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Original Research Article

Variability of lipid profile in acute myocardial infarction

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Abstract

The present study was carried out with the primary objective of investigating the changes in lipid profile in patients with acute myocardial infarction. Secondary objective was to know the effects of age, gender, body mass index (BMI), smoking, hypertension, and diabetes mellitus on lipid profile and to know the prevalence of hypertriglyceridemia, hypercholesterolemia, low HDL cholesterol. Seventy four patients admitted for acute myocardial infarction during the study period of one year at a tertiary care referral hospital affiliated to a medical college in Belgaum, South India were analysed. The mean serum concentrations of total cholesterol, triglycerides, HDL cholesterol and LDL cholesterol were 233.28±45.34, 139.22±41.71, 171.43±36.53 and 27.07±36.53, respectively. Mean levels of total cholesterol, HDL cholesterol, triglycerides were not affected by age, gender, BMI, diabetes, hypertension and smoking. BMI >30kg/m2 was associated with increased levels of total cholesterol (p=0.013) and LDL cholesterol (p=0.014). Also an increase in LDL cholesterol was seen in the male gender (p=0.04). The prevalence of hypercholesterolemia, hypertriglyceridemia and low HDL cholesterol was 82.4%,77% and 78%, respectively. In conclusion, high prevalence of hypercholesterolemia, hypertriglyceridemia and low HDL cholesterol may play a important role in the development of coronary heart disease.

Keywords: Hypercholesterolemia; Myocardial infarction; Lipid profile; Low HDL cholesterol

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1. Introduction

Dyslipidaemias are one of the major modifiable risk factors for coronary heart disease.[1] Abnormal lipids along with other risk factors account for most of the risk of myocardial infarction in all ages and in both sexes. Globally, 80% of deaths due to cardiovascular diseases occur in low and middle income countries.[2] In developing countries, cardiovascular disease (CVD) represents three-fourth of mortality from non-communicable diseases. The primary and secondary intervention in developed countries have made CVD a disease of older age, whereas in developing countries the age of onset is at a younger age.[3] According to the World Health Organisation (WHO) by 2030 more than 23 million people will die annually from CVD.[4]

Statins used for treatment of dyslipidaemias have shown to reduce cardiovascular events, morbidity and mortality, not only in patients with ischaemic heart disease[5] but also in normal healthy subjects as a primary prevention.[6] This

shows the importance of determining the lipid profile in patients with coronary artery disease (CAD) to reduce future adverse coronary events.

The present study was carried out with the primary objective of investigating the changes in lipid profile in patients with acute myocardial infarction (AMI). Secondary objective was to know the effects of age, gender, body mass index (BMI), smoking, hypertension, and diabetes mellitus on lipid profile and to know the prevalence of hypertriglyceridemia, hypercholesterolemia, low HDL cholesterol.

2. Materials and methods

This study was conducted in the Departments of Cardiology and General Medicine of a tertiary care referral hospital affiliated to a medical college in Belgaum, South India, for a period of one year.

In-patients with history suggestive of acute myocardial infarction, ECG evidence of acute myocardial infarction, and elevated levels of cardiac enzymes (CKMB, LDH, AST) were included in the study. Total sample size of 74 was determined by the systematic sampling method. The 74 patients who met the aforementioned inclusion criteria were evaluated in detail regarding, signs and symptoms, risk factors like smoking, alcohol, family history of CVD, type A personality, obesity, hypertension, diabetes mellitus, lipid profile, type of infarction, course of hospital stay, complications, and mortality.

Patient who smoked more than 25 cigarettes per day was taken as smoker. Hypertension was defined as persistent recording of blood pressure more than 140/90mmhg. Patients with FBS>126mg/dl; PPBS>200mg/dl; and patient who require insulin therapy or oral drugs for the control of diabetes were said to be diabetics. Obesity was considered the risk factor if the BMI exceeded 30mg/m2. BMI was calculated by the formula, weight (kg)/Height $(m)^2$. Serum triglycerides level >200mg/dl considered to be hypertriglyceridemia. Serum total cholesterol level >200mg/dl is taken as hypercholesterolemia. Serum HDL Cholesterol level< 40mg/dl is taken as low HDL cholesterol.

Blood collected for analysis within 24 hours of onset of acute myocardial infarction. Enzymatic estimation of total cholesterol by CHOD-PAP method based on the principle cholesterol esterase hydrolyses cholesterol esters to give cholesterol and free fatty acid.

Enzymatic estimation of serum Triglyceride using GPO-Kit method based on the principle, Lipase hydrolyses TG into Glycerol and FFA. Enzymatic estimation of High Density Lipoprotein: The method is the same for cholesterol estimation except that a precipitant is first used to precipitate, out of the serum, other forms of lipoprotein present in the serum, leaving only HDL. It is consequently estimated using the HDL-cholesteroldirect kit. LDL and VLDL are estimated using Friedewald formula.

Mean values have been presented as mean (SD). Univariate and multivariate analysis was carried out using SPSS 16 (statistical package for social sciences). The sample independent't' test was used to compare the statistical significance between continous variables (age, BMI). Chi square test was used to compare between categorical variable (gender, diabetes, hypertension, and smoking). For comparison of lipid levels in young and older groups, the patients were divided into those above 50 years and below 50 years. A 'p' value of <0.05 was considered significant.

3. Results

Of the 74 patients, 55 (74.32%) were males and 19 (25.68%) were females. Mean age of patients was 52.7±10.7 years. 37.83% were obese (BMI>30kg/m^2); 47.30% of patients were hypertensive; 45.95% diabetic with mean value

of fasting glucose 133.46±59.54 mg/dl. Table 1 depicts the demographic and clinical characteristics of the patients. The effect of age, gender, BMI, diabetes mellitus, hypertension, and smoking on serum levels of lipids in AMI patients is illustrated in Table 2. Table 3 shows the prevalence of hypercholesterolemia, hypertriglyceridemia and low HDL-cholesterol in AMI patients.

In the present study the mean concentration of HDL cholesterol and triglycerides were not significantly affected by age, gender, BMI, diabetes mellitus, hypertension and smoking. However, mean LDL cholesterol levels were found to be significantly increased in male gender (p=0.04), and in patients with BMI>30kg/m^2 (p=0.014). Total cholesterol level was not found to be affected by age, gender, diabetes mellitus, hypertension and smoking. But it significantly increased with BMI >30kg/m^2.

Prevalence of hypercholesterolemia, hypertriglyceridemia and low HDL cholesterol was 82.4%, 77% and 78%, respectively. Comparison between males and females revealed significant difference only in total triglyceride level (p = 0.013).

4. Discussion

India has about 9.5 million deaths a year and about one in six of all deaths worldwide. CVD's cause 1.7-2 million deaths annually in India.[7] India is now in the middle of the CHD epidemic with urban Indians having CHD rates similar to overseas Indians.[8] The huge burden in Indian subcontinent may be due to large population and prevalence of major cardiovascular risk factors.[9] In a case control study in young north Indian patients clustering of hyperinsulinemia and impaired GTT was seen along with dyslipidemias.[10] Gupta et al. demonstrated a persistent high prevalence and increasing non-

Table 1: Demographic and clinical characteristics of the patients

Variable		Value Mean(SD)	Number	Frequency (%)
Age (years)		52.7(10.7)	-	-
BMI (kg/m2)		-	-	-
	>30	-	28)	37.83
Hypertension	Yes	-	35	47.39
	No	-	39	52.70
Diabetes	Yes	-	34	45.95
	No	-	40	54.05
Smoking	Yes	-	38	51.35
	No	-	36	48.65
Fasting Glucose(mg/dl)		133.46(59.54)	-	-
Total cholesterol(mg/dl)		233.28(45.34)	-	-
Triglycerides (mg/dl)		139.22(41.71)	-	-
HDL cholesterol(mg/dl)		171.43(36.53)	-	-
LDL cholesterol(mg/dl)		27.07(36.53)	-	-

Table 2: The effect of age, gender, BMI, diabetes, hypertension, and smoking on serum levels of lipids in AMI patients

Factors	Numbers cholesterol	Lipid concentration (mg/dl)			
		Total cholesterol	HDL-cholesterol	LDL-	Triglycerides
Age (years)					
<50	37	229.38 (50.88)	35.6 (11.73)	168.63 (47.94)	129.81(42.41)
>50	37	232.22 (49.72)	35.68 (8.37)	169.68 (33.89)	146.24 (42.41)
	(p0.808)	(p0.974)	(p0.914)	(p0.098)	
Gender					
Male	55	35.60 (11.75)	35.64 (9.6)	176.53 (33.97)	144.58 (7.85)
Female	19	35.68 (8.37)	35.00 (10.36)	156.68 (40.51)	135.65 (43.64)
	(p0.304)	(p0.603)	(p0.04)	(p0.569)	
BMI(mg/m^2)					
>30	24	212.84 (63.25)	35.68 (10.14)	154.52 (47.02)	141.51 (7.85)
<30	50	242.09 (35.81)	35.61 (10.27)	178.37 (34.76)	135.65 (43.64)
	(p0.013)	(p0.976)	(p0.014)	(p0.694)	
Diabetes					
Yes	34	236.97 (37.67)	35.62 (7.73)	171.53 (36.66)	133.76 (46.07)
No	40	230.15 (51.24)	36.30 (11.29)	171.35 (36.89)	143.85 (37.58)
	(p0.523)	(p0.767)	(p0.983)	(p0.303)	
Hypertension					
Yes	35	230.29 (47.73)	35.54 (7.87)	171 (30.61)	148.31 (37.9)
No	39	235.97 (43.53)	36.38 (11.27)	171.82 (41.5)	131.05 (43.67)
	(p0.593)	(p0.714)	(p0.924)	(p0.075)	
Smoking					
Yes	38	235.97 (49.51)	36.08 (10.55)	177 (32.99)	147.03 (44.71)
No	36	230.44 (40.99)	35.89 (8.98)	165 (39.54)	130.97 (37.13)
	(p0.604)	(p0.934)	(p0.180)	(p0.098)	

Table 3: Prevalence of hypercholesterolemia, hypertriglyceridemia and low HDL- cholesterol in AMI patients

Variable	Frequency (%)			
	Males n=55	Females n=19	Total n=74	P value
Hypercholesterolemia (>200mg.dl)	47 (85%)	14 (74%)	61 (82.4%)	0.638
Hypertriglyceridemia (>100mg/dl)	43 (78%)	14 (74%)	57 (77%)	0.013
Low HDL cholesterol (<40mg/dl)	46 (84%)	12 (63%)	58 (78%)	0.283

HDL cholesterol and Triglycerides over a period of 8years in India in Jaipur Heart Watch -5 study.[11] Our study showed increased triglycerides in AMI patients in age group of more than 50 years. Our study is in concurrence with the baseline levels of lipids reported in similar research in Pakistan.[12]

Our study did not find any significant association between hypertension and lipid profile. Similarly diabetes mellitus also appears to have no significant effect on total cholesterol, HDL cholesterol and total triglyceride level in AMI patients. However increase in LDL cholesterol was seen more in males than in females. Estari M et al. observed dyslipidemia in 52.7% of men against 42.9% in women.[13] Kadar et al. reported that age and diabetes was associated with hypertriglyceridemia.[14] Gupta et al. concluded that in an urban Indian population, trends reveal increase in non-HDL cholesterol, cholesterol remnants, and total-HDL cholesterol ratio. Increasing dyslipidemias correlated significantly with truncal obesity.[15]

Smoking did not appear to have significant impact on serum lipid levels in our study. We found significant association of BMI>30kg/m2 on values of total cholesterol level and LDL levels. BMI>30kg/m2 is a major cardiovascular risk factor and often associated with raised BP, glucose intolerance, type 2 diabetes and dyslipidemias.[16] 82% of our patients had hypercholesterolemia. Triglyceride level of >100mg/dl seen in 77% of patients. Low HDL cholesterol seen in 78% of patients. Low HDL cholesterol is the most common lipoprotein abnormality in patients with CHD and is predictive of CHD events, even when total cholesterol levels are normal.[17] The national cholesterol education programme recommends total cholesterol level <200mg/dl and LDL cholesterol <100mg/dl to be optimal. HDL cholesterol <40mg/dl is a major risk factor for CHD.[18] Our data confirms the previous observations that dyslipidemias is one of the major risk factor for CHD. Moreover the excess burden of premature CAD in Asian Indians may be due to genetic susceptibility mediated through elevated levels of lipoprotein (a), together with the lifestyle factors and changes in the diet.[8,19] The association of polymorphism in the fatty acid binding protein and in the apolipoprotein C-111 was noted in study on Chennai urban population by Guittier et al.[20] The high level of triglycerides and low level of HDL cholesterol forms a part of metabolic syndrome, the atherogenicdy-slipidemia which is a risk factor for CHD.[21]

In conclusion dyslipidemias is an important modifiable risk factor for CHD. Life style modification along with measures to reduce cholesterol levels with lipid lowering agents may improve coronary events. An unhealthy dietary intake, increases the risk of AMI globally and accounts for approximately 30% of the population-attributable risk.[22] Statins are known to be effective in reducing LDL cholesterol and fibrates for their beneficial effect on triglycerides and HDL cholesterol and other LDL cholesterol sub species.[23] It was found that combination of lovastatin and niacin offers an effective control of LDL cholesterol besides providing additional benefits in terms of reduced triglycerides, lp(a), and increased HDL cholesterol and apoA1/apoB ratio.[24] This had special relevance in context of Asian Indian dyslipidemia as well as insulin resistance syndrome and the metabolic syndrome.[24]

Ornish et al. in their prospective randomised controlled study concluded that comprehensive life style modification may be able to bring about regression of severe coronary atherosclerosis only after 1year, even without using lipid lowering agents.[25] Among women, adherence to lifestyle factors involving diet, exercise, and abstinence from smoking was associated with a very low risk of coronary heart disease.[26] Among persons at high cardiovascular risk, a mediterranean diet supplemented with extra-virgin olive oil or nuts reduced the incidence of major cardiovascular events.[27]

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