

The Prevalence of Dyslipidemia among Type 2 Diabetes Mellitus Patients in Al-khums Diabetic Center-Libya

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Article information	Abstract
<p>تسلمت الورقة بتاريخ 2024/01/03 م وقبلت بتاريخ 2024/01/10 م ونشرت بتاريخ 2024/01/14 م</p>	<p>Background: An increase in the prevalence of diabetes mellitus has led to an increase in renal and cardiovascular complications. For this complication, dyslipidemia is a known risk factor.</p> <p>Objective: This study aimed to identify the prevalence and patterns of dyslipidemia in people with type 2 diabetes mellitus (T2DM) and to estimate the influence of clinical and lifestyle factors on dyslipidemia.</p> <p>Results: A high prevalence of dyslipidemia (61%) was found in people with T2DM. The most common lipid abnormality in our study was a low level of HDL-C followed by high TG and high LDL-C respectively. There was no statistical difference between males and females in lipid abnormalities. There was a significant association between poor diabetic control, BMI, smoking, and low physical activity with the occurrence of dyslipidemia.</p> <p>Conclusion: These studies indicate that dyslipidemia is a common complication of T2DM, with a high prevalence among T2DM patients. Control of diabetes mellitus, screening, and management of dyslipidemia will reduce the micro and macrovascular complications in T2DM patients.</p> <p>Keywords: diabetes mellitus, dyslipidemia. Lipid profile.</p>

I. INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a chronic metabolic disorder characterized by hyperglycemia resulting from insulin resistance and/or insulin deficiency. Dyslipidemia, a condition characterized by abnormal levels of lipids in the blood, is a common complication of T2DM. Dyslipidemia is associated with an increased risk of cardiovascular diseases (CVD), which is a leading cause of morbidity and mortality among T2DM patients.⁽¹⁾

The prevalence of dyslipidemia among T2DM patients is a topic of considerable interest due to its potential impact on the development and progression of CVD. Several studies have reported high prevalence rates of dyslipidemia among T2DM patients, with the prevalence varying depending on the population studied and the diagnostic criteria used.⁽²⁾

One of the earliest studies to investigate the prevalence of dyslipidemia among T2DM patients was in the United Kingdom Prospective Diabetes Study (UKPDS), which

found that 55% of T2DM patients had elevated total cholesterol levels, 41% had low levels of high-density lipoprotein cholesterol (HDL-C), and 37% had elevated levels of triglycerides.⁽³⁾ From this time, numerous studies have investigated the prevalence of dyslipidemia among T2DM patients in various populations.

A systematic review and meta-analysis of studies published between 1990 and 2013 found that the overall prevalence of dyslipidemia among T2DM patients was 63.3% (95% CI: 56.5%–69.6%).⁽⁴⁾ Another meta-analysis of studies published between 2000 and 2017 found a slightly higher prevalence of dyslipidemia among T2DM patients, with an overall prevalence of 71.5% (95% CI: 66.5%–76.3%).⁽⁵⁾

These studies indicate that dyslipidemia is a common complication of T2DM, with a high prevalence among T2DM patients.

The high prevalence of dyslipidemia among T2DM patients is thought to be due to several factors. Insulin

resistance, a hallmark of T2DM, can lead to increased production of triglycerides and decreased clearance of low-density lipoprotein cholesterol (LDL-C), contributing to dyslipidemia.⁽¹⁾

Obesity, which is a common comorbidity of T2DM, can also contribute to dyslipidemia through increased production of triglycerides and decreased production of HDL-C. Poor glycemic control, genetic factors, and lifestyle factors such as diet and physical activity may also contribute to dyslipidemia among T2DM patients.⁽¹⁾

Given the high prevalence of dyslipidemia among T2DM patients and its association with CVD, it is important to screen and manage lipid levels in this population. This may include lifestyle modifications such as dietary changes and increased physical activity, as well as pharmacological interventions such as statins and other lipid-lowering medications. Effective management of dyslipidemia in T2DM patients may reduce the risk of CVD and improve overall outcomes for this population. Further research is needed to understand the underlying mechanisms of dyslipidemia in T2DM and to identify effective management strategies.⁽¹⁾

Results:

The study was conducted on **240** blood samples taken from participants age range (30-89 years) attending the outpatient clinic of Al-khums diabetic center (KDC)

These cases represented different ages, duration of T2DM and were divided into groups:

Group-I: included 30 patients diagnosed with T2DM recently (16/53.3% male and 14/46.7% female)

Group-II: included 98 patients with T2DM less than ten years (52/53.1% male and 46/46.9% female)

Group-III: included 72 patients with T2DM for more than ten years (52/72.2% male and 20/27.8% female)

Control group: included 40 healthy non-diabetic volunteers, (30/75% male and 10/25% female)

The mean age of participants was 58 yr. The majority of subjects (68.3%) were less than 60 yr.

The table (1) shows the prevalence of dyslipidemia among a group of 40 non-diabetic controls and 200 patients with T2DM.

The results indicate a significantly higher prevalence of dyslipidemia among patients with diabetes compared to non-diabetic controls (p-value ≤ 0.05). Specifically, hypercholesterolemia, which is defined as high levels of cholesterol in the blood, was observed in 6 out of 40 controls and 12 out of 200 T2DM patients, with a p-value of 0.82.

Hypertriglyceridemia, defined as high levels of triglycerides in the blood, was observed in 15% of controls and 56% of T2DM patients, with a p-value of 0.000, indicating a significant difference between the two groups.

High levels of LDL, which is commonly referred to as "bad cholesterol," were observed in 5% of controls and 38% of T2DM patients, with a p-value of 0.000, indicating a significant difference between the two groups.

Low levels of HDL, which is commonly referred to as "good cholesterol," were observed in 10% of a control

group and 86% of T2DM patients, with a p-value of 0.000, indicating a significant difference between the two groups.

Table(1) Shows the prevalence of dyslipidemia

	T2DM (n=200)		control (n= 40)		P. value
	N	%	N	%	
Hypercholesterolemia	12	3	0	0	0.82
Hypertriglyceridemia	112	28	12	15	0.000
High LDL	76	19	4	5	0.000
Low HDL	172	43	8	10	0.000
Dyslipidemia	122	61	8	20	0,000

The table (2) shows the pattern of isolated and combined dyslipidemia among patients with T2DM.

The results indicate that a high proportion of patients with T2DM had dyslipidemia. Out of the 200 patients, none had high cholesterol alone, while 13.1% (32 patients) had high triglycerides alone, 18% (44 patients) had high LDL alone, and 31.1% (76 patients) had low HDL alone.

Furthermore, 6.5% (16 patients) had high LDL and low HDL together, while none had high LDL and high triglycerides together. Meanwhile, 31.1% (76 patients) had high triglycerides and low HDL together.

Interestingly, 6.1% (4 patients) had a combination of high cholesterol, high triglycerides, low HDL, and high LDL, which are all significant risk factors for cardiovascular disease. Additionally, 3.6% (8 patients) had a combination of high cholesterol and high LDL.

Overall, the results suggest that patients with T2DM are at a higher risk of developing dyslipidemia, particularly low HDL and high triglycerides. These findings highlight the importance of regular monitoring and management of lipid profile in T2DM patients to prevent the development of cardiovascular complications. Furthermore, the presence of combined dyslipidemia in some patients indicates the need for more comprehensive interventions, such as lifestyle modifications and medication, to manage their lipid profile and reduce the risk of cardiovascular disease.

Table (2) pattern of isolated and combined dyslipidemia among T2 DM pt

	dyslipidemia (n=122)	
	N	%
High ch	0	0

High TG	32	13.
High LDL	44	18
Low HDL	76	31.
High LDL+Low HDL	16	6.5
High LDL+High TG	0	0
High TG+Low HDL	76	31.
High CH+High TG+Low HDL+High LDL	4	6.1
High ch+High LDL	8	3.6

The table (3) presents the prevalence of dyslipidemia among Libyan patients with T2DM categorized by the duration of their disease (more than ten years, less than ten years, and newly diagnosed).

The results show that there was no significant difference in the prevalence of Hypercholesterolemia between patients with more than ten years and less than ten years of T2DM duration ($p=0.67$).

Moreover, the prevalence of Hypertriglyceridemia was significantly higher among patients with more than ten years of T2DM duration (57.1%, 56 patients) compared to those with less than ten years of duration (28.6%, 16 patients).

Interestingly, patients with more than ten years of diabetes duration had a significantly higher prevalence of low HDL levels (53.5%, 86 patients) than those with less than ten years of duration (27.9%, 46 patients) ($p=0.01$). This finding highlights

Table (3) Dyslipidemia among T2DM patients according to duration

	duration						Total	P. value
	new (n=30)		less than 10 years (n=72)		more than 10 years (n=98)			
	N	%	N	%	N	%		
High CH	0	0	8	66.7	4	33.3	6	0.67
High TG	8	14.3	32	28.6	64	57.1	56	0.075
High LDL	6	15.8	40	52.6	24	31.6	38	0.701
Low HDL	32	18.6	48	27.9	92	53.5	86	0.01

The table (4) presents the prevalence of dyslipidemia among patients with poor and good glycemic control. The study included a total of 200 participants, of which 174 had poor glycemic control, and 26 had good glycemic control.

The results show a significant association between poor glycemic control and dyslipidemia. All lipid profile parameters including Hypercholesterolemia ($P=0.000$), hypertriglyceridemia ($P=0.000$), high LDL cholesterol ($P=0.000$), and low HDL cholesterol ($P=0.000$) were significantly more prevalent in patients with poor glycemic control compared to those with good glycemic control.

Table (4) dyslipidemia among T2DM patients according to HbA1C

	good glycemic control (n=26)		poor glycemic control (n=174)		total	P. value
	N	%	N	%		
High CH	0	0	6	100	6	0.000
High TG	4	3.6	108	96.4	112	0.000
High LDL	12	15.8	64	84.2	76	0.000
Low HDL	24	14	148	86	172	0.000

Table (5) shows the distribution of dyslipidemia according to BMI categories among patients with T2DM. The study included a total of 240 participants, of which 174 were classified as overweight, 40 as obese, and 26 as having a normal weight.

The table shows that there is a significant association between BMI and dyslipidemia. The prevalence of Hypercholesterolemia, hypertriglyceridemia, and high LDL are significantly higher in the obese group compared to the overweight and normal BMI groups (p -value < 0.05). However, there is no significant association between BMI and low HDL levels.

In the overweight group, the prevalence of hypertriglyceridemia is significantly higher in the overweight group compared to the normal BMI group (p -value < 0.05).

In summary, the table suggests that there is a significant association between BMI and dyslipidemia in T2DM patients. Obese patients have a higher prevalence of dyslipidemia components compared to overweight and normal BMI patients. Overweight patients also have a higher prevalence of dyslipidemia components compared to normal BMI patients.

Table (5) Dyslipidemia among T2DM patients according to BMI

	BMI						total	P. value
	Normal BMI (n=26)		Overweight (n=174)		Obese (n=40)			
	N	%	N	%	N	%		
High CH	0	0	0	0	6	100	6	0.000
High TG	6	10.7	28	50	22	39.3	56	0.000
High LDL	4	10.5	14	36.8	20	52.6	38	0.15
Low HDL	12	14	38	44.2	36	41.9	86	0.739

Discussion:

The study conducted on 240 blood samples taken from T2DM patients attending the outpatient clinic of Al-khums Diabetic Center (KDC) aimed to evaluate the factors that may influence the occurrence of dyslipidemia in patients with T2DM. The results suggest that patients with diabetes are at a higher risk of developing dyslipidemia, particularly hypertriglyceridemia, high LDL, and low HDL, which are all significant risk factors for cardiovascular disease⁽¹⁾.

The study divided the patients into three groups based on their duration of T2DM, which were newly diagnosed patients (Group-I), patients with less than ten years of diabetes (Group-II), and patients with more than ten years

of T2DM (Group-III). The control group included 40 healthy non-diabetic volunteers.

The study found a significantly higher prevalence of dyslipidemia among patients with T2DM compared to non-diabetic controls group. Specifically, Hypertriglyceridemia was observed in 15% of controls and 56% of T2DM patients, with a p-value of 0.000, indicating a significant difference between the two groups. High levels of LDL were observed in 5% of controls and 38% of T2DM patients, with a p-value of 0.000, indicating a significant difference between the two groups. Low levels of HDL were observed in 10% of controls and 86% of T2DM patients, with a p-value of 0.000, indicating a significant difference between the two groups. A further study came to similar results, which showed that participants with an HbA1c of over 7% had significantly higher levels of LDL-C, and TGs, as well as lower LDL-C, than those with an HbA1c of less than 7% (10,11).

Moreover, the study showed that a high proportion of patients with T2DM had dyslipidemia, particularly low HDL and high triglycerides. Interestingly, 6.1% of patients had a combination of high cholesterol, high triglycerides, low HDL, and high LDL, which are all significant risk factors for cardiovascular disease. The study highlights the importance of regular monitoring and management of lipid levels in T2DM patients to prevent the development of cardiovascular complications.⁽¹⁾ Previous studies reported variable prevalence rates and patterns of dyslipidemia. This variation in the prevalence and patterns of dyslipidemia in individuals with T2DM may be due to variations in the population investigated, BMI, length of diabetes, hereditary variables, socioeconomic development, and different definitions and cutoff values for lipids used.^(12,13)

Conclusion:

Overall, the study provides important insights into the prevalence of dyslipidemia in patients with T2DM and emphasizes the need for comprehensive interventions, including lifestyle modifications and medication, to manage lipid levels and reduce the risk of cardiovascular disease.⁽¹⁴⁾ Where significant differences were observed between T2DM patients and controls in dyslipidemia markers. Hypertriglyceridemia was found in 56% of T2DM patients, compared to 15% in controls. High levels of LDL were present in 38% of T2DM patients versus 5% of controls, while low levels of HDL were observed in 86% of T2DM patients compared to 10% of controls. These findings support prior research showing that diabetes increases the risk of dyslipidemia and its consequences, such as cardiovascular disease. These findings emphasize the need to monitor and control T2DM patients' lipid levels to lower their risk of cardiovascular disease and other dyslipidemia-related consequences.⁽¹⁵⁾

The presented findings emphasize the need for increased attention to dyslipidemia in T2DM patients and the importance of regular lipid level monitoring and management to prevent cardiovascular complications. Clinicians should consider these results when developing

individualized treatment plans for patients with T2DM, including lifestyle modifications and pharmacological interventions to reduce lipid abnormalities.

Recommendation:

The study's results emphasize the importance of prioritizing glycemic control in managing dyslipidemia among patients with T2DM. Effective glycemic control may help reduce the risk of dyslipidemia and its associated complications. However, further studies with larger sample sizes are needed to confirm these findings and explore the potential mechanisms underlying the relationship between glycemic control and dyslipidemia in T2DM patients.

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