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Original Research Article

A study on evaluating lipid profile of patients with diabetes mellitus

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ABSTRACT

Background: The diabetic patients are at increased risk to develop lipid abnormalities (hyperlipidemia). Diabetic patients who have lipid abnormalities are more prone to develop cardiovascular diseases. The aim of the current study was to estimate lipid profiles of patients with type-2 diabetes mellitus at Savar area, Dhaka, Bangladesh.
Methods: This was a multidisciplinary study conducted between January to April, 2017. A total of 105 known cases of type-2 diabetic patients were investigated. Demographic characteristics and clinical data situation of the patients were taken by interview questionnaire. About 5 ml of fasting venous blood sample was collected from each subject for biochemical analysis. Data obtained were analyzed using Statistical Package of Social Sciences (SPSS-IBM) version 22.
Results: Out of 105 patients, 64.8% patients were male and 35.2% were female. The mean±SD for age of patients was 47.67±5.9. The pattern of lipid abnormalities estimated was high serum triglycerides (TGs) in 58.1% patients, high serum total cholesterol (TC) in 61.9%, low high-density lipoprotein cholesterol (HDL-C) in 44.8%, high low-density lipoprotein (LDL-C) in 53.3%. Among all the variables only HDL levels was found significantly associated with age group (p=0.043). Study also revealed that, among all the variables only LDL-C level was found significantly associated with education (p=0.028) and TC level was associated with gender (p=0.003).
Conclusions: Hyperlipidemia is a common complication of diabetes mellitus. Therefore maintaining good lipid profile can prevent development and progression of related complications among patient with diabetes mellitus.

Keywords: Diabetes mellitus, Lipid profiles, Lipid abnormalities

INTRODUCTION

Diabetes mellitus (DM) is one of the most prevalent non-communicable diseases all over the world. The number of diabetic patients has risen globally and the prevalence has been rising more rapidly in middle and low-income countries.[1] In Bangladesh, 8.4 million people (10% of total population) live with diabetes and the prevalence will be 13% by 2030.[2] DM is not a single disease rather a group of metabolic disorders characterized by high blood sugar resulting from defects in insulin secretion, insulin action or both.[3] The two major forms of diabetes mellitus are type-1 diabetes mellitus (T1DM) and type-2 diabetes mellitus (T2DM). T1DM presents with acute symptoms, while T2DM develops.[4] Acute consequences of uncontrolled diabetes are hyperglycemia with ketoacidosis or the nonketotic hyperosmolar syndrome while the chronic complications of diabetes are associated with retinopathy with potential loss of vision; nephropathy leading to impairment of renal functions; peripheral neuropathy with risk of foot ulcers and amputations, cardiovascular symptoms, sexual dysfunction and so on.[5] Lipids play a very important role in the physiologic functions of the body. It includes total cholesterol (TC), triglycerides (TG), high-density lipoprotein cholesterol (HDL-C) and low-density lipoprotein cholesterol (LDL-C).[6] Patients with T2DM have an abnormal lipid profile with high levels of LDL-

C, TG and a low level of HDL-C.[7] Lipid profile is a type of blood test that are used to measure serum TC, TG, HDL-C, LDL-C.[4] Physicians often ask for lipid profiles to detect lipid abnormality in diabetic patients. Patients with type-2 diabetes have increased risk of hyperlipidemia or dyslipidemia.[8] The dyslipidemia is a major risk factor for cardiovascular disease which is a leading cause of morbidity and mortality in patients with diabetes mellitus.[9] Early detection and treatment of hyperlipidemia in diabetes mellitus can prevent the progression of further complications and reduce the risk of developing cardiovascular diseases. To our knowledge, no study has been reported to estimate the lipid profiles levels among type-2 diabetic patients in Savar area. Therefore, the study was designed to evaluate the lipid profiles levels of patients with T2DM.

METHODS

This was a community-based, multidisciplinary study conducted in Savar area located 24 km northeast of the capital city of Bangladesh, Dhaka. The study population consisted of all patients with type-2 diabetes attending Jahangirnagar University campus in Savar for morning walk. The study was conducted from January to April 2017.

A sample of 105 known cases of type-2 diabetes mellitus was selected using random sampling. The purpose of the study was clearly explained to the respondents and a written consent was taken from every patient before clinical examination and all routine investigations. Personal information (sex, age, education and marital status) was taken by interview questionnaire. Every patient was advised for at least 12-14 hours overnight fasting. About 5 ml of fasting venous blood sample was collected from each subject in a disposable syringe on next morning before breakfast. TC, TGs, HDL-C and LDL-C were measured by following the methods mentioned by Altaher et al in a previous study.[4] Laboratory facilities for biochemical analysis were provided by Department of Public Health and Informatics, Jahangirnagar University. The lipid profiles were evaluated by following classification of lipid profile of National Cholesterol Education Programme (NCEP) Adult Treatment Panel III (ATP III).[9] Data obtained were analyzed using Statistical Package of Social Sciences (SPSS-IBM) version 22.0. Descriptive statistics were computed for the variables. Association between variables was analyzed using chi-square tests. Association of variables was significant it the p-value was less than or equal to 0.05.

RESULTS

A total of 105 patients with type-2 diabetes were investigated. Out of 105 participants, 64.8% were male and 35.2% were female. Majority of the patients (62.9%) were in the age group of 40-50 and the mean age of participants was 47.67±5.9 years, with a range of 35 to 60 years. 45.7% patients were illiterate while 24.3% were literate (Table 1).

Table 1: Demographic characteristics of the study population (n=105).

Variable	Categories	Frequency	%
Gender	Male	68	64.8
	Female	37	35.2
Age group (years)	30-40	08	7.6
	41-50	66	62.9
	>50	31	29.5
Educational status	Illiterate	48	45.7
	Literate	57	54.3

Table 2: Lipid profiles of the type-2 diabetic patients (n=105).

Variables	Categories	Frequency	%	Mean (±SD)
TC (mg/dl)	Normal	40	38.1	212.49 ±38.52
	Hypercholesterolemia	65	61.9	
TG (mg/dl)	Normal	44	41.9	171.67 ±38.1
	Hypertriglyceridemia	61	58.1	
HDL-C (mg/dl)	Normal	58	55.2	49.78± 12.01
	Low	47	44.8	
LDL-C (mg/dl)	Normal	49	46.7	121.1± 29.6
	High	56	53.3	

The results of the study indicate that 38.1% had normal TC level while 61.9% patients had hypercholesterolemia. The mean total TC level was 212.5±38.52 mg/dl for all the patients investigated. Normal TG level was found in 41.9% individuals whereas 58.1% individuals had hypertriglyceridemia. The mean total of TG level was 171.67±38.1 mg/dl. The study also found 44.8% patients with low HDL-C level and 53.3% with high LDL-C level. Mean HDL-C and LDL-C levels were 49.78±12.01 mg/dl and 121.1±29.6 mg/dl respectively for all the participants (Table 2).

The comparative distribution of the lipid profiles among the study patients was also calculated. The results of the present study revealed that 82.5% male had normal TC level whereas 53.8% male had hypercholesterolemia. In case of female, 17.5% had normal TC level whereas 46.2% had hypercholesterolemia. Majority of the cases had hypertriglyceridemia. The rates were 67.2% and 32.8% for male and female cases respectively. 63.8% males had low HDL-C level while 36.2% females had low HDL level. 67.3% male and 32.7% female had normal LDL level. In contrast, 62.5% male and 37.5% female had high LDL level. Table -3 also illustrates the relation between lipid profiles and demographic characteristics among diabetic patients. There was a statistically significant relation between TC levels and gender (p=0.003). In contrast, there were no statistically

relation between TG, LDL & HDL level and gender among the study participants (p>0.05).The study reported that 67.5% patients had normal TC level while 60% patients were found with hypercholesterolemia in the age range 30-40 years. In the age group 41-50 years, majority (60%) patients had hypercholesterolemia. Normal TC levels were found in 27.5% patients whereas hypercholesterolemia was found in 30.8% in the age range greater than 50 years. 11.4% patients had normal TG level in the age range 30-40 years. In the age group 40-50 years, 56.8% patients had normal TG level. Normal TG levels were found in 31.8% patients whereas hypertriglyceridemia was found in 27.9% in the age range greater than 50 years. 12.1% patients had normal HDL-C level whereas only 2.1% patients had low HDL-C level in the age range 30-40 years. In the age group 41-50 years, 53.4% patients had normal HDL-C level. Normal HDL-C levels were found in 34.5% patients whereas low HDL-C was found in 23.4% in the age range greater than 50 years. Only 8.2% patients had normal LDL-C level whereas 7.1% had high level of HDL-C in the age range 30-40 years. In the age group 41-50 years, normal LDL-C levels were found in 55.1%. Also 36.7% patients had normal LDL-C level whereas high LDL-C was found in 23.2% in the age range greater than 50 years. Among all the variables only HDL levels was found significantly associated with age group (p=0.043). Above table also revealed that, among all the variables only LDL-C level was found significantly associated with education (p=0.028) and TC level was associated with gender (p=0.003) (Table 3).

Table 3: Relation of lipid profiles with demographic characteristics (n=105).

Variable	Categories	Gender			χ2	P value
		Male		Female		
TC (mg/dl)	Normal	33 (82.5)		7 (17.5)	8.909	0.003*
	Hypercholesterolemia	35 (53.8)		30 (46.2)		
TG (mg/dl)	Normal	27 (61.4)		17 (38.6)	0.383	0.536
	Hypertriglyceridemia	41 (67.2)		20 (32.8)		
HDL-C (mg/dl)	Low	30 (63.8)		17 (36.2)	0.032	0.857
	Normal	38 (65.5)		20 (34.5)		
LDL-C (mg/dl)	Normal	33 (67.3)		16 (32.7)	0.269	0.640
	High	35 (62.5)		21 (37.5)		
		Age group (years)				
		30-40	41-50	>50		
TC (mg/dl)	Normal	2 (5.0)	27 (67.5)	11 (27.5)	0.893	0.640
	Hypercholesterolemia	6 (9.2)	39 (60.0)	20 (30.8)		
TG (mg/dl)	Normal	5 (11.4)	25 (56.8)	14 (31.8)	1.968	0.374
	Hypertriglyceridemia	3 (4.9)	41 (67.2)	17 (27.9))		
HDL-C (mg/dl)	Low	1 (2.1)	35 (74.5)	11 (23.4)	6.272	0.043*
	Normal	7 (12.1)	31 (53.4)	20 (34.5)		
LDL-C (mg/dl)	Normal	4 (8.2)	27 (55.1)	18 (36.7)	2.533	0.282
	High	4 (7.1)	39 (69.6)	13 (23.2)		
		Education level				
		Illiterate		Literate		
TC (mg/dl)	Normal	20 (50.0)		20 (50.0)	0.478	0.489
	Hypercholesterolemia	28 (43.1)		37 (56.9)		
TG (mg/dl)	Normal	24 (54.5)		20 (45.5)	2.380	0.123
	Hypertriglyceridemia	24 (39.3)		37 (60.7)		
HDL-C (mg/dl)	Low	22 (46.8)		25 (53.2)	0.041	0.839
	Normal	26 (44.8)		32 (55.2)		
LDL-C (mg/dl)	Normal	28 (57.1)		21 (42.9)	4.836	0.028*
	High	20 (35.7)		36 (64.3)		

DISCUSSION

Globally diabetes mellitus is a leading cause of death and disability. Lipid abnormalities are frequently found in patients with T2DM which increases the risk of developing cardiovascular diseases.[10] Caring for patients with type 2 diabetes is generally viewed as a challenge. The aim of this study was to estimate lipid profiles of patient with T2DM. The present study reported that T2DM prevalence were more in male than female patients. Similar finding was also reported by previous study.[9] The majority of the patients were between age ranges 41-50 years. Type-2 diabetes develops slowly and takes time to manifest. This finding was similar to a previous study.[11] The prevalence of T2DM increases with age although the patterns of incidence vary considerably.[12] Regarding the patients' educational level,

the study showed that about half of the patients were illiterate. There was congruency with previous studies.[13,14] The study showed only TC level was found significantly associated with gender, where more male patients were found with low HDL-C level than female. This finding is contrary with other studies.[15,16] The result of this study agreed with other studies that showed that, female patients had significant higher serum cholesterol and triglyceride but significantly lower HDL-C levels as compared to males. Regarding age group, age between 41-50 years had a higher percentage of hypercholesterolemia, hypertriglyceridemia than in younger or older age. HDL-C level was found statistically significant with age group. Hypertension and abnormalities of lipoprotein metabolism are often found in people with diabetes.[17] Uncontrolled lipid profile of diabetic patients for long time can produce cardiovascular diseases. Effective self-management of diabetes is critical to the achievement of healthy, independent and flexible day-to-day living but this requires personal motivation and changes in behavior and routines. Patient with type-2 diabetes should follow diabetic dietary habits to keep lipid profile at normal level. Moreover, healthy lifestyle and recommended medicine should be adopted appropriately.

CONCLUSION

In summary, hyperlipidemia is a common complication of diabetes mellitus and it provokes them to develop ahterosclerosis and macrovascular complications. Common lipid abnormalities in diabetes are raised triglycerides, LDL serum cholesterol and low HDL. Therefore maintaining good lipid profile can prevent development and progression of related complications among patient with diabetes mellitus.

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