e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2023; 15(11); 170-174

Original Research Article

A Study to Assess the Lipid Profile Abnormalities in Newly Diagnosed Type 2 Diabetes Mellitus: An Observational Study

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Received: 06-05-2023 Revised: 10-06-2023 / Accepted: 26-07-2023

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Conflict of interest: Nil

Abstract

Aim: The aim of the present study was to assess the lipid profile abnormalities in newly diagnosed type 2 diabetes mellitus.

Material & Methods: A cross-sectional study was carried out to determine the triglyceride levels in newly diagnosed type 2 diabetics in the Department of General Medicine. A total of 200 newly diagnosed type 2 diabetics were enrolled in our study. The Study was carried out during a period of 2 years.

Results: Among the total participants, 80 (40%) were males, and 120 (60%) were females. The maximum number of patients belonged to the age group of 40-50 years (52%) and the least number belonged to the age group 20-30 years (2%). Among the participants in the study, 22.5% male and 32.5% female participants had above normal triglyceride levels. The total number of female participants who had abnormal triglycerides was higher than the male participants. The p value was not statistically significant. The Gender distribution showed that 35 male participants and 58 female participants had low HDL. The P value was >0.05 and was not statistically significant. In our study, among the 200 participants, 138 (69%) participants had desirable total Cholesterol levels of <200mg/dl, 52 (26%) had borderline high levels of 200-239mg/dl and 10 (5%) had high total cholesterol levels of ≥240mg/dl. Among the total participants, according to the NCEP-ATP III criteria, 70 (35%) participants had an optimal level of LDL of which 30 participants were males and 40 were females. 68 (34%) had near optimal levels of LDL and 23 participants were males and 45 were females. 35 (17.5%) had borderline high levels of LDL out of which 15 participants were males and 20 were females. 17 (8.5%) had high levels of LDL of which 7 were males and 10 were females. 8 (4%) participants had very high levels of LDL of which 3 was male and 5 was female.

Conclusion: Deranged lipid profiles are quite prevalent in type 2 diabetics with females having higher triglyceride levels. Recognition of such elevated triglyceride levels in even newly diagnosed type 2 diabetics will help in better prevention of associated cardiovascular disease.

Keywords: Cardiovascular disease, Hypertriglyceridemia, Type 2 diabetes, Lipid profile.

Introduction

Diabetes mellitus is a common metabolic disorder characterized by absolute or relative deficiencies in insulin secretion and/or insulin action associated with chronic hyperglycemia and disturbances of carbohydrate, lipid and protein metabolism. [1] One of the important cardiovascular risk factors in type 2 diabetes is dyslipidemia. The composition of lipids in diabetic dyslipidemia is more atherogenic than in dyslipidemia in general. [2]

As early as 1988, it was described a multifactorial metabolic abnormality consisting of insulin resistance with compensatory hyper insulinaemia, type 2 diabetes mellitus (T2DM), essential hypertension and hypercholesterolaemia. [3,4] People with diabetes have a 2 to 4-fold increase in the risk of ischemic heart disease, a 2- fold increase in stroke risk and a 4 to 8 years reduction in life expectancy. [5,6]

The prevalence of dyslipidemia among patients with type 2 DM is high. [7] Dyslipidemia, characterized by an abnormal lipid profile, is one of the major risk factors for cardiovascular disease in patients with diabetes, [8] and is mainly due to increased free fatty acids flux secondary to insulin resistance. [9] Metabolic syndrome with its associated insulin resistance leads to increased

lipolysis by reducing inhibition of hormone-sensitive lipase in adipose tissue, thereby stimulating portal flux of free fatty acids to the liver. [10.11]

These fatty acids in turn disrupt the activity of the hormone lipoprotein lipase causing an overproduction of triglyceride rich lipoproteins [very-low-density lipoprotein (VLDL) and Chylomicrons] which are commonly associated with a reduction in HDL-c and an increase in small dense oxidized LDL-c levels. [12] In diabetes the associated hyperglycemia, obesity and insulin changes highly accelerate the progression to atherosclerosis. [13,14] An association between elevated triglycerides levels and CVD risk [15] independent associated with long term all-cause mortality supports the idea that serum triglycerides could play a role in type 2 diabetic patients mortality risk. [16]

So in the present study, aimed to study the lipid profile abnormalities in newly diagnosed type 2 diabetics; as such an assessment will enable earlier detection and treatment of these lipid profile derangements thereby minimizing the cardiovascular morbidity and mortality that these can ensue.

Material & Methods

A cross-sectional study was carried out to determine the triglyceride levels in newly diagnosed type 2 diabetics in the Department of General Medicine, Jannayak Karpuri Thakur Medical College and Hospital Madhepura, Bihar, India. A total of 200 newly diagnosed type 2 diabetics were enrolled in our study. The Study was carried out during a period of 2 years. Relevant patient data was collected from the in-patient and out-patient. Fasting lipid profile levels were measured in these patients.

Inclusion Criteria

- All patients who have been diagnosed as having type2 diabetes mellitus within the last 3 months using the ADA (American Diabetes Association)
- Age of the patient>25years
- Sex: Both males and females.
- Exclusion criteria
- Patients on steroids
- Type1diabetics
- Patients on antipsychotic medications
- Known cases of active hypothyroidism
- Known cases of Cushing's syndrome were excluded from the study.

Statistical analysis

- Continuous variables were expressed using mean, standard deviation, range and mean while categorical variables were expressed in terms of percentages.
- Test of significance was done using student test for normally distributed continuous variables. Mann Whitney test was done for not normally distributed continuous variables.
- P value less than 0.05 was considered as statistically significant.

Results

Table 1: Demographic data

Gender	**N**	**%**
Female	120	60
Male	80	40
Age group in years		
20-30	4	2
30-40	42	21
40-50	104	52
50-60	50	25

Among the total participants, 80 (40%) were males, and 120 (60%) were females. The maximum number of patients belonged to the age group of 40-50 years (52%) and the least number belonged to the age group 20-30 years (2%).

Table 2: Gender Distribution of serum triglycerides

Serum triglycerides	**Male**	**Female**	**Total**
Normal (<150 mg/dl)	35	55	90
Borderline (150-199mg/dl)	30	32	62
High (200-499 mg/dl)	10	20	30
Very high (≥500 mg/dl)	5	13	18
Total	80	120	200

Among the participants in the study, 22.5% male and 32.5% female participants had above normal triglyceride levels. The total number of female participants who had abnormal triglycerides was higher than the male participants. The p value was not statistically significant.

Table 3: Gender Distribution of serum HDL and serum cholesterols

Serum HDL	Male	Female	Total
Normal	45	62	107
Low	35	58	93
Total	80	120	200
Serum cholesterols			
Desirable <200mg/dl	54	84	138
Borderline 200-239 mg/dl	20	32	52
High ≥240mg/dl	6	4	10
Total	80	120	200

According to the NCEP ATP III criteria, HDL levels ≤40 is considered low for males and ≤50 is considered low for females. Based on this criterion, in our study, 48% participants had low HDL and 52% participants had normal HDL. The Gender distribution showed that 35 male participants and 58 female participants had low HDL. The P value was >0.05 and was not statistically significant. In our study, among the 200 participants, 138 (69%) participants had desirable total Cholesterol levels of <200mg/dl, 52 (26%) had borderline high levels of 200-239mg/dl and 10 (5%) had high total cholesterol levels of ≥240mg/dl. Among the participants who had elevated cholesterol levels, a female predominance was noted who had borderline high cholesterol levels.

Table 4: Gender Distribution of serum LDL

Serum LDL	Male	Female	Total
Optimal <100 mg/dl	32	40	72
Near optimal 100-129 mg/dl	23	45	68
Borderline 130-159 mg/dl	15	20	35
High 160-189 mg/dl	7	10	17
Very high >190 mg/dl	3	5	8
Total	80	120	200

Among the total participants, according to the NCEP-ATP III criteria, 70 (35%) participants had an optimal level of LDL of which 30 participants were males and 40 were females. 68 (34%) had near optimal levels of LDL and 23 participants were males and 45 were females. 35 (17.5%) had borderline high levels of LDL out of which 15 participants were males and 20 were females. 17 (8.5%) had high levels of LDL of which 7 were males and 10 were females. 8 (4%) participants had very high levels of LDL of which 3 was male and 5 was female.

Discussion

One of the important cardiovascular risk factors in type 2 diabetes is dyslipidemia. The composition of lipids in diabetic dyslipidemia is more atherogenic than in dyslipidemia in general. [17] The term diabetic dyslipidemia comprises a triad of raised triglycerides, reduced high density lipoprotein (HDL) and excess of small, dense low density lipoprotein. [18] Every one of these dyslipidemic features are associated with an increased risk of cardiovascular disease. Increased hepatic secretion of large triglyceride-rich VLDL and impaired clearance of VLDL is central to the pathophysiology of this dyslipidemia. [19] The contribution of triglycerides to CVD risk has been much debated in the past, with many important prospective studies observing an association between elevated triglycerides levels and CVD risk. [20] This independent association with long term all-cause mortality supports the idea that serum triglycerides could play a role in type 2 diabetic patients mortality risk. [21]

Among the total participants, 80 (40%) were males, and 120 (60%) were females. The maximum number of patients belonged to the age group of 40-50 years (52%) and the least number belonged to the age group 20-30 years (2%). A similar female predominance was noted in a study done by Deepa et al comprising of 26001 participants. [22] Among the 100 participants, 74 were less than 50 years and 26 were more than 50 years. Among them, majority of patients were in the age group of 40-50 years which is 53%. A similar study done by Nahar et al involving 200 participants also showed majority of participants in the between 40-50 years. [23]

Among the participants in the study, 22.5% male and 32.5% female participants had above normal triglyceride levels. The total number of female participants who had abnormal triglycerides was higher than the male participants. The p value was not statistically significant. A study done by Bharadwaj et al [24] in North India showed that hypertriglyceridemia was present in 42.7% of subjects who were diabetics. A study done in four selected regions of India showed that 29.5% had hypertriglyceridemia with the highest prevalence in Chandigarh and the common risk factors being

obesity, diabetes and dysglycemia. [25] The Gender distribution showed that 35 male participants and 58 female participants had low HDL. The P value was >0.05 and was not statistically significant. Karadag et al to assess prevalence of metabolic syndrome in cardiac patients and it was found that the most prevalent paramenter was found to be low HDL (69%). In our study, among the 200 participants, 138 (69%) participants had desirable total Cholesterol levels of <200mg/dl, 52 (26%) had borderline high levels of 200-239mg/dl and 10 (5%) had high total cholesterol levels of ≥240mg/dl.[26] Among the total participants, according to the NCEP-ATP III criteria, 70 (35%) participants had an optimal level of LDL of which 30 participants were males and 40 were females. 68 (34%) had near optimal levels of LDL and 23 participants were males and 45 were females. 35 (17.5%) had borderline high levels of LDL out of which 15 participants were males and 20 were females. 17 (8.5%) had high levels of LDL of which 7 were males and 10 were females. 8 (4%) participants had very high levels of LDL of which 3 was male and 5 was female. Study by Ogbera [27] showed that elevated LDL levels were the most commonly documented lipid abnormality in patients with metabolic syndrome.

Abnormal glucose reading is the commonest metabolic abnormality in people with T2DM accompanied by lower HDL levels, elevated LDL, hypercholesterolaemia, and hypertriglyceridaemia. Poor glycaemic control and hypertriglyceridaemia are significant biochemical abnormalities in patients with T2DM. Dyslipidemia management in people with diabetes mellitus, just like in any other individual, starts with a flawless evaluation that aims to identify secondary causes that might contribute to the abnormal lipid profile. [28] The triglyceride-to-HDL cholesterol (TG/HDL) ratio has been investigated recently for various potential clinical uses in adult and paediatric populations. Previous research has demonstrated its positive associations with adverse cardio-metabolic risk factor profiles, metabolic syndrome and prediction of incident diabetes or its complications. [29,30,31]

Conclusion

In our present study, more than 50 per cent of diabetics were found to have hypertriglyceridemia and elevated LDL levels. This suggests that such high levels of dyslipidemia are seen even during the early stages and newly detected diabetics as well. These are likely to play a major role in the development of cardiovascular diseases and cerebrovascular accidents among the diabetic patients. Hence in view of the associated cardiovascular mortality and morbidity, optimum care of these patients includes not only adequate glycemic control but effective measure to control the dyslipidemia as well. The appropriate treatment for glycemic control should go concomitantly with lipid lowering drugs and lifestyle modifications.

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