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Original Research Article

SYSTEMIC INFLAMMATION AND CARDIOVASCULAR RISK FACTORS IN ACUTE MYOCARDIAL INFARCTION: A CASE-CONTROL ANALYSIS

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ABSTRACT

Background: The conventional cardiovascular risk factors and inflammatory pathways have been shown to contribute to the development of acute myocardial infarction (AMI). The objective is to compare serum fibrinogen and conventional coronary artery disease (CAD) risk factors between AMI patients and healthy controls.

Materials and Methods: A cross-sectional study was conducted in Aurangabad, including 60 participants: 30 AMI patients and 30 age- and sex-matched controls free of CAD risk factors. The study parameters included serum fibrinogen, lipid profile [triglycerides, low-density lipoprotein cholesterol (LDL-C), total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C)], obesity, smoking, alcohol, hypertension, and diabetes.

Results: Serum fibrinogen was markedly elevated in AMI patients (497.17 ± 57.31 vs 167.87 ± 13.19 mg/dL, $p<0.001$). Conventional risk factor prevalences in AMI were: hypertriglyceridemia 50%, LDL-C 33%, hypercholesterolemia 20%, low HDL-C 17%, obesity 50%, smoking 43%, alcohol 40%, hypertension 17%, and diabetes 17%; all controls were risk-free by design.

Conclusion: AMI patients exhibited clustering of inflammatory and metabolic risk factors, underscoring the multifactorial and inflammatory basis of AMI.

Keywords: Acute myocardial infarction, fibrinogen, dyslipidaemia, obesity, smoking, systemic inflammation

INTRODUCTION

Globally, cardiovascular diseases are a leading cause of mortality, accounting for nearly one-third of global deaths.[1] Coronary artery disease (CAD) has been linked with atherosclerosis and other well-established risk factors like dyslipidaemia, smoking, diabetes, obesity, and hypertension.[2]

Among inflammatory biomarkers, fibrinogen is especially relevant. Elevated fibrinogen may lead to thrombogenesis, endothelial dysfunction, and vascular inflammation.[3-4] Rise in serum fibrinogen has been linked to increase in cardiovascular events.[5-7] Increase in levels of fibrinogen and white blood cells contribute to instability of the plaque, indicating a link between inflammation and acute coronary events.[8]

Although there is availability of data from extensive international studies,[2,9-11] there are few Indian studies that have assessed fibrinogen in AMI patients compared to risk-free controls. We therefore investigated serum fibrinogen levels and other conventional CAD risk factors in AMI patients compared with healthy adults.

MATERIALS AND METHODS

Study Design and Setting: Cross-sectional, case–control study conducted at a tertiary health care centre at Government Medical College, Aurangabad, Maharashtra, India. The study was carried out over a period of ten months. Informed and written consent was taken from all the study participants.

Study Population: A total of 60 participants were enrolled, divided equally into two groups:

- Group A (AMI patients): Thirty consecutive patients under 60 years of age, admitted to the Intensive Coronary Care Unit (ICCU) with a diagnosis of acute transmural myocardial infarction (AMI). Diagnosis was done on the basis of clinical history and characteristic electrocardiographic (ECG) changes.

- Group B (Controls): Thirty age- and sex-matched healthy volunteers recruited from the community, screened to ensure absence of systemic illness, or conventional CAD risk factors.

Inclusion and Exclusion Criteria:

Inclusion criteria

AMI patients aged <60 years with confirmed diagnosis; healthy adults without systemic illness or CAD risk factors.

Exclusion criteria:

Systemic inflammatory or autoimmune conditions, recent use of antibiotics or anti-inflammatory drugs, immunosuppressive disorders, or chronic liver/renal disease.

Data Collection and Clinical Assessment: A structured case record form was used to document demographics, history, and lifestyle factors. All study participants underwent detailed physical examination and their laboratory evaluation was done. Clinical variables included obesity (BMI ≥25 kg/m² or abnormal waist–hip ratio), smoking, alcohol consumption, hypertension (≥140/90 mmHg or known diagnosis), and diabetes mellitus (fasting glucose ≥126 mg/dL or prior diagnosis). Biochemical assessments included serum fibrinogen (Clauss method, mg/dL) and lipid profile (total cholesterol, triglycerides, LDL-C, HDL-C). Dyslipidaemia was defined as triglycerides >150 mg/dL, LDL-C >130 mg/dL, total cholesterol >200 mg/dL, or HDL-C <40 mg/dL.

Study parameters: The primary study parameter was the difference in mean fibrinogen levels between groups. Secondary parameters were the prevalence of conventional CAD risk factors.

Statistical Analysis: Data were entered in Microsoft Excel and analysed using SPSS v11.0. Continuous variables were expressed as mean ± SD and compared using independent-samples t-tests. Categorical variables were expressed as percentages. A p-value <0.05 was considered statistically significant.

RESULTS

A total of 60 participants were analysed, with 30 in each group (AMI and controls). The two groups were matched for age and sex, with no statistically significant differences in baseline demographics.

Serum fibrinogen levels were significantly higher in AMI patients compared to controls (497.17 ± 57.31 vs 167.87 ± 13.19 mg/dL, p<0.001).

The prevalence of conventional risk factors was markedly greater in the AMI group, including hypertriglyceridemia (50%), elevated LDL-C (33%), hypercholesterolemia (20%), low HDL-C (17%), obesity (50%), smoking (43%), alcohol use (40%), hypertension (17%), and diabetes mellitus (17%). In contrast, no such risk factors were observed among controls. These findings are summarised in [Table 1].

Table 1: Serum Fibrinogen and Conventional Risk Factors in AMI vs Controls

Parameter	AMI (n=30)	Control (n=30)	p-value
Fibrinogen (mg/dL)	497.17 ± 57.31	167.87 ± 13.19	<0.001
Triglycerides ↑ (%)	50	0	—
LDL-C ↑ (%)	33	0	—
Total Cholesterol ↑ (%)	20	0	—
Low HDL-C (%)	17	0	—
Obesity (%)	50	0	—
Smoking (%)	43	0	—
Alcohol (%)	40	0	—
Hypertension (%)	17	0	—
Diabetes mellitus (%)	17	0	—

DISCUSSION

This study demonstrated that patients with acute myocardial infarction had significantly elevated serum fibrinogen levels compared to risk-free healthy controls. Additionally, there was a considerably higher prevalence of conventional cardiovascular risk factors among AMI patients, such as dyslipidaemia, obesity, smoking, alcohol use, hypertension, and diabetes. These study results suggest the role of metabolic and inflammatory mechanisms in the pathogenesis of AMI.

Meta-analyses have earlier reported that fibrinogen can be a predictor of cardiovascular events even after adjustment for other established risk factors.[3,4] Fibrinogen can be a contributor to increased plasma viscosity, platelet aggregation, and endothelial dysfunction, thereby accelerating atherothrombosis.[9,10]

The presence of conventional risk factors in AMI patients is in line with study results from the INTERHEART study, that reflected the impact of modifiable risk factors such as dyslipidaemia, smoking, abdominal obesity, and hypertension on myocardial infarction.[2] Our study results support the hypothesis that metabolic risk factors and systemic inflammation often coexist, amplifying cardiovascular risk.[12,13]

Extensive prospective studies, including the Framingham Heart Study,[14] and the Northwick Park

Heart Study,[15] have shown that elevated fibrinogen is strongly associated with cardiovascular morbidity and mortality. Inflammation plays a central role in plaque initiation, progression, and rupture. Cytokine-driven hepatic synthesis of fibrinogen and leucocytosis both promote a prothrombotic environment.[5,8]

The study limitations are a modest sample size, cross-sectional design, and data from a single region in India, which may limit generalisability. Future larger, multicentre, population-based studies are warranted to validate fibrinogen as a routine biomarker in risk prediction.[1,10]

Despite these limitations, our study signifies the importance of including inflammatory markers like fibrinogen into cardiovascular risk assessment that may allow earlier identification of high-risk individuals, particularly in resource-limited settings where traditional lipid and biomarker panels are not routinely performed.

CONCLUSION

The study demonstrated that patients with acute myocardial infarction have significantly higher serum fibrinogen levels compared to risk-free healthy controls, along with an increased prevalence of conventional cardiovascular risk factors like dyslipidaemia, obesity, smoking, alcohol use, high blood pressure and diabetes.

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