NUJHS Vol. 4, No.1, March 2014, ISSN 2249-7110
Nitte University Journal of Health Science

Original Article

GLYCEMIC AND LIPIDEIC STATUS IN PATIENTS WITH ACUTE MYOCARDIAL INFARCTION

A. Harish Rao
Associate Professor, Department of General Medicine,
Srinivas Institute of Medical Sciences and Research Centre, Mangalore, Karnataka, INDIA

Correspondence
A. Harish Rao
Associate Professor, Department of General Medicine, Srinivas institute of Medical Sciences and Research Centre
Mangalore, Karnataka, India. Mobile : +91 98454 55766 E-mail: drharishrao@gmail.com

Abstract:

Objective: to know the glycemic and lipidaemic status in patients with acute myocardial infarction, and with the secondary objective to know the effect of age, gender, diabetes, smoking, hypertension on fasting glucose and lipid levels.

Methods and materials : The 74 patients admitted for acute myocardial infarction during the study period of one year were analysed for fasting glucose values and serum levels of total cholesterol, HDL cholesterol, LDL cholesterol and triglycerides.

Results : 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 and fasting glucose values were not affected by age, gender, BMI, hypertension and smoking. BMI >30kg/m2 was associated with increased levels of total cholesterol(p=0.013) and LDL cholesterol(p=0.014). Also increase LDL cholesterol was seen in male gender(p=0.04). The prevalence of hypercholesterolemia, hypertriglyceridemia and low HDL cholesterol was 82.4%,77% and 78% respectively. Diabetes had no effect on lipid profile.

Conclusion: our study highlighted the prevalence of dyslipidemias associated with myocardial infarction but not significant impact of fasting glucose levels.

Keywords: fasting glucose, lipidemic status, myocardial infarction, coronary heart disease

Introduction:

80% of deaths due to cardiovascular disease occur in low and middle income countries. In developing countries, CVD represents ¾ of mortality from non-communicable diseases. [1] CVD's cause 1.7-2.0 million deaths annually in India.[2] By 2030 more than 23 million people will die annually from CVD's.[3]

Global prevalence of diabetes was estimated to be 10% and CVD accounts for about 60% of all mortality in people with diabetes.[4] Diabetes also is associated with numerous cardio vascular risk factors, and increased incidence of myocardial infarction and congestive heart failure.[5,6] Women with diabetes seem to lose most of their inherent protection against developing CVD.[7]

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Dyslipidemias are one of the major modifiable risk factor for coronary heart disease.[8] Low HDL-C is the most common lipoprotein abnormality in patients with CHD and is predictive of CHD events even when total cholesterol levels are normal. Gupta R et al demonstrated a persistent high prevalence and increasing non-HDL cholesterol and Triglycerides over a period of 8 years.[9] Clinical trials of lipid lowering agents have shown that modest increase in HDL-cholesterol significantly reduces CHD event rates.[10]

Aims and objectives: The primary objective to know the glycemic and lipidaemic status in patients with acute myocardial infarction, and with the secondary objective to know the effect of age, gender, diabetes, smoking, hypertension on fasting glucose and lipid levels.

Materials and Methods: The present study was conducted in the department of cardiology, and medicine of K.L.E 's

Hospital and MRC, Belgaum for a period of one year.

Selection of cases: Inpatients who met the following criteria were included in the study

1. Patients with history suggestive of acute myocardial infarction.
2. ECG evidence of acute myocardial infarction
3. Elevated levels of cardiac enzymes(CKMB, LDH, AST)

Total sample size as determined by the systematic sampling method was 74.

The 74 patients who met the above said inclusion criteria were evaluated in detail regarding,

1. Symptoms and signs
2. Risk factors like smoking, alcohol, family history of CVD, type A personality, obesity ,hypertension, diabetes mellitus, lipid profile, lipoprotein (a),
3. Type of infarction
4. Course of hospital stay and complications
5. Mortality

Definitions in our study included,

Smoking: 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 according to Framingham heart study.

Diabetes Mellitus: Patients with FBS>126mg/dl, PPBS>200mg/dl. Patient at the time of diagnosis of DM or who require insulin therapy or oral drugs for the control of diabetes were said to be diabetics.(AMERICAN DIABETES ASSOCIATION, Standards of Medical Care in Diabetes 2013, DIABETES CARE, VOLUME 36, SUPPLEMENT 1, JANUARY 2013)

Obesity: Was considered the risk factor if the BMI exceeded 30mg/m2. BMI was calculated by the formula,

$$\frac{\text{weight(kg)}}{\text{Height(m)}^2}$$

Hypertriglyceridemia: Serum triglycerides level >200mg/dl

Hypercholesterolemia: Serum total cholesterol level >200mg/dl

Low HDL- Cholesterol: Serum HDL Cholesterol level< 40mg/dl

Blood collected for analysis within 24 hours of onset of acute myocardial infarction.

Enzymatic estimation of total cholesterol by CHOD – PAP method. Enzymatic estimation of serum Triglyceride using GPO – Kit method. Enzymatic estimation of High Density Lipoprotein using HDL-cholesteroldirect kit. LDL and VLDL are estimated using Friedewald formula.

Methods :

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, smoking). For comparison of lipid levels in young and older groups, the patients were divided into those above 50 years and below 50years. A p value of <0.05 was considered significant.

Maximum incidence of myocardial infarction was seen in age group of 41-50 years(36.4%). The age group of 51-60 accounted for 22.9%.

75% of patients were males. Male to female ratio was 2.9:1

The commonest presentation was typical history of chest pain with radiation and associated with sweating. 31% of our patients had anterior wall myocardial infarction and 29.7% had inferior wall myocardial infarction. Combination of infero lateral infarction was seen in 12.1% of patients.

47.2% had ST segment elevation with T wave inversion . Q wave myocardial infarction was present in 28.3% of our

patients.

85.1% of patients recovered from the cardiovascular event.

64.8% of them had complications during hospital stay. The most common was arrhythmias seen in 36.4% of patients. Ventricular tachycardia was commonest arrhythmia seen. Others included cardiogenic shock(17.5%), LVF(9.4%),complete heart block(5.4%), papillary muscle dysfunction(1.3%) and post infarction pericarditis(1.3%).

Duration of hospital stay was 14 days. Mortality rate was 9.4% in our study.

37.83% were obese (BMI>30kg/m2), 47.30% of patients were hypertensive, 45.95% diabetic with mean value of fasting glucose 133.46±59.54mg/dl.

Among the diabetics, 55.88% of patients had normal FBS,

Table 1: shows the demographic and clinical characteristics of the patients.

Variable		Value Mean(SD)	Frequency (%)
Age (years)		52.7(10.7)	
Gender	male	55(74.32)	
	female		19(25.68)
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)	

Demographic and Clinical characteristics of patients of AMI

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

Factors	Numbers	Lipid concentration (mg/dl)			
		Total cholesterol	HDL-cholesterol	LDL-cholesterol	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)
		p(0.808)	p(0.974)	p(0.914)	p(0.098)
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)
		p(0.304)	p(0.603)	p(0.04)	(p0.569)
BMI(mg/m2)					
>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)	p(0.014)	p(0.694)
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)	p(0.767)	p(0.983)	p(0.303)
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)
		p(0.593)	p(0.714)	p(0.924)	p(0.075)
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)
		p(0.604)	p(0.934)	(p0.180)	p(0.098)

Effect of age, gender, BMI, diabetes mellitus, hypertension and smoking on serum levels of lipids in AMI patients.

Table 3 : Effect of age, gender, BMI, hypertension, and smoking on fasting glucose value

Factors	Numbers	FBS		P value
		Mean	SD	
Age (years)				
<50	37	145.27	71.70	0.088
>50	37	121.64	41.96	
Gender				
Male	55	134.94	62.22	0.718
Female	19	129.15	52.28	
BMI kg/m2				
>30	24	140.32	64.23	0.443
<30	50	129.28	56.81	
Hypertension				
yes	35	123.25	57.65	0.164
No	39	142.61	60.45	
Smoking				
Yes	38	137	69.35	0.603
No	36	129.72	47.75	

Effect of age, gender, BMI, hypertension , and smoking on fasting glucose value

and 44.12% had raised FBS values. Among non diabetics FBS was raised in 35% of cases. Diabetic patients had multiple risk factors.

There was no significant effect of age, gender,smoking, BMI, hypertension on fasting blood glucose values.

In our 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>30mg/m2(p=0.014). Total cholesterol level was not found to be affected by age, gender, diabetes mellitus, hypertension and smoking. But it significantly increased when BMI >30mg/m2.

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 = o.o13).

Discussion:

CVD's cause 1.7-2.0million deaths annually in India.[2] India has a higher number of people with diabetes than any other country in the world. By 2025 the countries with largest number of diabetes will be in India, China and US. 52% of cardiovascular deaths occur below age of 70, compared to 23% in developed countries.[11,12] Based on modelled estimate by WHO, a marked rise of diabetes related burden is expected in near future.[13] The International Federation of Diabetes estimates the number of people with diabetes for 2003 and 2025 to be 194 million and 334 million respectively. In association with increasing diabetes prevalence, it inevitably increases the proportion of deaths from cardiovascular diseases in these countries as well as the consequence of diabetes.[14]

In a case control study in young north Indian patients clustering of hyperinsulinemia and impaired GTT was seen along with dyslipidemias. [15] The high prevalence of glucose intolerance and a lipid pattern of reduced concentrations of HDL cholesterol and high concentration of triglycerides and abdominal obesity are characteristics of urban adult in India.[11]

Gupta R et al demonstrated a persistent high prevalence and increasing non-HDL cholesterol and

Triglycerides over a period of 8years in India in Jaipur Heart Watch -5 study.[9] Our study showed increased triglycerides in AMI patients in age group of more than 50 years. Our study compare well with the baseline levels of lipids reported in other study.[16] 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.[17] Kadar in his study found 75.7% cases with dyslipidemia, with men greatly affected with hypertriglyceridemia than women.[18]

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.[4]

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. Swaminathan and co workers in their review concluded that South Asians have substantially higher rates of diabetes and coronary heart disease. An innate predisposition along with behavioural, traditional and environmental risk factors lead to insulin resistance and to diabetes and coronary vascular disease.[19] Significantly higher BMI, abdominal obesity causes significant dyslipidemias and insulin resistance and also 3fold increase in diabetes.[20,21] In a large cohort study from Asia Pacific region, continuous association was found between the fasting blood glucose and cardiovascular disease. The associations were very similar for males and females.[22] Kannel examined prospectively , in the Framingham cohort, the relation between the diabetes and impaired glucose tolerance with CVD. It was found that the incidence of CVD and risk factors were more in diabetic than in non diabetic men and women. Impact of diabetes on cardiovascular mortality and cardiac failure were more in women. Diabetes is a risk factor for several forms of CVD's.[5] A study showed that markers of impaired insulin secretion and insulin resistance were independently associated with an increased risk of heart failure.[23]

82% of our patients had hypercholesterolemia. Triglyceride level of >100mg/dl seen in around 77% of patients. Low HDL cholesterol seen in around 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. [10]

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. [24]

Our data confirms the previous observations that dyslipidemias is one of the major risk factor for CHD. We observed low HDL cholesterol and high triglycerides which are component of metabolic syndrome. 6 components of metabolic syndrome related to cardiovascular disease are identified by ATP111 which includes underlying risk factors for CVD are obesity, physical inactivity and atherogenic diet ; major risk factors are cigarette smoking, hypertension, elevated LDL cholesterol, low HDL cholesterol, family history of premature coronary heart disease (CHD), and aging; and the emerging risk factors include elevated triglycerides, small LDL particles, insulin resistance, glucose intolerance, proinflammatory state, and prothrombotic state.[25] Kanjilal S and co workers concluded in their study that prevalence of MS varies amongst ethnic groups. Asian Indians are high at risk for CVD, diabetes, and their predispositions. [26] BMI of 23.32 kg/m^2 and higher was found to predict significant risk of metabolic syndrome in a study done by Pranitha & co workers.[27]

A large international case control study (INTERHEART STUDY) reported that tobacco use, obesity with high waist:hip ratio, high blood pressure, high LDL cholesterol/low HDL cholesterol, abnormal apolipoprotein A-1:B ratio, diabetes, low consumption of fruits and vegetables, sedentary lifestyles and psychosocial stress are 9 important risk factors/determinants of CVD which accounted for >90 per cent of population attributable risk of CHD globally. Two-thirds of this risk comes mainly from smoking and elevated Apo B and Apo A ratio.[28] The excess burden 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.[20,29] 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.[30]

In conclusion, our study highlighted the prevalence of dyslipidemias associated with myocardial infarction but not significant impact of fasting glucose levels.

Given the multifactorial nature of CVD, no single solution will be applicable to all geographic and economic regions of the world. However risk factor reduction done by implementing public health measures, targeting high risk subgroup of population that will benefit most from cost effective preventive measures and finally by giving higher cost treatments.[31]

Acknowledgement :

I thank Soumya Shetty for the statistical analysis of this study.

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