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Original Research Article

A Case Control Study on Hs-CRP as an Important Inflammatory Risk marker of CAD in Diabetes Mellitus Patients

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Abstract:

Background: Patients with type 2 diabetes mellitus (T2DM) have an elevated risk of developing coronary artery disease (CAD) when their hs-CRP levels are elevated. The purpose of this study was to evaluate the hs-CRP in patients with type 2 diabetes mellitus who had CAD.

Methods: During the period of July 2022 to June 2023, all patients admitted under the Medicine department (Cardiology wing) of PMCH, Patna, Bihar, were included in the present case control study. The present study included individuals who were willing to participate in the study and who had a history of diabetes mellitus lasting five to ten years and who were aged more than forty.

Results: Seventy patients in total who fulfilled the inclusion criteria were included. Of these, 35 belonged to Group A (T2DM with CAD) and 35 to Group B (T2DM without CAD). Thirty of the patients were female, and forty were male. Patients in group A had a mean age of 57.2±9.4, whereas those in group B had a mean age of 58.2±10.4. These differences were not statistically significant. Patients in group A had a significantly greater mean hs-CRP than patients in group B.

Conclusion: Elevated hs-CRP in T2DM patients has a substantial correlation with coronary artery disease, ashs-CRP is a valid predictor for atherosclerotic events. To identify CAD risk early, we recommend that patients with diabetes mellitus routinely have their hs-CRP levels examined.

Keywords: Diabetes Mellitus, hs-CRP, Coronary Artery Disease.

Introduction

Worldwide, the incidence and prevalence of CAD is increasing rapidly primarily as a result of changes due to Type 2 diabetes, which is not insulin-dependent. Of all cases of diabetes, type 2 DM represents over 90%. [1, 2]

Ischemic heart disease is the most common cause of death and cardiovascular problems are the main source of morbidity in diabetic people. [3] Compared to non-diabetic individuals of similar age, sex, and ethnicity, patients with diabetes have two-to eight-fold increased risk of cardiovascular disease (CVD). [4,5] Early coronary syndrome and death from an early myocardial infarction are two additional risks that diabetes is linked to in people with coronary artery disease (CAD). [6,7]

Insulin resistance, a pro-inflammatory and hypercoagulable condition that predisposes individuals to CVD, is the pathophysiological cause of type 2 diabetes. Atherosclerosis risk factors, such as dyslipidemia, hypertension, inflammation, and poor hemostasis, are linked to type 2 diabetes. [8] Measurement of hs-CRP may be beneficial for patients at intermediate or high risk of coronary artery disease, according to the American Heart Association's recommendation. Patients with T2DM have an elevated risk of developing CAD when their hs-CRP levels are elevated. [9]

The purpose of this study was to evaluate the hs-CRP in patients with type 2 diabetes mellitus who had CAD.

Material and Methods

In this case control study, which was carried out between July 2022 and June 2023, all patients admitted under the medicine department (cardiology wing) of Patna Medical College and Hospital, Patna, Bihar was included.

The present study comprised individuals who were willing to participate in the research and who had a history of diabetes mellitus lasting five to ten years and who were aged more than forty. Patients with

diabetes mellitus and CAD were grouped as cases in Group A, while patients without diabetes mellitus and CAD were grouped as controls.

According to ADA guidelines, fasting blood sugar (FBS) and/or HbA1c readings were recorded in order to evaluate diabetes. [10]

Cases of Cardiology that had already been identified with CAD and Type 2 Diabetes were considered to be in good standing (positive treadmill test according to American Heart Association). Using comparable criteria, patients with type 2 diabetes who had no CAD diagnosis were included as controls.

Five milliliters of fasting blood samples were drawn in plain and EDTA vacutainers from the patients and controls.

Samples were left to clot for two hours at room temperature before being centrifuged for fifteen minutes at 1000×g at 2~8° C. However, HbA1c was measured using the BioRad D-10 analyzer, which applies the principles of ion-exchange high-performance liquid chromatography (HPLC), while Hs-CRP was measured using a Beckman auto analyzer using a Latex enhanced immunoturbidometric method. All of the data was entered into an Excel spread sheet, and SPSS v21, a Windows program, was used for analysis. The median and inter-quartile range was indicated for data that were not normally distributed, and the data are displayed as mean standard deviation. The student t-test was used to analyze the mean difference between the normally distributed data and the Mann-Whitney U test was used to analyze the non-normally distributed data. P-values less than 0.05 were regarded as statistically significant.

Result

Seventy patients in total who met the inclusion criteria were included. Of these, 35 belonged to Group A (T2DM with CAD) and 35 to Group B (T2DM without CAD).

Thirty of the patients were female, and forty were male. Patients in group A had a mean age of 57.2±9.4, whereas those in group B had a mean age of 58.2±10.4. These differences were not statistically significant.

Nine patients had a history of smoking, and six patients had previously consumed alcohol. 35 participants in Group A had positive results from the treadmill test and ECG. Diabetes individuals with CAD had statistically significant elevated levels of hs-CRP in contrast to those without CAD. (Table 1)

Table 1: Mean age of the patients in two groups

	Group A (Mean±SD)	Group B (Mean±SD)	p-value
Age in years	57.2±9.47	58.2±10.47	0.69

P-value < 0.05 statistically significant. Group A: DM with CAD; Group B:DM without CAD. When compared to diabetic individuals without CAD, the diabetic patients with CAD had a significantly higher median hs-CRP. (Table 2)

Table 2: Showing the median value of hs-CRP and Cyclophilin A in both groups using Mann-Whitney U Test

Mann-Whitney U Test	Group A (DM with CAD) Median (Min. – Max.)	Group B (DM without CAD) Median (Min. – Max.)	p-value
hs-CRP (mg/dL)	2.73 (1.01 – 17.31)	0.98 (0.2 – 7.87)	0.001

P < 0.05 statistically significant; < 0.001 statistically highly significant. The findings of the lipid profile revealed a substantial mean difference in the levels of total and LDL cholesterol between the two groups. (Table 3)

Table 3: Mean difference in Lipid profile among Group A (DM with CAD) and Group B (DM without CAD)

	Group A (DM with CAD)		Group B (DM without CAD)		p-value
	Mean	Std. Deviation	Mean	Std. Deviation	
Total Cholesterol (mg/dL)	164.51	60.10	218.06	53.71	0.001
High Density Lipoprotein (mg/dL)	47.11	54.48	43.53	12.37	0.710
Very low density lipoprotein (mg/dL)	40.38	25.21	41.12	22.26	0.897
Low density lipoprotein (mg/dL)	84.57	35.47	133.82	38.50	0.001
Triglyceride (mg/dL)	192.70	119.21	198.06	107.28	0.843
Urea (mg/dL)	31.73	13.18	29.88	15.56	0.590
Creatinine (mg/dL)	1.12	0.88	0.88	0.42	0.143

P<0.05 statistically significant; <0.001 statistically highly significant.

Discussion

Patients with diabetes mellitus have higher rates of all kinds of CVD in terms of prevalence, incidence, and death. [4,5] The assessment of hs-CRP, a significant inflammatory marker, can forecast future vascular events on its own, improving the overall risk classification regardless of an individual's LDL-C values. [11,12]

According to a carotid artery risk for atherosclerosis study (ICARAS), patients with increased inflammation are often at a higher risk of developing atherosclerosis. The study also revealed that hs-CRP was greater in patients with systemic progressive atherosclerosis disease. [13]

One of the early markers for identifying the underlying subclinical inflammation that the patients were experiencing was Hs-CRP. It is a recognized marker for the prognosis of atherosclerosis and the problems associated with diabetes mellitus in both diabetic and non-diabetic patients. There is evidence that CAD patients have higher hs-CRP concentrations than non-CAD patients.

Hepatocytes and certain extra-hepatic tissues, including vascular smooth muscle, atherosclerotic plaques, and intracardial tissue, generate CRP, which is a member of the pentraxin protein family. In fact, peripheral blood inflammation biomarker testing is becoming more important as cardiac imaging techniques are rarely used to assess vascular inflammatory alterations. The most thoroughly researched biomarker in CAD and CVDs is hs-CRP. It remains stable insample over long periods of time and can be tested quitesimply, rapidly and inexpensively. [14] Hs-CRP levels amongthe Group-1 patients [2.73 (1.01 - 17.31)] was significantly higher than group-2 patients [0.98 (0.7-7.87)] (p-value <0.001). Similar findings were present in recent studies. [15,16]

Conclusion

Elevated hs-CRP in patients has a substantial correlation with coronary artery disease, and hs-CRP is a valid predictor for atherosclerotic events. In diabetic CAD, there was a positive correlation seen between high levels of hs-CRP and multivessel disease. To identify CAD risk early, we recommend that patients with diabetes mellitus routinely have their hs-CRP levels evaluated.

References

1. King H, Aubert RE, Herman WH. Global Burden of Diabetes, 1995-2025: Prevalence, numerical estimates, and projections. Diabetes Care. 1998; 21(9):1414–31.
2. Boyle JP, Honeycutt AA, Narayan KMV, Hoerger TJ, Geiss LS, Chen H, et al. Projection of Diabetes Burden Through 2050: Impact of changing demography and disease prevalence in the U.S. Diabetes Care. 2001; 24(11):1936–40.
3. Grundy SM, Howard B, Smith SJ, Eckel R, Redberg R, Bonow RO. Prevention Conference VI: Diabetes and Cardiovascular Disease: executive summary: conference proceeding for healthcare professionals from a special writing group of the. Am Heart Assoc.2002; 105:2231–9.
4. Kleinman JC, Donahue RP, Harris MI, Finucane FF, Madans JH, Brock DB. Mortality among diabetics in a national sample. Am J Epidemiol. 1988; 128(2):389–401.
5. Butler WJ, Ostrander L, Carman WJ, Lamphiear DE. Mortality from coronary heart disease in the Tecumseh study. Long-term effect of diabetes mellitus, glucose tolerance and other risk factors. Am J Epidemiol. 1985; 121(4):541–7.
6. Gu K, Cowie CC, Harris MI. Diabetes and decline in heart disease mortality in US adults. JAMA. 1999; 281(14):1291–7.
7. Aronson D, Rayfield EJ, Chesebro JH. Mechanisms determining course and outcome of diabetic patients who have had acute myocardial infarction. Ann Intern Med. 1997; 126(4):296–306.
8. Dandona P. Effects of Antidiabetic and Antihyperlipidemic Agentson C - reactive protein. Mayo Clin Proc. 2008; 83(3):333–42.
9. Pfützner A, Forst T. High-Sensitivity C-Reactive Protein as Cardiovascular Risk Marker in Patients with Diabetes Mellitus. Diabetes Technol Ther. 2006; 8(1):28–36.
10. Association AD. Diagnosis and classification of diabetes mellitus. Diabetes Care. 2010; 33(Suppl 1):62–9.
11. Ridker P, Cushman M, Stampfer MJ, Tracy RP, Hennekens CH. Inflammation, Aspirin, and the Risk of Cardiovascular Disease in Apparently Healthy Men. N Engl J Med. 1997; 336(14):973–9.
12. Ballantyne CM, Hoogeveen RC, Bang H, Coresh J, Folsom AR, Heiss G, et al. Lipoprotein-Associated Phospholipase A2, High-Sensitivity C-Reactive Protein, and Risk for Incident Coronary Heart Disease in Middle-Aged Men and Women in the Atherosclerosis Riskin Communities (ARIC) Study. Circulation. 2004; 109(7):837–42.
13. Blackburn R, Giral P, Bruckert E, André JM, Gonbert S, Bernard M, et al. Elevated C-Reactive Protein Constitutes an Independent Predictor of Advanced Carotid Plaques in Dyslipidemic Subjects. Arteriosclerosis Thromb Vasc Biol. 2001; 21(12):1962–8.
14. Salazar J, Martinez M, Mervin C, Toledo A, Anez R, Torres Y. Creactive protein: clinical

and epidemiological perspectives. Cardiol Res Pr. 2014; 2014:605–8.
15. Ramachandran S, Venugopal A, Kutty V, Vinitha A, Divya G, Chitrasree V, et al. Plasma level of cyclophilin A is increased in patients with type 2 diabetes mellitus and suggests presence of vascular disease. Cardiovasc Diabetol. 2014; 13(1):38.
16. Satoh K, Nigro P, Berk BC. Oxidative Stress and Vascular Smooth Muscle Cell Growth: A Mechanistic Linkage by Cyclophilin A. Antioxid Redox Signal. 2010; 12(5):675–82.