Section: Cardiology

Original Research Article

COMPARISON OF THE AGE RELATED RISK FACTORS IN PATIENTS WITH ST-SEGMENT ELEVATED MYOCARDIAL INFRACTION (STEMI) AT TERTIARY CARE HOSPITAL IN SOUTHERN RAJASTHAN: A PROSPECTIVE OBSERVATIONAL STUDY

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Received *: 05/02/2026*
Received in revised form *: 20/04/2026*
Accepted *: 03/05/2026*

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DOI: 10.70034/ijmedph.2026.2.607

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2026; 16 (2); 3686-3690

ABSTRACT

Background: Objective: To investigate the age-related variations of risk factors for ST segment-Elevation Myocardial Infarction (STEMI) in a tertiary care setting.
Study Design: Prospective Observational Study.
Place and Duration: This study was performed in Department of Cardiology at Geetanjali Medical College and Hospital, Udaipur (Rajasthan). The study duration was six months.
Materials and Methods: Data were collected from 112 STEMI patients and were categorised into below 45 (n=18) and above 45 (n=94) years age group at Geetanjali Hospital, Udaipur. SPSS version 27 was used for data calculation and mean (SD) was calculated for numerical data. Chi-square was used calculate categorical variables.
Result: Risk factors were stratified on the basis of age and it was seen that hypertension, diabetes mellitus and alcohol, serum creatinine, urea, triglycerides, LDL were found to be high in above 45 age group. HDL was low and potassium was high in below 45 age group. GRACE risk score was found low in below 45 age group, while intermediate and high risks score was found in above 45 age group which indicating a greater risk of cardiac events.
Conclusion: Age had significant impact on GRACE score and predicted risk level in STEMI patients.
Keywords: Acute Coronary Syndrome, Coronary Artery Disease, Diabetes, Grace Risk Score, Hypertension, ST- Segment Elevation Myocardial Infarction.

INTRODUCTION

Myocardial infarction occurs when heart muscle cells die due to prolonged lack of blood flow and oxygen, causing permanent damage. CAD reduces blood flow via plaques rupture which causes thrombus, leading to ischemia, cell death and loss of heart contractility.[1] Prolonged oxygen deprivation can cause irreversible heart muscle damage within 20-40 minutes, influenced by metabolism and collateral blood circulation.[2] STEMI caused by a total thrombotic occlusion of a coronary artery. Factors like HTN, high cholesterol, smoking, and diabetes heighten the risk of atherosclerosis, making plaque more prone to rupture. ACS refers to a range of conditions caused by sudden reduced blood flow in the coronary arteries, leading to heart muscle ischemia or infarction. This critical condition requires prompt medical attention to restore blood flow and prevent further damage[3,4]. ACS is classified into two main types: N-STEMI and STEMI. STEMIs are categorized based on the specific region of the heart affected by the MI, including areas like anterior, posterior, lateral, or inferior walls.[6] Plaque rupture in a coronary artery initiates a sequence of reactions leading to thrombus formation, which obstructs blood flow to the heart

muscle. The process involves changes in the inner lining of the artery, followed by platelet activation and aggregation, resulting in a thrombus that obstructs blood flow. When a Coronary artery becomes acutely blocked due to thrombosis, it can lead to ST elevation on ECG. This sequence of events can have serious consequences, highlighting the importance of prompt medical attention. STEMI is diagnosed based on specialized findings in an ECG, elevated cardiac marker, ECHO, CK-MB, BNP[5,7]. GRACE Score for risk stratification in ACS patients, providing crucial prognostic information on in-hospital and six-month post-discharge mortality risks, thereby guiding clinical management. This score plays a critical role in guiding treatment strategies and predicting patient outcomes. Risk scores are valuable prognostic tools for ACS patients, accurately predicting in-hospital and long-term mortality risks, and enabling healthcare providers to make informed decisions. The GRACE score calculation involves eight specific factors: age, heart rate, systolic blood pressure, creatinine levels, prior cardiac arrest, elevated cardiac enzymes, and ST segment changes, Killip class. It gives a comprehensive assessment of risk in ACS patient. The Killip classification system evaluates heart failure severity in post myocardial infarction patient. Its higher classes corresponding to increased mortality and poorer outcomes. thereby it is guiding prognosis and treatment decisions. Killip Class I indicates no evidence of heart failure. Killip Class II indicates Mild to moderate HF shown by symptoms like an S3 gallop & distended jugular vein Killip Class III indicates Severe pulmonary oedema. Killip Class IV indicates Cardiogenic shock. These factors help determine the risk of in-hospital mortality.[8] Its need for prevention and timely management and also highlighted by the rising burden of cardiovascular disease. Early intervention and lifestyle modifications can help reduce the risk of heart attack and related complications. Effective management strategies are essential to mitigate the impact of cardiovascular disease on in-hospital patients.

MATERIALS AND METHODS

It was a prospective observational study. It conducted over a period of six months in the Department of Cardiology at Geetanjali Medical College and Hospital, Udaipur. A total of 112 patients were enrolled consecutively to avoid selection bias. Data was systematically collected through pre-designed data collection form from medical records after obtaining written informed consent. The study aims to investigate the age-related variations in risk factors for ST segment-Elevation Myocardial Infarction (STEMI) in a tertiary care setting. All the patients above 18 years of age diagnosed with STEMI and patients who are able to give written consent form were included. Patients arrived without STEMI diagnoses were excluded. This helped in maintaining the uniformity and ensured that they were true representative of the study.

Statistical Analysis: Data was analysed using MS Excel and IBM-SPSS. A normality test was performed before applying appropriate statistical test. Descriptive statistical analysis (mean, SD, percentage) was used to summarize demographics variables. The Chi-square test was applied for categorical variables. The Mann -Whitney and independent t-tests were used to analysed continuous data. A p value of < 0.05 was considered statistically significant.

RESULTS

Demographic findings & risk factors

Over the study period of 6 months 112 STEMI patients aged below 45 and above 45 were included and the mean age of the participant were found to be 38.1 ± 4.5 and 63.13 ± 10.42 respectively. Data was taken from both the genders in which males were more. The analysis revealed a statistically nonsignificant difference between genders ($p=0.57$). Gender as a factor was found to be non-significant based on the age distribution. Diabetes (11.11% vs 52.12%; $p < 0.001$), Hypertension (44.44% vs 67.02; $p<0.02$) and alcohol consumption ($p<0.04$) were found to be significantly more common in above 45 years, as shown in **Table 1.** Smoking and tobacco were not found to be statistically significant. Multivariate analysis showed HTN, DM & alcohol were statistics significantly.

Table 1: Comparison of the risk factors in stratified age groups

Variables	Below 45 years (%)	Above 45 years (%)	p Value
Hypertension	44.44	67.02	**<0.02**
Diabetes mellitus	11.11	52.12	**<0.001**
Smoking	61.11	56.38	0.07
Tobacco	50	47.8	0.3
Alcohol	27.77	29.7	**<0.04**

Table 2: Laboratory Parameters [m= mean, SD= Standard Division]

Variables	Below 45 years		Above 45 years		p value
	M	SD	m	SD	
Serum Creatinine	1.088	0.427	1.44	0.922	**<0.01**
Uric Acid	5.22	1.96	7.22	8.77	0.39
Urea	33.51	18.03	47.39	32.90	**<0.01**
BUN	14.92	6.05	25.59	18.80	**<0.012**
Hb	13.60	1.61	12.55	2.24	**<0.02**
Platelet	325.7	117.8	251.6	103.97	**<0.021**
TLC	12.54	5.80	12.88	6.28	0.52
Cholesterol	130.6	43.97	181.4	66.00	0.12
HDL	35.43	47.1	56.35	81.61	**<0.05**
LDL	71.68	40.89	105.40	50.33	**<0.04**
Triglycerides	112.6	72.94	117.7	63.22	**<0.03**
VLDL	22.52	14.59	36.89	47.54	0.94
Potassium	6.84	9.30	4.37	0.84	**<0.001**
Chloride	100.8	4.74	99.0	5.92	0.513
Sodium	135.43	5.20	133.66	14.46	0.75

Table 3: Presentations characteristic of the parameter of the GRACE

Parameters	<45 years (=18)	>45years (n=94)	p value
Pulse	94(65.5 -122.5)	82(68.0 -96.0)	
Blood Pressure	114(124.5 -103.5)	123.5(145.0-102.0)	
Types of MI			
AWMI	88.89 %	62.77%	**<0.03**
IWMI	11.11%	32.98%	0.06
LWMI	0%	1.06%	0.66
PWMI	0%	1.06%	0.66
Killip Class			
Class 1	22.22%	9.57%	0.11
Class 2	61.11%	37.23%	
Class 3	5.56%	12.77%	
Class 4	16.67%	36.17%	
Cardiac Arrest	5.55	18.0	
Troponin T	16.66	21.27	
GRACE SCORE	Below 45 years	Above 45 year	P value
<109 (LOW)	83.33	17.02	**<0.001**
109-140 (INTERMEDIATE)	11.11	29.78	
>140 (HIGH)	5.55	53.19	

Laboratory Finding

Serum Creatinine (1.08 ± 0.427 vs 1.44 ± 0.92; p <0.01), urea (33.51 ± 18.03 vs 47.39 ± 32.9; p <0.01), BUN (14.92 ± 6.05 Vs 25.59 ± 18.8; p <0.01), Triglycerides (112.6 ± 72.94 vs117.7 ± 63.22; p <0.03), LDL (71.68 ± 40.89 vs 105.40 ± 50.33; p <0.004) were found to be high in above 45 years age group. Potassium (6.84 ± 9.30 vs 4.37± 0.84; p<0.001), Hb (13.60 ± 1.61 vs 12.55 ± 2.24; p <0.02), PC (325.7 ± 117.8 vs 251.6 ± 103.97; p <0.021) were significantly higher while HDL (35.43 ± 4.71 vs 56.35 ± 81.61; p <0.05) was lower in below 45 age group as depicted in Table 2.

The pulse and blood pressure in below and above 45 years age group are shown in Table 3. The pulse median for below 45 is 94 (IQR 65.5-122.5) and for above 45 is 82 (68-96) indicating higher in patients below 45 years. Blood pressure also differs as 114 (124.5- 103.5) vs 123.5 (145-102) indicating higher in patients above 45 years. The comparison underscores that older patients had higher BP, while younger patient had higher pulse rate. AWMI is significantly more common in below 45 group 88.89 % compares to 62.77 % in above 45 group (p <0.03). IWMI appears more in above 45 32.98% than below 45 11.11% (p <0.06). The heart failure severity (Killip class) differs between below 45 and above 45 years. Class 1 and 2 were more significant in below 45 age group while Class 3 and 4 were more significant in above 45 age group. Above 45 group are prone to cardiac arrest as compared to below 45 group. Troponin was found to be more in above 45 years age as to below 45 years. The GRACE score for the 112 STEMI patients divided on the basis of their risk score as low, medium and high. More population was found in below 45 age group with low GRACE risk score while intermediate and high was found in above 45 age group indicating the greater risk of

cardiac event. Age has significant ($p<0.001$) impact on GRACE score & thus predicted risk level in STEMI patient.

DISCUSSION

The study evaluates and compares the risk factors & seriousness of STEMI in patients aged with below and above 45 years of age that shows males (72.32%) were more dominant than females (27.68%). More than half of the population of were affected by hypertension (67.02%) and diabetes mellitus (52.12%). The lifestyle of patients below 45 were characterized by smoking and tobacco while alcohol consumption was more in above 45 age group. Similarly, the reference studies also shows that hypertension, diabetes and alcohol were more in above 45 years age group.

The laboratory parameters between participants of age group 45 years presenting with MI, aiming to identify differences in metabolic and haematological profiles that may influence clinical outcome. A significant finding was the elevated serum creatinine levels in above 45 years (1.08±0.427 mg/dL) compared to below 45 years (1.44 ±0.92 mg/dL) ($p<0.01$). This suggest that impaired renal function is more in above 45 patients. Conversely, platelet count was significantly higher in below 45 years (325.7 ± 117.8). This shows that below 45 years groups are more reactive to thrombotic environment with early onset of coronary events. Triglycerides (117.7 ± 63.22) ($p<0.03$), were slightly but significantly higher in >45 years of age. VLDL, uric acid, urea, BUN, Chloride and sodium level did not show statistically significant differences. potassium (36.89±47.54) value was reported significant higher in above 45 group. Reference studies show similar Hb, PC in below 45 group patients indicating more thrombotic state. Additionally, below 45 group had elevated total cholesterol, triglycerides, levels along with lower HDL level. The comparison underscores that older patient trend to have higher BP, while younger patient may present with higher pulse rate. The comparison underscores that older patient trend to have higher BP, while younger patient may present with higher pulse rate. The Killip class 1 & 2 and MI type AWMI was significantly more prevalent in below 45 group while Killip class 3 & 4 and IWMI was more prevalent in above 45 group. Patients over 45 years show a higher incidence of cardiac arrest (18.08%) and elevated troponin (21.27%). This indicates that advancing age is associated with greater myocardial injury and an increased risk of serious cardiac events.

GRACE score was analysed among 112 STEMI patients, stratified into three risk categories: low (140). Among patients aged 45 years 53.19% were in high-risk category and only 17.02% were in low-risk group. This clearly shows that older patients are at higher risk score indicating a greater adverse outcome and mortality. On the basis of reference studies, it was found that increasing GRACE scores with age, elevated heart rate, higher serum creatinine and Killip class- factors that are commonly more pronounced in older individual.

CONCLUSION

Hypertension, Diabetes and alcohol were found to be significantly more common in patients above 45 years age. Serum Creatinine, Urea, BUN, HDL, Triglycerides were significantly high in patients above 45 age group. Potassium was significantly high in patients below 45 years age. In contrast patients above 45 years age group were experienced severe heart failure (Killip Class 3& 4), IWMI and high GRACE scores.

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