A Hospital-Based Retrospective Observational Study Assessing Patterns of Dyslipidemia and Management Strategy in Newly Diagnosed Patients of Type 2 Diabetes Mellitus

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Abstract

Aim: The aim of the present study was to evaluate the patterns of dyslipidaemia in newly diagnosed type 2 diabetes mellitus (T2DM) patients and to understand the initial management options utilised by the treating physician.

Material & Methods: This retrospective observational study observed patterns of dyslipidemia and management strategy in newly diagnosed Patients of type 2 diabetes mellitus-2 (REMAP-2) study was conducted at department of General Medicine in between the duration of 1 year. Clinicians at the respective center captured the data in REMAP-2 study data capture form. Dyslipidemia was considered as: total cholesterol >200 mg/dl, low density lipoprotein cholesterol (LDL-C) >100 mg/dl, high density lipoprotein cholesterol (HDL-C) <40 mg/dl, or triglyceride >150 mg/dl.

Results: The patients had a mean age of 54.6±10.32 years, and majority of the patients were males (65%) while females constituted 35% of the study population. More than half of the patients were either overweight (40%, n=4000) or obese (18.6%, n=1860). The triglyceride levels were found to be high (>150 mg/dl) in 85% (n=8190) of patients. Approximately one fourth (26.90%) of newly diagnosed T2DM patients were found to be smokers in this study. Around 52.30 percentages patients had positive family history of diabetes. Most of the patients were not very physically active or lightly active. In the context of dietary pattern, majority (60%) of the patients were non- vegetarian. Hypertension (71.10%) was the most common comorbidity followed by coronary artery disease (23.50%) in patients of newly diagnosed T2DM with dyslipidemia. Statin therapy was used in 94.80% (n=9480) patients, of which atorvastatin was the most (77.74%) preferred statin therapy.

Conclusion: This study on newly diagnosed T2DM patients with dyslipidemia found that majority of the patients had hypertriglyceridemia, family history of diabetes and was physically inactive. More than half of T2DM patients were either overweight or obese. More than 2/3rd of the patients had mixed dyslipidemia. Statins were prescribed to the majority of these patients and atorvastatin was the most commonly prescribed statin in Indian T2DM. patients with dyslipidemia.

Keywords: Diabetes Mellitus, Newly Diagnosed, Dyslipidemia.

Introduction

Diabetes mellitus (DM) is a chronic disease condition associated with hyperglycemia resulting from an imbalance in insulin secretion and insulin action or cooperation of. [1,2] Of all cases of diabetes, more than 90% are detected as type-2 diabetes mellitus (T2DM) around the world. [3] Diabetes is considered to confer at least a two-fold excess risk for cardiovascular diseases (CVD), independently from other conventional risk factors. [4,5] In T2DM patients, there is often an elevated cardiovascular risk for several years before biochemical hyperglycaemia begins. Obesity and insulin resistance, combined with hypertension and dyslipidaemia, commonly referred to as metabolic syndrome, are also present during this period. [6] Intensive glycaemic control has essentially failed to significantly improve cardiovascular outcomes in clinical trials.4 Dyslipidaemia is common in diabetes and there is convincing evidence that cholesterol lowering improves cardiovascular outcomes, even in patients with unremarkable lipid profiles. [7,8]

Dyslipidemia, characterized by an abnormal lipid profile, is one of the major risk factors for cardiovascular disease in patients with diabetes, [9] and is mainly due to increased free fatty acids flux secondary to insulin resistance. [10] 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. [11,12] 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. [13,14]

The lipid changes associated with diabetes mellitus are attributed to increased free fatty acid flux secondary to insulin resistance and aggravated by increased inflammatory adipokines. [15] Low density lipoprotein cholesterol (LDL-C) in patients with diabetes underestimates the atherogenic contribution of triglyceride-rich particles, and non-high density lipoprotein (HDL) cholesterol is a good measure of atherogenicity in diabetes. [16] The availability of several lipid-lowering drugs and nutritional supplements offers novel and effective options for achieving target lipid levels in people with diabetes. The use of combination of statins with fibrates or nicotinic acid in reducing cardiovascular events is inconclusive. [17] It is vital to understand the demographic profile, pattern of dyslipidaemia and initial management approach in T2DM patients with abnormal lipid profile. Hence the study was designed to evaluate the patterns of dyslipidaemia in newly diagnosed T2DM patients, to evaluate the glycaemic status of the patients and the initial management options utilised by the treating physician.

Material & Methods

A retrospective observational study evaluates recent trends in the patterns of dyslipidaemia and Management strategy in newly diagnosed Patients of type 2 diabetes mellitus. The study was conducted at Department of General Medicine, Patna Medical College and Hospital, Patna, Bihar, India in between the duration of 1 year. A total of 10,000 patients of newly diagnosed T2DM with dyslipidemia identified were included in this study. The respective physicians, diabetologists, endocrinologists and cardiologists collected the data retrospectively in the predesigned REMAP-2 study data capture form.

Methodology

The details on patient's diagnosis, age, gender, dietary habit, level of physical activity, family history of T2DM, status of obesity, history of smoking, presenting complaints, comorbid conditions, stage of chronic kidney disease (CKD) if present, glycemic status [Glycated hemoglobin (HbA1c), fasting blood glucose (FBG), postprandial blood glucose (PPBG)], lipid profiles, dietary advice, prescribed anti-diabetic drugs and lipid lowering drugs were captured from the medical records. Patients were selected based on treating physician's discretion, and no additional evaluations or investigations were performed during data capture in this real world, observational study. The dyslipidemia was defined if any of these four conditions were met: total cholesterol >200 mg/dl or LDLC >100 mg/dl, or HDL-C <40 mg/dl or triglycerides (TG) >150 mg/dl. The mixed dyslipidemia was defined as TG >150 mg/dl, total LDL-C >100 mg/dl or HDL-C <40 mg/dl.

Statistical Analysis: Descriptive statistics was used for demographic and baseline characteristics. Categorical variables were summarized with frequency and percentage, whereas count, mean, and standard deviation were presented for continuous variables. Statistical analyses were performed using Microsoft excel (IBM Corp., USA).

Results

Table 1: Baseline demography and disease characteristics

Parameters	
Age (Years), mean ± SD	54.6±10.32
Gender, N (%)	
Men	6500 (65)
Women	3500 (35)
Weight (kg), mean ± SD	74.36±12.08
BMI (kg/m^2)	27.3
Weight status, N (%)	
Underweight	340 (3.40)
Normal BMI (Kg/m^2)	3800 (38)
Overweight	4000 (40)
Obese	1860 (18.60)
Lipid parameters, (mg/dl), N (%)	
Total cholesterol >200	7625 (76.25)

LDL-C >100	8640 (86.40)
HDL-C <40	3990 (39.90)
TG >150	8678 (86.78)
Glycaemic parameter, mean (SD)*	
HbA1c%	150 (1.50)
FBG in mg/dl	176 (43.05)
PPBG in mg/dl	256.34 (65.70)
Smoking history, N (%)	
Yes	2690 (26.90)
No	7310 (73.10)
Family history of diabetes present, N (%)	5230 (52.30)
Dietary pattern, N (%)†	
Non-vegetarian	6000 (60)
Vegetarian	4000 (40)
Physical activity, N (%)#	
Not very active	3270 (32.60)
Lightly active	4680 (46.80)
Active	1900 (1900)
Very active	150 (1.50)

The patients had a mean age of 54.6±10.32 years, and majority of the patients were males (65%) while females constituted 35% of the study population. More than half of the patients were either overweight (40%, n=4000) or obese (18.6%, n=1860). The triglyceride levels were found to be high (>150 mg/dl) in 85% (n=8190) of patients. Approximately one fourth (26.90%) of newly diagnosed T2DM patients were found to be smokers in this study. Around 52.30 percentages patients had positive family history of diabetes. Most of the patients were not very physically active or lightly active. In the context of dietary pattern, majority (60%) of the patients were non-vegetarian.

Table 2: Proportion of patients with comorbidities in T2DM with dyslipidemia

Comorbidity	Frequency (%)
Hypertension	7110 (71.10)
Coronary arterydisease	2350 (23.50)
Heart failure	514 (5.14)
Chronic kidneydisease	10 (0.01)
Hypothyroid	8 (0.08)
Cancer	4 (0.04)
Metabolic syndrome	4 (0.04)

Hypertension (71.10%) was the most common comorbidity followed by coronary artery disease (23.50%) in patients of newly diagnosed T2DM with dyslipidemia.

Table 3: Prescribed statin therapy in newly diagnosed T2DM patients with dyslipidaemia

Drugs	%
Pitavastatin 4 mg	0.04
Pitavastatin 3 mg	0.10
Pitavastatin 2 mg	0.20
Pitavastatin 1 mg	0.12
Rosuvastatin 80 mg	0.80
Rosuvastatin 40 mg	8
Rosuvastatin 20 mg	11
Rosuvastatin 10 mg	2
Atorvastatin 80 mg	0.70
Atorvastatin 40 mg	18
Atorvastatin 20 mg	34
Atorvastatin 10 mg	25.04

Statin therapy was used in 94.80% (n=9480) patients, of which atorvastatin was the most (77.74%) preferred statin therapy.

Table 4: Prescribed antidiabetic medications

Drugs	%
Metformin	86
DPP4i	62
SGLT2i	44
Sulfonylurea	42
Pioglitazone	7
Insulin	6
AGI	5
GLP1 analogues	0.50

Metformin (86%) was the most commonly prescribed antidiabetic agent in T2DM patients with dyslipidaemia followed by dipeptidyl peptidase 4 inhibitors (DPP4i, 62%) and sodium-glucose cotransporter 2 inhibitor (SGLT2i, 44%).

Discussion

Type 2 diabetes mellitus (T2DM) is associated with a considerably increased risk of premature atherosclerosis, particularly coronary heart disease (CHD) and peripheral arterial disease. [18,19] Diabetes is considered to confer at least a twofold excess risk for cardiovascular diseases (CVD), independently from other conventional risk factors. [20,21] In T2DM patients, there is often an elevated cardiovascular risk for several years before biochemical hyperglycaemia begins. Obesity and insulin resistance, combined with hypertension and dyslipidaemia, commonly referred to as metabolic syndrome, are also present during this period.5 Intensive glycaemic control has essentially failed to significantly improve cardiovascular outcomes in clinical trials. [20] Dyslipidaemia is common in diabetes and there is convincing evidence that cholesterol lowering improves cardiovascular outcomes, even in patients with unremarkable lipid profiles. [8,19]

The patients had a mean age of 54.6±10.32 years, and majority of the patients were males (65%) while females constituted 35% of the study population. More than half of the patients were either overweight (40%, n=4000) or obese (18.6%, n=1860). The triglyceride levels were found to be high (>150 mg/dl) in 85% (n=8190) of patients. Around 52.30 percentages patients had positive family history of diabetes. Most of the patients were not very physically active or lightly active. In the context of dietary pattern, majority (60%) of the patients were non- vegetarian. Almost half of newly diagnosed T2DM patients had positive family history for T2DM. Hypertension was widely prevalent in newly diagnosed patients of T2DM with dyslipidaemia. A remarkably high prevalence of hypertension was noted (72.33%) in the present study. Epidemiological studies have established that prevalence of hypertension is associated with increase in blood lipid levels. [22] This could be due to common pathophysiological aetiologies,

resulting in dysregulation of adipocytokine release from adipose tissue and changes in arterial properties. [23] Approximately one fourth (26.90%) of newly diagnosed T2DM patients were found to be smokers in this study. These results are comparable to one of the recently published systematic review and meta-analysis, which showed the global mean prevalence of tobacco use in T2DM patients as 20.81%. [24] Studies have shown that intensity of smoking is associated with small but significant increases in LDL-C and decreases in HDL-C. [25]

In the management of diabetic dyslipidaemia, lifestyle modifications are the first-line intervention, which include weight loss, dietary modification, and aerobic exercise. [26] Obesity increases insulin resistance and is associated with increased TGs and LDL-C, and decreased HDL-C. [27] Hypertension (71.10%) was the most common comorbidity followed by coronary artery disease (23.50%) in patients of newly diagnosed T2DM with dyslipidemia. Statin therapy was used in 94.80% (n=9480) patients, of which atorvastatin was the most (77.74%) preferred statin therapy. Metformin (86%) was the most commonly prescribed antidiabetic agent in T2DM patients with dyslipidaemia followed by dipeptidyl peptidase 4 inhibitors (DPP4i, 62%) and sodium-glucose cotransporter 2 inhibitor (SGLT2i, 44%). Metformin decreases serum TGs in addition to improving insulin resistance. [28] Metformin therapy appreciably improves dyslipidaemia in people with T2DM and its lipid-modifying effect may be attributable to insulin sensitization, reduction of irreversibly glycated LDL-C, and weight loss. [29,30] Fibrates act as peroxisome proliferator-activated receptor (PPAR)-a agonists to reduce triglycerides and modestly increase HDL cholesterol but also affect multiple pathways linked to the retinoid-X receptor. [31]

Conclusion

This study found that in newly diagnosed T2DM patients with dyslipidemia, majority of the patients were physically inactive, had family history of diabetes and hypertriglyceridemia. More than half of T2DM patients were either overweight or obese. Hypertension was the most common comorbidity.

More than 2/3rd of the patients was of mixed dyslipidaemia. Statins were prescribed to majority of these patients and atorvastatin was the most commonly prescribed statin in Indian T2DM patients with dyslipidaemia.

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