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DIABETIC CARDIOVASCULAR COMPLICATIONS AND DYSLIPIDEMIA: A HOSPITAL BASED CROSS SECTIONAL STUDY IN NORTHWEST INDIA

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ABSTRACT

Aim: To investigate the strength of association of each parameter of deranged lipid profile with diabetic cardiovascular complications **Methods**: This was a hospital based cross sectional study which included 150 diabetic patients who visited shree krishna hospital from May 2008 to April 2009. Lipid profile of all the patients was estimated by fully autoanalyser, cardiovascular complications assessed by Echo-cardio graphic changes and Electro cardiogram (ECG) changes. **Results**: The prevalence of dyslipidemia is higher in diabetic population in our study. Serum cholesterol >240 mg/dl was seen in 14%, serum triglycerides >160 mg/dl was seen in 43.33 %, raised LDL (low density lipoproteins) >130 mg/dl in 35.33 %, VLDL (very low density lipoproteins) >40 mg/dl in 25.33% and low levels of HDL (high density lipoproteins)<40 mg/dl were seen in 46.66 %. Though duration of disease, use of statins, abnormal level of cholesterol and lipoproteins also influence the development of diabetic cardiovascular complications, but on multiple logistic regression analysis, CVD (cardiovascular disease) had strong correlation with high levels of LDL only. **Conclusion**: Our study showed that Lipid profile abnormalities which are very common in type 2 diabetes, have a great influence on CVD. Estimated cardiovascular risk can be correlated with abnormal lipid profile, especially high level of LDL.

Keywords: Dyslipidemia, Type II Diabetes, Cardiovascular complications

INTRODUCTION

Diabetes Mellitus and its associated complications have become a public health problem of considerable magnitude. Cardiovascular disease (CVD) is the most prevalent complication and is associated with excess morbidity and mortality in diabetic patients. (1)The etiopathogenesis of the long-term complications of diabetes is not fully understood and controversies exist about why they occur in some patients and not in others. (2) Though role of dyslipidemia in the development of diabetic complications is well known but data regarding individual parameter of deranged lipid profile are lacking. Various risk factors act synergistically for the development of cardiovascular complications in type II diabetes and the contribution of individual risk factor is yet to be clearly identified and quantified. (3) Thus the present study aimed to assess the effect of dyslipidemia on cardiovascular complications in western India.

MATERIAL AND METHODS

Study population

In this hospital based cross-sectional prospective study, total 150 type II diabetic patients attending diabetic clinic and medicine OPD at shree krishna hospital, PSMC, karamsad during May 2008 to April 2009 were included. Patients were confirmed for diabetes by clinical and biochemical diagnosis based on American Diabetes Association revised criteria. (4) Approval from the institutional ethics committee was taken prior to study. The patients included in the study were informed about the study in brief, in their local language, and then written consent was taken from them.

Study design

Diabetic patients were evaluated for presence of cardiovascular complications which was assessed by either Electrocardiogram or Echocardiographic changes. Lipid profile was done by fully-auto analyzer (ERBA -XL-300). Triglyceride level was estimated by GPO (trinder) method. (5) Total cholesterol was estimated by CHOD-POD method (6), while HDL estimation was done by phosphotungustic method. (7) Blood glucose was estimated by glucose oxidase method (8) and glycosylated hemoglobin by immunoturbidometric method. (9) Estimated values of total cholesterol >240 mg/dl, serum triglycerides >160 mg/dl, HDL <40 mg/dl, LDL >130 mg/dl and VLDL >40 mg/dl were considered as abnormal.

Statistical analysis

Means or proportions for baseline clinical and laboratory characteristics were computed for subjects with and without cardiovascular risk. T-test was used to compare means and chi square test was used to compare proportions. Significance tests were two tailed and p-values less than 0.05 were considered statistically significant. Multiple Logistic regression analysis was used to assess effect of individual variable in the development of cardiovascular complication of diabetes.

RESULTS

The details of demographic profile of the study population revealed that the mean age of the study population was 60.4 years, with average duration of diabetes 9.7 years. Mean fasting blood sugar was 161.9 ± 51.7 mg/dl and mean glycosylated hemoglobin was found to be 8.2 %. Mean serum cholesterol was 182.9 ± 50 mg/dl, serum HDL was 40.6 ± 13.2 mg/dl, serum LDL was 110.3 ± 41.3 mg/dl, serum VLDL was 35.8 ± 23.8 mg/dl and serum triglyceride (TG) was 175.8 ± 110 mg/dl. Data regarding lipid profile showed that out of 150 patients, hypertriglyceridemia is most common abnormality in diabetic patients, followed by high level of LDL and VLDL. Serum TG levels were high (>160 mg/dl) in 43.33 % patients, while high LDL level (>130 mg/dl) were found in 35.33% patients.

Comparison of means revealed that duration of disease, serum cholesterol, serum LDL, serum VLDL and serum triglyceride levels were significantly associated with the cardiovascular complication, with p value < 0.05. While age of patients, serum HDL levels, fasting blood sugar levels (FBS) and PP2BS levels did not have statistically significant association with cardiovascular complication. (Table-1)

Use of statins in diabetic patients was found to be significantly associated with reduction of cardiovascular complications. Sex of the patients, glycosylated hemoglobin levels and smoking were not found to be significantly associated with the risk of cardiovascular complications, with p values more than 0.05. (Table-2)

On application of multiple logistic regression and after adjusting all the variables mutually, only serum LDL level was found to be significantly associated with the development of cardiovascular complication in diabetes patients with approximately a threefold increase in the

risk of cardiovascular complications (OR 2.7, 95% CI **1.5613 to 4.8532).** (Table-3)

DISCUSSION

The present study showed the prevalence of dyslipidemia in diabetic population of west India comprising rural population. Dyslipidemia is an established risk factor for CAD in patients with type II diabetes, (10, 11) which include low HDL levels, raised triglycerides and raised LDL levels.

LDL is a major determinant of atherosclerosis in patients with diabetes, results are consistent with study of R.P. Agrawal et al, in which changes in LDL particle composition such as density, oxidation potential and glycation, render even normal LDL levels as highly atherogenic. (3) The Strong Heart Study, which was an American Indian population based study, concluded that each 10 mg/dl increase in LDL-cholesterol corresponded to a 12% increase in cardiovascular risk. (12). Similar information was also observed in present study, in which LDL-cholesterol was the most important independent variable in the model used for multivariate analysis, while from baseline data of the United Kingdom Prospective Diabetes Study (UKPDS), Stratton IM et al revealed that both decreased HDL and elevated LDL predict CHD. (13)

There were some limitations in the present study, sample size was small and it was a hospital based study, so can't represent whole population. There is a need to perform such studies on larger and community based population.

CONCLUSION

In conclusion, the results of our study showed that in type 2 diabetes population of western India, estimated cardiovascular risk correlated with abnormal lipid profile, especially high serum levels of LDL. These data could explain the failure of intensive glycemic control in reducing cardiovascular events observed in diabetic patients. Duration of disease also had strong impact on diabetic complications. Patients on hypolipidemic drugs had an inverse relationship with the development and progression of cardiovascular complications, while patient's age, sex, and smoking behavior did not show statistically significant asssociation. More studies are required for development of appropriate preventive and treatment strategies to reduce diabetic cardiovascular complications.

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Table1: Association of various clinical characteristics and laboratory parameters with cardiovascular complications

S.No.	Variable	Total Study participants		Without Cardiovascular complications		With Cardiovascular complications		P value
		Mean	SD	mean	SD	mean	SD	
1.	Age	60.4	10.8	61.7	11.2	59.2	10.2	0.1557
2.	Duration	9.7	5.9	10.8	6.8	8.6	4.6	0.0224*
3.	Cholesterol	182.9	50.0	168.04	43.9	198.71	51.56	0.0001*
4.	Serum HDL	40.6	13.2	41.9	14.2	39.2	12.1	0.2132
5.	Serum LDL	110.3	41.3	96.6	38.1	124.8	39.8	< 0.0001*
6.	Serum VLDL	35.8	23.8	31.4	15.2	39.0	27.2	0.0351*
7.	Serum TG	175.8	110.6	157.2	75.9	195.4	136	0.0360*
8.	FBS	161.9	51.7	165	60.4	158.4	40.6	0.4360
9.	PP2BS	257.4	86.3	254.5	87.3	260.4	85.8	0.4360

* p value < 0.05 (statistically significant)

Table 2: Association of various clinical characteristics and laboratory parameters with cardiovascular complication

S.No.	Variable		With CV complication	Without CV complication	P value
1.	Sex	Male	46	43	0.4671
		Female	27	34	
2.	HbA1c (gm/Hb)	<7	18	25	0.3807
		>7	55	52	
3.	Statins	Yes	27	43	0.0315*
		No	46	34	
4.	Smoking	Yes	09	12	0.7346

* p value < 0.05 (statistically significant)

Table 3: Multiple logistic regression analysis using cardiovascular complication as a dependent variable

S.No.	VARIABLE	ADJUSTED ODDS RATIO	95% CI
1.	Duration	0.9338	0.8741 to 0.9975
2.	Cholesterol	1.1421	0.5606 to 2.3268
3.	**Serum LDL**	**2.7527**	**1.5613 to 4.8532**
4.	Serum TG	1.3718	0.5777 to 3.2576
5.	Serum VLDL	0.9565	0.4445 to 2.0580
6.	Statin use	0.7316	0.3444 to 1.5542