International Journal of Research in Medical Sciences
Adnan T et al. Int J Res Med Sci. 2026 Mar;14(3):849-854
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20260599

Original Research Article

Association of Mehran risk score and contrast-induced nephropathy in patients undergoing primary PCI

Tanvir Adnan[1]*, Fazila Tun Nesa Malik[2], Kalimuddin[2], Nazir Ahmed[2], Mir Nesaruddin Ahmed[2], Ireen Akhter[3], Sami Nazrul Islam[4], Kamrul Hasan[5], Sayem Bin Latif[6]

[1]Department of Cardiology, Asgar Ali Hospital, Dhaka, Bangladesh
[2]Department of Cardiology, National Heart Foundation Hospital and Research Institute, Dhaka, Bangladesh
[3]Department of Obstetrics and Gynecology, Shaheed Suhrawardi Medical College Hospital, Dhaka, Bangladesh
[4]Department of Cardiology, Universal Medical College Hospital, Dhaka, Bangladesh
[5]Department of Cardiology, Popular Medical College Hospital, Dhaka, Bangladesh
[6]Department of Cardiology, Ibrahim Cardiac Hospital and Research Institute, Dhaka, Bangladesh

Received: 13 January 2026
Accepted: 13 February 2026

***Correspondence:**
Dr. Tanvir Adnan,
E-mail: daredevilz0065@gmail.com

ABSTRACT

Background: Contrast-induced nephropathy (CIN) remains a common and serious complication following primary percutaneous coronary intervention (PCI) in patients with ST-elevation myocardial infarction (STEMI). Early risk stratification is essential to identify high-risk patients. The Mehran CIN risk score is widely used in elective PCI, but evidence in the primary PCI setting is limited. This study aimed to evaluate the association between Mehran risk score and the development of CIN in STEMI patients undergoing primary PCI.
Methods: This cross-sectional analytical study was conducted in the department of cardiology, National Heart Foundation Hospital and Research Institute, Dhaka, from January 2018 to July 2019. Consecutive STEMI patients undergoing primary PCI were enrolled using a non-randomized purposive sampling method.
Results: Among the study population, 34 (13.7%) patients developed CIN, while 214 (86.3%) did not. CIN occurred most frequently in higher Mehran risk categories, with a statistically significant association ($p<0.05$). Factors such as anemia, diabetes mellitus, baseline serum creatinine >1.5 mg/dl, eGFR <60 ml/minute/1.73 m^2, and age >75 years were significantly associated with CIN. The ROC analysis showed an area under the curve of 0.774 (95% CI: 0.692-0.855; $p<0.001$). A Mehran score of 8 demonstrated 70% sensitivity and 71% specificity, while a score of 9 showed 61% sensitivity and 78% specificity.
Conclusions: The Mehran CIN risk score is a useful and reliable tool for predicting contrast-induced nephropathy in STEMI patients undergoing primary PCI and may aid in early risk stratification and preventive strategies.

Keywords: Acute myocardial infarction, Contrast-induced nephropathy, Mehran risk score, Primary PCI, STEMI

INTRODUCTION

ST-elevation myocardial infarction (STEMI) remains a major cause of morbidity and mortality worldwide and requires prompt reperfusion therapy, most commonly achieved through primary percutaneous coronary intervention (PCI).[1] Although primary PCI significantly improves survival and clinical outcomes, the procedure is frequently associated with the administration of iodinated contrast media, which may lead to contrast-induced nephropathy (CIN).[2] CIN is a well-recognized complication of PCI and is associated with prolonged hospitalization, increased healthcare costs, and higher short- and long-term mortality rates, particularly in high-risk patients.[3]

The incidence of CIN varies widely depending on patient-related and procedural factors, including advanced age, diabetes mellitus, baseline renal dysfunction, hemodynamic instability, heart failure, and contrast volume.[4] Patients undergoing primary PCI for STEMI are especially vulnerable to CIN because of the emergent nature of the procedure, limited opportunity for pre-procedural optimization, and frequent presence of hemodynamic compromise.[5] Early identification of patients at high risk for CIN is therefore essential to guide preventive strategies and improve clinical outcomes.[6]

The Mehran risk score is a validated clinical tool developed to predict the risk of CIN following PCI. It incorporates readily available clinical and procedural variables, allowing effective risk stratification into low, medium, high, and very high-risk categories.[7] Although the Mehran risk score was initially derived from elective PCI populations, several studies have suggested its applicability in acute coronary syndrome settings, including primary PCI.[8] However, the predictive performance of the Mehran risk score may vary across different populations and healthcare settings, underscoring the importance of local validation.[9]

The burden of CIN and its association with the Mehran risk score among patients undergoing primary PCI are limited.[10] Given the increasing use of primary PCI and the high prevalence of cardiovascular risk factors in this population, evaluating the clinical utility of the Mehran risk score in predicting CIN is of significant importance.[11] Understanding this association may facilitate early risk stratification, enable targeted preventive measures, and optimize post-procedural monitoring in routine clinical practice.[12]

Therefore, the present study was designed to assess the incidence of contrast-induced nephropathy and to evaluate the association between Mehran risk score and the development of CIN in patients undergoing primary PCI for STEMI. Additionally, the study aimed to determine the predictive accuracy of the Mehran risk score for CIN using logistic regression and receiver operating characteristic curve analysis.

METHODS

This cross-sectional analytical study was conducted in the department of cardiology, National Heart Foundation Hospital and Research Institute, Mirpur, Dhaka, from January 2018 to July 2019. The study population consisted of patients admitted with a clinical diagnosis of ST-elevation myocardial infarction (STEMI) who provided consent for primary percutaneous coronary intervention (PCI). A non-randomized purposive sampling method was applied, and all consecutive eligible STEMI patients undergoing primary PCI during hospitalization were enrolled. Patients not amenable to primary PCI, those exposed to radiographic contrast within one week, patients on regular peritoneal or hemodialysis for chronic kidney disease, and patients who died within 48 hours of the procedure were excluded.

The study aimed to evaluate the association between Mehran risk score and the development of contrast-induced nephropathy (CIN). Based on previous evidence showing a CIN incidence of 7.5% in the low-risk group (score ≤5) and 26.1% in the medium-risk group, the required sample size was calculated as 62 patients per group using an uncorrected chi-squared test with 80% power and a type I error of 0.05. As four Mehran risk categories were included, the total sample size was 248 patients. Participants were categorized into low (≤5), medium (6-10), high (11-15), and very high (≥16) Mehran risk groups.

Baseline demographic characteristics, clinical variables, and Mehran risk factors were recorded using a structured data collection form. The Mehran risk score was calculated for each patient prior to PCI. Serum creatinine levels were measured at baseline and 48 hours after the procedure, and CIN was defined according to guideline criteria. All patients received intravenous hydration with 0.9% saline at a rate of 1 ml/kg/hour for 12 hours, which was reduced to 0.5 ml/kg/hour in patients with ejection fraction ≤30% or overt heart failure. Primary PCI was performed using low-osmolality contrast media (Iohexol). Data were analyzed using SPSS version 16.0. Descriptive statistics were used to determine CIN incidence, while comparisons were performed using chi-square test and ANOVA. Binary logistic regression analysis and receiver operating characteristic (ROC) curve analysis were applied to assess the predictive performance of the Mehran risk score. A p value <0.05 was considered statistically significant.

RESULTS

Pie chart shows 34 (13.7%) patients developed CIN and 214 (86.3%) did not develop CIN (Figure 1).

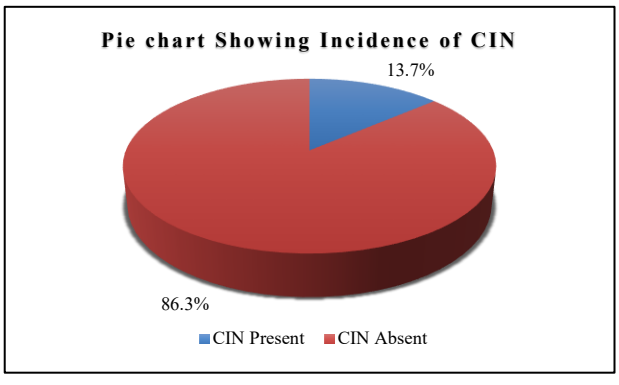

Figure 1: Pie chart of incidence of CIN in study population (n=248).

Table 1 is showing the distribution of study population by the development of CIN. Here CIN developed most in group III and the result was statistically significant (p<0.05).

Table 1: Distribution of incidence of CIN in Mehran risk group in whom CIN present or absent (n=248).

CIN	Group I (n=95) (%)	Group II (n=88) (%)	Group III (n=55) (%)	Group IV (n=10) (%)	P value
Present	3 (3.2)	11 (12.5)	15 (27.3)	5 (50)	0.001[s]
Absent	92 (96.8)	77 (87.5)	40 (72.7)	5 (50)	

s= significant, ns= not significant, p value reached from chi-squared test.

Table 2: Distribution of demographic and clinical characteristics among study population according to presence or absence of CIN (n=248).

Patient characteristics risk factors	CIN present (n=34) (%)	CIN absent (n=214) (%)	P value
Age (Mean±SD)	61.62±10.32	54.32±11.32	[a]0.005[s]
Male	28 (82.4)	192 (89.71)	[b]0.207[ns]
Female	6 (17.6)	22 (10.3)	
Smoking	16 (47.0)	134 (62.7)	0.129[ns]
Diabetes	23 (67.6)	99 (46.3)	0.021[s]
Hypertension	11 (32.4)	122 (57.0)	0.242[ns]
Dyslipidemia	26 (76.5)	175 (81.8)	0.463[ns]
Family H/O CAD	8 (23.5)	75 (35.0)	0.186[ns]
Obesity	15 (44.1)	82 (38.3)	0.234[ns]
Hypotension	11 (32.35)	42 (19.60)	0.093[ns]
LVF	5 (14.7)	19 (8.9)	0.286[ns]

s= significant, ns= not significant [a]P value reached from unpaired t-test, [b]P value reached from Chi-squared test (χ^2).

Table 3: Distribution of Mehran risk factors among study population in whom CIN present or absent (n=248).

Mehran risk score factors	Total (n=248) (%)	CIN present (n=34) (%)	CIN absent (n=214) (%)	P value
Hypotension	53 (21.37)	11(32.35)	42 (19.60)	0.093[ns]
CHF	24 (9.67)	5 (14.71)	19 (8.94)	0.286[ns]
Anemia	134 (54.03)	23 (67.66)	110 (51.45)	0.028[s]
Diabetes	122 (49.20)	23 (67.66)	99 (51.31)	0.021[s]
Serum creatinine>1.5 mg/dl	45 (18.14)	17 (50.40)	186 (86.95)	0.001[s]
eGFR<60 ml/minute/1.73 m^2	95 (38.30)	23 (67.66)	72 (33.62)	0.001[s]
Age>75 years	16 (6.45)	6 (17.64)	10 (4.68)	0.004[s]
Contrast volume≥150 ml	5 (2.01)	1 (2.94)	4 (1.86)	0.761[ns]
IABP use	0	0	0	

s= significant, ns= not significant, p value reached from chi-squared test.

Table 4: Distribution of clinical and laboratory parameter among study population in whom CIN present or absent (n=248).

Parameters	CIN present (n=34) Mean±SD	CIN absent (n=214) Mean±SD	P value
Heart rate (beats/minute)	85.29±19.72	83.59±19.61	0.639[ns]
Systolic BP (mmHg)	107±19.85	114.39 ±23.42	0.082[ns]
Diastolic BP (mmHg)	72.65±10.81	75.58±13.90	0.241[ns]
Ejection fraction (%)	42.97±6.37	45.10±5.72	0.048[s]
Serum Hb% (gm/dl)	11.97±1.87	12.92±1.86	0.006[s]
Serum creatinine (mg/dl)	1.67±0.85	1.16±0.27	0.001[s]
Serum creatinine (mg/dl) (48 hours after procedure)	2.59±1.15	1.23±0.34	0.001[s]
eGFR (ml/min/1.73 m^2)	51.12±24.32	67.73±17.71	0.001[s]
Contrast volume (ml)	87.05±21.35	86.00±18.27	0.761[ns]
Door to balloon time (minute)	70.56±22.17	67.7±20.48	0.457[ns]
Mehran risk score	10.91±4.28	6.61±4.29	0.001[s]

s= significant, ns= not significant, P value reached from Unpaired t-test

Table 2 shows comparison of study participants by their characteristics and risk factors according to presence or absence of CIN. Patients who developed CIN were older age, more diabetic, anemic, had higher base line serum creatinine level lower left ventricular ejection fraction and higher Mehran risk score which were statistically significant ($p<0.05$).

Table 3 is showing distribution of study participants by Mehran risk score between who developed and who did not develop CIN. Among them Anemia, diabetes, S. creatinine >1.5 mg/dl, eGFR<60 ml/minute/1.73 m^2 and age >75 years was statistically significant ($p<0.05$).

Table 4 is showing baseline clinical and laboratory parameters between who developed CIN and who did not develop CIN. Among the parameters ejection fraction, Hb%, serum creatinine and 48 hours post procedure serum creatinine, eGFR and Mehran risk score was statistically significant ($p<0.05$). The patients who developed CIN had high mean heart rate, low mean systolic BP, low mean diastolic BP, low mean EF, low Hb%, high mean serum creatinine, and high mean 48 hours post procedure creatinine, high mean door to balloon time, high mean Mehran risk score and in case of them more amount of contrast was used.

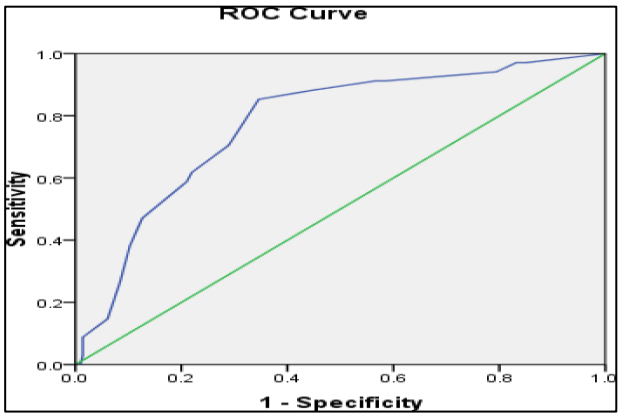

Figure 2: ROC curve.

Figure 2 shows receiver operating characteristic curve (blueline) for Mehran's score applied to the study population. Receiver operator curve (ROC) showing the area under the curve (AUC) is 0.774 (95% CI; 0.692-0.855, p value <0.001).

Table 5: Receiver operating characteristic (ROC) curve of sensitivity and specificity of Mehran risk score.

Mehran risk score	Cut off value	Sensitivity	Specificity
	8	70%	71%
	9	61%	78%

Table 5 is showing the sensitivity and specificity of MRS 8 and 9 obtained by ROC curve.

DISCUSSION

This cross-sectional study was conducted in the department of cardiology, National Heart Foundation Hospital and research institute, Dhaka, over a period of January 2018 to July 2019. The main objective was to evaluate the relation or association between Mehran risk score and contrast induced nephropathy in patients undergoing primary PCI. A total of 248 patients were included in this study of which 95 patients were in group I (MRS≤5), 88 patients were in group II (MRS 6-10), 55 patients were in group III (MRS 11-16), 10 patients were in group IV (MRS≥16).

The findings of the present study can be summarized as follows: 1) incidence of CIN in patients undergoing primary PCI is 13.7%; 2) the MRS is a good predictor of the risk to develop CIN in patients undergoing primary PCI; 3) the MRS can be applied in the STEMI population in primary PCI as in elective PCI for a better stratification of the risk of CIN development.

In this study, 34 (13.70%) patients developed contrast induced nephropathy which is similar to the results of Mehran et al, but it was done only for patients undergoing elective procedure.[13] The incidence of CIN in patients undergoing primary PCI in this study was 13.7%, which is almost similar to study done by Kaya et al, 13.3%; Sgura et al, 14.14%; Lucreziotti et al, 15.2%. In contrast to this study, lower incidence of CIN showed Caspi et al, 10.9%; Ando et al, 5.2% and higher incidence of CIN by Santos et al, 23.8%; Channappagoudra et al, 20.71%.[14-20] Patients developing CIN were in group I- 3 (1.20%), in group II- 11 (4.43%), in group III- 15 (6.05%) and in group IV- 5 (2.02%). The incidence of CIN following coronary angiography varies greatly depending on the demographic and clinical variables of the sample, as well as the characteristics of the angiography. The incidence of CIN was statistically significant ($p<0.05$) in this study. Out of 13.7%, 1.2% patients developed CIN in low risk group; 4.4% in medium risk group, 6.04% in high risk group and 2.06% patients in very high risk group. Risk of developing CIN in low risk group was 3.2%, in medium risk group 12.5%, in high risk group 27.3% and in very high risk group 50% which correlates (7.50%, 14.0%, 26.10%, 57.3% respectively in each group) with risk for CIN reported by Mehran et al.[13]

Marenzi et al, stated that age is an independent factor for development of contrast induced nephropathy in patients undergoing primary PCI. In present study the study participants had predominance of age group of 50 to 59 years.[21] The patient who developed CIN mean age was 61.62±10.32 years. Mean age of the study population, who developed CIN was 63.7±14.4 years by Ivanes et al, 65.6 years by Narula et al.[22,23]

Mean age of the study population who developed CIN was similar to study done by Ivanes et al, in all other studies mean age was higher except Channappagoudra et al, where

mean age was lower than this study.[20,22] When comparing patients with and without CIN, patients with CIN were older (61.62±10.32 years versus 54.32±11.32 years; p=0.005) as in all above mentioned studies. The higher mean age and age range obtained by the above authors may be due to geographical variations, racial, ethnic differences and genetic causes that have significant influence on coronary artery disease in their study subjects. In this study, 16 patients above 75 years were found among them 6 (17.64%) developed CIN.

Among the common risk factors for coronary artery disease were collected by asking close ended questions and observing previous medical records. There was similar type of risk factors like hypertension, smoking, dyslipidemia, obesity and family history of CAD in both groups except diabetes.

Mean Mehran risk score was found 10.9±4.28 in whom CIN developed and who did not developed CIN was 6.61±4.29, which was statistically significant (p=0.001). Mean MRS was 6.5±4.8 in the patients who developed CIN compared with 5.2±4.6 (p=0.07) in those who did not develop the complication.[16] Mean Mehran risk score was more in Lin et al, but Ando et al, had less mean Mehran risk score.[18,24]

Variables present in Mehran CIN risk score was compared between this study and Mehran et al, study group in whom CIN was present or absent.[13] In this study hypotension, anaemia, CHF was more prevalent and CIN was also present more for these factors than their study. S. creatinine >1.5 mg/dl or eGFR<60 ml/minute/1.73 m^2 was almost similar. But in their study, they had more patients above 75 years, they used more contrast volume and they also used IABP which was not used in this study group as now a days it has no proven mortality benefit.

In this study receiver operator characteristic curve for Mehran risk score was applied to study population and area under the curve was found 0.774. (95% CI; 0.692-0.855, p value <0.001). Sensitivity and Specificity of Mehran risk score 8 was 70% and 71% but for Mehran risk score 9 was 61% and 78%. Narula et al, found AUC 0.60; Ivanes et al, showed AUC in his study 0.59.[22,23]

From the above discussion it can be inferred that patient with STEMI who would undergo primary PCI, CIN could be predicted in them by using Mehran CIN risk score.

Despite achieving its objectives, this study has several limitations. It was conducted in a single tertiary care center, which may limit the generalizability of the findings to the broader population. The use of non-randomized purposive sampling may have introduced selection bias. The study population was predominantly male, potentially limiting the applicability of the results to female patients. Additionally, short-term and long-term clinical outcomes, including mortality and morbidity, were not evaluated. Finally, intra-aortic balloon pump (IABP), a component of the Mehran risk score, was not used in the study population, which may have influenced the overall risk assessment.

CONCLUSION

The Mehran contrast-induced nephropathy (CIN) risk score demonstrated good sensitivity and specificity in predicting CIN among patients with ST-elevation myocardial infarction undergoing primary percutaneous coronary intervention. A higher Mehran risk score was associated with a progressively increased risk of developing CIN compared with lower risk categories. These findings support the use of the Mehran risk score as a practical and effective screening tool for early identification of patients at risk of CIN. Furthermore, the Mehran risk score can be reliably applied in the STEMI population undergoing primary PCI, similar to its established role in elective PCI, to facilitate improved risk stratification and targeted preventive strategies.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Koowattanatianchai S, Chantadansuwan T, Kaladee A, Phinyo P, Patumanond J. Practical risk stratification score for prediction of contrast-induced nephropathy after primary percutaneous coronary intervention in patients with acute ST-segment elevation myocardial infarction. Cardiol Res. 2019;10(6):350.
2. Kumar R, Ahmed T, Khatti S, Memon AU, Shaikh NA, Farooq F, et al. Validity of Mehran risk score for predicting contrast induced nephropathy in modern primary percutaneous coronary interventions era. Pak Heart J. 2022;55(1):73-8.
3. Abdel-Ghany M, Morsy G, Kishk YT. Predictors of contrast-induced nephropathy in ST-elevation myocardial infarction patients undergoing primary percutaneous coronary intervention. Egypt J Intern Med. 2021;33(1):16.
4. Valappil SP, Kunjukrishnapillai S, Iype M, Koshy AG, Viswanathan S, Gupta PN, et al. Predictors of contrast induced nephropathy and the applicability of the Mehran risk score in high risk patients undergoing coronary angioplasty- a study from a tertiary care center in South India. Indian Heart J. 2018;70(3):399-404.
5. Liu X, Zhang P, Zhang J, Zhang X, Yang S, Fu N. The preventive effect of alprostadil on the contrast-induced nephropathy of coronary heart disease treated by percutaneous coronary intervention in moderate and high-risk population stratified by Mehran score. Angiology. 2022;73(1):33-41.
6. Guo Y, Xu X, Xue Y, Zhao C, Zhang X, Cai H. Mehran 2 contrast-associated acute kidney injury risk

score: is it applicable to the Asian percutaneous coronary intervention population? Clin Appl Thrombos Hemostas. 2022;28:10760296221116353.
7. Zhang X, Zhang P, Yang S, Li W, Men X, Fu N. Preventive effect of trimetazidine on contrast-induced nephropathy undergoing percutaneous coronary intervention in elderly moderate and high-risk diabetics stratified by mehran score. Perfusion. 2021;36(5):491-500.
8. Abdulsalam N. External multicenter validation of the mehran risk score for contrast induced acute kidney injury. Int Arch Cardiovasc Dis. 2021;5:048.
9. Samir A, Gabra W, Alhossary H, Bakhoum S. Predictive value of CHA2DS2VASC score for contrast-induced nephropathy after primary percutaneous coronary intervention for patients presenting with acute ST-segment elevation myocardial infarction. Egypt Heart J. 2023;75(1):52.
10. Mehran R, Owen R, Chiarito M, Baber U, Sartori S, Cao D, et al. A contemporary simple risk score for prediction of contrast-associated acute kidney injury after percutaneous coronary intervention: derivation and validation from an observational registry. Lancet. 2021;398(10315):1974-83.
11. Yuan Y, Qiu H, Hu X, Zhang J, Wu Y, Qiao S, et al. A risk score model of contrast-induced acute kidney injury in patients with emergency percutaneous coronary interventions. Front Cardiovasc Med. 2022;9:989243.
12. Kumar R, Khan KA, Rai L, Solangi BA, Ammar A, Khan MN, et al. Comparative analysis of four established risk scores for predicting contrast induced acute kidney injury after primary percutaneous coronary interventions. IJC Heart Vasculat. 2021;37:100905.
13. Mehran R, Aymong ED, Nikolsky E, Lasic Z, Iakovou I, Fahy M, et al. A simple risk score for prediction of contrast-induced nephropathy after percutaneous coronary intervention: development and initial validation. J Am Coll Cardiol. 2004;44(7):1393-9.
14. Kaya A, Karataş A, Kaya Y, Düğeroğlu H, Dereli S, Bayramoğlu A. A new and simple risk predictor of contrast-induced nephropathy in patients undergoing primary percutaneous coronary intervention: TIMI Risk Index. Cardiol Res Pract. 2018;2018(1):5908215.
15. Sgura FA, Bertelli L, Monopoli D, Leuzzi C, Guerri E, Sparta I, et al. Mehran contrast- induced nephropathy risk score predicts short- and long-term clinical outcomes in patients with ST-elevationmyocardial infarction. Circulat Cardiovasc Intervent. 2010;3:491-8.
16. Lucreziotti S, Centola M, Salerno-Uriarte D, Ponticelli G, Battezzati PM, Castini D, et al. Female gender and contrast-induced nephropathy in primary percutaneous intervention for ST-segment elevation myocardial infarction. Int J Cardiol. 2014;174(1):37-42.
17. Caspi O, Habib M, Cohen Y, Kerner A, Roguin A, Abergel E, et al. Acute kidney injury after primary angioplasty: is contrast-induced nephropathy the culprit? J Am Heart Assoc. 2017;6(6):e005715.
18. Andò G, De Gregorio C, Morabito G, Trio O, Saporito F, Oreto G. Renal function–adjusted contrast volume redefines the baseline estimation of contrast-induced acute kidney injury risk in patients undergoing primary percutaneous coronary intervention. Circulat Cardiovasc Intervent. 2014;7(4):465-72.
19. Santos PR, Neto JDC, Plácido F, Arcanjo N, Carneiro RJK, de Carvalho RC, Cet al. Contrast-induced nephropathy after primary angioplasty for acute myocardial infarction. Brazil J Nephrol 2015;37(4):439-45.
20. Channappagoudra P, Nath R, Pandit N. Contrast induced nephropathy in acute STEMI patients undergoing primary PCI and its correlation with volume of contrast and duration of symptoms. Int J Curr Res. 2016;8(04):29789-93.
21. Marenzi G, Cosentino N, Werba JP, Tedesco CC, Veglia F, Bartorelli AL. A metaanalysis of randomized controlled trials on statins for the prevention of contrast induced acute kidney injury in patients with and without acute coronary syndromes. Int J Cardiol. 2015;183:47-53.
22. Ivanes F, Isorni MA, Halimib JM, Fauchiera L, Etiennea CS, Babutya D, et al. Predictive factors of contrast-induced nephropathy in patients undergoing primary coronary angioplasty. Arch Cardiovasc Dis. 2014;107:424-32.
23. Narula A, Mehran R, Weisz G, Dangas GD, Yu J, Genereux P, et al. Contrast-induced acute kidney injury after primary percutaneous coronary intervention: results from the HORIZONS-AMI substudy. Eur Heart J. 2014;35(23):1533-40.
24. Lin K, Zheng W, Bei W, Chen S, Islam SMS, Liu Y, et al. A novel risk score model for prediction of contrast-induced nephropathy after emergent percutaneous coronary intervention. Int J Cardiol. 2017;230:402-12.

Cite this article as: Adnan T, Malik FTN, Kalimuddin, Ahmed N, Ahmed MN, Akhter I, et al. Association of Mehran risk score and contrast-induced nephropathy in patients undergoing primary PCI. Int J Res Med Sci 2026;14:849-54.