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Assessment of Serum Lipid Profiles and Kidney Function in Patients with Type 2 Diabetes

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ABSTRACT

The research study was carried out in the Diabetes and Endocrinology Center of Al-Sadr Teaching Hospital in Najaf, Iraq, to examine how the lipid profiles of patients with Type 2 Diabetes have changed since 2025–10–1 to 2026–2–30. The characteristics of 25 healthy subjects (with no health conditions) were compared to the characteristics of the 50 Types 2 Diabetic patients. Glucose levels were assessed and the serum lipid profiles were assessed in terms of TC (total cholesterol), TG (triglycerides), HDL (high-density lipoproteins), LDL (low-density lipoproteins), and VLDL (very low-density lipoproteins), as well as urea and creatinine. The findings showed that the glucose levels in diabetic patients were statistically significantly higher ($p < 0.01$) than those of the normal group. and the serum lipid profile levels (TC, TG, LDL, VLDL) were also statistically significantly greater ($p < 0.01$) in the Type 2 Diabetic patients compared to the healthy group. When compared with the control (healthy) group, the HDL measurement of the lipid profile appears significantly less ($p < 0.01$) for type 2 diabetic patients in a serum sample. Additionally, type ii diabetic patients demonstrated very high levels ($p < 0.01$) of both urea and creatinine concentrations (measured via blood draw) compared to non-diabetic control subjects. As such, these data support the proposition that diabetes has an adverse effect on both serum lipid profile and kidney function relative to subjects without diabetes.

Keywords: diabetes mellitus (T2DM), lipid profiles, Kidney function.

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1.INTRODUCTION

Diabetes mellitus (DM) is a prevalent metabolic disorder characterized by elevated blood sugar (glucose) levels as a result of decreased insulin production, decreased tissue responsiveness to insulin or both processes combined. DM is one of the most common non-communicable diseases. (1). Diabetes also leads to many problems such as micro and macrovascular complications and helps explain why so many people suffer from ill health (2). Type 2 diabetes has multiple potential causes and risk factors including age, poor nutrition, hormones, obesity, genetics and inactivity (3). Diabetes can result in blindness, nonhealing amputations, kidney failure, vascular disease (small vessels) & valvular disease, anemia, cardiovascular disease, brain damage, decreased ability to function & independence and many other problems (4).

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Approximately 90-95% of all diabetes cases are classified as type 2. People diagnosed with type 2 diabetes usually do not require insulin therapy. The majority of people with diabetes have type 2 diabetes, which is due to insulin resistance within the body's tissues. Insulin is produced by Beta cells in the pancreas, but they cannot utilize it effectively. As a result, there are changes in the body at the cellular level where muscles, liver, and fat do not use insulin properly causing an inability of these tissues to utilize glucose (5). There are two main types of diabetes, type 1 (T1DM) and type 2 (T2DM). In T1DM, nearly all insulin-producing cells in the pancreas are destroyed; therefore, when someone has type 1 diabetes, they must frequent have much lower insulin levels than people with type 2 diabetes or normal people. Type 2 diabetes, the most frequent form, results from both insufficient insulin secretion and defect in the body's cells response to insulin (6).

Since there are low levels of sensitivity to insulin produced by the pancreas' insulin secretion, there is resistance of the cells in the body to insulin's actions, leading to an accumulation of glucose in the bloodstream (7). Many other risk factors contribute to diabetes mellitus, including genetic defects, viral infections, altered hormone levels during pregnancy, and some medications (8). Dyslipidaemia, which is a known risk factor for microcirculatory disease in patients with type 2 diabetes mellitus (T2DM), is a strong predictor of dyslipidaemia in individuals with T2DM or individuals with prediabetes (9). Individuals with dyslipidaemia often have elevated total cholesterol (TC) levels. Having high TC levels is believed to be a sign for identifying people with a high risk of developing T2DM (type 2 diabetes) and CVD (cardiovascular disease). When someone has a lot of fat in their body, they will have a hard time using insulin and controlling the amount of glucose in their blood. As a result, their blood glucose will go up; their triglycerides and total cholesterol levels will go up; and their HDL cholesterol will go down (10).

Creatinine and urea levels in the blood are used to determine how well the kidneys are working. Since diabetes can lead to kidney failure, it is very important to monitor these levels in patients who have been diagnosed with diabetes because their creatinine and urea levels will usually be higher than those of non-diabetic people. High levels of creatinine and urea in the blood strongly correlate with blood glucose levels. Therefore, high blood glucose levels are the primary reason for developing kidney failure. (11).

2. MATERIALS AND METHODS

2.1 Subject

This study took place at the Diabetes and Endocrinology Center in Al-Sadr Teaching Hospital, Najaf Al-Ashraf, from 1st October 2025 to 30th February 2026. The participants were 50 Type II diabetic subjects of both sexes (25 females and 25 males). Among them, various variables (glucose levels, kidney function and lipid profile variables including total cholesterol (TC), triglycerides (TG), high-density lipoproteins (HDL), low-density lipoproteins (LDL), very-low-density lipoproteins (VLDL), urea and creatinine) were measured in patients with type II diabetes compared to a healthy group consisting of 25 subjects of both sexes (12 females and 13 males)..

2. 2 Blood samples collection

Venous blood samples were obtained using sterile medical syringes that could hold five milliliters of blood after an 8-hour fasting period and the blood is placed at room temperature for (10) minutes to coagulate, then centrifuged in a centrifuge at 6000 rpm for (10) minutes, then the serum is separated and frozen at

-20°C to maintain the stability of the serum until it is used.

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3. RESULTS

3.1 Comparisons based on distribution of age in patients with type 2 DM and control

Table (1) shows no difference in the prevalence of Type 2 diabetes by age ($p< 0.05$) when compared with healthy individuals, The sample population with Type 2 diabetes in the 61-72-year age the highest number of cases within that demographic at 17 individuals, while the 25-36 age demographic had range had the lowest number of cases within that demographic at 3 individuals.

Table (1): Distribution of age in patients with type 2 DM and control.

Age interval	Control No. (%)	Patients No. (%)
25-36	7(28)	3(6)
37-48	4(16)	7(14)
49-60	6(24)	13(26)
61-72	6(24)	17(34)
73-84	2(8)	10(20)
Total	25(100)	50(100)
X^2	8.16	
P value	0.086(NS)	

NS; No *significant difference at (P<0.05.)*

3. 2 Comparison based on Glucose levels in Patients with type 2 DM and Control

In Table (2) The statistical results showed a highly significant increase ($p< 0.01$) in Glucose levels (FBG) of patients with type 2 DM (239.96±12.06) compared with the healthy group (99.52±1.89).

Table (2) Comparison Based on Glucose levels in the patients with type 2 DM and control .

Groups	Glucose levels FBG (mg/dL)
Control	99.52±1.89
type 2 DM patients	239.96±12.06
T value	11.50
P value	<0.0001(HS)

HS; Highly significant difference at (P<0.01).

3. 3 Comparison Based on Lipid Profile (TC &TG) in Patients with type 2 DM and Control

Table (3) the results showed a highly significant increase ($p < 0.01$) in Lipid Profile TC (218.7±8.11) & TG (178.6±7.67) patients with type 2 DM compared to the healthy group TC (116.8±4.60) &TG(101.28±2.77).

Table (3): Comparison Based on Lipid Profile TC &TG in Patients with type 2 DM and Control.

Groups	TC (mg/dL)	TG(mg/dL)
Control	116.8±4.60	101.28±2.77
type 2 DM patients	218.7±8.11	178.6±7.67
T value	10.92	9.48
P value	<0.0001(HS)	<0.0001(HS)

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HS; Highly significant difference at (P<0.01).

3.4: Comparison based on Lipid Profile HDL &LDL& VLDL in Patients with type 2 DM and Control

Table (4) the results showed a highly significant increase (p< 0.01) in Lipid Profile LDL (139.38±6.82) &VLDL (39.34±1.32), the results showed a significant decrease (p<0.01) in Lipid Profile HDL (41.14±1.12) in the patients with type 2 DM compared to the healthy group.

Table (4) Comparison Based on Lipid Profile HDL &LDL& VLDL in Patients with type 2 DM and Control.

Groups	HDL(mg/dL)	LDL(mg/dL)	VLDL(mg/dL)
Control	80.96±2.27	58.64±2.34	22.44±0.64
type 2 DM patients	41.14±1.12	139.38±6.82	39.34±1.32
T value	15.70	11.19	11.40
P value	<0.0001(HS)	<0.0001(HS)	<0.0001(HS)

HS; Highly significant difference at (P<0.01).

3.5 Comparison Based on Kidney function Urea and Creatinine levels in patients with type 2 DM and Control.

Table (5) the results showed a highly significant increase (p < 0.01) in Kidney function Urea (43.44±0.93) and Creatinine (0.957±0.06) in patients with type 2 DM compared to the healthy group Urea (23.16±0.68) & Creatinine (0.449±0.05).

Table (5) Comparison Based on Kidney Function, Urea and Creatinine in Patients with type 2 DM and Control.

Groups	Urea(mg/dL)	Creatinine (mg/dL)
Control	23.16±0.68	0.449±0.05
type 2 DM patients	43.44±0.93	0.957±0.06
T value	17.48	6.04
P value	<0.0001(HS)	<0.0001(HS)

HS; Highly significant difference at (P<0.01).

4. DISCUSSION

4.1: Comparisons based on distribution of age in patients with type 2 DM and control

The results from analyzing the age structure of T2DM patients show a high concentration of cases in the 61 to 72 age range with a total of 17 cases; whereas, there is a correspondingly low level of cases in the ages of 25 to 36. This finding is supported by previous findings from other studies, specifically a study done by (12). Interestingly, both male and females show a higher exposure to T2DM with increasing age due to physiological changes that occur within our bodies as we transition through life stages, thus affecting our ability to metabolize foods and secrete different hormones than when we were younger (13).

4.2 Comparison Based on Glucose levels in Patients with type 2 DM and Control

The statistical results showed a highly significant increase (p < 0.01) in Glucose levels of in the blood serum of patients with type 2 DM (239.96±12.06) compared with the healthy group (99.52±1.89) demonstrated a substantial increase in T2DM patients. This outcome is consistent with other research, such as (14) & (15), unusually high blood glucose, is a common symptom of (DM). In addition to the microvascular and macrovascular problems associated with diabetes mellitus, a

weakened immune system makes a diabetic patient more vulnerable to many infections.

4.3 Comparison Based on Lipid Profile TC &TG in Patients with type 2 DM and Control

Results indicate a highly statistically significant increase ($p<0.01$) in lipid profile, total cholesterol (TC) & Triglycerides (TG) levels within individuals with T2DM compared to the normal group. Individuals with dyslipidaemia, prediabetes) or T2DM frequently exhibit elevated levels of Total Cholesterol (TC) - which are considered an important marker for identifying individuals that are at high risk of developing (diabetes) or cardiovascular disease (CVD) (10). Individuals who are considered obese (with Guillain Barre Syndrome) and are resistant to insulin, cannot effectively control their glucose levels therefore resulting in: an increase in blood glucose (BG), increased triglyceriders (TG) and TC levels and decreases in high-density lipoprotein (HDL) levels. All these conditions indicate that the individual has CVD risk traits, further supported by additional references (16,17).

4. 4 Comparison Based on Lipid Profile HDL &LDL& VLDL in Patients with type 2 DM and Control

The results indicated that individuals with type 2 diabetes mellitus (T2DM) had statistically significantly higher LDL and VLDL levels compared to control subjects ($P<0.01$); however, HDL levels were statistically significantly lower in the same group of individuals ($P<0.01$). Thus, it appears that dyslipidemia is present in all individuals with T2DM and, as demonstrated by this study, increased production of VLDL from the liver and decreased clearance of TAG-rich lipoproteins have contributed to a surplus amount of TAG precursors and increased delivery of free fatty acids (FFA) from adipose tissue into the bloodstream in individuals with T2DM (18). In addition, a fasting triglyceride (TAG) level greater than 150 mg/dL indicates increased risk for cardiovascular disease (CVD) and type 2 diabetes mellitus (T2DM). Elevated fasting TAG levels (>150 mg/dL) are one criterion indicating an individual is at a high risk of developing CVD and T2DM (19). High levels of low-density lipoprotein (LDL-C) are one of the best predictors of atherosclerosis and coronary heart disease (CHD). In addition, elevated TAG levels are common dyslipidemia seen in patients with T2DM and prediabetic states (20). By lowering TAG levels, the severity of the disease and the risk of death from the disease can be reduced. The data suggest that treatment with medications that normalize lipid levels increases LDL-C and decreases high-density lipoprotein cholesterol (HDL-C) compared to no medication. (21).

4. 5 Comparison Based on Kidney function Urea and Creatinine levels in patients with type 2 DM and Control

Elevated kidney function urea (43.44 ± 0.93) and creatinine (0.957 ± 0.06) in patients with type 2 diabetic mellitus compared to their healthy controls indicates an increase in kidney damage or failure. High glucose levels in the bloodstream have been shown to cause an irreversible amount of injury to the kidneys from diabetes mellitus (22), while high levels of urea and creatinine in the blood indicate glomerular injury that has reached the point of no return despite intensive treatment efforts. To limit the continued and worsening progression of "glomerular injury," blood tests for serum urea and creatinine must be performed as soon as possible to facilitate early intervention to limit or prevent the considerable rise of both. (23).

CONCLUSIONS

1-This result emphasizes the necessity of early lipid profile and Kidney function screening in diabetic patients and the significance of early glucose control to postpone the onset of diabetes complications**.**

2- This finding suggests that dyslipidemia, which may play an important role in the development of cardiovascular disease, is more common in diabetic patients.

3- This result showed a strong positive correlation with total cholesterol, triglycerides, LDL cholesterol, VLDL cholesterol, urea, and creatinine, and a strong negative correlation with HDL cholesterol in patients with type 2 diabetes.

4- The most vulnerable age group to develop T2DM disease is those older than 60 years.

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