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Original Article

Clinical Status and Laboratory Parameters of Patients with Acute Myocardial Infarction

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Abstract

Background: *Acute Myocardial Infarction (AMI) is a major cause of morbidity and mortality worldwide. It results from sudden blockage of coronary arteries and is influenced by various clinical and biochemical risk factors. Understanding these risk profiles is crucial for early diagnosis and prevention, particularly in resource-limited settings. The purpose of the study is to evaluate and compare the clinical and laboratory characteristics-including blood pressure, risk factors, and serum lipid profiles-of patients with AMI and healthy controls.*

Materials and methods: *This cross-sectional study was conducted at Chattogram Medical College Hospital, Bangladesh, from July 2018 to June 2019. A total of 170 participants (100 AMI patients and 70 healthy controls) were recruited. Clinical parameters (Blood pressure, waist circumference, history of diabetes, hypertension, smoking, and family history) and biochemical markers (Total cholesterol, triglycerides, LDL-C, HDL-C, and Lp(a) were assessed. Data were analyzed using SPSS v 20.0, p-values < 0.05 were considered statistically significant.*

Results: *The majority of AMI patients were middle-aged (40–60 years). Systolic and diastolic blood pressures were significantly higher in cases than in controls (p < 0.001 and p < 0.05, respectively). Prevalence of hypertension (77%) diabetes (30%) smoking (58%) family history of MI (28%) and increased waist circumference (40%) were significantly greater in AMI patients. Biochemical analysis showed elevated levels of total cholesterol, triglycerides, and LDL-C and reduced HDL-C in AMI cases (p < 0.01 or p < 0.001 for all).*

Conclusion: *AMI is strongly associated with modifiable risk factors including hypertension, diabetes, smoking, central obesity and dyslipidemia. Early identification and control of these factors are essential to reduce AMI incidence and improve cardiovascular outcomes.*

Key words: Acute Myocardial Infarction; Lipid Profile; Risk Factors.

INTRODUCTION

Acute Myocardial Infarction (AMI) commonly referred to as a heart attack, remains one of the leading causes of morbidity and mortality worldwide. It is a critical cardiovascular emergency resulting from the interruption of blood flow to a portion of the myocardium, most often due to the rupture of an atherosclerotic plaque and subsequent thrombus formation in the coronary arteries.[1-3] Despite advancements in medical science and interventional cardiology, AMI continues to pose significant challenges in both diagnosis and management, particularly in resource-limited settings.

The clinical presentation of AMI varies, ranging from classic chest pain to more subtle symptoms such as dyspnea, fatigue, or even silent infarctions, especially in diabetic or elderly patients. Prompt recognition of symptoms and early intervention are crucial for reducing infarct size and improving outcomes. Vital signs, such as heart rate, blood pressure and oxygen saturation, often reflect the severity of myocardial damage and the presence of complications like cardiogenic shock or arrhythmias.[4-5]

Laboratory investigations play a pivotal role in confirming the diagnosis and assessing the extent of myocardial injury. Cardiac biomarkers, particularly troponins (I and T) have become the cornerstone for the diagnosis of AMI due to their high sensitivity and specificity. Other laboratory findings such as elevated Creatine Kinase-MB (CK-MB) changes in Complete Blood Count (CBC) lipid profile abnormalities, renal function tests, and markers of inflammation (e.g. C-reactive protein) also provide valuable insights into the patient's overall status and risk profile.[6-7]

Electrolyte imbalances, such as hypokalemia or hyperkalemia, and elevated blood glucose levels are commonly observed in AMI patients and may contribute to worse prognoses if not promptly managed. Moreover, coagulation profiles and D-dimer levels may aid in evaluating the risk of thrombotic complications, particularly in the setting of concurrent conditions like deep vein thrombosis or pulmonary embolism.

Evaluating both clinical and laboratory parameters offers a comprehensive view of the patient's condition and helps in risk stratification, guiding therapeutic decisions such as the need for reperfusion therapy, antithrombotic agents, and intensive monitoring. Serial assessments also help track the progress of recovery or detect potential complications, including heart failure or reinfarction.

In our study our main goal is to evaluate the clinical and laboratory characteristics-including blood pressure, risk factors and serum lipid profiles-of patients with AMI and healthy controls.

MATERIALS AND METHODS

This was a cross-sectional study conducted over a period of one year, from July 2018 to June 2019. The first two months were dedicated to proposal development, followed by six months of data collection. The remaining time was utilized for data processing, analysis, report writing, and literature review, which continued throughout the study period.

The study was carried out in the Department of Biochemistry and the Coronary Care Unit (CCU) of the Department of Cardiology at Chittagong Medical College and Hospital (CMCH) Bangladesh.

170 study population included patients admitted with a confirmed diagnosis of Acute Myocardial Infarction (AMI) in the Cardiology Department of CMCH, as well as healthy individuals serving as controls.

Inclusion criteria

- Diagnosed cases of AMI (Case group)
- Apparently healthy individuals (control group)

Exclusion criteria (Applied to both groups)

- Stroke
- Renal failure
- Liver failure
- Acute infections
- Malignancies
- Refusal to provide consent

Participants were recruited from the Cardiology Department of CMCH. After preliminary screening, the study objectives were explained, and informed written consent was obtained. Data on demographics, clinical history and anthropometry were recorded using a structured, pre-tested case record form.

Anthropometric and Clinical Measurements

- *Waist Circumference:* Measured using a plastic measuring tape.
- *Blood Pressure:* Measured by the auscultatory method using a standard mercury sphygmomanometer.

Sample Collection and Laboratory Analysis

Venous blood (5 ml) was collected from each participant under aseptic conditions. The blood was allowed to clot in red-top tubes and serum was separated by centrifugation at 4000 rpm for 5 minutes. Serum samples were analyzed within 4 hours or stored at -20°C if delayed.

- *Lp(a):* Measured using nephelometry on the Siemens BN ProSpec analyzer.
- *Lipid Profile (TC, TG, HDL-C, LDL-C):* Analyzed by enzymatic kinetic method using an autoanalyzer.

Safety and Biosafety Measures

Universal safety precautions were strictly followed, including the use of lab coats, gloves and safety glasses. All contaminated materials were disposed of in biohazard bags. Hand hygiene was maintained throughout.

Data were analyzed using Microsoft Excel and IBM SPSS version 20.0. Results were presented as mean ± standard error of mean (SEM). Statistical significance was set at $p< 0.05$.

- *Student's t-test* was used to compare means between groups
- *Chi-square test* was used for categorical variables
- *Pearson's correlation* was applied to evaluate relationships between Lp(a) and other variables (Lipid profile, HTN, DM, WC).

Ethical approval was obtained from the Ethical Review Committee of Chittagong Medical College (Memo No: CMC/PG/2018/453). Institutional permission was also secured from the relevant departments.

RESULTS

The baseline socio-demographic characteristics of the study participants revealed notable differences in age distribution between the two groups. A higher proportion of younger individuals (<40 years) was observed in the control group (57.0%) compared to the case group (14.0%), while the majority of cases (57.0%) were in the 40–60 years age group, indicating a higher incidence of acute myocardial infarction (AMI) in middle-aged individuals. Additionally, the proportion of individuals over 60 years was also greater in the case group (29.0%) than in controls (13.0%). In terms of sex distribution, both groups were relatively balanced, with males slightly more represented in both groups-52.0% in cases and 54.28% in controls-indicating no significant gender disparity in this sample.

Table I Distribution of Baseline Socio-Demographic Characteristics among the Study Groups (n = 170)

Socio-Demographic Variables	Group A (%)	Group B (%)	Total (%)
Age Group			
< 40 Years	14.0	57.0	31.76
40 – 60 Years	57.0	30.0	45.88
> 60 Years	29.0	13.0	22.35
Gender			
Male	52.0	54.28	52.94
Female	48.0	45.72	47.06

The analysis of blood pressure levels between the two study groups revealed significant differences. The mean systolic blood pressure was significantly higher in the case group (128.20 ± 1.91 mmHg) compared to the control group (114.60 ± 1.33 mmHg) with the difference being highly statistically significant ($p < 0.001$). Similarly, the mean diastolic blood pressure was also higher in the case group (79.95 ± 1.19 mmHg) than in the control group (76.00 ± 0.74 mmHg) and this difference was statistically significant ($p < 0.05$). These findings suggest a strong association between elevated blood pressure and acute myocardial infarction.

Table II Distribution of blood pressureamong the study groups (n = 170)

	Study Groups	n	Mean	± SEM	Range	t-test* Significance
Systolic Blood Pressure (mmHg)	Group A	100	128.20	1.91	80 – 180	p < 0.001
	Group B	70	114.60	1.33	90 – 130	Highly
	TOTAL	170	123.67	1.44	80 – 180	Significant
	Study Groups	**n**	**Mean**	**± SEM**	**Range**	**t-test* Significance**
Diastolic Blood Pressure (mmHg)	**Group A**	**100**	**79.95**	**1.19**	**50 – 110**	**p < 0.05 Significant**
	Group B	70	76.00	0.74	70 – 85	
	TOTAL	170	78.63	0.85	50 – 110	

The distribution of major cardiovascular risk factors showed significant differences between the case and control groups. Hypertension was markedly more prevalent among cases (77%) compared to controls (11.43%) with a highly significant association ($p < 0.001$). Similarly, diabetes was present in 30% of cases and only 11.43% of controls ($p < 0.01$). Smoking was found to be a strong risk factor, reported by 58% of cases versus just 4.28% of controls ($p < 0.001$). A positive family history of myocardial infarction was observed in 28% of cases compared to 5.71% of controls ($p < 0.01$). Additionally, increased waist circumference was more common in cases (40%) than in controls (24.28%) showing a statistically significant difference ($p < 0.05$). These findings highlight the strong association between these modifiable and non-modifiable risk factors and the occurrence of acute myocardial infarction.

Table III Distribution of risk factorsamong the study groups (n = 170)

Risk Factors		Study Groups		Total (n = 170)	Chi-square Test Significance
		Group A (n = 100)	Group B (n = 70)		
Hypertension	Present	77 (77.0)	8 (11.43)	85 (50.0)	p < 0.001 Highly Significant
	Absent	23 (23.0)	62 (88.57)	85 (50.0)	
Diabetes	Present	30 (30.0)	8 (11.43)	38 (22.35)	p < 0.01 ighly HSignificant
	Absent	70 (70.0)	62 (88.57)	132 (77.65)	
Smoking Status	Smoker	58 (58.0)	3 (4.28)	61 (35.88)	p < 0.001 Highly Significant
	Non-smoker	42 (42.0)	67 (95.72)	109 (64.11)	
Family History	Present	28 (28.0)	4 (5.71)	32 (18.82)	p < 0.01 Highly Significant
	Absent	72 (72.0)	66 (94.29)	138 (81.18)	
Waist Circumference	Increased	40 (40.0)	17 (24.28)	57 (33.53)	p < 0.05 Significant
	Normal	60 (60.0)	53 (75.72)	113 (66.47)	

The comparison of serum lipid profiles between the study groups revealed statistically significant differences across all parameters. Cases of acute myocardial infarction (Group A) had significantly higher mean levels of total cholesterol (200.33 ± 4.94 mg/dl) triglycerides (192.38 ± 8.34 mg/dl) and LDL-C (120.50 ± 3.32 mg/dl) compared to the control group (Group B) which had mean values of 179.88 ± 4.23 mg/dl, 138.36 ± 4.23 mg/dl, and 93.16 ± 2.11 mg/dl respectively. Conversely, the mean HDL-C level was significantly lower in the case group (38.75 ± 0.69 mg/dl) than in controls (45.84 ± 0.99 mg/dl). These differences were all found to be highly statistically significant ($p < 0.01$ or $p < 0.001$) indicating a strong association between dyslipidemia and acute myocardial infarction.

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Table IV Distribution of serum lipid profiles among the study groups (n = 170)

	Study Groups	n	Mean	± SEM	Range	t-test Significance
Serum Total Cholesterol (mg/dl)	Case	100	200.33	4.94	108 – 312	p < 0.01
	Control	70	179.88	4.23	106 – 269	Highly
	TOTAL	170	193.51	3.66	106 – 312	Significant
Serum Triglyceride (mg/dl)	Case	100	192.38	8.34	62 – 450	p < 0.001
	Control	70	138.36	4.23	90 – 284	Highly
	TOTAL	170	174.37	6.13	62 – 450	Significant
Serum LDL-C (mg/dl)	Case	100	120.50	3.32	59 – 202	p < 0.001
	Control	70	93.16	2.11	63 – 148	Highly
	TOTAL	170	111.39	2.55	59 – 202	Significant
Serum HDL-C (mg/dl)	Case	100	38.75	0.69	25 – 62	p < 0.001
	Control	70	45.84	0.99	31 – 57	Highly
	TOTAL	170	41.11	0.63	25 – 62	Significant

DISCUSSION

The findings suggest a higher incidence of AMI among middle-aged individuals, aligning with previous studies which reported that individuals aged 40–60 years are at increased risk due to cumulative exposure to risk factors like hypertension and dyslipidemia.[8] Our results also showed no significant gender disparity, which is consistent with findings from the INTERHEART study, indicating a rising incidence of cardiovascular events in both men and women, although traditionally men have been at higher risk.

Blood pressure analysis revealed significantly elevated systolic and diastolic levels in the case group, supporting the well-established role of hypertension as a major contributor tomyocardial infarction. A Study emphasized the linear relationship between elevated blood pressure and coronary events.[9] Our findings reinforce this association, with systolic blood pressure being significantly higher in cases (128.20 mmHg) compared to controls (114.60 mmHg) suggesting that uncontrolled blood pressure is a critical modifiable risk factor.

In terms of other cardiovascular risk factors, hypertension, diabetes, smoking, positive family history and increased waist circumference were all significantly more prevalent among AMI patients. These observations are consistent with studies which demonstrated a high burden of modifiable risk factors among South Asian populations with cardiovascular diseases.[10] Notably, smoking emerged as a particularly strong risk factor, with 58% of cases being smokers compared to only 4.28% in controls, mirroring the conclusions of WHO reports that highlight tobacco as a major global contributor to premature heart disease.

Dyslipidemia was another significant finding in this study. Patients with AMI had notably higher levels of total cholesterol, triglycerides and LDL-C and lower levels of HD-C than controls. These results echo the findings of who emphasized the critical role of lipoprotein imbalances in atherogenesis.[11] The strong statistical significance of lipid profile differences further supports the use of lipid-lowering strategies in primary and secondary prevention of coronary artery disease.

Moreover, our observation of increased waist circumference in AMI cases aligns with the growing recognition of central obesity as a cardiovascular risk factor. Similar conclusions were drawn in the study which reported that visceral adiposity is more strongly linked to cardiovascular events than general obesity. [12]The metabolic effects of abdominal fat, including insulin resistance and pro-inflammatory states, likely explain this connection.

CONCLUSION

In conclusion, the findings of this study demonstrate a strong association between Acute Myocardial Infarction (AMI) and multiple modifiable and non-modifiable risk factors, including hypertension, diabetes, smoking, dyslipidemia, central obesity, and a positive family history. Middle-aged individuals (40–60 years) were most affected, highlighting the critical period for preventive interventions. Significantly higher levels of blood pressure, total cholesterol, triglycerides, and LDL-C, along with lower HDL-C in AMI patients, emphasize the importance of early screening and targeted lifestyle and pharmacological interventions to reduce the burden of cardiovascular disease in at-risk populations.

DISCLOSURE

All the authors declared no competing interest.

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