Original Article

Studies on Dyslipidemia in Diabetic and Non Diabetic Hypertensive Patients

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ABSTRACT

Objective: Background reliable information about the prevalence of dyslipidemia in hypertensive and non hypertensive diabetic patients in local region is essential to the development of regional health policies for prevention and control of this condition. An attempt was made in Puducherry region to examine the lipid profile parameters in the diabetic patients with and without hypertension and thereby to create awareness on the importance of closely watching their lipid parameters frequently from the age of 30-70. **Method:** Totally case sheets of 105 Puducherry patients are referred covering hypertensive and non hypertensive diabetic patients. To ascertain the significance of each parameters student's t-test has been done. **Results:** It is found that elevated serum triglycerides (TG), very low density lipoprotein (VLDL) and Cholesterol/High density lipoprotein Ratio (CHOL/HDL) but normal cholesterol, low density lipoprotein (LDL) and HDL in diabetic patients of all age groups. In both gender Serum triglycerides are significantly elevated in diabetics of all age groups compared to non diabetics. Plasma VLDL is significantly elevated in female diabetic patients between the age group of 30-40 years and 60-70 years compare to non diabetics and other age groups. Plasma VLDL is significantly elevated in male diabetic patients also between the age group of 30-50 years compare to non diabetics and other age groups. **Conclusion:** Serum TG and VLDL was found to be more significantly increased in diabetic patients with hypertension compared to without hypertension. Similarly serum TG is also elevated in non diabetic hypertensive patients.

Keywords: Lipid profile; Diabetes; Hypertension.

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INTRODUCTION

As per the WHO Report, 2002 in terms of burden of disease top 10 risks globally and regionally are alcohol consumption, high blood pressure, tobacco consumption, under weight, unsafe water, and high cholesterol, and obesity, smoke from fuels, sanitation and hygiene. Together these account for more than 1/3 of all deaths worldwide[1]. Hypertension and diabetes mellitus are interrelated diseases, which, if untreated, strongly predispose to atherosclerotic cardiovascular disease. Patients who have both diabetes and hypertension have more renal diseases and atherogenic risk factors, including dyslipidemia (lipid abnormalities), hyperuricemia, elevated fibrinogen, and left ventricular hypertrophy. Lifestyle and genetic factors are important in the genesis of both conditions. Hypertension is approximately twice as common in persons with diabetes as in those without[2].

Population-based surveys of 75 communities in 32 countries show that diabetes is rare in communities in developing countries where a traditional lifestyle has been preserved. By contrast, some Arab, migrant Asian Indian, Chinese, and U.S. Hispanic communities that have undergone westernization and urbanization are at high risk in these populations, the prevalence of diabetes ranges from 14 to 20%. In addition, most of the population growth in the developing world is taking place in urban areas. Consequently, diabetes is rapidly emerging as a global health care problem that threatens to reach pandemic levels by 2030; the number of people with diabetes worldwide is projected to increase from 171 million in 2000 to 366 million by 2030[3].

Studies conducted in India in the last decade have highlighted that not only is the prevalence of type II diabetes high, but also that it is increasing rapidly in the urban population[4]. A national survey of diabetes conducted in six major cities in India in the year 2000 showed that the prevalence of diabetes in urban adults was 12.1 %. Prevalence of Impaired glucose tolerance (IGT) was also high (14.0 %). The onset of diabetes occurred before the age of 50 years in 54.1 % of cases, implying that these subjects developed diabetes in the most protective years of their life and had a greater chance of developing the chronic complications of diabetes[5].

Lipid profile abnormalities are common in Diabetes and contribute significantly to its complications. But the treatment of dyslipidemia was often neglected, despite convincing evidence linking it to the development of atherosclerosis. The compounding effects of age, obesity, ethanol, antihypertensive drugs, diet and separately inherited lipid disorders, often aggravate them. In recent years, prevention of microvascular complications of diabetes has been shown to be possible with aggressive treatment of hyperglycemia. Unfortunately, trails on the prevention of macrovascular complications of diabetes and insulin resistant states are currently lacking. This is somewhat surprising, given that these complications are the important cause of morbidity and mortality associated with both type I and type II diabetes, with a twofold to threefold increased incidence in men and an up to six fold increase in women compared to age matched, non diabetic individuals[6].

The complications of diabetes are far less common and less severe in people who have well controlled blood sugar level. In fact, the better the control, the lower the risk of complications. Hence, patient education, understanding, and participation are vital. Healthcare professionals treating diabetes also often attempt to address health issues that may accelerate the deleterious effect of

diabetes. These include smoking (stopping), elevated cholesterol levels (control or reduction with diet, exercise or medication), obesity (even modest weight loss can be beneficial), high blood pressure (exercise or medication if needed), and lack of regular exercise.

MATERIALS AND METHOD

Totally case sheets of 105 Puducherry patients those who are having hypertensive diabetes, non hypertensive diabetes and non diabetic hypertension cases are collected from ARAVIND DIAGNOSTIC CENTER and Private Clinic of Dr. MANIMARAN, MD., Heart Specialist, IGGGH, Puducherry. These patients aged ranged from 30 to 70 years. Of the 105 patients 55 are male and 50 are female. All the parameters are analyzed for each sex, overall and by specific age strata (30-40, 40-50, 50-60, and 60-70 years).

For ascertaining the influence of hypertensive and non hypertensive diabetes, the lipid parameters viz. fasting Blood sugar, cholesterol, triglycerides, LDL, VLDL,HDL, ratio are taken into account as abnormality indices. The data on age and sex related changes in the selected lipid parameters are statistically tested using students‘t’ test.

To ascertain the significance of each parameters student’s t-test has been done. All the data pertaining to lipid indices viz. Fasting blood sugar (FBS), Cholesterol, Triglycerides, LDL, VLDL, HDL, and Cholesterol/HDL Ratio are compared with the normal values of those parameters given in the reagent kits as well as non-diabetic patients. The reagent kits were purchased from ACCUREX Biomedical Private Ltd. for Cholesterol estimation, ACCU CARE- Lab Care Diagnostic (INDIA) Private Ltd. for the estimation of HDL and AGAPPE Diagnostic Private Ltd for the estimation of TGL and Sugar.

RESULT

105 subjects comprising 55 male 50 female were included in the present study. Measurements of fasting blood glucose, cholesterol, triglycerides, LDL, VLDL, HDL, and Cholesterol/HDL Ratio were done in both the groups by specific age strata. The results of the study are given below.

Among the male diabetic patients between age group of 30-70 years the lipid profile viz. FBS, TG level was found to be significantly high and the Chol/HDL ratio and VLDL was found to be altered ununiformly among all the age groups (Table 1). Similarly in the diabetic female patients FBS, TG was found to be significantly high and Chol/HDL ratio and VLDL were found to be altered ununiformly among all the age groups (Table 2).

Where as in the non diabetic male and female patients between the age group of 30-70 years the TG level was alone found to be significantly high and the remaining parameters of lipid profile showed no significant variations (Table 3, 4).

In the hypertensive diabetic patients of male and female between the age group of 30-70 years, the lipid profile viz. FBS, TG, and VLDL level was found to be increased significantly. The Chol/HDL ratio was found to be high in diabetic patients with hypertension where as it was within the normal range in non diabetic patients with hypertension. The remaining parameters showed no significant variations. Similarly in the non hypertensive diabetic patients of male and female between the age group of 30-70 years, the lipid profile viz. FBS, TG level was found to be increased significantly, where as in the non diabetic hypertensive patients of male and female between the age group of 30-70 years, TG level alone increased significantly. The remaining parameters of lipid profile showed no significant variations.

DISCUSSION

Disorders of lipoprotein metabolism in diabetic patients are of great interest because their association to the presence of atheromatosis and cardiovascular diseases. More than 80% of people with hypertension have additional comorbidities, such as obesity, glucose intolerance, hyperinsulinemia, reduced HDL cholesterol, elevated LDL cholesterol, elevated triglycerides etc. More than 50% of people with hypertension have two are more comorbidities[7].

The present study is done to compare the pattern of lipid profile in diabetic hypertensive and diabetic non hypertensive patients. In the present study we also measured the pattern of lipid profile in non diabetic hypertensive patients to check whether there is any significance in cases with the previous one. 105 cases comprising 55 male 50 female were included in the present study. Measurements of fasting blood glucose, cholesterol, triglycerides, LDL, VLDL, HDL, and Cholesterol/HDL Ratio were done in both the groups by specific age strata.

Diabetic dyslipidemia is characterized by high triglycerides, low HDL and normal LDL cholesterol in most of the patients[8]. In our study in table-1 and 2, it has been observed that out of 105, 40 cases aged 30-70 years elevated levels of FBS, TG, VLDL and Chol/HDL Ratio in all the four groups of diabetic patients of both sexes. Significantly an elevated level of TG was observed in all the four groups of diabetic patients of both sexes. Hyper triglyceridemia is the common dyslipidemia seen in uncontrolled diabetic stage. It has been suggested that the increase in TG may be due to insulin deficiency which result faulty glucose utilization cause hyperglycemia and mobilization of fatty acids from adipose tissue. In diabetes blood glucose is not utilized by tissue resulting in hyperglycemia. The fatty acids from adipose tissue are mobilized for energy purpose and excess fatty acids are accumulated in the liver, which are converted to triglyceride[9, 10, 11].

In this study triglycerides level was found to be positively related to VLDL in Diabetic patients. But alternation in VLDL levels was not uniform in term of age and sex in patients with diabetes Mellitus. Serum VLDL is significantly elevated in female diabetic patients between the age group of 30-40 years and 60-70 years compared to non diabetics and other age groups. Serum VLDL is significantly elevated in male diabetic patients also between the age group of 30-50 years compared to non diabetics and other age groups. Again, in Indian diabetics hypertriglyceridemia with increased VLDL is the more common dyslipidemia than low HDL cholesterol levels. An increased in VLDL occurred in diabetes mellitus due to increase availability of glucose for VLDL synthesis and decrease in lipoprotein lipase activity leading to decrease of VLDL from peripheral circulation. The triglyceride is endogenous in origin with rise in VLDL levels i.e. Type IV hyperlipoproteinemia. The hypertriglyceridemia is consequent to over production by liver and poor clearance of VLDL in the peripheral tissue[12, 13].

In table-3 and 4, it has been found that out of 105, 40 cases aged 30-70 years elevated level of only serum TG, but normal VLDL, LDL and HDL in non diabetic patients of both sex. This is in corroboration with earlier studies which showed that dyslipidemia may also arise due to the genetic predisposition, secondary life styles, fatty food consumption, saturated fat, smoking and increased alcohol intake[13].

In table-5, it has been observed that out of 105, 25 cases aged from 30-70 years serum TG and VLDL was found to be more significantly increased in hypertensive

diabetic patients compared to non hypertensive diabetic patients. Since more than 80% of people with hypertension have additional comorbidities, such as obesity, glucose intolerance, hyperinsulinemia, reduced HDL cholesterol, elevated LDL cholesterol, elevated triglycerides etc. More than 50% of people with hypertension have two or more comorbidities[14].

The significantly higher serum TG in hypertensive non diabetic patients in the present study is in corroboration with earlier studies[15, 16].

In the present study the absolute differences between estimated prevalence of dyslipidemia in diabetic with and without hypertension among different age groups and gender was not found, even statistically.

So the contribution factors for the growing burden of lipid profile are increased prevalence of cardiovascular risk factors especially by hypertension, diabetes, obesity, physical inactivity and tobacco use. It is an area where major health gains can be made through the implementation of primary care intervention and basic public health measures targeting diet, lifestyle and the environment.

CONCLUSION

Glycemic control seems to be paramount importance, rather than the mode of therapy in the management of diabetes induced lipoprotein abnormalities. Newer modes of therapy, specifically aimed at normalizing the lipid abnormalities in diabetics include dietary modification and the use of pharmacological agents for lowering triglycerides and cholesterol, when they are not controlled by intensive therapy of diabetic alone. All efforts to ensure good glycemic control should be made prior to initiation of drug therapy for hyperlipedemia. These data can be considered as indicative of the prevalence of these diseases in the population of puducherry aged from 30 – 70. Although improvement have been made in our country, rate of control remain far from adequate. From this study we conclude that people should be educated to get cheeked regularly for lipid abnormalities and if found to be abnormal, should start controlling blood sugar and lipid level very effectively.

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Table 1. Dyslipidemia in male diabetic patients

PARAMETERS	30-40 YEARS	40-50 YEARS	50-60 YEARS	60-70 YEARS
FBS	178.4±12.96*	171.8±36.68*	169.2±16.31*	158.0±19.28*
CHOLESTEROL	210.2±37.18	224.0±70.65	195.2±20.16	186.4±26.45
TRIGLYCERIDES	311.4±59.68*	479.2±174.6*	279.8±69.58*	246.8±77.09*
HDL	32.4±6.22	32.7±3.34	42.4±9.39	45.0±9.92
LDL	119.0±17.5	95.6±43.4	103.6±19.76	95.5±14.7
VLDL	61.0±5.98NS	95.6±25.1*	49.0±18.3*	51.6±18.9NS
CHOL/HDL RATIO	6.5±0.33NS	6.5±0.3NS	4.84±1.23	4.3±1.13

Data represent mean value ± standard deviation of five observations. NS-Not Significant*Level of significance at P < 0.05.

Table 2. Dyslipidemia in female diabetic patients

PARAMETERS	30-40 YEARS	40-50 YEARS	50-60 YEARS	60-70 YEARS
FBS	176.0±44.0*	152.14±19.8*	195.0±37.36*	145.5±25.43*
CHOLESTEROL	194.5±32.5	213.0±19.77	238.0±30.8	178.0±29.16
TRIGLYCERIDES	289.0±6.14*	253.4±56.5*	276.5±36.65*	314.25±77.1*
HDL	33.5±1.5	40.1±8.8	45.3±4.31	32.7±2.0
LDL	140.0±1.5	125.4±19.2	135.6±28.54	92.5±26.1
VLDL	62.0±6.0*	49.9±10.8NS	59.3±15.2NS	86.0±19.8*
CHOL/HDL RATIO	5.8±1.2NS	5.6±1.1NS	5.29±0.98NS	4.85±2.37

Data represent mean value ± standard deviation of five observations. NS-Not significant
*Level of significance at P < 0.05.

(Normal values: Fasting blood sugar (FBS) -70-110 mg/dl; Cholesterol -150-250 mg/dl; Triglycerides - 80 -150 mg/dl; HDL- 30 - 70 mg/dl; LDL- 62-185mg/dl; VLDL -25- 50mg/dl; Cholesterol/HDL ratio- 2-6)

Table 3. Dyslipidemia in male non diabetic patients

PARAMETERS	30-40 YEARS	40-50 YEARS	50-60 YEARS	60-70 YEARS
FBS	79.5±1.5	77.8±9.36	91.5±1.5	92.5±3.5
CHOLESTEROL	162.0±22.0	192.0±37.1	166.0±22.5	180.5±17.2
TRIGLYCERIDES	173.0±7.11*	349.0±146.6*	193.0±29.3*	227.5±27.5*
HDL	39.5±2.5	33.5±5.19	45.5±2.5	52.0±2.0
LDL	88.0±18.0	81.0±23.67	51.0±18.3	84.5±7.5
VLDL	34.5±1.5	69.5±42.12	34.5±1.5	43.5±11.5
CHOL/HDL RATIO	4.04±0.34	4.2±2.1	2.88±0.92	3.45±0.45

Data represent mean value ± standard deviation of five observations. NS-Not significant
*Level of significance at P < 0.05.

Table 4. Dyslipidemia in female non diabetic patients

PARAMETERS	30-40 YEARS	40-50 YEARS	50-60 YEARS	60-70 YEARS
FBS	79.1±7.7	92.0±6.0	94.0±4.0	92.6±14.5
CHOLESTEROL	201.0±42.4	197.0±28.59	202.0±2.51	181.5±17.0
TRIGLYCERIDES	221.0±11.5*	187.6±12.82*	215.0±11.2*	236.0±26.2*
HDL	34.7±6.3	45.3±3.77	40.0±2.7	54.3±4.5
LDL	110.0±8.9	116.6±28.1	120.0±6.0	86.7±17.6
VLDL	37.8±2.1	35.3±5.25	42.5±2.5	41.0±9.8
CHOL/HDL RATIO	4.45±0.9	4.3±0.3	5.06±0.6NS	3.35±1.36
Data represent mean value ± standard deviation of five observations. NS-Not significant Level of significance at P < 0.05.				

(Normal values: Fasting blood sugar (FBS) -70-110 mg/dl; Cholesterol -150-250 mg/dl; Triglycerides - 80 -150 mg/dl; HDL- 30 - 70 mg/dl; LDL- 62-185mg/dl; VLDL -25- 50mg/dl; Cholesterol/HDL ratio- 2-6)

Table 5. Dyslipidemia in hypertensive and non hypertensive diabetes and non diabetic hypertension

Conditions	FBS	Cholestrol	Triglycerides	HDL	LDL	VLDL	CHOL/HDL Ratio
Hypertensive Diabetes	178.18±27.8*	211.7±34.9	316.45±75.3*	41.95±6.5	106.18±21.74	66.45±12.3*	5.36±2.1 NS
Non hypertensive Diabetes	187.86±24.7*	208.4±33.8	254.42±49.4*	42.0±4.86	131.6±14.7	53.57±15.4 NS	4.95±1.05
Non diabetic hypertension	86.6±14.4	186.6±18.4	195.2±22.86	46.0±6.0	101.8±16.2	38.6±14.4	4.1±0.9
Data represent mean value ± standard deviation of ten observations. NS-Not significant *Level of significance at P < 0.05. (Where m-mean from the normal range)							

(Normal values: Fasting blood sugar (FBS) -70-110 mg/dl; Cholesterol -150-250 mg/dl; Triglycerides - 80 -150 mg/dl; HDL- 30 - 70 mg/dl; LDL- 62-185mg/dl; VLDL -25- 50mg/dl; Cholesterol/HDL ratio- 2-6)