ORIGINAL ARTICLE

C-Reactive Protein And Lipid Profile In Ischemic Heart Disease A Cross-Sectional Analytical Study

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Abstract:

Inflammation plays a major role in the initiation, progression & destabilization of atheroma. C-reactive protein (CRP) is a sensitive marker of inflammation, and elevated levels have been associated with future risk of myocardial infarction (MI). Risk of coronary heart disease & other forms of atherosclerotic vascular disease rises with plasma cholesterol concentration & in particular the ratio of total cholesterol to high density lipoprotein (HDL-C) cholesterol. Measurement of C- reactive protein (CRP) adds to the predictive value of total cholesterol (TC) and HDL cholesterol (HDL-C) in determining subsequent risk of first myocardial infarction.

Methods: This cross-sectional analytical study was undertaken to observe association between high sensitive CRP and lipid profile level with chronic ischaemic heart disease and was conducted in the Department of Biochemistry, Dhaka Medical College, Dhaka from July 2010 to June 2011. A total 50 cases were selected purposively according to the selection criteria from the patients admitted in the Department of Cardiology, Dhaka Medical College Hospital with chronic ischaemic heart disease (IHD). Diagnosed IHD patients were taken as cases; age- & sex- matched 50 healthy subjects were taken as controls. Serum hsCRP and serum TC, TAG, LDL-C & HDL-C were measured in all study subjects. Results: The mean serum CRP concentration in cases and controls were 11.22±7.64 mg/dl and 1.72±0.98 mg/dl respectively. Mean serum TC, TAG, HDL-C and LDL-C in cases groups were 314±74 mg/dl, 288±60 mg/dl, 36±4 mg/dl, and 178±22 mg/dl respectively and in controls groups were 175±19 mg/dl, 118±12 mg/dl, 43±2 mg/dl & 126±11 mg/dl respectively. Serum hsCRP, Total Cholesterol, TAG & LDL-C were significantly higher in cases than control subjects. Serum HDL-C was significantly lower in cases than control subjects. Conclusions: The present study reveals that the patients of chronic ischaemic heart disease have been found to have close association of increased level of hsCRP and lipid profile.

Key words: Myocardial infarction, c-reactive protein, total cholesterol (TC), triacylglycerol (TAG), high-density lipoprotein (HDL-C) cholesterol, low-density lipoprotein (HDL-C) cholesterol.

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Introduction :

Coronary heart disease remains the leading cause of morbidity & mortality in the industrialized world. Clinical & laboratory studies have shown that inflammation plays a major role in the initiation, progression& destabilization of atheroma[1]. Virtually all people develop the first lesions of vascular disease that starts early in life and progresses slowly and silently for decades. This lesion may evolve into typical plaques, which may progress through various stages from the relatively simple structure of fatty streak to the stable or sometimes-unstable plagues of advanced atherosclerosis[2]. CRP is a non-specific acute phase protein produced by the liver in response to injury, infection & inflammation[3]. Mild CRP elevation (within the

normal, non-acute-phase range) is emerging as a marker of cardiovascular risk3. Mildly elevated CRP has been linked with risk for cardiovascular diseases (CVD), including recurrent coronary events & stroke[4], vascular events after stroke, myocardial infarction & patients with peripheral vascular disease[4]. Studies with highly sensitive assays such as Cardio CRP have consistently shown CRP to be a predictor of increased cardiovascular risk in both men & women[3]. Its predictive value is higher than other established risk factors, including LDL-Cholesterol[3], and the combination of CRP level, LDL-Cholesterol: HDL-Cholesterol ratio is more predictive than either risk factor alone[5]. About half of the individuals in the United States who develop myocardial infarction have normal cholesterol level would be missed with cholesterol screening alone[6]; adding CRP measurement to current methods could improve detection of such individuals. CRP is a marker of cardiovascular risk not only among those with stable & unstable angina, the elderly & selected high risk patients but also among individuals with no current evidence of cardiovascular disease[7]. CRP adds to the ability to predict atherothrombotic risk with more confidence than currently achievable with standard lipid screening[7]. Measuring CRP added to the predictive value of TC & HDL-C in determining subsequent risk of first MI. In addition, determine the risks of future MI associated with CRP were present among those with low risk as well as high-risk profiles as assessed by baseline lipid status[7]. The present study was carried out to see the association of CRP & lipid profile with the ischemic heart disease.

Materials and Methods :

The study was carried out in the Department of Biochemistry, Dhaka Medical College, Dhaka during the period of July 2010 to June 2011. The patients were taken from the department of cardiology, Dhaka Medical College Hospital. Chronic IHD patients of both sexes & with age range of 30-65 years were considered as cases; and the control were age & sex matched healthy volunteers. Cases were the diagnosed (positive ECG findings) chronic IHD patients of both sexes admitted in the hospital during the study period. In this study sample size were taken as 100. Fifty patients with chronic IHD were taken as cases among which 31 were males & 19 were females; and 50 age-sex matched healthy volunteers were taken as controls among which 28 were males & 22 were females. All statistical analyses were done by SPSS, version 17.0. Results were expressed as mean± SD. Student's't' test was done to see the difference and $P < 0.05$ was considered as significant.

Results :

Sex distribution of the study subjects are presented in Table-I. Group I included 31 males & 19 females of chronic IHD patients of age range 30-65 years. In group II, healthy control of age range 30-65 years were included where 28 were males & 22 were females.

Table I. Sex distribution of the study subjects

Sex	Group I (n=50) Frequency	Group II (n=50) Frequency
Male	31 (62.0)	28 (56.0)
Female	19 (38.0)	22 (44.0)

Figures in parentheses indicate percentage

Table II. Level of BMI in the study groups

BMI	Male (31)	Female (19)	Total (50)
Group I	27-33	25-30	29.2 ±43
Group II	20.5-24.5	18.5-22.5	21.5 ±3.1

Results were expressed as Mean±SD. Unpaired student's t-test was performed to calculate statistical difference. ($P<0.05$) was taken as level of significance. Group-I, subjects with myocardial infarction; Group- II, healthy subjects.

Table- III. Shows the level of hsCRP in different groups. In group I (cases) & group II (controls), mean values were 11.22±7.64 mg/ L with range

3.41- 30.8 mg/ L & 1.64±0.98 mg/ L with range 0.29- 3.0 mg/ L respectively.

In group-I (cases), mean values (11.22±7.64 mg/ L) were significantly higher than group II healthy controls (1.64±0.98 mg/ L).

Table III. Level of hsCRP in the study groups

hsCRP (mg/L)	Group I (n=50)	Group II (n=50)	t value	P value
Mean±SD	11.22±7.64	1.64±0.98	8.720	0.0001*
Range	3.41 30.80	0.29 3.0		

Unpaired Student's 't' test * = Significant (P<0.001)

Table- IV. Shows the lipid profile in different groups. There was observed significant difference between two groups. Mean (±SD) of TC, TAG, LDL-C were significantly high in group-I than group-II & Mean (±SD) of HDL-C was significantly high in group-II than group-I.

Table IV. Lipid profile of the study subjects

Parameters	Group I (n=50)	Group II (n=50)	t value	P value
TC (mg/dl)				
Mean±SD	314±74	175±19	12.995	0.0001*
Range	160 388	130 194		
TAG (mg/dl)				
Mean±SD	288±60	119±11	19.316	0.0001*
Range	171 348	90 130		
LDL c (mg/dl)				
Mean±SD	178±22	126±11	14.557	0.0001*
Range	150 200	115 137		
HDL c (mg/dl)				
Mean±SD	36±4	43±2	10.207	0.0001*
Range	20 40	40 45		

Unpaired Student's 't' test * = Significant (P<0.001)

Table-V shows the correlation coefficient between hsCRP & lipid profile in two groups. In group I (cases) strong positive correlation found between serum hsCRP & TC, TAG LDL-C, whereas strong negative correlation found between serum hsCRP & HDL-C.

Table V. Correlation coefficient between hsCRP and lipid profile in case and control

hsCRP	TC		TAG		LDL c		HDL c	
	Value r	Value p	Value r	Value p	Value r	Value p	Value r	Value p
Group I	+0.275	0.053	+0.210	0.143	+0.151	0.295	-0.286	0.044
Group II	-0.225	0.117	-0.212	0.138	-0.086	0.553	+0.213	0.138

Pearson's correlation coefficient test was carried out.

Discussion :

In this cross- sectional analytical study we have measured the serum hsCRP and lipid profile concentration in IHD cases (Group I) and healthy control subjects (Group II) to evaluate the involvement of hsCRP and lipid profile with IHD. The present study has revealed that the mean serum hsCRP concentration 1.64±0.98 mg/ L with the range 0.29-3.0 mg/L in healthy control group. This is nearly consistent with several studies[8,9,10]. Serum hsCRP concentration found in group I (IHD) ranges from 3.41-30.8 mg/ L with the mean 11.22±7.64 mg/ L. IHD patients of this study has shown serum hsCRP concentration significantly high in comparison to control. Same phenomenon observed in many other studies around the world[5,7,11]. One recent study revealed that elevated hsCRP levels were associated with an 8-fold increase in cardiovascular mortality but have no predictive value for death from other causes[12]. Other studies show that hsCRP level predicts heart attack and stroke but not malignancy or other disorder. Thus persistently elevated hsCRP level is indicative of the risk of heart disease and of the accelerated atherosclerosis[12]. The first ever decision to consider hsCRP estimation and evaluation in an individual is probably in mid 30 years, the age that mostly deserves cholesterol to be checked. There is good evidence that hsCRP levels

in teens and 20s are very predictive of its levels later in life. Elevated hsCRP levels predict risk over the next 30 to 40 years. This is commendable from a prevention perspective because in that situation ample time may be available to institute life style change and pharmacological interventions to prevent first ever heart attack & stroke[12]. In our study TC, TAG and LDL-C values found higher and HDL-C value found lower in group I (cases) compared to group II (controls). These findings are consonatal with that of other studies[5,7]. In current strategies of coronary risk assessment, lipid testing is the blood test routinely recommended. However, hsCRP evaluation may have the potential to improve coronary risk prediction when used as an adjunct to this approach[7]. Both cholesterol and hsCRP predict risk of coronary events but one can not predict one's hsCRP level on the basis of one's cholesterol level or vice versa. That's because each of these blood tests picks up a different component of disease process[12]. Atherothrombosis often occurs in the absence of hyperlipidemia and recently consensus panels assembled by the National Heart, Lung and Blood Institute and the centers for Disease Control and Prevention have concluded that population based data on other risk factors are urgently needed[13]. Because of critical importance of LDL-C in atherogenesis, LDL-C is the focus for the determination of the risk of coronary disease[13]. But in a study, (Ridker 2003) observes that persons having high hsCRP and low LDL-C level are at higher risk of coronary events than those having low hsCRP and high LDL-C levels[12]. In another study (Ridker et al., 2002) shows that hsCRP is actually stronger overall predictor of heart disease and stroke than LDL-C. In this study, though LDL-C level remained below the threshold values, individuals experienced 1st coronary events (non fatal). However as hsCRP & LDL-C levels are claimed to be minimally correlated, so the combined evaluation of both hsCRP and LDL-C seems to be superior as a method of risk detection over the either biological marker alone[13]. According to the survival analysis in the study done by Ridker et al. (2002) persons in the high hsCRP-low LDL-C subgroup were at higher absolute risk than those in the low hsCRP-high LDL-C subgroup. These observations suggest that, continued reliance only on LDL-C to predict the risk of cardiovascular events may provide false negative impression to affect the primary prevention[13]. In fact the precise mechanism may be that hsCRP selectively binds to LDL-C, particularly to phosphocholine moieties of oxidized LDL-C found within atherosclerotic plaque and is generally present together with activated complement. Such plaques which are proinflammatory may contributes to atherogenesis[14].

Conclusion :

It can apparently be concluded from this study that serum hsCRP might be a strong coronary marker in its own merit, independent of lipid status; however, the combined biphasic evaluation of hsCRP and lipid profile rather than their isolated and individual evaluation may be more promising in forecasting ischemic heart disease prediction.

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