



A Study of Coronary Risk and LDL in Type II Diabetic Patients

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Abstract

A prospective study was carried out to find the percentage of dyslipidemia in type II diabetics in comparison with non diabetic individuals, to study the pattern of dyslipidemia, categorize the levels of LDL, HDL and triglycerides into higher, borderline and lower risk of developing coronary heart disease in type II diabetics and categorize the type of and level of dyslipidemia in symptomatic and asymptomatic coronary artery disease.

Introduction

In newly diagnosed, middle-aged patients with type 2 diabetes, the same group found that the incidence of cardiovascular mortality increased with rising fasting plasma glucose (FPG) at baseline during a 10-year study. In all patients, irrespective of treatment mode this association was found. A high FPG level significantly predicted cardiovascular mortality independent of other risk factors in multiple regression analysis¹⁹. As hyperglycemia alone does not explain all the increased risk for CHD in people with type 2 diabetes, other factors must be considered. It has been postulated that rather than being a complication of DM, CHD and DM share common genetic and environmental antecedents. They have in common many CHD risk factors, and a possible link between them is insulin

resistance syndrome. Compared with the non diabetic population the prevalence of dyslipidemia, obesity and sedentary lifestyle is higher in people with type 2 diabetes.

People with diabetes tend to have higher low-density lipoprotein (LDL) cholesterol and triglycerides and lower HDL. In them LDL particles tend to be smaller and denser, and this increases the risk for atherosclerosis.

Even at concentrations well below the National Cholesterol Education Program target of 130 mg/dl, LDL cholesterol is a strong independent predictor of coronary heart disease in individuals with diabetes, even when components of diabetic dyslipidemia are present. These results support recent recommendations for aggressive control of LDL, cholesterol in diabetic individuals, with a target level of <100 mg/dl.²¹

Materials and Methods

100 type II diabetes mellitus and 50 age, sex and BMI matched non diabetic individuals were studied. The labeling of dyslipidemia and the categorization of risk for developing coronary heart disease (CHD) was done according to guidelines of American diabetes association.

Results and Discussion

Out of 50 type 2 diabetics in LDL class almost more than half (68%) fell in the higher risk group (LDL > 130 mg %) of developing CHD. These are the patients who require pharmacological intervention at the outset as diet, exercise,

behavioral modification and glycemc control alone cannot reduce LDL more than 15-25 mg%' The prime aim is to achieve absolute reduction of LDL to less than 100 mg% and not the percentage reduction in LDL levels. 30 percent fell in the borderline group (LDL 100- 130 mg %) who may require drug therapy preceded by or with behavioral modification simultaneously and only two percent fell in lower risk (LDL < 100 mg %) who should be monitored yearly for any increase in lipid levels. Thus, LDL hyperlipoprotienemia was the major dyslipidemia observed in dangerously high levels in type 2 diabetic patients.

Table 1: Distribution of the study population based on the BMI

BMI	Type II DM	Controls	P value
18.5 – 24.9	11 (22%)	15 (30%)	.0718
25 – 30	36 (72%)	30 (60%)	
30.1 – 34.9	3 (6%)	5 (10%)	
Total	50 (100%)	50 (100%)	
Mean ± SD	28.45 ± 2.15	26.7 ± 2.04	

P value derived by applying student t test

Table 10 shows the distribution of the study population based on the BMI. It is seen from the table that the majority of the study subjects in both the groups were in the BMI group between 25 and

30 and there is no statistical significant difference in BMI between the two groups and it proves that BMI is not an independent risk factor for diabetes.

Fig 1: Distribution of the study population based on the BMI

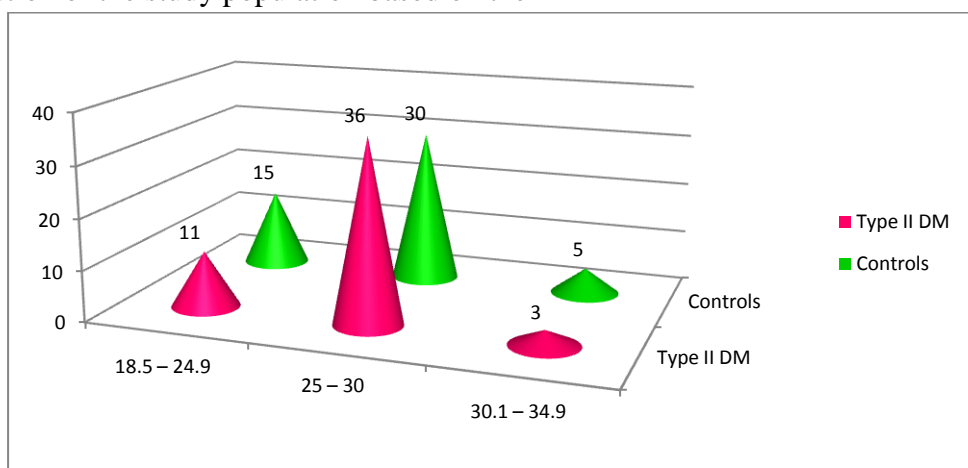


Table 2: Mean and SD of the blood pressure between the two groups

Blood pressure	Type II DM (mean ± SD)	Controls (mean ± SD)	P value
Systolic BP	143.2 ± 20.6	129.1 ± 10.5	<.001
Diastolic BP	87.1 ± 11.9	78.5 ± 8.4	<.001

P value derived by student T test

Table 2 shows the Mean and SD of the blood pressure between the two groups. It is inferred from the table that the mean systolic and diastolic

BP in the type II diabetes group was much more higher than the control group and the difference was found to be statistically significant ($p < .05$).

Fig 2: Mean and SD of the blood pressure between the two groups

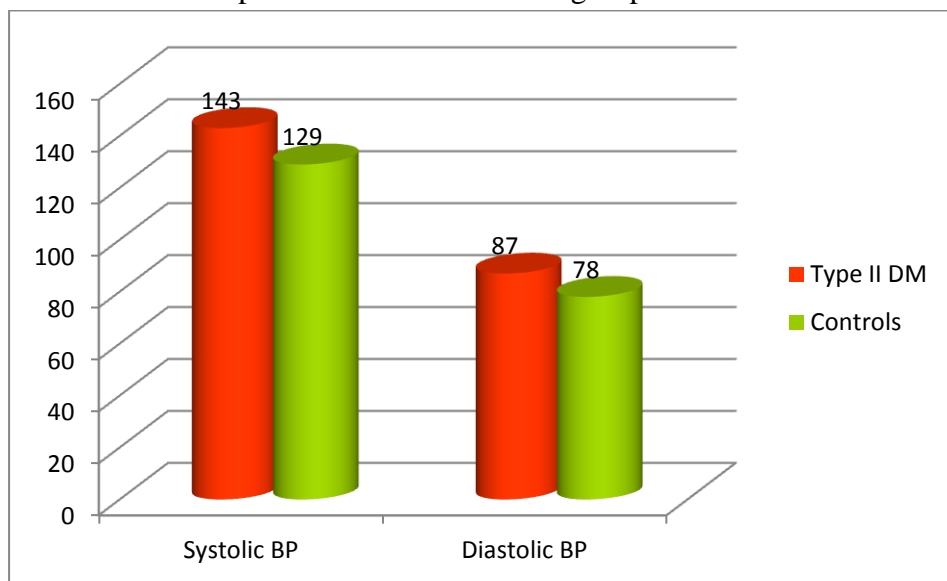


Table 3: Mean and SD of fasting and post-prandial blood sugar between the two groups

Blood glucose	Type II DM (mean ± SD)	Controls (mean ± SD)	P value
Fasting	151.4 ± 18.9	95.4 ± 15.5	<.001
Post-prandial	260 ± 39.5	141.6 ± 22.6	<.001

P value derived by student T test

Table 3 shows the Mean and SD of fasting and post-prandial blood sugar between the two groups. It is inferred from the table that that the fasting and post-prandial blood glucose levels are much

higher among the diabetes group than the control group and the difference was found to be statistically significant ($p < .05$).

Fig 3: Mean and SD of fasting and post-prandial blood sugar between the two groups

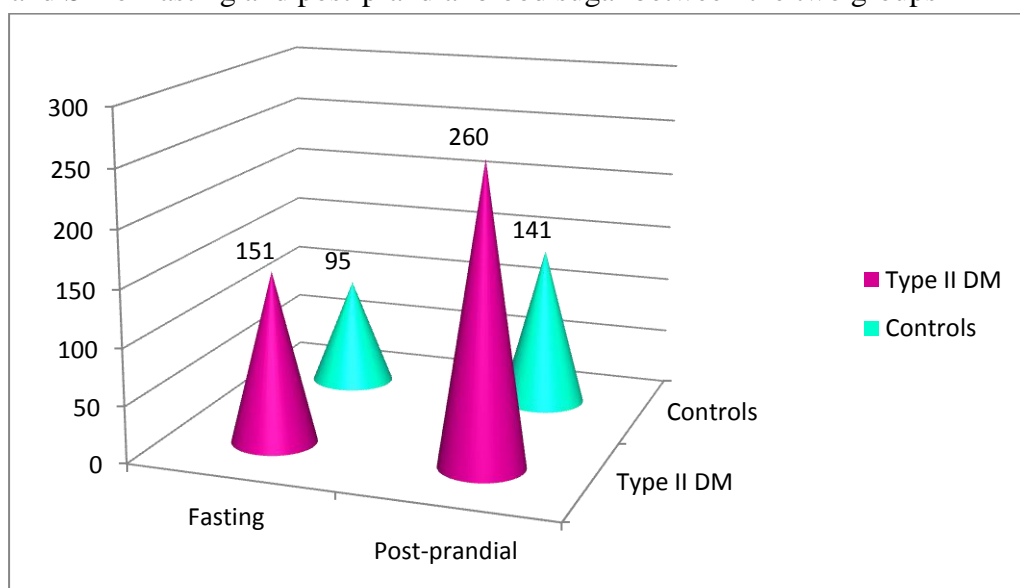


Table 4: Distribution of the study population based on the ECG findings

ECG findings	Type II DM	Controls	P value
Abnormal	35 (70%)	4 (8%)	<.001
Normal	15 (30%)	46 (92%)	
Total	50 (100%)	50 (100%)	

P value derived by applying chi-square test

Table 4 shows the distribution of the study population based on the ECG findings. The most common ECG abnormalities which were present in our study subjects were old inferior wall MI, anterior wall MI or lateral wall MI and few patients had chronic stable ischemia and all these

abnormalities were present in 70% of the patients with type II DM and among the control group only 8% had these abnormalities and the difference was found to be statistically significant (p<.05).

Fig 4: Distribution of the study population based on the ECG findings

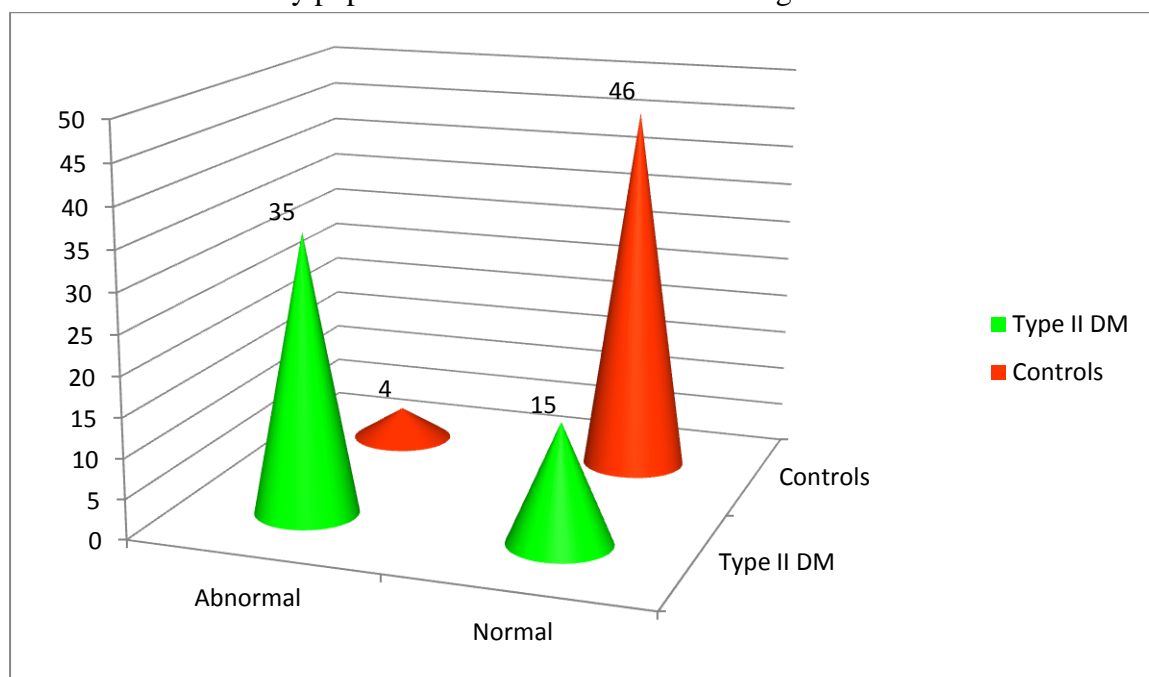


Table 5: Mean and SD of the lipid parameters between the two groups

Lipid parameter	Type II DM (mean ± SD)	Controls (mean ± SD)	P value
HDL	40.3 ± 5.5	49 ± 6.4	<.001
LDL	159.7 ± 33.7	101.4 ± 29.6	<.001
Total cholesterol	203.4 ± 26.5	162 ± 21.5	<.001
Triglycerides	255.4 ± 34.9	152.5 ± 30.6	<.001
VLDL	59.7 ± 18.8	29.6 ± 15.5	<.001

P value derived by student T test

Table 5 shows the Mean and SD of the lipid parameters between the two groups. It is inferred from the table that the LDL, total cholesterol, triglycerides and VLDL were higher among the diabetes group than that of the control group and

similarly the HDL cholesterol was higher in the control group than the diabetes group and this difference was found to be statistically significant (p<.05).

Fig 5: Mean and SD of the lipid parameters between the two groups

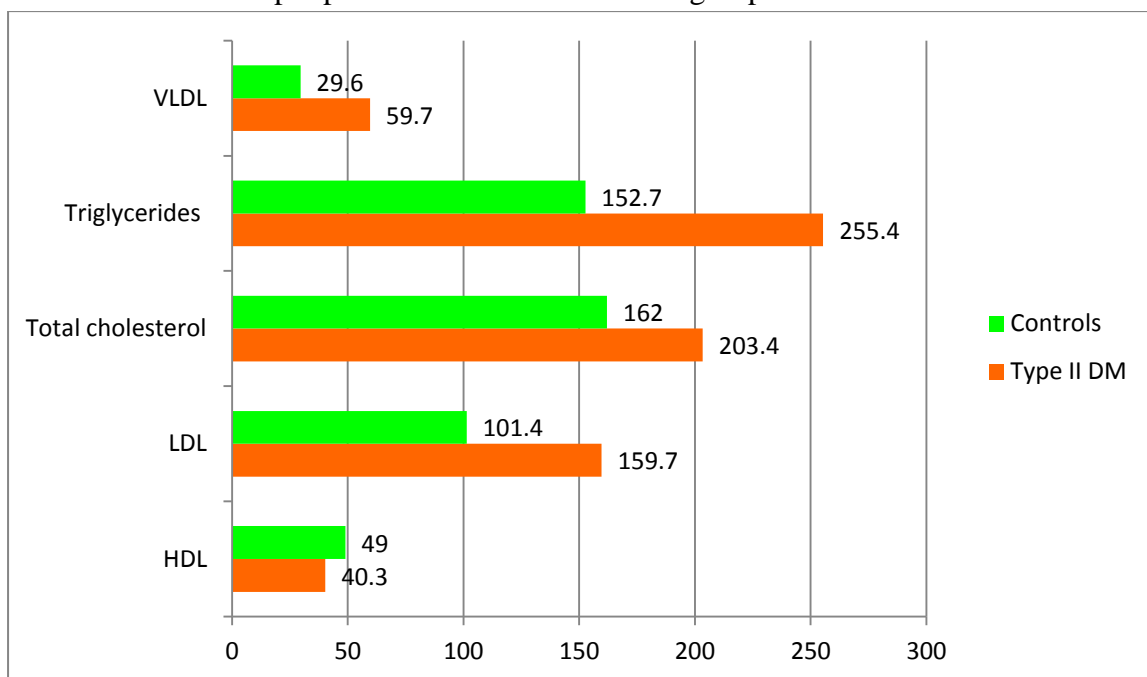


Table 6: Association between LDL cholesterol levels and IHD among the study subjects

LDL cholesterol levels	Type II DM		Controls		P value
	CAD present	CAD absent	CAD present	CAD absent	
<130	2 (6%)	14 (93.3%)	0	43 (93.4%)	<.001
>130	33 (94%)	1 (6.6%)	4 (100%)	3 (6.6%)	
Total	35 (100%)	15 (100%)	4 (100%)	46 (100%)	

P value derived by applying chi-square test

Table 6 shows the association between LDL cholesterol levels and IHD among the study subjects. It is inferred from the table that the prevalence of ischemic heart diseases was more

common among people with LDL levels more than 130 mgs/dl among the diabetic patients than the control group and this difference was found to be statistically significant (p<.05).

Fig 6: Association between LDL cholesterol levels and IHD among the study subjects

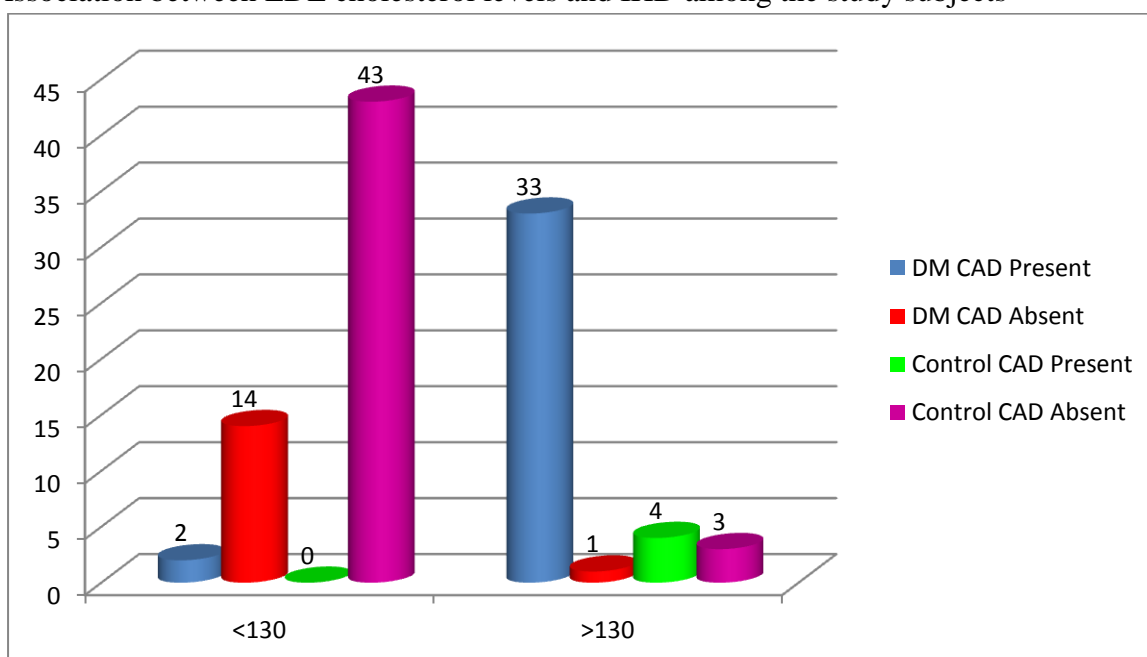
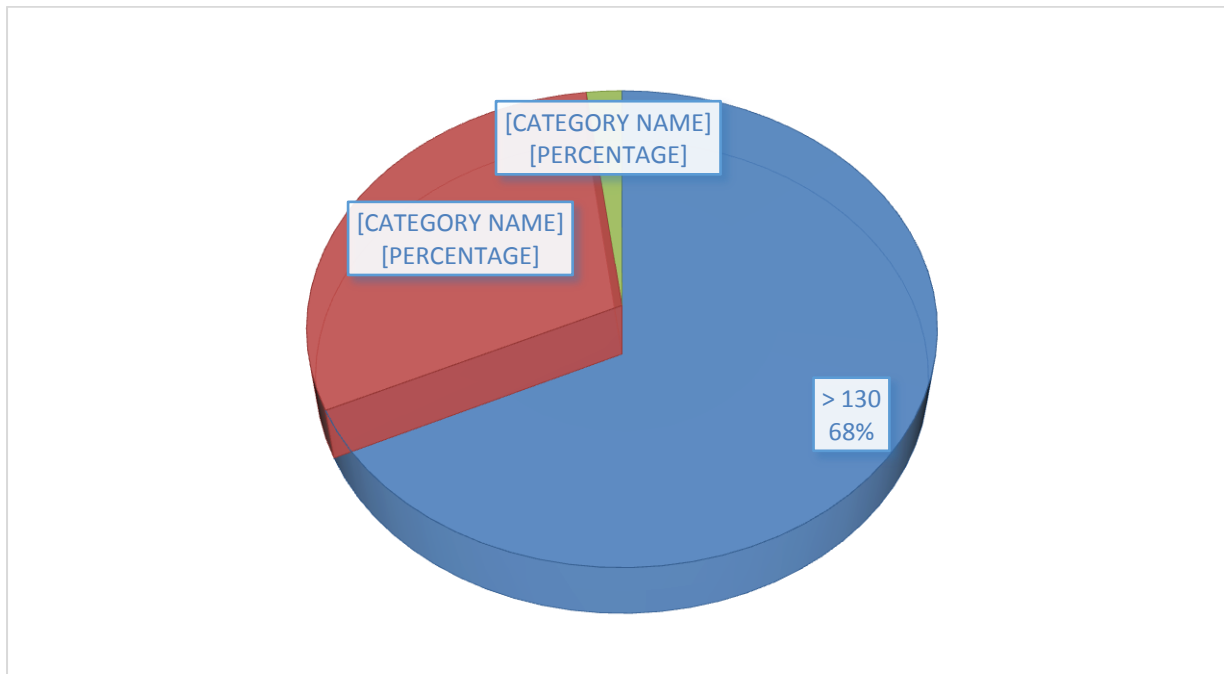


Table 7: Association between LDL levels and Risk of CAD

LDL level /Risk	No of persons	Percentage
>130/ high	34	68
100 – 130/Borderline	15	30
<100/Low	1	2

Fig 7: Association between LDL levels and Risk of CAD



Discussion

The present study consisted of 50 patients of type diabetes who were either known cases, already on treatment or freshly diagnosed attending either the OPD or diabetic clinic or admitted were studied for the prevalence of dyslipidemia and assessment of coronary risk by detailed history, clinical examination investigations, ECG. A control group of 50 non diabetic healthy individuals were taken and compared.

In this study group patients whose type and level of dyslipidemia was compared to assess the severity of CHD risk, also their ECG compared to confirm the propensity of underlying dyslipidemia leading to coronary heart disease.

An interestingly high percentage of dyslipidemia (100%) has been found in type 2 diabetic in the present study as compared to the western data (60-80%). The major concern which this study highlights is the percentage (78.5%) of LDL dyslipidemia which is similar to western data (60-80%) while hypertriglyceridemia (>200mg/dl)

was seen in 42% (compare PROCAM study, 39%). Low HDL (<35mg/dl) was present in 32% patients (PROCAM study, 27%).

When the group was compared, LDL dyslipidemia emerged as the deciding factor with 68% falling at high risk for CHD (LDL>130mg/dl) patients.

The UKPDS 23 study⁷⁴ showed that the coronary artery disease was significantly associated with increased concentration of low density lipoproteins decreased high density lipoprotein concentrations and increased concentration of triglycerides.

In the san antonia heart study (1998)⁷¹ the median TG level was 200mg % and <5% of diabetic women and 15% of diabetic men had TG levels >400mg % whereas in the present study 5% patients had TG >400mg % the median LDL cholesterol level LDL was 130-140 mg% and only25% of subjects had an LDL cholesterol level >155mg% whereas in this study 28.5% had LDL cholesterol level >155mg% whereas in this study 28.5 % had LDL >155mg%

In Indian studies udawat et al (2001)⁵⁵ reported dyslipidemia in 89% of type 2 diabetic patients LDL hyperlipoproteinemia (LDL>100 mg %) in 76%, HDL dyslipidemia (HDL<35mg%) in 58 %, hypertriglyceridemia (TG>200mg%) in 22% patients on analyzing CHD risk based on lipid profile it was revealed that in LDL moiety 68% fell in higher risk of CHD (LDL > 130 mg%), 30% in borderline risk (LDL 100-130 mg%), and 2% (LDL<100mg %) in lower risk. For HDL 18.5% fell in higher risk (HDL <35mg %) and TG only 0.5% fell in higher risk (TG >400mg%). The lipid profile was significantly altered in diabetic patient as compared to non diabetics .

Kodali et al (1991)⁸¹ reported prevalence of hyperlipidemia in 34% of type 2 diabetics subjects where hyperlipidemia was labeled when total cholesterol was > 275mg% and / or triglyceride > 175mg%

Walia et (1999)⁷⁰ observed hypercholesterolemia in 43.6% hypercholesterolemia in 43.6% hypertriglyceridemia in 52.5% HDL dyslipidemia in 42% and LDL dyslipidemia in 29.9% where dyslipidemia was labeled when total cholesterol>200mg%, HDL<40mg, TG>150 mg % and LDL>140mg% the difference between present study and the above two studies is probably due to the different cut of values taken for labeling dyslipidemia.

The earlier Indian studies have also compared the lipid profile in diabetics and non diabetics bhu et al (1998)⁸² observed higher levels of cholesterol and LDL in diabetics whereas hardas et al (1991)⁸³ found only higher TG levels in diabetics However in the present study higher total cholesterol, TG, LDL and lower HDL levels were seen in diabetics and the comparison was statistically significant

Conclusion

Out of 50 type 2 diabetics in LDL class almost more than half (68%) fell in the higher risk group (LDL > 130 mg%) of developing CHD. These are the patients who require pharmacological intervention at the outset as diet, exercise,

behavioral modification and glycemic control alone cannot reduce LDL more than 15-25 mg%⁷⁸ The prime aim is to achieve absolute reduction of LDL to less than 100 mg% and not the percentage reduction in LDL levels. 30 percent fell in the borderline group (LDL 100- 130 mg %) who may require drug therapy preceded by or with behavioral modification simultaneously and only two percent fell in lower risk (LDL < 100 mg %) who should be monitored yearly for any increase in lipid levels. Thus, LDL hyperlipoproteinemia was the major dyslipidemia observed in dangerously high levels in type 2 diabetic patients. LDL dyslipidemia is more significant from prognostic and therapeutic point of view hence preference should be given to reduction of LDL by pharmacotherapy in form of statins as first choice followed by HDL and then Triglycerides. This is at variance to the earlier held view where high TG and low HDL have been identified as major risk factors in the majority of cases⁵⁵.

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