

ORIGINAL ARTICLE

A Cross-Sectional Study on Prevalence and Pattern of Dyslipidemia and Its Associated Factors among Patients with Type 2 Diabetes Mellitus

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Background and Aim: Diabetes mellitus type 2 (T2DM) and dyslipidemia are growing health issues. Multidimensional dyslipidemia is a characteristic of diabetes. Diabetes mellitus and dyslipidemia are comorbid conditions associated with an increased risk of cardiovascular disease. The aim of the present study was to determine the prevalence and pattern of dyslipidemia in T2DM patients.

Material and Methods: This cross-sectional study was conducted on 426 type 2 diabetes mellitus patients in the Department of Family Medicine and General Surgery, Hayatabad Medical Complex, Peshawar for the duration from May 2022 to October 2022. Prior to study conduction, ethical approval was taken from institute research and ethical committee. Patient's demographic details, laboratory findings, medications, and clinical features were recorded. Dyslipidemia was analyzed as categorical variables described as frequency and percentages. Laboratory findings included Low-density lipoprotein cholesterol (LDL-C), triglycerides (TGs), high-density lipoprotein cholesterol (HDL-C), and total cholesterol (TC). SPSS version 26 was used for data analysis.

Results: Of the total 426 T2DM patients, there were 224 (52.6%) male and 202 (47.4%) females. The incidence of dyslipidemia was 92.6% among T2DM patients. Based on dyslipidemia patterns, the incidence of low HDL-C, hypertriglyceridemia, and high LDL-C were 72.4%, 62.6%, and 68.8% respectively. Diabetic dyslipidemia patterns were significantly associated with gender, hypertension, and obesity. Hypercholesterolemia and high LDL-C were significantly associated with poor glycemic control and duration of T2DM. Smoking and reduced glycemic control was related with hypertriglyceridemia.

Conclusion: It has been found that the incidence of dyslipidemia among T2DM patients was 92.6%. Patients with type 2 diabetes are most likely to have low HDL-C and high triglycerides. It is strongly recommended to provide educational programs emphasizing the significance of adopting a healthy routine.

Keywords: Dyslipidemia, Pattern, Type 2 diabetes mellitus

INTRODUCTION

Diabetes type 2 has been related to cardiovascular mortality and morbidity at a global level. Ischemic heart disease, a reduction in life expectancy, and stroke are all higher risks associated with diabetes [1, 2]. Diabetic patients are significantly at increased risk for cardiovascular disease due to dyslipidemia, which is considered an irregular lipid profile, caused by insulin resistance [3]. As a result of the metabolic syndrome and insulin resistance, transporting free fatty acids to the liver through the portal circulation, enhancing lipolysis [4, 5]. The hormone lipoprotein lipase activities disrupted by these fatty acids leading to an excess triglyceride-rich lipoproteins which is predominantly related to HDL-c decrease and increase in LDL-c oxidized [6, 7]. T2DM patients had higher incidence of dyslipidemia [8]. A previous research found that diabetic dyslipidemia was present in 85% in T2DM patients and the most prevalent patterns were higher serum cholesterol level and high LDL [9].

Based on age standardization, incidence of diabetes varied from 13% to 23.7% in 2017 [10]. A previous study reported that the incidence of one or more type of dyslipidemia was over 90% among T2DM patients [11]. The incidence of low HDL-C, hypercholesterolemia, high LDL-C, and hypertriglyceridemia was 83.9%, 77.2%, 91.5%, and 83.1% respectively [12]. Another study reported that the hypertriglyceridemia occurrence rates, low HDL-C, hypercholesterolemia, and high LDL-C were 41.9%, 59.5%, 44.3%, and 75.9% respectively [13]. In Pakistan, data regarding prevalence and patterns of dyslipidemia among type 2 diabetes mellitus patients was limited. Therefore, the present study aimed to determine the dyslipidemia prevalence and patterns among T2DM patients.

METHODOLOGY

This cross-sectional study was carried out on 426 type 2 diabetes mellitus patients in the Department of Family Medicine and

General Surgery, Hayatabad Medical Complex Peshawar for the duration from May 2022 to October 2022. Prior to study conduction, ethical approval was taken from institute research and ethical committee. Patient's demographic details, laboratory findings, medications, and clinical features were recorded. Dyslipidemia was analyzed as categorical variables described as frequency and percentages. Low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), triglycerides (TGs), and total cholesterol (TC) were included in laboratory findings. Gestational diabetes mellitus women and type 1 diabetes mellitus patients were excluded. Socio-demographic details included age, marital status, gender, and occupation. The clinical data included height, weight, body mass index, and other comorbidities such as ischemic heart disease and hypothyroidism. Smoking history, diabetes duration and types, anti-dyslipidemia treatment duration, and stain treatment compliances were recorded.

Patients with fasting blood sugar >126 mg/dl, random plasma glucose >200 mg/dl, and HbA1c >6.5% were diagnosed of diabetes mellitus. The presence of abnormal lipid profile such as TCL >200 mg/dl, LDL-c >100 mg/dl, HDL-c < 40 mg/dl, triglyceride level >150 were considered as dyslipidemia. Dyslipidemia patients were further sub-divided into single-parameter, combined-parameters, and mixed-parameter dyslipidemia. SPSS version 26 was used for data analysis. Continuous variables were expressed as mean and standard deviation whereas categorical variables were described as frequency and percentages. Chi-square test was used for comparing different lipid abnormalities. All the descriptive statistics were done by taking 95% confidence interval and 5% level of significance.

RESULTS

Of the total 426 T2DM patients, there were 224 (52.6%) male and 202 (47.4%) females. The incidence of dyslipidemia was 92.6% among T2DM patients. Based on dyslipidemia patterns, the

incidence of low HDL-C, hypertriglyceridemia, and high LDL-C were 72.4%, 62.6%, and 68.8% respectively. Diabetic dyslipidemia patterns were significantly associated with gender, hypertension, and obesity. Hypercholesterolemia and high LDL-C were significantly associated with poor glycemic control and T2DM duration. Smoking and reduced glycemic control was related with hypertriglyceridemia. Table-I represents the demographic details, laboratory and clinical characteristics. Figure-1 depicts the gender's distribution. Patients distribution based on BMI (kg/m²) are illustrated in Figure-2. Figure-3 demonstrate the different comorbidities of T2DM patients. Patterns and lipid profile of dyslipidemia in T2DM patients are shown in Table-II. Patterns of Dyslipidemia in Type 2 Diabetes Patients Based on Investigated Characteristics are represented in Table-III.

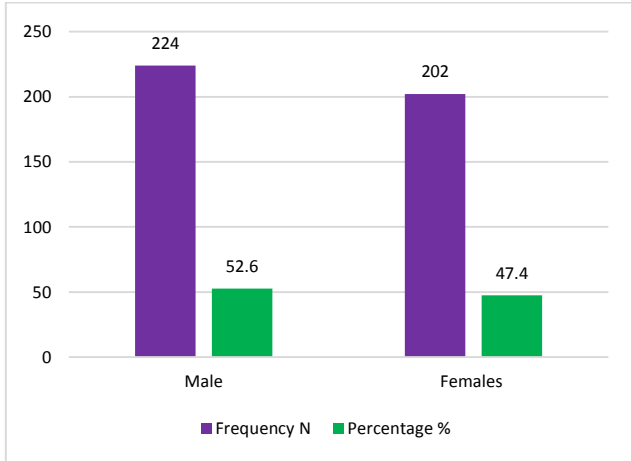


Figure-1: Gender's distribution

Table-1: demographic details, laboratory and clinical characteristics.

Parameters	Value N (%)
Age (years)	58.4±6.8
BMI (kg/m ²)	29.8±5.6
Medications for lipid lowering	
Statins	286 (66.7)
Fibrates	26 (6.1)
Diabetes duration (years)	10.92 ± 8.48
Systolic BP (mm Hg)	132.64 ± 16.86
Diastolic BP (mm Hg)	80.42 ± 12.26
FBS (mg/dl)	9.92 ± 5.83
HbA1c (%)	8.62 ± 2.26
≤7	140 (32.9)
≥7	286 (67.1)

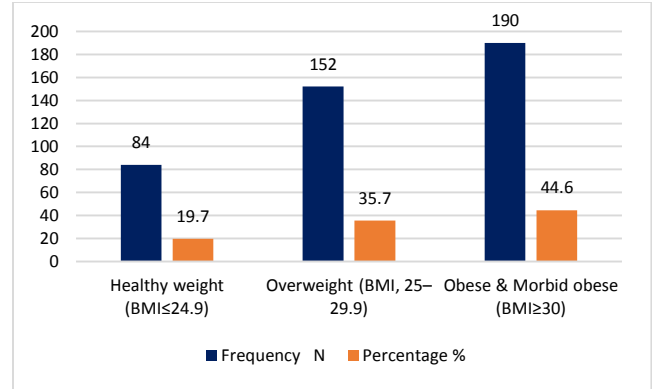


Figure-2: Patients distribution based on BMI (kg/m²)

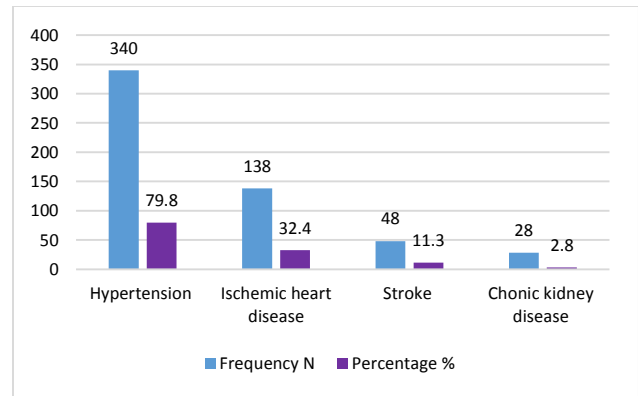


Figure-3: different comorbidities of T2DM patients

Table-2: Patterns and lipid profile of dyslipidemia in T2DM patients

Parameters	Value N (%)
Lipid profile (mg/dl)	
HDL-C	42.43 ± 12.36
LDL-C	116.23 ± 38.84
TC	174.94 ± 48.76
TGs	204.06 ± 204.21
Patterns of dyslipidemia	
Low HDL-C	308 (72.4)
High LDL-C	293 (68.8)
Hypercholesterolemia	267 (62.6)
Hypertriglyceridemia	258 (60.6)
Dyslipidemia patterns combinations N (%)	
Nil	40 (9.4)
One	92 (21.6)
Two	124 (29.1)
Three	106 (24.9)
Four	64 (15)

Table-3: Patterns of Dyslipidemia in T2DM Patients Based on Investigated Characteristics

Parameters	Low HDL-C N (%)	High LDL-C N (%)	Hypercholesterolemia N (%)	Hypertriglyceridemia N (%)	P-value
Age (yrs)					
25-40	52 (16.9)	78 (26.6)	48 (18.0)	78 (30.2)	0.03
41-55	156 (50.6)	86 (29.4)	82 (30.7)	142 (55)	<0.001
56-70	88 (28.6)	111 (37.9)	98 (36.7)	30 (11.6)	0.001
71-85	12 (3.9)	18 (6.1)	39 (14.6)	8 (3.1)	0.082
Gender					
Male	156 (50.6)	182 (62.1)	146 (54.7)	130 (50.4)	0.001
Females	152 (49.4)	156 (53.2)	121 (45.3)	128 (49.6)	<0.001
Smoking status					
Never smoked	212 (68.8)	226 (77.1)	168 (62.9)	146 (56.6)	0.357
Ex-smoker	82 (26.6)	56 (19.1)	38 (14.2)	62 (24)	0.231
Smoker	14 (4.5)	11 (7.5)	61 (22.8)	52 (20.2)	0.011
Diabetic duration (yrs)					
≤10	208 (67.5)	182 (62.1)	74 (27.7)	124 (48.1)	<0.001
≥10	100 (32.5)	111 (37.9)	193 (72.2)	134 (51.9)	
Glycemic control					
HbA1c ≤7%	200 (64.9)	140 (47.8)	48 (18)	136 (52.7)	<0.001
HbA1c ≥7%	108 (35.1)	153 (52.2)	219 (82)	122 (47.3)	

DISCUSSION

The present study mainly focused on dyslipidemia incidence and patterns in T2DM and found that diabetic dyslipidemia was the most common (92.6%) among T2DM patients. Low HDL-C, hypertriglyceridemia, and high LDL-C were found in 72.4%, 62.6%, and 68.8% of people with dyslipidemia, respectively. Pattern of diabetic dyslipidemia were significantly related to gender, hypertension, and obesity. Hypercholesterolemia and high LDL-C levels were related to poor glycemic control and T2DM duration. Hypertriglyceridemia was associated to smoking and poor glycemic control. A previous study findings were significantly higher than the present study, according to which the frequency of low HDL-C, high LDL-C, hypertriglyceridemia, and hypercholesterolemia were 83.9%, 91.5%, 77.2%, and 83.1% respectively [14]. Another study reported lower incidence of low HDL-C, high LDL-C, hypertriglyceridemia, and hypercholesterolemia was 66.2%, 62.1%, 28.7%, and 58.2% respectively [15].

Yaseen et al [16] conducted their study on type 2 diabetes mellitus and found that the incidence of overweight or obese patients were 90.9% compared to 80.1% in the present study. Another study reported that higher incidence of dyslipidemia are significantly associated with higher rates of hypothyroidism, nephropathy, and retinopathy [17]. Similarly, Rashan et al. [18] reported similar results to the present study in terms rates of dyslipidemia related different parameters. According to their study the incidence of diabetic dyslipidemia was 91.4%. Likewise, they reported the rates of high LDL-C and low HDL-C of dyslipidemia in 60.3% and 62.0% respectively. Yet, the prevalence of dyslipidemia in the current study was remarkably higher among type 2 diabetes mellitus. These findings were similarly reported in previous studies [19, 20].

The outstanding findings of the present study were the declined patterns of dyslipidemia in type 2 diabetes mellitus after 60 years where incidence was peak at age group 41-55 years for hypertriglyceridemia, high LDL-C, high TC/HDL, and hypercholesterolemia respectively. Previous studies reported similar findings [21, 22]. This could be explained by higher mortality of type 2 diabetes mellitus patients before 60 years age [23]. Hypertensive patients and obese women were more susceptible to different risk factors for patterns of dyslipidemia.

Numerous studies found higher incidence of dyslipidemia was found in females compared to males [24, 25]. In contrast, no significant association was found between dyslipidemia and gender distributions. Though, the gender difference was observed in the present study could be attributed to female subjects' postmenopausal state [26]. Many studies reported that different risk factors for dyslipidemia patterns were hypertension and obesity [27, 28]. In the present study, smoker were more susceptible to hypertriglyceridemia, as reported in a previous study [29].

The present study found that type 2 diabetes mellitus for longer duration is an independent risk factor for hypercholesterolemia and high LDL-C development and associated with TC/HDL ratio. Similar evidence have been reported in other studies [30, 31]. Another study reported that T2DM duration was insignificant in association with low HDL-C and high LDL-C [32]. In type 2 diabetes mellitus patients, various dyslipidemia are significantly associated with macro and microvascular diabetic related complications. These findings resembled with other studies [33, 34] which depicts the diabetic complications bilateral association with dyslipidemia.

CONCLUSION

It has been found that the incidence of dyslipidemia among T2DM patients was 92.6%. Patients with type 2 diabetes are most likely to have low HDL-C and high triglycerides. It is strongly recommended to provide educational programs emphasizing the significance of adopting a healthy routine.

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