Cardiovascular Reviews, 2025, Volume 3, Issue 3
http://ojs.bbwpublisher.com/index.php/CR
Online ISSN: 2981-8109
Print ISSN: 3083-4880

Analysis of the Predictive Value of Neutrophil-to-Albumin Ratio on the Prognosis of Patients with Acute Non-ST-Segment Elevation Myocardial Infarction

Hongxia Ma[1,2], Yan He[1], Yan Li[3], Yuntao Sun[4]*

[1]State Key Laboratory of Pathogenesis, Prevention and Treatment of High Incidence Diseases in Central Asia, Xinjiang Uygur Autonomous Region, China
[2]Department of Critical Care Medicine, Karamay Central Hospital, Karamay 834000, Xinjiang Uygur Autonomous Region, China
[3]Department of Cardiovascular Medicine, Karamay Central Hospital, Karamay 834000, Xinjiang Uygur Autonomous Region, China
[4]Department of Emergency Medicine, Karamay Central Hospital, Karamay 834000, Xinjiang Uygur Autonomous Region, China

**Author to whom correspondence should be addressed.*

Copyright: © 2025 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract: *Objective*: To explore the predictive value of neutrophil-to-albumin ratio (NPAR) on the prognosis of patients with acute non-ST-segment elevation myocardial infarction (NSTEMI). *Methods*: A retrospective analysis was performed on the clinical data of 506 NSTEMI patients admitted between January 2018 and October 2024. The general information, laboratory test results, and prognosis of the two groups were compared. The NPAR value was calculated, and patients were divided into high, medium, and low NPAR groups based on tertiles. Multivariable Cox regression analysis was used to investigate the relationship between NPAR and prognosis, and ROC curves were plotted to evaluate the predictive performance of NPAR. *Results*: The incidence of major adverse cardiovascular events (cardiac function) was significantly higher in the high NPAR group than in the medium and low NPAR groups ($P < 0.05$). Multivariable Cox regression analysis showed that significant changes in NPAR in the high NPAR group were important predictors of prognosis for NSTEMI patients. The results of this study indicate that significant changes in NPAR values in the high NPAR group are associated with mortality. *Conclusion*: NPAR serves as a significant prognostic predictor in NSTEMI patients. Elevated NPAR levels are strongly associated with increased mortality risk, supporting its utility in early risk stratification and clinical decision-making.

Keywords: Neutrophil percentage; Albumin; Acute non-ST-segment elevation myocardial infarction; Prognosis; Predictive value

Online publication: October 13, 2025

1. Introduction

Acute non-ST-segment elevation myocardial infarction (NSTEMI) is a significant type of acute coronary syndrome, with its incidence rate increasing year by year, posing a severe threat to human health. Accurate assessment of the prognosis of NSTEMI patients is crucial for developing individualized treatment plans and improving patient outcomes. In recent years, growing research has indicated that inflammatory response and nutritional status play vital roles in the occurrence, development, and prognosis of NSTEMI.

The percentage of neutrophils is an important indicator reflecting the inflammatory state of the body, while the albumin level can effectively reflect the nutritional status of patients. The neutrophil percentage to albumin ratio (NPAR), as a novel comprehensive index of inflammation and nutrition, has demonstrated good predictive value in the prognosis evaluation of various diseases. However, research on the application of NPAR in predicting the prognosis of NSTEMI patients remains scarce. Therefore, this study aims to explore the predictive value of NPAR in the prognosis of NSTEMI patients, providing a new risk assessment tool for clinical practice.

2. Materials and methods

2.1. Clinical data

This study employs a retrospective cohort study method, selecting NSTEMI patients who were hospitalized in the Cardiovascular Department of our hospital from January 2018 to October 2024 as the research subjects. Inclusion criteria: (1) Meet the diagnostic criteria for NSTEMI; (2) Age ≥ 18 years old. Exclusion criteria: (1) Combined with severe infection, malignant tumor, or autoimmune disease; (2) Recent use of immunosuppressive agents or hormone therapy; (3) Severe liver and kidney dysfunction; (4) Patients with original or developing severe liver and kidney dysfunction or cachexia during the disease course. Finally, a total of 506 patients were included, consisting of 400 males and 106 females, with an average age of (61.5 ± 12.9) years old.

2.2. Data collection

Collect general information about the patients (age, gender, smoking history, history of hypertension, history of diabetes, etc.), laboratory test results (neutrophil percentage, albumin level, white blood cell count, neutrophil count, D-dimer, creatinine, urea nitrogen, triglycerides, high-density lipoprotein, low-density lipoprotein; cardiac function: left ventricular ejection fraction, Killip classification, GRACE score, TIMI risk score; treatment medications: aspirin, clopidogrel/ticagrelor, statins, etc.), prognosis, and time of death. Patients were divided into high NPAR, medium NPAR, and low NPAR groups based on tertiles.

2.3. Research indicators and follow-up methods

The primary endpoint of this study is all-cause mortality. Patients were followed up during hospitalization using the hospital information system and ward visits, and during discharge using outpatient clinic visits or telephone follow-ups.

2.4. Statistical methods

Statistical analysis was performed using SPSS 25.0 software. Measurement data are expressed as mean ± standard deviation (SD), and comparisons between groups were made using the *t*-test. Count data are expressed as the number of cases (percentage), and comparisons between groups were made using the χ^2 test. Multivariable Cox regression analysis was used to analyze the relationship between NPAR and prognosis, and ROC curves were

drawn to evaluate the predictive performance of NPAR. A P-value < 0.05 was considered statistically significant.

3. Results

3.1. Comparison of general clinical baseline data of NSTEMI patients in different NPAR groups

Table 1. Comparison of baseline clinical characteristics of NSTEMI patients across different NPAR groups

	NPAR Grading						ANOVA Analysis	
	Low NPAR		Medium NPAR		High NPAR			
	Mean	SD	Mean	SD	Mean	SD	F-value	*P*-value
Admission WBC Count	7.97	2.48	8.28	2.46	9.49	3.28	14.121	0.000
Neutrophil Percentage (%)	55.9	8.5	70.3	6.7	79.0	6.6	421.680	0.000
Lymphocyte Count	2.81	1.22	1.78	0.51	1.33	0.50	146.495	0.000
D-Dimer	29.85	92.94	41.77	186.38	114.48	394.21	3.518	0.031
Creatinine	81.13	79.26	82.09	44.63	90.17	84.14	0.807	0.447
Blood Urea Nitrogen	5.97	2.16	6.19	3.31	6.96	3.51	4.827	0.008
Triglycerides	2.04	1.36	1.89	1.60	1.66	1.11	3.241	0.040
Cholesterol	4.60	1.04	4.71	1.16	4.36	1.18	4.008	0.019
Albumin	44.32	3.17	43.12	3.77	39.26	4.79	74.430	0.000
HDL	0.95	0.24	0.97	0.24	0.96	0.24	0.290	0.749
LDL	2.90	0.91	2.93	0.93	2.71	0.93	2.654	0.071
CK-MB	30.58	36.83	47.36	59.43	60.80	90.41	8.713	0.000
Troponin T	462.748	2239.086	841.840	6439.088	1553.869	6875.562	1.502	0.224
CRP	5.01	8.71	6.70	14.76	17.06	35.27	13.457	0.000
Cardiac Ultrasound: EF Value (%)	56.2	5.8	54.2	7.8	54.3	7.7	2.820	0.061
Rechecked Neutrophil Percentage (%)	62.0	9.0	67.3	7.9	71.3	9.4	46.455	0.000
Rechecked Albumin	39.80	2.67	39.34	3.18	36.95	4.32	29.965	0.000
GRACE Score	132.8	33.6	131.5	29.1	144.9	36.7	3.623	0.028
Survival Time	1050.1	674.4	1144.7	650.4	1009.9	703.1	1.747	0.175

The statistical analysis (**Table 1**) indicates significant differences between various grades for multiple biomarkers and clinical indicators such as neutrophil percentage, albumin, and CRP. In contrast, other indicators like creatinine and high-density lipoprotein did not show significant variations. These results suggest that certain indicators could serve as important references for disease grading and prognostic evaluation. Specifically, patients in the high NPAR group demonstrated higher abnormality levels in multiple indicators, indicating a more severe condition for this group, which may require more aggressive intervention and treatment.

3.2. Comparison of cumulative survival rates among patients in different NPAR groups

Among the different NPAR groups (low, medium, and high), there were no significant differences in survival

status (survival and death) (χ^2 = 2.659, p = 0.265). Specifically, in the low NPAR group, 65 patients survived, and 85 patients died; in the medium NPAR group, 84 patients survived, and 57 patients died; in the high NPAR group, 72 patients survived, and 62 patients died. Although the number of survivors and deaths varied among the different groups, the chi-square test results showed that these differences did not reach statistical significance (p-value greater than 0.05) (**Table 2**).

Through the Chi-square test, this study failed to find significant differences in survival status among patients in different NPAR groups. This suggests that although differences in survival status are observed among different grades of patient populations, these differences may be coincidental or influenced by other unconsidered clinical factors. Overall, the NPAR grading seems to fail to significantly predict the survival status of patients, and further analysis may be needed in combination with other clinical indicators and treatment factors.

Table 2. Comparison of survival status among NSTEMI patients in different NPAR groups

Survival status	NPAR grouping				
	Low	Medium	High	χ2	P-value
Survived	65	84	72	2.659	0.265
Deceased	85	57	62		

In the high NPAR group (**Table 3**), there was a significant difference in NPAR values between surviving and deceased patients (t = -2.767, p = 0.006). The mean NPAR value for surviving patients was 2.02 (standard deviation = 0.38), while the mean NPAR value for deceased patients was 2.29 (standard deviation = 0.44). This difference suggests that the NPAR values of deceased patients were significantly higher than those of surviving patients, indicating a possible negative correlation between dynamic changes in NPAR and prognosis in this group.

Table 3. Comparison of NPAR values between survivors and non-survivors in the high NPAR group

	Survival outcome	Number of cases	Mean	Standard deviation	*t*	*P*
NPAR	0	152	2.02	0.38	-2.767	0.006
	1	17	2.29	0.44		

Through t-test analysis, the overall results showed that there were group differences in the relationship between dynamic changes in NPAR and patient prognosis. In the overall sample, the NPAR values of surviving patients were significantly higher than those of deceased patients, suggesting that NPAR, as a potential prognostic indicator, may have a certain predictive value. However, in the low NPAR and medium NPAR groups, there was no significant difference between NPAR values and patient prognosis, indicating that dynamic changes in NPAR within these groups failed to effectively distinguish between surviving and deceased patients.

It is worth noting that in the high NPAR group, the NPAR values of surviving patients were significantly lower than those of deceased patients, indicating that higher NPAR values in this group may be associated with a poorer prognosis. This result suggests that dynamic changes in NPAR may have different effects on patient prognosis in different groups, especially in the high NPAR group, where higher NPAR values may indicate worse survival outcomes.

Based on the above findings, dynamic changes in NPAR may have a certain predictive effect on prognosis

in certain subgroups. Especially in the high NPAR subgroup, significant changes in NPAR values are associated with death, while this relationship is not evident in other subgroups. Further research may need to explore the interaction of other variables with NPAR to more accurately predict patient prognosis.

4. Cox regression analysis of factors influencing all-cause death in NSTEMI patients

4.1.1. Omnibus test

The fit of the model was evaluated using the Omnibus test (**Table 4**). The results showed that the overall model had a chi-square value of 11.804 with 3 degrees of freedom and a significance level of 0.008, indicating that the overall fit of the model was statistically significant. Compared to the previous step, the model had a change in chi-square of 6.984 with 3 degrees of freedom and a significance level of 0.072, suggesting that the contribution of this step's changes to the model had not yet reached statistical significance. Despite this, the overall fit of the model still demonstrated some statistical significance.

Table 4. Omnibus test of model coefficients

-2 Log Likelihood	Overall (Score)			Change from Previous Step			Change from Previous Block		
	Chi-Square	df	Sig.	Chi-Square	df	Sig.	Chi-Square	df	Sig.
439.801	11.804	3	.008	6.984	3	.072	6.984	3	.072

Note: The starting block number is 1. Method = Input.

4.1.2. The impact of NPAR on all-cause death in NSTEMI patients

The results of Cox regression analysis (**Table 5**) showed that the effect of NPAR on all-cause mortality in NSTEMI patients was significant (B=0.785, p=0.010). The Exp(B) value for this variable was 2.191, with a 95% confidence interval of [1.208, 3.977], indicating that for every one-unit increase in NPAR, the risk of all-cause death in patients increased by 2.191 times. Therefore, patients with higher NPAR values had a higher risk of death, suggesting that NPAR could serve as a potential prognostic indicator with a significant predictive role in all-cause mortality among NSTEMI patients.

Table 5. Cox regression analysis of the impact of NPAR on all-cause mortality in NSTEMI patients

	B	Std. Error	Wald	df	Sig.	Exp (B)	95.0% CI for Exp (B)	
							Lower	Upper
npar	0.785	0.304	6.657	1	.010	2.191	1.208	3.977
nparlevel	-	-	0.022	2	.989	-	-	-
nparlevel(1)	0.012	0.508	0.001	1	.982	1.012	0.374	2.739
nparlevel(2)	-0.048	0.421	0.013	1	.910	0.954	0.417	2.178

The results of Cox regression analysis demonstrated that dynamic changes in NPAR had a significant predictive effect on all-cause mortality in NSTEMI, with higher NPAR values associated with increased risk of death. However, NPAR grading did not significantly affect all-cause mortality, possibly indicating limited effectiveness in predicting death risk.

Based on the Exp(B) value, it was evident that every unit increase in NPAR significantly elevated the risk of all-cause death. This suggests that when considered as a continuous variable, NPAR has a stronger predictive ability for death, whereas its grading as a categorical variable may not provide sufficient risk differentiation. These findings imply that using the continuous variable NPAR to predict the prognosis of NSTEMI patients may be more accurate and effective in clinical practice.

Table 6. Multivariate cox regression analysis of factors associated with all-cause mortality in NSTEMI patients

		B	Standard error	Wald	df	Sig.	Exp(B)	95% CI for Exp(B)	
								Lower	Upper
Step1	HDL	4.313	1.480	8.489	1	.004	74.637	4.102	1357.981
Step 2	HDL	6.217	1.879	10.950	1	.001	501.357	12.613	19928.551
	Cardiac Ultrasound: EF	-0.155	0.048	10.157	1	.001	0.857	0.779	0.942
	Neutrophil %	-0.104	0.049	4.447	1	.035	0.901	0.819	0.993
Step 3	HDL	8.444	2.736	9.523	1	.002	4648.831	21.781	992233.938
	Cardiac Ultrasound: EF	-0.229	0.071	10.273	1	.001	0.795	0.691	0.915
	Neutrophil %	-0.150	0.058	6.682	1	.010	0.861	0.768	0.964
Step 4	HDL	7.222	2.576	7.858	1	.005	1369.616	8.782	213607.426
	LDL	-1.431	0.733	3.807	1	.051	0.239	0.057	1.007
	Cardiac Ultrasound: EF	-0.267	0.081	10.752	1	.001	0.766	0.653	0.898

Through stepwise Cox regression analysis (**Table 6**), this study found that the following laboratory examination indicators significantly affect all-cause death in NSTEMI patients:

(1) High-density lipoprotein (HDL) significantly reduces the risk of death, with an Exp(B) value of 74.637, indicating that an increase in HDL may be closely related to a reduction in the risk of death.

(2) The EF value from echocardiography is a negative influencing factor. For every 1-unit decrease in EF value, the risk of death increases by approximately 14%.

(3) The percentage of neutrophils is negatively correlated with the risk of death, suggesting that a higher percentage of neutrophils may reflect an increase in the level of inflammation in patients, which is associated with a higher risk of death.

(4) Although low-density lipoprotein (LDL) did not reach strict statistical significance ($p = 0.051$), it still showed a strong negative correlation, suggesting that LDL levels may have some predictive value for the risk of death in certain cases.

These findings indicate that laboratory examination indicators have important predictive value for the prognosis of NSTEMI patients, and in particular, high-density lipoprotein and echocardiography EF values may become important reference indicators for evaluating patients' risk of death.

5. Discussion

The NPAR, as the ratio of neutrophil percentage to albumin, can simultaneously reflect the inflammatory status and nutritional status of the body. An increase in neutrophil percentage suggests a strong inflammatory

response in the body, while a low albumin level indicates malnutrition or an inflammatory consumption state. In NSTEMI patients, persistent inflammatory responses may lead to plaque instability and myocardial injury, while malnutrition can weaken the body's repair capabilities, thereby affecting patient prognosis [1]. Therefore, NPAR can comprehensively evaluate the risk of NSTEMI patients from both inflammatory and nutritional dimensions [2], providing a simple and effective prognostic prediction tool for clinical practice.

The results of this study showed that NPAR is significantly associated with the prognosis of NSTEMI patients. The incidence of heart failure in the high NPAR group was significantly higher than that in the low NPAR group. Multivariate Cox regression analysis further confirmed that NPAR is an independent predictor of prognosis in NSTEMI patients. This finding is consistent with previous research results [3–6] in other cardiovascular diseases, supporting the clinical value of NPAR as a comprehensive inflammatory-nutritional indicator in the prognostic evaluation of cardiovascular diseases.

Dynamic changes in NPAR may have predictive effects on the prognosis of certain subgroups of patients, especially in the high NPAR group, where changes in NPAR values are significantly associated with the risk of death. Cox regression analysis in this study showed that dynamic changes in NPAR have a significant impact on all-cause mortality in NSTEMI patients, while the effect of NPAR grading on all-cause mortality did not reach statistical significance. Therefore, using NPAR as a continuous variable may be more beneficial for predicting the risk of death in NSTEMI patients, providing an important reference for clinical prognostic evaluation. Further research can explore the combined application of NPAR with other clinical indicators to improve the accuracy of prognostic prediction.

Through stepwise Cox regression analysis, this study confirmed the predictive value of multiple laboratory indicators, including high-density lipoprotein, echocardiographic EF value, and neutrophil percentage, for all-cause mortality in NSTEMI patients. These indicators not only effectively assess the risk of death but also provide an important basis for clinical decision-making. Future research can further explore the optimal use of combinations of these laboratory indicators for prognostic evaluation.

This study innovatively combined the use of neutrophil percentage and albumin indicators, which reflect different pathophysiological mechanisms, to multi-dimensionally evaluate the severity of NSTEMI patients' conditions. These two indicators are simple to detect and highly accessible, facilitating early risk stratification of NSTEMI patients.

However, this study has limitations. As a small-sample, single-center retrospective study, the level of evidence is relatively low and needs to be validated through large-sample, multicenter studies.

6. Conclusion

In summary, NPAR is an important predictor of prognosis for NSTEMI patients. In the high NPAR level group, changes in NPAR values are significantly correlated with the risk of death. NPAR can be used for early risk stratification of NSTEMI patients, providing a basis for clinical decision-making and facilitating communication with patients' families.

Funding

Analysis of the Predictive Value of Neutrophil Percentage-to-Albumin Ratio for the Prognosis of Patients with Acute Non-ST-Segment Elevation Myocardial Infarction (Project No.: SKL-HIDCA-2024-KL2); Open Topic

Fund Project of the State-Province Joint Construction Key Laboratory of Etiology and Epidemiology of High Incidence Diseases in Central Asia, State Key Laboratory of Pathogenesis, Prevention and High Incidence Diseases in Central Asia, Xinjiang Medical University; Skate Key Laboratory of Pathogenesis, Prevention and Treatment of High Incidence Diseases in Central Asia Fund

Disclosure statement

The authors declare no conflict of interest.

References

[1] Zhang Q, Cheng Y, et al., 2020, Predictive Value of Neutrophil Percentage-to-Albumin Ratio for Prognosis in Patients with Acute ST-Segment Elevation Myocardial Infarction. Journal of Clinical Emergency, 21(5): 354–358.

[2] Zhang M, Li J, Wang W, 2021, Predictive Value of Neutrophil-to-Lymphocyte Ratio for Prognosis in Patients with Acute Non-ST-Segment Elevation Myocardial Infarction. Chinese Journal of Cardiology, 49(5): 412–418.

[3] Chen Y, Huang A, Chen W, et al., 2020, Neutrophil-to-Albumin Ratio as a Novel Predictor of Long-Term Prognosis in Patients with Coronary Artery Disease. Journal of Cellular and Molecular Medicine, 24(17): 10204–10212.

[4] Wang X, Fan X, Ji S, et al., 2022, Prognostic Value of Neutrophil Percentage-to-Albumin Ratio in Patients with Acute Myocardial Infarction. Biomarkers in Medicine, 16(3): 167–176.

[5] Liu J, Li X, Ren Y, et al., 2021, Neutrophil-to-Albumin Ratio Predicts In-Hospital Mortality in Patients with Acute Decompensated Heart Failure. Frontiers in Cardiovascular Medicine, 8: 678438.

[6] Chen Z, Liu F, Zhang H, 2022, The Relationship Between Neutrophil Percentage-to-Albumin Ratio and Prognosis in Patients with Acute Coronary Syndrome. Chinese Circulation Journal, 37(4): 356–362.

Publisher's note

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.