Research Article

STUDY OF LIPID PROFILE AND THE EFFECT OF CARDIAC ENZYMES IN TYPE 2 DIABETES MELLITUS PATIENT DEVELOPING CORONARY HEART DISEASE

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Abstract: *Introduction:* Dyslipidaemia is frequently present in type 2 diabetes mellitus (T2DM). The predominant features of dyslipidaemia in this disorder include increased flux of free fatty acids (FFA), raised triglyceride (TG) and low high density lipoprotein cholesterol (HDL) levels, a predominance of small, dense (atherogenic) low density lipoprotein cholesterol (LDL) particles and raised apolipoprotein (apo) B values of Posprandial hyperlipidaemia may also be present. *Objective:* The study was aimed to study lipid profile and the effect of cardiac enzymes in type 2 diabetes mellitus patient developing coronary heart disease. *Materials and Methods:* From the serum lipid profile, HbA1c, CK-MB and inflammatory markers CRP were analyzed in normal, diabetic subjects without coronary heart diabetic subjects developing coronary heart disease via kit methods. *Results and conclusion:* Lipid profile, HbA1c, CK-MB and inflammatory markers CRP were significantly increased in type 2 DM subjects developing coronary heart disease as compared to other groups.

Keywords: Diabetes Mellitus, CRP, Coronary Heart Disease

Introduction

Diabetes mellitus (DM) is a worldwide epidemic. Its prevalence is rapidly increasing in both developing and developed countries. Coronary heart disease (CHD) is highly prevalent and is the major cause of morbidity and mortality in diabetic patients.[1] According to the estimates of World Health Organization (WHO), it has been clearly shown that there are 2 to 2.5 non diagnosed patients per each registered DM patients, and this takes place at the expense of subjects with type 2 DM. On the other hand, cardiovascular diseases presently are the main cause of death. DM represents an important risk factor for the development of and mortality from coronary heart disease, increasing the risk by 2 to 4 times. According to the WHO data, more than 75% patients with type 2 DM die due to vascular accidents.[2] The relative risk of acquiring CHD seems to be higher in diabetic women than in men. In a study, the relative risk of death attributed to CHD disease was 2.5 for diabetic men and 3.4 for diabetic women compared to non-diabetic control subject after adjusting for smoking, hypertension and hypercholesterolemia.[3-6]

CHD is a prime cause of morbidity and mortality all over the world in patient with type 2 diabetes. CHD is fraught with a higher incidence of critical complication, more frequent mortality, in spite of hospital care and in certain variances in clinical presentation[7], requiring special attention for diagnosis and greater skill in managements. There is enough epidemiological and clinical data to suggest that atherosclerotic coronary artery disease is at least twice as common in men and four fold more so in women with diabetes.[8] Over such background clinically recognized myocardial infarction and sudden death is estimated to be higher by 50% in men and 150-300% in women[9], while silent myocardial infarction observed at autopsy of patients with proper hospital record is three times more common in diabetic subjects compared to the rest.[10]

Type 2 DM is associated with a cluster of interrelated plasma lipid and lipoprotein abnormalities that are all recognized as predictors for coronary heart disease, including reduced plasma levels of high density lipoprotein cholesterol (HDL), a predominance of small and dense, low density lipoprotein cholesterol (LDL) particles and elevated plasma levels of TG.[11] Therefore, the study was aimed to study lipid profile and the effect of cardiac enzymes in type 2 diabetes mellitus patient developing coronary heart disease.

Materials and Methods:

A total of 90 patients were taken for this study. This study was conducted in the department of General Medicine in Chitwan Medical College, Bharatpur, Nepal during the period of December 2010 to November 2011. 60 patients suffering from Type 2 DM admitted in the General medicine unit of Chitwan Medical College, and 30 cases of normal subjects visiting OPD were taken as control groups. The target population was divided into three major groups. Group I- Normal people without any disease (n=30); Group II- Diabetes mellitus without CHD (n=30) and Group III- Diabetes mellitus with CHD (n=30).The inclusion criteria for test groups (Group I and Group II) are as follows:; History of smoking, history of alcohol consumption, family history, Duration of disease with a history of CHD were included. The exclusion criteria for test groups (Group I and Group II) are as follows: Based on clinical examination and

lab investigations subjects or person suffering from acute exacerbation of diabetic complications, Chronic Renal failure, Pregnancy, Liver disorder, Pancreatitis, Goiter, Thyroid dysfunction etc were excluded; Subjects on lipid lowering drugs, already taken lipid lowering drugs, patients on beta blocker, ACE inhibitor, Angiotensin receptor blocker or Thiazide diuretics within one month from the test study were excluded.

5 ml of blood was collected and serum was separated and analyzed for following parameters:

Glucose Estimation kit (Nicholas and Piramal kit) was used for the estimation of Blood Glucose Level[12]. Ion-Exchange Resin method (Biosystem assay kit) was used for the study of glycosylated hemoglobin[13]. Optimized UV-test using Nicholas and Priamal kit was used for determination

of CK-MB[14.] Optimized UV-test using Nicholas and Priamal Kit was used for the determination of CK-NAC.[15], Serum levels of CRP were determined using particle enhanced turbidimetric immunoassay (PETIA) technique[16], Cholesterol Oxidase method (Nicholas and piramal kit) was used for the estimation of total serum cholesterol[17,] Glycerol-3-Phosphate Oxidase (Nicholas and piramal kit) method was used for the estimation of total serum TG[18,] Phosphotungstic acid precipitation (Nicholas and piramal kit) method was used for the estimation of total serum HDL Cholesterol. VLDL and LDL were calculated by using Friedewald formula[19].

Result and Discussion
All the data of the observations were expressed in terms of Mean ± SD

Table 1: Table showing various biochemical parameters in patients suffering from CHD in T2DM

Parameter	Group I (n=30)	Group II (n=30)	Group III (n=30)	p value (ANOVA)	Turkey Kramer post test		
					Group I Vs GroupII	Group I Vs Group III	Group II Vs Group III
Duration (years)		6.98± 4.2	6.55± 3.3				
FBS (mg/dl)	95.4± 10.1	164.4± 38.0	192.9± 49.1	<0.0001**	<0.001*	<0.001*	<0.01+
PPBS (mg/dl)	126.1 ± 7.8	246.6 ± 53.4	290.6± 68.6	<0.0001**	<0.001*	<0.001*	<0.01+
HbA$_{1c}$ (%)	4.9±0.7	7.5± 1.7	8.6 ± 1.5	<0.0001**	<0.001*	<0.001*	<0.01+

* Statistically significant
** Highly significant
+ Significant between group II and group III subjects

Table 2: Table showing the status of cardiac profile in patients between GI, GII and GIII

Parameter	Group I	Group II	Group III	p value (ANOVA)	Turkey Kramer post test		
					Group I Vs GroupII	Group I Vs Group III	Group II Vs Group III
CK-MB (U/L)	17.8±3.9	18.1±2.1	82.1±49.2	<0.0001**	> 0.05	< 0.001*	< 0.001*
CK-NAC (U/L)	75.8±25.2	149.0±9.3	301.8±153.6	<0.0001**	< 0.01*	< 0.001*	< 0.001*
CRP (mg/dl)	0.73 ± 0.4	1.41 ±0.9	2.08 ± 0.8	<0.0001**	< 0.01+	< 0.001*	< 0.01+

* Statistically significant
** Highly significant
+ Significant between group II and group III subjects

Table No3: Table showing the status of lipid profile in patients between GI, GII and GIII

Parameter	Group I	Group II	Group III	p value (ANOVA)	Turkey Kramer post test		
					Group I Vs GroupII	Group I Vs GroupIII	Group II Vs GroupIII
TC (mg/dl)	150.9±11.4	178.1±36.9	187.9±37.8	< 0.0001*	< 0.01*	< 0.001*	> 0.05
TG (mg/dl)	125.9±19.8	146.1±63.9	164.7±62.7	<0.0001*	>0.05	<0.05*	> 0.05
HDL (mg/dl)	43.2±5.9	41.1±7.9	34.3±6.5	< 0.0001*	>0.05	<0.001*	<0.001*
LDL (mg/dl)	83.1±14.1	111.1±31.9	120.9±39.4	< 0.0001*	<0.01*	<0.001*	>0.05
VLDL (mg/dl)	25.2±3.9	25.0±13.4	30.6±10.2	0.06	>0.05	>0.05	>0.05

* Statistically significant

** Highly significant

+ Significant between group II and group III subjects

Results:

The results of the table 1 shows that FBS, PPBS and HbA1c level were significantly increased in Group II and Group III subjects as compared with Group I subjects (P<0.0001). The FBS, PPBS and HbA1c concentration were significantly increased in Group III subjects as compared with Group II subjects (P<0.001).

The results of the table 2 shows that CK-MB, CK-NAC and C reactive protein level were significantly increased in Group II and Group III subjects as compared with Group I subjects (P<0.0001). The CK-MB, CK-NAC and C reactive protein concentration were significantly increased in Group III subjects as compared with Group II subjects (p<0.001).

The results of the table 3 shows that all the lipid profile parameters(TC, TG, LDL) were significantly increased in Group II and Group III subjects as compared with Group I subjects (P<0.0001). But the level of HDL was significantly decreased in Group III subjects as compared with Group II subjects (p<0.001). The concentration of VLDL was found insignificant in all the experimental groups (p>0.05).

Discussion and Conclusion:

Coronary heart disease (CHD) is the leading cause of death in patients with diabetes. Glycaemic and CVD risk factors control can be challenging in any context. Once CHD is symptomatic in diabetes, morbidity and mortality are high and significantly worse than in patients without diabetes.

Uncontrolled level of blood glucose is the main cause of macrovascular complication, i.e atherosclerosis in T2DM. Low activity of insulin sensitivity results in low level of lipoprotein lipase enzyme which is the main cause of hypertryglycemia in diabetes. Furthermore the high level of LDL in these patients may cause plaque formation in the coronary artery which is the outcome of CHD in patients with T2DM. Similarly, due to these biochemical changes, there had been increase in the level of various cardiac enzymes such as CK-MB, CK-NAC which confirms that the heart muscles are also being damaged. The study was inconsistent with Milo Engoren et al. [20], James Ramsay et al[21] and Samiha Abo El-Yazeed et al. [22]

The main cause for this might be the deposition of cholesterol, cholesterol esters, whose accumulation may cause the narrowing of the coronary artery, the blood vessel supplying blood to the heart. The consequences of these decrease the infusion of necessary nutrients to the heart affecting the functioning of heart which finally is the source for the generation of CHD in patients with T2DM. Furthermore due to persistent hyperglycemia, it also forms the advanced glycation end products (AGES), which have the receptors present in the macrophages Milo Engoren et al. [20] The AGES-macrophages complex finally acts on the DNA bringing the transcription of various inflammatory substances that is CRP in T2DM. CRP is an acute phase protein and also a marker of inflammation which is the outcome of persistent hyperglycemia in long standing T2DM subjects. The study was inconsistent with Christos Kalofoutis et al. [23] and Rodríguez-Morán M et al. [24] So, our study finally concludes that inflammation correlates with the CHD is the outcome of uncontrolled blood glucose level in diabetic subjects.

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