Research Article

Dyslipidemia in type 2 diabetes mellitus – a major risk factor for cardiovascular morbidity

Bobby D[1], Vinodha R[2]

[1]Dr. Bobby D, Assistant Professor, Department of Physiology, Government Villupuram Medical College, Villupuram, Dr MGR University, India, [2]Dr.Vinodha. R, Professor and Head of the Department, Department of Physiology, Thanjavur Medical College, Thanjavur, Dr MGR University, India.

Address for Correspondence: Dr. Bobby D, Assistant Professor, Department of Physiology, Government Villupuram Medical College, Dr MGR University. email id- bobbyraja26@yahoo.com

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Abstract

Introduction: Diabetes mellitus is growing worldwide like an epidemic. Early identification of cardiovascular risk factors will decrease the morbidity in type 2 diabetes mellitus. This study was done to assess the prevalence of dyslipidemia among type 2 diabetic population. **Methods:** 40 cases of type 2 DM with duration of 8 to 12 yrs and 40 controls of both males and females in the age group of 40 to 65yrs were selected. Laboratory investigations like fasting glucose and lipid profile (fasting) were taken. **Results:** In the present study the levels of fasting glucose, total cholesterol, low density lipoproteins, triglycerides were high and the levels of high density lipoproteins were low in the type 2 diabetics compared to controls. **Conclusion:** Thus this study suggests the importance of early detection of dyslipidemia in type 2 diabetics mellitus and will reduce the prevalence of complications in diabetics.

Keywords: Type 2 diabetes mellitus, Cardiovascular risk factor, Dyslipidemia.

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Introduction

Diabetes mellitus is a syndrome of chronic hyperglycemia due to insulin deficiency, resistance or both. Two types of diabetes mellitus have been described. Type I is caused by T- cell mediated autoimmune destruction of islet insulin secreting beta cells. Type II is characterized by the resistance to insulin with both hyperglycemia and hyperinsulinemia followed by the deficiency of insulin [1]. Type II diabetes is associated with two to four fold increase in the risk of cardiovascular disease. Cardiovascular diseases are the main cause of morbidity and mortality among type II diabetic patients and an estimated 75% to 85% of diabetes die because of cardiovascular diseases. This occurs as a result of atherosclerotic progress in diabetes. Type 2 diabetes is frequently associated with cardiovascular risk factors (CVRF) such as hypertension and dyslipidemia and that the prevalence of other factors such as smoking, sedentary life style and obesity is greater than in non diabetic population. The global prevalence of diabetes in 2010 is 6.6% (285 million) and it is expected to increase to 7.8% (438 millions) in 2030. In addition, there are 344 million people with IGT (impaired glucose tolerance) in 2010 which is predicted to rise to 472 million by 2030. Unfortunately, India tops the list with the largest number of diabetics (57 millions in 2010) which is expected to rise to 90 millions in another 20 years. The high prevalence is due to strong genetic predisposition, and also by the presence of low threshold levels for age and environmental risk factors for diabetes [2].

Dyslipidemia is an important contributing factor to the cardiovascular complication in diabetes mellitus. Lipid disturbances in diabetes mellitus are dominated by hypertriglyceridemia, and low High density lipoprotein cholesterol (HDL-C). Although average Low density cholesterol (LDL-C) levels may not be increased, diabetic patients have higher concentrations of small dense LDL-C. These proatherogenic particles are readily oxidised and taken up by monocytes and endothelial smooth muscles, contributing to atherogenesis and subsequent progression of atherosclerosis [3].

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Materials and Methods

This study was undertaken to assess the cardiovascular risk factors in type 2 DM. Case control type of study was done. The study was approved by Ethical committee of Thanjavur Medical College. The study was conducted during 2009-2011. 40 cases of type II DM, 8-12 yrs duration, 40 to 65yrs both male and female were selected from patients attending diabetic OP at Thanjavur medical college. Age and sex matched controls were selected from the healthy, non-diabetic general population residing at Thanjavur district.

Informed consent was obtained from all subjects prior to enrolment into the study. A proforma with detailed history of the subjects were filled. Height, weight, BMI were measured. General examination was done including examination of CVS, RS, CNS and abdomen. Vital signs were recorded. Baseline investigations were done for all subjects, including Fasting Blood Sugar, haemoglobin estimation, ECG.

Biochemical analysis- Collection of blood samples for biochemical assay was done after fasting for at least 12 hrs. Blood samples were collected in the morning. 5 ml of blood from antecubital vein from each subject was collected aseptically in disposable sterile 5 ml syringe and was allowed to clot. Samples were processed within 1hour for quantitative lipoprotein cholesterol measurements using the vertical spin centrifugation technique– serum was obtained by centrifugation for 4 mins at 3000 rpm and was transferred into properly labelled sterile vials stored at -20 ºC till the performance of lipid profile. Serum total cholesterol, triglycerides, High density lipoprotein tests were evaluated by standard enzymatic kits methods whereas low density lipoprotein was calculated according to FRIEDWALD FORMULA LDL = Total cholesterol – {(TGL/5) + HDL} (If TGL IS < 400mg /dl). Total cholesterol was estimated using CHOD-PAP method enzymatic assay. Serum triglyceride was estimated employing standard GPO-POD method of enzymatic assay. HDL cholesterol was estimated by PEG precipitation method. These test were carried out in a semi autoanalyzer.

Statistical analysis was done using Epidemiological Information package (EPI2010) developed by Centre of Disease Control, Atlanta. All data were compared between the diabetic and the control groups using the software, frequencies, percentages, mean, standard deviations were calculated. Chi-square test was used to test the significance of difference between variables. A 'p' value less than 0.05 is taken to denote significant relationship.

Results

As seen in table 1 the mean serum cholesterol in diabetics is 229 ± 39.5 mg/dl and the mean cholesterol in controls is 192 ± 33.5 mg/dl. The values of total cholesterol are significantly higher in diabetics than in non diabetics. The P value is < 0.0001. The mean serum triglycerides in diabetics is 216 ± 74.25 mg/dl and the mean value in non diabetics is 157 ± 385 mg/dl. The values of serum triglycerides are significantly higher in diabetics than in control group. The P value is < 0 .0001. The mean serum HDL in diabetics is 38.9± 55 mg/dl and the mean for non diabetics is 44.8± 5.55 mg/dl. The values of HDL are found to be lower in diabetic than in non diabetic. The P value is < 0 .0001. The mean serum LDL cholesterol in diabetics is 147 ± 41.5 mg/dl and the mean for non diabetic is 116.1± 32.75 mg/dl. The values of serum LDL are significantly higher in diabetic than in control. The P value is < 0 .0003.

Table-1: Observation of all Parameters.

Parameters	N	Minimum	Maximum	Mean	Standard deviation
AGE (yrs)	80	39	70	58	8.4
Total Cholesterol					
mg/dl	80	155	310	229.2	39.5
TGL mg/dl	80	109	390	216.4	74.2
HDL mg/dl	80	34	51	38.9	5.0
LDL mg/dl	80	49.4	242.2	147	41.5

Table-2: Observation about total cholesterol in this study.

Group	No. of cases	Total Cholesterol			
		<200mg/dl		>200mg/dl	
		N	%	N	%
Diabetic	40	11	27.5	29	72.5
Control	40	31	77.5	9	22.5
P		<.0001			

77.5% of controls have serum total cholesterol value < 200 mg/dl and 22.5% have serum total cholesterol > 200 mg/dl. In study group 27.5% show serum Total cholesterol < 200 mg/dl and 72.5% show serum total cholesterol > 200 mg/dl. The result shows that most of the diabetics have raised values of serum total cholesterol compared to non diabetics.

Table-3: Triglycerides in this study.

Group	No.of cases	Triglyceride			
		<150 mg/dl		>150 mg/dl	
		N	%	N	%
Diabetic	40	5	12.5	35	87.5
Control	40	29	72.5	11	27.5
P		<.0001			

In the control group 72.5% show serum triglyceride <150 mg/dl and 27.5% of them show a value >150 mg/dl. In diabetic group 12.5% show serum triglyceride <150mg/dl and 87.5% show serum triglyceride value >150 mg/dl. So the result shows that there is a definite increase in triglyceride in diabetics than control groups.

Table-4: Observation about HDL cholesterol.

Group	No. of cases	High Density Lipoprotein			
		<40 mg/dl		>40 mg/dl	
		N	%	N	%
Diabetic	40	32	80	8	20
Control	40	8	20	32	80
P		<.0001			

Among non diabetics 20% of them have HDL values <40 mg/dl whereas 80 % of them have > 40 mg/dl. Among diabetic 80% of them have serum HDL values <40 mg/dl and 20% shows HDL value > 40 mg/dl. The results show reduced serum HDL values in diabetics when compared with controls.

Table-5: Observation about LDL cholesterol.

Group	No.of cases	Low Density Lipoprotien			
		<130 mg/dl.		>130 mg/dl.	
		N	%	N	%
Diabetic	40	15	37.5	25	62.5
Control	40	31	77.5	9	22.5
P		<.0001			

77.5% of controls show serum LDL <130 mg/dl and 27.5% of them show >130 mg/dl. In the study group 37.5% of diabetic show serum LDL <130mg/dl and 62.5% show serum LDL value >130 mg/dl. The result show that there is a definite increase in LDL in diabetics than control groups.

Table-6: Observation about Dyslipidemia.

Group	No.of cases	Dyslipidemia			
		Present		Absent	
		N	%	N	%
Diabetic	40	35	87.5	5	12.5
Control	40	14	35	26	65
P		<.0001			

In controls 35% have dyslipidemia and 65% have normal lipid level. In the study group (diabetics) 87.5% show dyslipidemia and 12.5% have normal lipid level. The results show that most of the diabetics have raised lipid levels than controls.

Discussion

The incidence of myocardial infarction, stroke is increased two to three fold in diabetes mellitus patients and the risk of death is increased two to three fold independent of other known risk factors for cardiovascular disease. In the present study the results indicate that subjects with diabetes mellitus of 8 to 12 years duration show a significant change in lipid profile compared to controls.

Serum Total Cholesterol- Significant difference was observed between diabetic and control group in total cholesterol values. The mean ± SD of serum total cholesterol in control is 192.3 ± 33.5mg/dl, while it is significantly higher in diabetics, (229.2 ± 39.5 mg/dl. P = 0.0001). Results found by Guanmin chen et al (2011) supports the findings of our study [4]. Sharon H Saydah et al (2004) in a study of diabetics with cardiovascular disease also found a significant rise in serum cholesterol in diabetics (222.8 mg/dl)[5]. Andan Gokcel et al (2001) have found a similar rise in serum cholesterol in their study. They used only female subjects for study, while both sexes have been included in my study [6].

Serum Triglycerides- Significant difference was observed between diabetics and control. The mean ± SD of triglycerides level in diabetics and control is 216.4±74.2mg/dl and 157±38 mg/dl respectively (P = 0.0001). The results are comparable to the following studies: Steven. M. Haffner et al (1998) in a cross sectional study between diabetics and non diabetics showed significant rise in serum triglycerides 223 mg/dl [7]. R.C. Turner et al (1998) also found a significant rise of serum triglycerides in diabetics which is similar to the present study [8]. Herman. A. Taylor et al (2009) have done a study in African– Americans (Jackson Heart study participants). They found statistically significant rise in serum triglycerides in their study [9].

HDL Cholesterol- The Mean ± SD serum HDL in diabetic group is 38.9 ± 5 mg/dl compared with higher value in control group (44.8 ±5.5 mg/dl). This difference was statistically significant (P=0.0001). These observations are similar to other studies.

Anthony keech et al (2003) in their study in diabetics, prediabetics and normal subjects found significant decrease in HDL levels, as seen in the present study [10]. Elizabeth Selvin et al (2005) have done a study in African– Americans (The atherosclerosis risk in community study). They have found significant decrease in HDL which is in conformity with my study [11]. James. R. Gavin (2008) has also found a significant decrease in HDL in diabetics in his study [12].

LDL Cholesterol- The mean ± SD serum LDL in diabetics is 147 ± 41.5 mg/dl compared to 116 ± 32.7 mg/dl in the controls. This difference is statistically significant. (P = 0.0003).

Salvador Trenche et al (2005) have found significantly raised serum LDL in a study in diabetics including newly diagnosed diabetes (158±72.9mg/dl) which is similar to my study [2]. H. Surekha rani et al (2005) have done a study in people with type 2 DM and found a significant rise in serum LDL (135.56±32.57mg/dl). RC. Turner et al (1998) found a significant rise in serum LDL. These results are similar to my study [13].

Conclusion

The present study found significant increase in levels of serum total cholesterol, triglycerides, low density lipoproteins, and significant decrease in levels of high density lipoprotein in subjects with Type 2 diabetes mellitus. The estimation of lipid profiles in diabetes mellitus in early stage is very useful to assess the

cardiovascular risk and will help the patient to improve and reduce the morbidity and mortality. This will go a long way in decreasing health costs incurred due to cardiovascular complications of diabetes and will help to improve the quality of life.

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