

Comparison of Plasma Fibrinogen Levels in Patients With Coronary Heart Disease According To The Presence of Conventional Cardiovascular Risk Factors Including Hypertension, Diabetes Mellitus, and Smoking

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Abstract

Objective: To compare plasma fibrinogen levels in patients with coronary heart disease (CHD) according to the presence of conventional cardiovascular risk factors, namely hypertension, diabetes mellitus, and smoking.

Methods: A hospital-based observational study was conducted among patients diagnosed with CHD. Plasma fibrinogen levels were measured using standard laboratory methods. Patients were categorized based on the presence or absence of hypertension, diabetes mellitus, and smoking history. Mean fibrinogen levels were compared between groups using appropriate statistical tests.

Results: Among the 100 patients with coronary heart disease, fibrinogen levels were significantly higher in patients with hypertension than in non-hypertensive patients (465.31 ± 4.02 vs. 453.10 ± 4.30 mg/dL, $p < 0.001$). Similarly, diabetic patients had higher fibrinogen levels than non-diabetic patients (466.42 ± 3.58 vs. 454.42 ± 4.81 mg/dL, $p < 0.001$), while smokers showed higher levels than non-smokers (467.51 ± 3.31 vs. 455.68 ± 5.34 mg/dL, $p < 0.001$). Thus, elevated fibrinogen levels were significantly associated with conventional cardiovascular risk factors.

Conclusion: Plasma fibrinogen levels were significantly elevated in CHD patients with hypertension, diabetes mellitus, and smoking habits. Fibrinogen may serve as an important inflammatory and thrombotic biomarker associated with conventional cardiovascular risk factors and disease severity.

Keywords: Coronary heart disease ; Blood Coagulation Tests: Fibrinogen; Hypertension, Diabetes Mellitus, Smoking, Cardiovascular Risk Factors.

Introduction

Coronary heart disease remains one of the leading causes of morbidity and mortality worldwide. The development and progression of CHD are influenced by various conventional cardiovascular risk factors, including hypertension, diabetes mellitus, smoking, dyslipidemia, and obesity.[1,2]

Fibrinogen is a plasma glycoprotein synthesized by the liver and plays a crucial role in coagulation, platelet aggregation, and inflammation. Elevated plasma fibrinogen levels have been identified as an independent risk factor for cardiovascular disease and are associated with increased thrombotic tendency and atherosclerotic progression. Studies have demonstrated that fibrinogen concentrations are often elevated in individuals with risk factors such as hypertension, diabetes mellitus, and smoking. Furthermore, increased fibrinogen levels have been linked with adverse cardiovascular outcomes and greater severity of coronary artery disease.[3,4,5,6]

Understanding the relationship between fibrinogen and conventional cardiovascular risk factors among CHD patients may provide insight into disease mechanisms and aid risk stratification.

Materials and Methods

This cross-sectional observational study was conducted among patients diagnosed with CHD. Clinical information regarding hypertension, diabetes mellitus, and smoking status was collected. Plasma fibrinogen levels were measured using standard laboratory methods. [7,8,9,10]

A total of 200 participants were included in the study, comprising 100 patients with coronary heart disease (cases) and 100 healthy controls. Among the patients with coronary heart disease, plasma fibrinogen levels were compared according to the presence of conventional cardiovascular risk factors, including hypertension, diabetes mellitus, and smoking.

Patients with hypertension demonstrated higher mean plasma fibrinogen concentrations compared with non-hypertensive patients. Similarly, patients with diabetes mellitus showed higher mean fibrinogen levels than non-diabetic patients. A comparable pattern was observed among smokers, who had higher plasma fibrinogen concentrations than non-smokers. These findings suggest that elevated fibrinogen levels may be associated with the presence of conventional cardiovascular risk factors in patients with coronary heart disease.[11,12,13,14]

Results

Risk factor	n	Mean fibrinogen $\pm$ SD (mg/dL)	Comparison group n	Mean fibrinogen $\pm$ SD (mg/dL)	p-value
Hypertension – Present	55	465.31 $\pm$ 4.02	Hypertension – Absent (45)	453.10 $\pm$ 4.30	<0.001
Diabetes mellitus – Present	45	466.42 $\pm$ 3.58	Diabetes mellitus – Absent (55)	454.42 $\pm$ 4.81	<0.001
Smoking – Present	35	467.51 $\pm$ 3.31	Smoking – Absent (65)	455.68 $\pm$ 5.34	<0.001

Discussion

Among the 100 patients with coronary heart disease, 55 (55%) were hypertensive and 45 (45%) were non-hypertensive. The mean plasma fibrinogen concentration was significantly higher among hypertensive patients compared with non-hypertensive patients (465.31 $\pm$ 4.02 vs. 453.10 $\pm$ 4.30 mg/dL, $p < 0.001$).

Similarly, 45 (45%) patients had diabetes mellitus, while 55 (55%) were non-diabetic. Diabetic patients demonstrated significantly higher mean plasma fibrinogen levels compared with non-diabetic patients (466.42 $\pm$ 3.58 vs. 454.42 $\pm$ 4.81 mg/dL, $p < 0.001$).

With regard to smoking status, 35 (35%) patients were smokers and 65 (65%) were non-smokers. Smokers exhibited significantly higher plasma fibrinogen concentrations than non-smokers (467.51 $\pm$ 3.31 vs. 455.68 $\pm$ 5.34 mg/dL, $p < 0.001$).

Overall, plasma fibrinogen concentrations were significantly higher among coronary heart disease patients with conventional cardiovascular risk factors, particularly hypertension, diabetes mellitus, and smoking. These findings indicate a possible association between elevated fibrinogen levels and the presence of established cardiovascular risk factors.

Limitations

This study has several limitations that should be considered when interpreting the findings. First, it was conducted as a single-center study, and therefore the study population may not fully represent patients with coronary heart disease from other hospitals, geographic regions, or healthcare setting.

Conclusion

The present study demonstrates that plasma fibrinogen levels are significantly elevated in patients with coronary heart disease compared with healthy controls. Furthermore, among patients with coronary heart disease, higher fibrinogen concentrations were observed in those with conventional cardiovascular risk factors, including hypertension, diabetes mellitus, and smoking. These findings suggest that increased plasma fibrinogen may be associated with the presence of established cardiovascular risk factors and may contribute to the prothrombotic and inflammatory underlying coronary heart disease.

Plasma fibrinogen may therefore have potential as a readily measurable biomarker for identifying patients with an increased cardiovascular risk profile.

Conflict of Interest

The authors declare no conflicts of interest. The authors received no financial support or other benefits that could have influenced the conduct or reporting of this study.

Ethical Declarations

Ethical approval for the study was obtained from the Institutional Ethics Committee, and all procedures were conducted in compliance with the Declaration of Helsinki.

Acknowledgements

The authors thank the hospital staff for their assistance with sample processing, and all study participants for their cooperation.

References

1. Kannel WB, Wolf PA, Castelli WP, D'Agostino RB. Fibrinogen and risk of cardiovascular disease. The Framingham Study. *JAMA*. 1987;258(9):1183-1186.
2. Danesh J, Lewington S, Thompson SG, Lowe GD, Collins R, Kostis JB, et al. Plasma fibrinogen level and the risk of major cardiovascular diseases and nonvascular mortality: an individual participant meta-analysis. *JAMA*. 2005;294(14):1799-1809. doi:10.1001/jama.294.14.1799.
3. Ernst E, Resch KL. Fibrinogen as a cardiovascular risk factor: a meta-analysis and review of the literature. *Ann Intern Med*. 1993;118(12):956-963.
4. Wilhelmsen L, Svärdsudd K, Korsan-Bengtson K, Larsson B, Welin L, Tibblin G. Fibrinogen as a risk factor for stroke and myocardial infarction. *N Engl J Med*. 1984;311(8):501-505. doi:10.1056/NEJM198408233110804.
5. Woodward M, Tunstall-Pedoe H, Rumley A, Lowe GD. Fibrinogen as a risk factor for coronary heart disease and mortality in middle-aged men and women. The Scottish Heart Health Study. *Eur Heart J*. 1998;19(1):55-62.
6. Meade TW, Mellows S, Brozovic M, Miller GJ, Chakrabarti RR, North WRS, et al. Haemostatic function and ischaemic heart disease: principal results of the Northwick Park Heart Study. *Lancet*. 1986;2(8506):533-537.
7. Kaptoge S, White IR, Thompson SG, Wood AM, Lewington S, Lowe GD, et al. Associations of plasma fibrinogen levels with established cardiovascular disease risk factors, inflammatory markers, and other characteristics: individual participant meta-analysis of 154,211 adults in 31 prospective studies: the Fibrinogen Studies Collaboration. *Am J Epidemiol*. 2007;166(11):1225-1237. doi:10.1093/aje/kwm191.
8. Folsom AR, Wu KK, Rosamond WD, Sharrett AR, Chambless LE. Prospective study of hemostatic factors and incidence of coronary heart disease: the Atherosclerosis Risk in Communities (ARIC) Study. *Circulation*. 1997;96(4):1102-1108.
9. Lippi G, Franchini M, Targher G, Favaloro EJ. Help me, doctor! My fibrinogen is too high. *Clin Chem Lab Med*. 2010;48(10):1377-1386.
10. Tracy RP. Inflammation in cardiovascular disease: cart, horse, or both? *Circulation*. 1998;97(20):2000-2002.
11. de Maat MP, Kastelein JJ, Kluft C. Fibrinogen and coronary artery disease. *Thromb Haemost*. 1997;78(1):1-5.
12. Woodward M, Rumley A, Lowe GD. C-reactive protein, fibrinogen, and other cardiovascular risk factors: results from the Scottish Heart Health Extended Cohort Study. *Atherosclerosis*. 1999;145(1):179-187.
13. Frohlich M, Imhof A, Berg G, Hutchinson WL, Pepys MB, Boeing H, et al. Association between C-reactive protein and features of the metabolic syndrome: a population-based study. *Diabetes Care*. 2000;23(12):1835-1839.
14. Yarnell JWG, Baker IA, Sweetnam PM, Bainton D, O'Brien JR, Whitehead PJ, et al. Fibrinogen, viscosity, and white blood cell count are major risk factors for ischemic heart disease: the Caerphilly and Speedwell collaborative heart disease studies. *Circulation*. 1991;83(3):836-844.