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THE INFLAMMATORY FINGERPRINT OF CORONARY ARTERY DISEASE – A PROSPECTIVE OBSERVATIONAL STUDY

Original Research Article

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Abstract

Background: The pathophysiology of atherosclerosis is significantly influenced by inflammation. We have investigated the correlation of hs-CRP levels with clinical profile and coronary artery disease angiographic severity. **Materials and Methods:** This study was performed at Department of cardiology Govt. Stanley medical college. Fifty patients (37 males and 13 females) with angiographically assessed CAD were involved in this study. The severity of each patient's CAD was assessed using vascular scoring. Lipid profile and high sensitivity C-reactive protein (hs-CRP) were analysed. **Results:** The age of 50 patients was 58.72 ±12.81 years and comprised 74% males and 26% females. Angiographic findings of the patients demonstrated that the prevalence of single vessel disease (SVD), double vessel disease (DVD), and triple vessel disease (TVD) were 42%, 36%, and 22%, respectively. Based on the hs-CRP cut-off value, patients were subdivided into high levels (hs-CRP < 3 mg/L) and low levels groups (hs-CRP > 3.1 mg/L), which indicated that 71.4%, 44.4%, and 18.2% of patients had SVD, DVD, and TVD, respectively in hs-CRP <3 Category, whereas 28.6%, 55.6%, and 81.8% of patients had SVD, DVD, and TVD, respectively, in the hs-CRP >3.1 categories. Both groups of high- and low- hs-CRP levels were compared, which showed a significant difference in both categories (p=0.014). **Conclusion:** We conclude that hs-CRP levels are significantly higher in patients with angiographically detected CAD and are associated with the existence and severity of CAD.

INTRODUCTION

Inflammation is a crucial element in the onset, development, and diagnosis of coronary artery disease (CAD). Inflammation has received much attention as a separate risk factor.[1] It plays a role in several stages of the progress of atherosclerosis, and activating inflammatory responses may be a significant factor in plaque instability.[1,2] The production of cytokines and procoagulant chemicals is increased by activating proinflammatory cells and the overexpression of adhesion molecules. Acute coronary syndrome (ACS) is caused by these chemicals, which also encourage the thickness or rupture of atherosclerotic plaques.[1,3] Interleukin-6 (IL-6), IL-1, and tumour necrosis factor-α (TNF-α) are three transacting cytokines that are necessary for the manufacture of the liver protein known as C-Reactive Protein (CRP).[4]

The diagnosis and assessment of infection, tissue damage, inflammatory illnesses, and related diseases are all improved by CRP measurement.[5] High levels of CRP have been observed in people with metabolic disorders like insulin resistance, obesity, dyslipidaemia, and unstable angina (UA).[4] It has been hypothesised that high concentrations of high-sensitivity CRP (hs-CRP) are linked to unfavourable outcomes in various cardiovascular disorders, type 2 diabetes mellitus (T2DM), and high blood pressure.[6] Hs-CRP levels are a powerful independent risk marker for identifying people at risk for developing cardiovascular disease. They may be helpful as an independent predictor of prognosis for recurrent episodes in patients with stable coronary disease or ACS.[5] In this study, we

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investigated the correlation of hs-CRP levels with clinical profile and angiographic severity of coronary artery disease.

MATERIALS AND METHODS

This study comprised of 50 CAD patients underwent coronary angiography at Department of cardiology Govt. Stanley medical college from October 2022 to December 2022.

Inclusion Criteria
CAD patients undergoing coronary angiography aged between 40 and 70 were included.

Exclusion Criteria
Severe respiratory disease, renal or liver disease, pregnancy, and associated inflammatory conditions such as acute or chronic infections, autoimmune disorders, or cancer were excluded.

Informed consent was signed by each participant before their inclusion in the study. The study received approval from our university's Institutional Ethics Committee board and adhered to the WMA Declaration of Helsinki's ethical principles. Further, information, including the age and sex of the participants, addiction habits, and the presence of comorbid conditions like diabetes mellitus (DM) and hypertension (HTN), were collected.

Angiographic diagnostic criteria

A 50% obstructive stenosis in at least one major coronary artery was considered a diagnosis of coronary artery disease (CAD). From hospital records, the clinical presentation of patients was noted. Chest pain lasting longer than 20 minutes, the persistent electrocardiographic elevation of the ST segment, and elevated cardiac troponin I (cTnI) concentrations indicative of an acute complete coronary blockage were all considered symptoms of ST-elevation myocardial infarction (STEMI). It is necessary to perform primary angioplasty or fibrinolytic treatment to achieve quick, thorough, and persistent reperfusion.

The assessment of CAD severity
All patients had percutaneous coronary intervention (PCI) and an angiographic evaluation. The severity of CAD was assessed based on the quantity and degree of severe stenosis in the coronary arteries. There are two levels of stenosis: moderate (classified as 50%–70%) and severe (70%–99%).

Laboratory Tests
From all the participants, serum samples were collected and stored at −80 °C until use. Standard techniques were used to assess triglycerides (TG), total cholesterol (TC), high-density lipoprotein-cholesterol (HDL-C), and hs-CRP. By using Friedewald's equation, low-density lipoprotein-cholesterol (LDL-C) was calculated.

Statistical Analysis
The Statistical Package for the Social Sciences was used to analyse the data. Continuous variables were defined as mean ± SD for normal distribution, while categorical data were summarized as frequencies or percentages. Categorical variables were compared using the Chi-square test. $P < 0.05$ were considered significant.

RESULTS

The baseline characteristics of the 50 patients with CAD were described in Tables 1 and 2. The mean age of patients was 58.72 ±12.81 years and comprised 74% males and 26% females. The prevalence of cardiovascular risk factors was reported as a family history of CAD (22%), diabetes mellitus (42%), hypertension (36%), alcohol (24%), smoking (38%), and menopause (90.8%). The lipid profile parameters indicated somehow high levels of TC (198.18 ±91), TG (156.65 ±74), and LDL (121.61 ±25.16), and low levels of HDL (42.5 ±13.58). The hs-CRP levels were reported as 4.54 ±0.55 [Tables 1 and 2].

Table 1: Clinical profile of study participants

Variables	Mean ± SD
Age	58.72 ±12.81
TC	198.18 ±91
TG	156.65 ±74
HDL	42.5 ±13.58
LDL	121.61 ±25.16
Hs-CRP	4.54 ±0.55

Table 2: Baseline characteristics of study participants

Variables	Frequency	Percentage
Male	37	74.0%
Female	13	26.0%
Family history	11	22.0%
DM	21	42.0%
HTN	18	36.0%
Smoking	19	38.0%
Alcohol	12	24.0%

Angiographic findings of the study subjects

Angiographic findings of the patients indicated that the prevalence of single vessel disease (SVD),

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double vessel disease (DVD), and triple vessel disease (TVD) were 42%, 36%, and 22%, respectively [Figure 1].
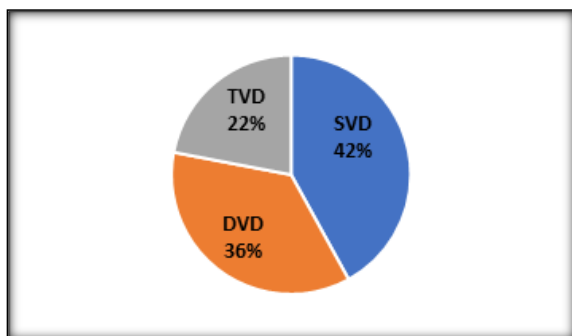

Figure 1: Prevalence of single, double, and triple vessel disease in study participants

Relationship between hs-CRP levels and angiographic findings:

Based on the hs-CRP cut-off value, patients were subdivided into the high level (hs-CRP < 3 mg/L) and low level groups (hs-CRP > 3.1 mg/L). This data indicated that 71.4%, 44.4%, and 18.2% of patients had SVD, DVD, and TVD, respectively, in hs-CRP <3 Category, whereas 28.6%, 55.6%, and 81.8% of patients had SVD, DVD, and TVD, respectively, in the hs-CRP >3.1 categories. Both groups of high- and low- hs-CRP levels were compared, showing a significant difference in both categories (p=0.014) [Figure 2].
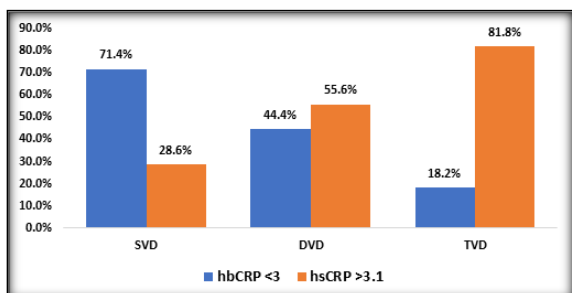

Figure 2: Relationship between hs-CRP levels and angiographic findings

DISCUSSION

Inflammation has been demonstrated a key role in each stage of atherosclerosis. Inflammatory indicators play a role in the progression of ACS by encouraging the development of atheromas, destabilising damaged atherosclerotic plaques, forming occlusive thrombi, and ultimately leading to thrombotic problems.[7,8] As a reliable, independent marker for cardiovascular disease and death risk, CRP is helpful in the prognosis of MI and UA.[9-11] Increased hs-CRP levels were linked to plaque susceptibility, macrophage differentiation, and endothelial dysfunction.[12] CRP encourages angiotensin's proatherogenic action, changes the shape and function of arteries, accelerates vascular repair, thickens the blood vessels, and raises peripheral vascular resistance. Vascular endothelium dysfunction is caused by CRP's interference with processes that regulate arterial blood pressure.[13,14]

The data reported in our study showed a significant difference in angiographic findings after the categorisation of hs-CRP in low and high levels groups (p=0.014). According to a study by Habib and Al Masri, hs-CRP is an indicator of both the presence and severity of CAD.[15] Other studies by Manoharan G et al. and Seyedian et al. exhibited that hs-CRP was linked to the severity of coronary stenosis in CAD patients.[16,17] One vessel disease patient may have numerous substantial plaques and stenosis, high levels of inflammatory cytokines, and a high incidence and numeral of cardiovascular risk factors. The different relationships between hs-CRP and degree and severity in CAD patients may be attributed to the complex nature of CAD and the variations in clinical consequences and indications.[18]

The prevalence and correlates of elevated hs-CRP have been re-evaluated by Cushman et al. They stated a substantial influence of hs-CRP measurement on CAD risk categorisation. They noticed that the Reynolds risk score categorised the population differently than the new Framingham risk scores when hs-CRP was included in their testing data.[19] There was a strong correlation between elevated hs-CRP levels and several traditional cardiovascular risk factors, including smoking, diabetes, and hypertension.[20] Discordance between the prevalence of cardiovascular risk factors and the degree of CAD has been theorised to be caused by inflammation, hereditary factors, age, hypercholesterolemia, and diabetes.[18] Furthermore, it has been demonstrated that hs-CRP levels are decreased by hypolipidemic medications, supporting its role in the inflammatory mechanism underlying cardiovascular disease.[21] According to our research, these risk factors were present in a modest percentage of the study participants.

The hs-CRP levels were allied to the incidence of CAD. Still, the correlation about severity was not significant, according to a study conducted in the Indian population to ascertain the concentration of hs-CRP and its association with coronary atherosclerosis measured by coronary angiography.[22] It is recommended that coming study methods should look for more variables that could account for regional variations in inflammatory biomarkers among healthy females.[23] Hrira et al. found a strong correlation between ApoB and hs-CRP levels and the severity of CAD in Tunisian patients.[24] Our investigation's insignificant sample size and cross-sectional strategy are potential limitations.

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CONCLUSION

We conclude that hs-CRP levels are linked with the presence and severity of CAD in patients with angiographically assessed CAD and are considerably greater in these patients than in healthy controls. Furthermore, future studies on a broad scale are required to investigate the true morbific significance of hs-CRP in determining cardiovascular risk.

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