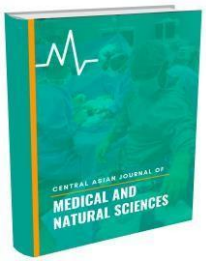

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Article

Evaluation of Intercorrelations Between Lipid Profiles in Patients with Type 2 Diabetes Mellitus in the Al-Muthanna Governorate of Iraq

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Abstract: The well-known metabolic condition known as type 2 diabetes mellitus is distinguished by its chronic nature and compromised lipid metabolism. Recognising and treating it is crucial due to its high prevalence, which affects about one in ten people worldwide. The object of this search was to investigate the relevance between diabetes type 2 and lipid profiles in the people of Al-Muthanna, Iraq. Additionally, we wanted to compare blood lipid levels in patients and healthy people. In our study, patients with type 2 diabetes and healthy people display statistically significant divergence ($p < 0.001$). With ($p < 0.001$) values, the parameters of cholesterol, treglycerides (TG), the high-densety lipoprotein (HDL) and low-density lipoprotein (LDL), cholesterol displayed varying degrees of significance. In a number of important areas, our study revealed significant differences between the healthy control group and those with type 2 diabetes. These variations, specifically the elevated standard of (LDL) cholesterol, triglycerides, and cholesterol in diabetes type 2 patients, point to a possible impact of these markers on the severity of the illness.

Keywords: Diabetes ,TG, Cholesterol, LDL, HDL.

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1. Introduction

Approximately 463 million people worldwide suffer from type two diabetes, which is emerged as one of the greatest drug challenges [1]. Diabetes mellitus is a diverse collection of long-term degenerative metabolic diseases marked by persistent hyperglycemia linked to alterations in the metabolism of proteins, fats, and carbohydrates due to deficiencies in insulin secretion, action (peripheral resistance in target tissues), or both [2]. Diabetes mellitus is a long-term metabolic disorder characterized by elevated blood glucose levels, either due to insufficient insulin production by the pancreas or insufficient cell response [3]. Due to obesity, urbanisation, physical inactivity, and population growth, the prevalence of diabetes mellitus is increasing annually worldwide [4]. Diabetes increases the risk of developing chronic kidney disease and cardiovascular disease by contributing to numerous other complications, including lipid disorders and impaired kidney function [5]. Dyslipidemia is usually associated with a glucose metabolism disorder and is generally defined by high levels of triglycerides (TG), low-density lipoproteins (LDL), and decreased levels of high-density lipoproteins (HDL) in the blood [6]. This change in blood lipid levels is explained by a lack of insulin, which impairs lipid metabolism by increasing the flow of free fatty acids between tissues and causing the

liver to produce triglycerides, thereby hastening atherosclerosis and making diabetic patients' prognosis worse [7], [8]. The majority of patients had concerning blood fat patterns, such as high triglycerides, elevated LDL cholesterol, and low HDL cholesterol, which result in a hazardous lipid profile that greatly raises the danger of cardiovascular disease [9]. To address these interconnected factors and lower the risk of complications, type 2 diabetes must be effectively managed with a combination of medication, lifestyle modifications, and insulin therapy (in certain situations) [10].

2. Materials and Methods

The Al-Hussein Teaching Hospital in the Al-Muthanna Governorate served as the study's site from February 2025 to April 2025. The total number of participants was 31 individuals with type 2 diabetes and 31 healthy individuals. Blood cholesterol levels (LDL), bad cholesterol (HDL), good cholesterol, and triglycerides were measured using purpose-built test kits within a fully automated immunoassay system.

Statistical analysis:

The outcomes were examined statistically using ANOVA (analysis of variance). The values shown in the table represent Mean ± SD. The acceptable statistical values were $P \leq 0.001$ and $P \geq 0.05$. Pearson's correlation test was used to examine the connection between the concentrations of TG, Cholesterol, LDL, and HDL parameters.

3. Results

The results showed significant differences ($p \geq 0.05$) between type 2 diabetic patients and healthy individuals in terms of triglycerides, cholesterol, LDL, and HDL, as displayed in Table 1.

Table 1. Lipid profile concentrations and statistical indicators for samples of diabetic type 2 patients and healthy individuals.

Parameters	patients	Healthy	p-value
	Mean ±SD		
NO.	31	31	
Triglycerides	204.91 ±54.8	82.1 ±11.3	< 0.001
Cholesterol	205.16 ±51.8	138.01 ±13.7	
LDL	93.01 ±30.1	85.91 ±7.5	
HDL	74.18 ±19.9	86.71 ±7.4	

The results showed that there was a positive relationship between the level (TG) and the level (cholesterol) of the infected in type 2 diabetic patients, as the value of the correlation coefficient was (r = 0.0.91**), as shown in Figure 1. And the levels (TG) and (LDL), as the value of the correlation coefficient was (r = 0. 912**), as shown in Figure 2. And the level of (TG) and the level of (HDL), as the value of the correlation coefficient was (r = 0.0.43*), as shown in Figure (3).

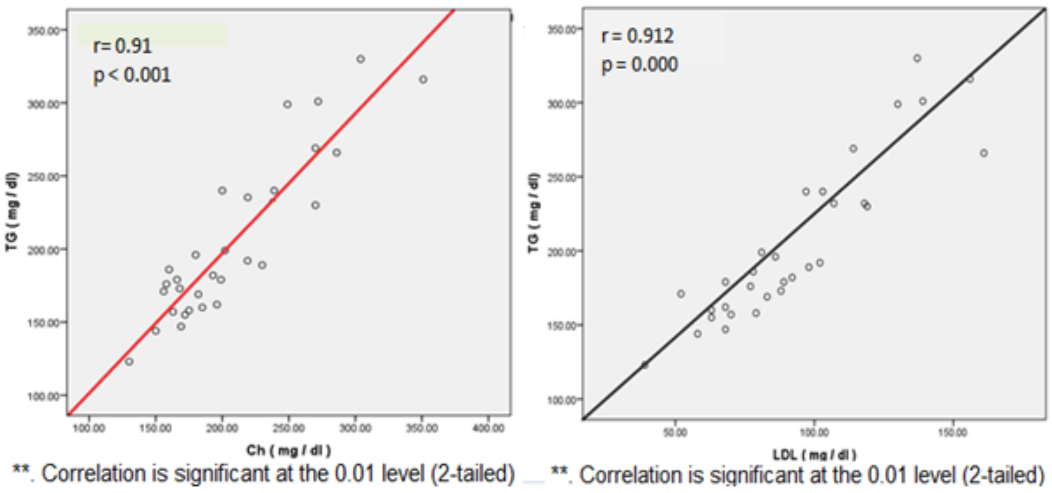

Figure 2.

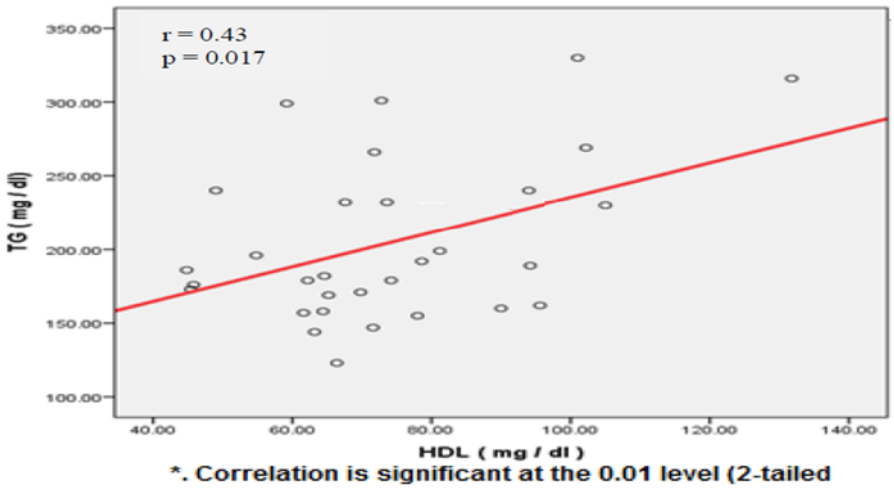

Figure 3.

The results showed a favourable correlation between the level (cholesterol) and the level (LDL) and (HDL) of the infected in diabetic type 2 patients, as the value of the correlation coefficient was (r = 0.0.92**), (r = 0.704**), as shown in Figure (4,5).

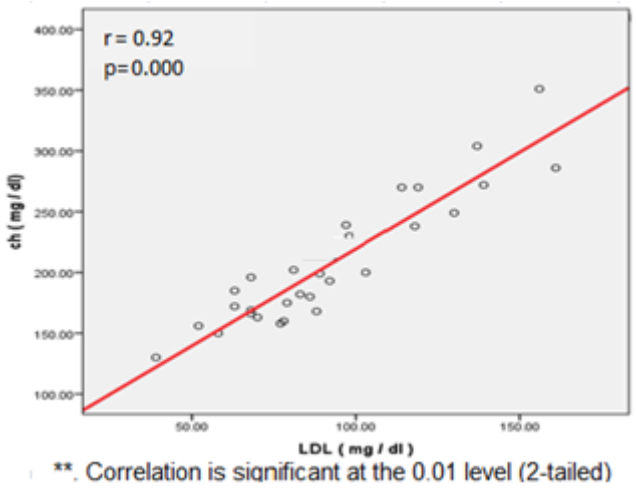

Figure 4.

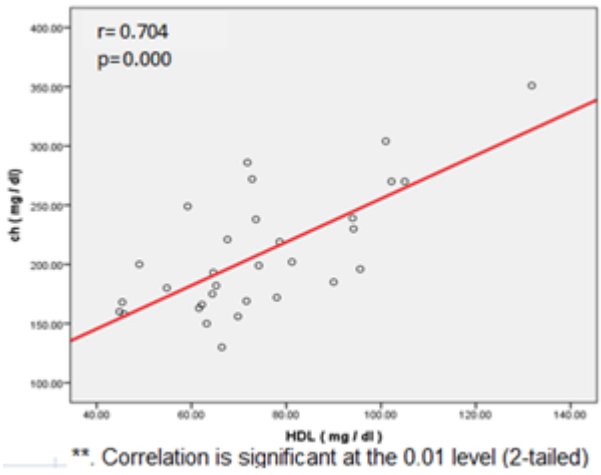

Figure 5.

The findings demonstrated a favourable correlation between the level of LDL and the level of HDL with the infected in diabetes type 2 patients, as the value of the correlation coefficient was (r = 0.395*), shown in Figure 6.

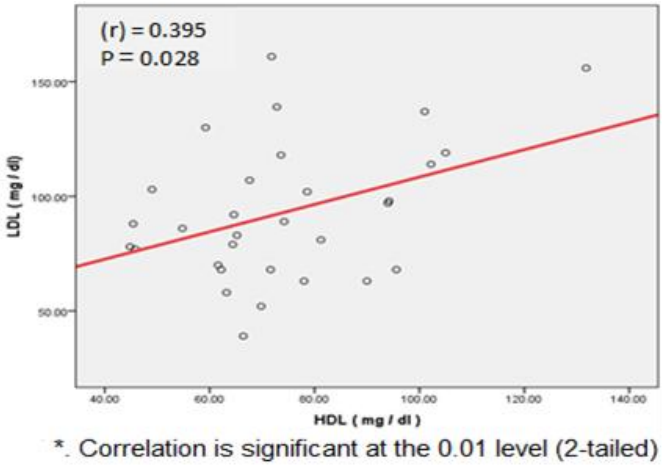

Figure 6.

4. Discussion

The findings (Table 1) revealed significant differences ($p \geq 0.01$) between all diabetic patients and healthy individuals in terms of lipid profiles. The reason might be that patients using Atorvastatin tablets were more effective in reducing lipid parameters and thus lowering lipid levels, as indicated by the researcher's study [11]. Similarly, the researcher [12] concluded that type 2 diabetes patients possess higher cholesterol levels compared to healthy individuals. As for triglycerides, the researcher's study [13], demonstrated a high triglyceride level, which is consistent with the findings of our study. The analysis revealed a significant increase in cholesterol concentration in individuals with type 2 diabetes compared to those with the healthiest. These results were consistent with the findings of [14] and inconsistent with those of [15], who found no significant differences between the two groups. The increased levels could be the result of metabolic problems in diabetes, where the body cannot use blood glucose and must instead break down fats from adipose tissue to meet its energy needs. Triglyceride standard in the blood rises, consequently. The study showed that LDL is high in the blood of diabetic patients. The imbalance results in cholesterol deposition in the walls of the arteries, causing hardening of the arteries and impaired blood flow to the tissues and heart, thus generating

fatal heart diseases. High cholesterol levels raise the amount of free oxygen radicals produced, which could attach to or reduce the activity of the enzyme nitric oxide synthase, leading to vasoconstriction. A large proportion of cholesterol is converted to LDL as a result of oxidation and glycation, which occurs in the blood of people with diabetes on low-density lipoproteins (LDL). This is consistent with [16].

A direct relationship was found between high blood sugar and high TG and TC. Research has revealed that high glucose leads to increased fat production in the liver (hepatic lipogenesis), perhaps as a result of insulin resistance, and leads to increased flow of free fatty acids, thus increasing the production of TG and VLDL, resulting in high TC [17]. Increased TG causes hepatic lipase and the CETP enzyme to produce small, dense LDL molecules. These molecules have a stronger vascular-hardening effect and are more closely linked to diabetes [18]. The cholesterol ester transporter protein (CETP), which moves lipids between VLDL, LDL, and HDL, is activated by elevated TG levels. This strengthens the positive correlation between TG, LDL, and TC by encouraging the formation of LDL and raising its lipid content [19]. The positive relationship between blood lipids that our study found may be due to hyperglycemia stimulating the synthesis of fats and cholesterol in the liver by activating factors such as SREBP-1c, leading to an increase in TG, TC, and LDL together [20].

5. Conclusion

Our study revealed significant differences between individuals with type 2 diabetes and the healthy control group in several key indicators, including cholesterol, triglycerides, HDL cholesterol, and LDL cholesterol. These findings suggest that elevated levels of these indicators in individuals with type 2 diabetes may significantly impact the severity of the condition. Our study also demonstrated a positive correlation between lipid profiles in people with type 2 diabetes.

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