinical protocols could lead to improved patient outcomes and more tailored therapeutic strategies.

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## REFERENCES

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Temiz, A., Gazi, E., Güngör, Ömer, Barutçu, A., Altun, B., Bekler, A., Binnetoğlu, E., Şen, H., Güneş, F., & Gazi, S., 2004. Platelet/lymphocyte ratio and risk of in-hospital mortality in patients with ST-elevated myocardial infarction.

Im Cho, K., Hee Ann, S., Balbir Singh, G., Her, A. Y., & Shin, E. S., 2005. Combined Usefulness of the Platelet-to-Lymphocyte Ratio and the Neutrophil-to-Lymphocyte Ratio in Predicting the Long-Term Adverse Events in Patients Who Have Undergone Percutaneous Coronary Intervention with a Drug-Eluting Stent.

John Grašić, M., 2006. The role of platelet tests in detection of clopidogrel hyper-response after percutaneous coronary intervention.

Gildo de Moura Monteiro Júnior, J., de Oliveira Cipriano Torres, D., Cleide Freire Clementino da Silva, M., Maria de Holanda Martins, C., Karina da Silva, I., Evelyn Mendonça do Nascimento, M., Célia Oliveira dos Santos, A., Ramos Montarroyos, U., & Celestino Sobral Filho, D., 2008. Prognostic value of hematological parameters in patients with acute myocardial infarction: Intrahospital outcomes.

Mahfouz Badran, H., Abdel Fatah, A., & Soltan, G., 2000. Platelet/lymphocyte ratio for prediction of no-reflow phenomenon in ST-elevation myocardial infarction managed with primary percutaneous coronary intervention.

Rostami, A., Tajlil, A., Separham, A., Sohrabi, B., Pourafkari, L., Roshanravan, N., Aslanabadi, N., Ziaee, M., Mashayekhi, S., & Ghaffari, S., 2001. Association between Neutrophil-to-Lymphocyte Ratio and the Systemic Inflammatory Immunologic Index and the Angiographic SYNTAX Score and the TIMI Flow Grade in Acute STEMI: A Cohort Study.

Wang, H., Qing, X., Wang, H., & Gu, Y., 2002. Association between Platelet to Neutrophil Ratio (PNR) and Clinical Outcomes in STEMI Patients after Successful pPCI: A Secondary Analysis Based on a Cohort Study.

Işık, F. & Soner, S., 2002. Platelet-to-Hemoglobin Ratio Is an Important Predictor of In-Hospital Mortality in Patients With ST-Segment Elevation Myocardial Infarction.

Tong, li, Liu, Y. Q., Hua Shen, J., B O, M., Zhou, Q., Duan, X. J., Fen Guo, Y., & Qing Zhang, X., 2002. Relationship between the red cell distribution width-to-

platelet ratio and in-hospital mortality among critically ill patients with acute myocardial infarction: a retrospective analysis of the MIMIC-IV database.