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A STUDY OF LIPID PROFILE AND ITS RELATIONSHIP WITH BLOOD GLUCOSE LEVEL IN METABOLIC SYNDROME

General Medicine

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ABSTRACT

Background: Metabolic syndrome (MetS) and its associated factors such as dyslipidemia and hyperglycemia are associated with increased risk of cardiovascular disease (CVD).
Aims and Objective: To assess lipid profile and its relation with blood glucose levels in patients with MetS.
Materials and Methods: This cross-sectional study included 320 patients with MetS. Anthropometry, lipid profile, blood glucose, and presence of MetS (NECP APT3) were determined.
RESULT : High LDL-C was the most common lipid abnormality observed in these patients. High LDL-C (>100 mg/dl) that is including suboptimal and high level were observed in 75.93% patients. Whereas high total triglyceride, high cholesterol, and low HDL level were found in 59.68% , 47.18% , 41.87% respectively. On intergroup comparison of NFG, IFG, and T2DM among patients with MetS, no statistically significant difference in lipid levels was observed.
Conclusion: we conclude that dyslipidemia is a common feature of MetS, and a large number of patients had more than one individual lipid abnormality. Most common dyslipidemia was high LDL-C and least was low HDL. Pattern of the dyslipidemia was similar in all three groups based on blood glucose levels.

KEYWORDS

INTRODUCTION

Metabolic syndrome is defined as per the NATIONAL CHOLESTEROL EDUCATION PROGRAMME AND ADULT TREATMENT PANEL 3 [NCEP ATP3] , Central obesity : waist circumference >102cm (M) , >88cm (F) , Hypertriglyceridemia : triglyceride level >=150 mg/dl or specific medication , Low HDL cholesterol : <40 mg/dl and <50 mg/dl for men and women respectively , or specific medication , Hypertension: blood pressure >=130 mmhg systolic or >=85 mmhg diastolic or specific medication, Fasting plasma glucose level >=100 mg/dl or specific medication or previously diagnosed type 2 diabetes.

Obesity, particularly abdominal obesity, is associated with resistance to the effects of insulin on peripheral glucose and fatty acid utilization, often leading to type 2 diabetes mellitus. Insulin resistance, the associated hyperinsulinemia and hyperglycemia, and adipocyte cytokines (adipokines) may also lead to vascular endothelial dysfunction, an abnormal lipid profile, hypertension, and vascular inflammation, all of which promote the development of atherosclerotic cardiovascular disease (CVD).

The co-occurrence of metabolic risk factors for both type 2 diabetes and CVD (abdominal obesity, hyperglycemia, dyslipidemia, and hypertension) suggested the existence of a "metabolic syndrome". Other names applied to this constellation of findings have included syndrome X, the insulin resistance syndrome, the deadly quartet, or the obesity dyslipidemia syndrome [12]. Genetic predisposition, lack of exercise, and body fat distribution all affect the likelihood that a given obese subject will become overtly diabetic or develop CVD.

Many studies available in literature show the association between lipid profile and MetS-associated variables. But there is paucity of data regarding relationship of blood glucose levels and lipid profile in MetS. In this study, lipid pattern and its relation to blood glucose levels in patients with MetS was investigated.

MATERIAL AND METHOID

This cross-sectional study was conducted in the Postgraduate Department of Medicine, AMC MET Medical College, Ahmedabad, India. Informed written consent was obtained after explaining the nature of the study to the patients.

This study included 320 patients with MetS, whereas those with history of CVD, thyroid disorders, or currently on lipid-lowering agents were excluded. Detailed history was noted and clinical examination was carried out. Body mass index (BMI), waist circumference (WC), and systolic and diastolic blood pressure were measured using standard methods. Laboratory assessment included venous blood samples in a fasted state for the determination of components of the lipid profile [total cholesterol (TC), HDL-C, and TG] and blood glucose levels. The serum glucose was measured using the glucose oxidase/peroxidase method and the lipid profile by the enzymatic colorimetric method. LDL-C was calculated from the formula of Friedewald., Patients were categorized into three groups depending on their fasting blood glucose levels. Group I comprised patients with normal fasting glucose (NFG; <100 mg/dL), Group II had patients with IFG status (100–125 mg/dL), and Group III had patients with T2DM (≥126 mg/dL).

Statistical Analysis:

Intergroup comparisons were done using Pearson's $\chi 2$-test, and mean values were compared using analysis of variance. Statistically significant differences were reported at $p < 0.05$.

RESULT

The baseline characteristics of 320 patients with MetS show that their mean age (years) was 58.59 ± 10.74, BMI (kg/m2) 24.5 ± 5.46 , and WC (cm) 91 ± 10.48 . Biochemical analysis showed that mean fasting blood sugar was 124 ± 52.34 mg/dL whereas HDL, TG, TC, and LDL-C were 41 ± 9.42 , 159 ± 34.19 , 198 ± 28.89 , and 117 ± 24.85 mg/dL, respectively (Table 1).

Table 1 : Baseline Characteristic Of Patients (n=320)

PARAMETERS	MEAN ±SD
AGE (years)	58.59 ± 10.17
BMI (kg/m2)	24.5 ± 5.46

WAIST CIRCUMFERENCE (cm)	91 ± 10.48
SYSTOLIC BP (mmhg)	135 ± 19.77
DIASTOLIC BP (mmhg)	85 ± 9.73
FASTING BLOOD SUGAR (mg/dl)	124 ± 52.34
SERUM HDL – C (mg/dl)	41 ± 9.42
SERUM TRIGLYCERIDE (mg/dl)	159 ± 34.19
TOTAL SERUM CHOLESTEROL (mg/dl)	198 ± 28.89
SERUM LDL – C (mg/dl)	117 ± 24.85

TABLE 2: Prevalence of optimal, suboptimal, and high lipid levels in metabolic syndrome (*n* = 320)

LIPID PROFILE	OPTIMAL	SUBOPTIMAL	HIGH
TG *	129 (40.31%)	159 (49.69%)	38 (11.86%)
LDL-C**	81 (25.31%)	230 (71.86%)	9 (0.029%)
TC***	169 (52.81%)	130 (40.62%)	21 (0.006%)

* TG: Optimal - <150 mg/dL; Suboptimal - 150–199 mg/dL; High: ≥200 mg/dL.
** LDL-C: Optimal - <100 mg/dL; Suboptimal - 100–159 mg/dL; High: ≥160 mg/dL.
*** TC: Optimal - <200 mg/dL; Suboptimal - 200–239 mg/dL; High: ≥240 mg/Dl

Table 3 : Prevelence Of Hdl C In Mets (n=320)

HDL – C	**Normal, ≥40 mg/dL**	**Low, <40 mg/dL**	**Total**
SUBJECT	186 (58.13%)	134 (41.87%)	320

Table 4 :distribution Of Dyslipidemia In Relation To Blood Glucose Level

LIPID PARAMETER	NFG (n=112)	IFG (n=106)	T2DM (n=102)	P VALUE
TG ≥ 200 mg/dL	11 (9.82%)	15 (14.15%)	12 (11.76%)	0.7166
LDL-C ≥ 160 mg/dL	6 (5.35%)	3 (2.83%)	4 (3.92%)	0.1159
TC ≥ 240 mg/dL	12 (10.71%)	4 (3.77%)	5 (4.90%)	0.9521
HDL-C < 40 mg/dL	49 (43.75%)	60 (56.60%)	52 (50.98%)	2.8127

TG < 150 mg/dL, LDL < 100 mg/dL, TC < 200 mg/dL), and HDL-C > 40mg/dL were observed in 40.31%, 25.31%, 52.81%, and 58.13% patients, respectively. TG ≥ 200 mg/dL, TC ≥ 240 mg/dL, and LDL-C ≥ 160 mg/dL were observed in 11.86%, 0.006%, and 0.029% patients, respectively, suggesting that many patients had more than one lipid abnormality (Tables 2 and 3).

Analysis of distribution of dyslipidemia showed that hypertrigly ceridemia (TG ≥ 200 mg/dL) was present in 9.82%, 14.15%, and 11.76% patients with NFG, IFG, and T2DM, respectively.Low HDL-C was observed in NFG (43.75%), IFG (56.60%) and T2DM (50.98%) of patients. High LDL-C was observed in 5.35%, 2.83% and 3.92% patients with NFG, IFG and T2DM, respectively. High TC was observed in 10.71%, 3.77% and 4.90% of patients with NFG,IFG and T2DM, respectively. On intergroup comparison, differences were not found to be statistically significant (Table 4).

DISCUSSION

In this study, the relationship between glucose levels and lipid pattern in patients with MetS was examined. High LDL-C was the most common lipid abnormality observed in these patients.

High LDL-C (>100 mg/dl) that is including suboptimal and high level were observed in 75.93% patients. Whereas high total triglyceride, high cholesterol, and low HDL level were found in 59.68% , 47.18% , 41.87% respectively.

High levels of TG and low levels of HDL-C in patients with MetS result from decreased clearance of these lipoproteins from the circulation. Lipoprotein lipase (LPL) is a major enzyme responsible for clearing TG-containing lipoproteins from the circulation, and insulin resistance is associated with impaired LPL activity. Hepatic lipase, which is responsible for clearing HDL particles from the circulation, shows increased activity in the presence of insulin resistance and causes HDL-C levels to decline.[15] A low level of HDL-C is an important risk factor for CVD. The cardio-protective effects of HDL-C have been attributed to its role in reverse cholesterol transport, its effects on endothelial cells, and its antioxidant activity.

Elevated levels of LDL-C are a major risk factor for CVD and its reduction is prime target of pharmacotherapy. The positive relationship between first or subsequent attacks of coronary heart disease is observed over a broad range of LDL-C levels. The higher the level of LDL-C, the greater the risk is.

In a study carried out on Indian population with T2DM, hypertrigly ceridemia and high serum LDL-C levels (≥100 mg/dL) were recorded as major components of dyslipidemia, and most of these patients had mixed dyslipidemia. These findings are in concurrence with the results of this study, whereas others have recorded normal levels of LDL-C.

On intergroup comparison of NFG, IFG, and T2DM among patients with MetS, no statistically significant difference in lipid levels was observed. Insulin-resistant individuals not having diabetes mellitus are likely to have lipid profiles that are nearly identical to those seen in the large majority of patients with T2DM as observed in this study

CONCLUSION

From results of this study, we conclude that dyslipidemia is a common feature of MetS, and a large number of patients had more than one individual lipid abnormality. Most common dyslipidemia was high LDL-C and least was low HDL. Pattern of the dyslipidemia was similar in all three groups based on blood glucose levels.

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