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Assessment of Triglyceride and Cholesterol Levels for a Sample of Type One Diabetic Patients

Mohammed Mohsin Aziza, Safaa Hussein Alia, Aamir M. Abed Al-Ghareebawia
Dept. of Histology and Anatomy, Veterinary Medicine College, Al-Shatrah Univ., Al-Shatrah, Dhi-Qar, Iraq

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Annotation: Diabetes is a medical condition that occurs routinely and can cause severe damage and long-term complications, such as kidney failure, blindness, end-organ necrosis, and amputation. The principal of this investigation was to determine the risk factors of long-term complications in Type 1 diabetics and the relationship between elevated levels of blood glucose, cholesterol, and triglycerides. The study had between 30 individuals divided into six groups by age and was conducted by comparing the patient's groups (A, B, C, D, and E) with the control group (N). The study attempted to examine three biochemical parameters: patients' random blood sugar (RBS), cholesterol, triglyceride levels in the blood.

The results help improve lifestyle, diabetic management, and nutritional-related actions. According to this examination, there were considerable differences between the control group and the patient's groups. The findings confirm a significant relationship between cholesterol, glucose, and triglycerides, and also conformed to the scientific guidance of lifestyle, diabetic management, and dietary preferences.

Keywords: Diabetes, cholesterol, triglycerides, hyperglycemia, dyslipidemia.

INTRODUCTION

Diabetes, characterized by a scarcity of insulin is fast becoming one of the major contemporary health issues that has captured the attention of the population in every part of the world as well as the medical world [1]. Fear and apprehension have risen with the many people who have been diagnosed with type 1 diabetes. It is defined as the persistent scorching of beta cells leading to the permanent lack of insulin secretion [2, 3]. The main clinical sign is a high level of blood glucose, known as hyperglycemia. Diabetes is one of the most commonplace endocrines as well as metabolic diseases that can occur at any age [4]. The principal cause in the majority of patients (70-90%) is losing of beta cell functions secondary to immunological problems, which are supported by the formation of auto-antibodies [5]. There was a small subset of diabetic patients in whom immunological responses are absent. The reason for the loss of beta cell secretion is unclear, but theoretically of genetic origin [6].

Diabetes mellitus is defined as a chronic disease that alters metabolic homeostasis. Carbohydrates and lipids are mainly from their presence in modern foods [4-7]. Diabetes and obesity have reached pandemic proportions in contemporary culture. There is a close relationship between the glucose levels and the type of food [8, 9]. As a result, some studies have suggested a variety of diets that help lower or maintain glucose levels, including the keto diet. Hyperglycemia can cause many health issues, including damage to the kidneys, nerves, eyes, cartilage, and blood vessels [10-13]. The hazards of diabetes are growing more complex and it requires a good understanding between health professionals and patients. Preventing or reducing cardiovascular risk in patients with diabetes requires unique cardiovascular awareness among individuals, as well as more effective dietary targeting of fat intake, including non-LDL cholesterol [14, 15]. Diet is an important factor in the diabetic development. The dietary fat high in saturated fats, trans fats, and polyunsaturated fats have been repeatedly linked to an increased risk of diabetes. Metabolic syndrome is distinguished by higher levels of cholesterol and glucose in the blood, leading to hypertension. On the other hand, an accumulation of metabolic imbalances is associated with cardiovascular disease in diabetic patients [18, 19]. Diabetic patients struggle with lipid regulation. Our modern lifestyle has now led to a widespread metabolic syndrome worldwide. According to research published in 2006 by the International Diabetes Association, approximately 25% of the world population is diagnosed with a metabolic disorder [20-21]. Given the epidemiological confusion surrounding diabetes, these recognized publications should mark a watershed moment in diabetes research, raising public awareness about the health ramifications of the disease. In the absence of an effective treatment for dyslipidemia, there is an urgent need to better understand the interaction between glucose levels and body fat, if it is to serve as a basis for fat intake in the blood [16, 19, 22].

In general, Middle Eastern diets are high in saturated fat and low in trans-fat due to the high cultural consumption of animal products in this region. There is a correlation between cholesterol levels and diabetes , although animal products are the primary source of lipids. This relationship is attributed to other lipid-related properties in animal products such as saturated fat [18, 23]. In addition, lecithin cholesterol acyltransferase catalyzes the esterification of extracellular lipids, mostly in HDL. A key feature of HDL metabolism is the amount of esterified cholesterol (EC) that normally transfers between HDL and lipoproteins, regulated by cholesteryl ester transfer proteins and also, triglycerides in regulating cholesterol esterification and net EC mass transfer. Focus plays an important role. Many studies have been conducted on the effects of fasting to reduce cholesterol, but no explanation is provided for the mechanism of cholesterol reduction, and diabetics continue to be at risk for developing atherosclerosis [22, 24-25]. Furthermore, studies show a strong association between dyslipidemia and hypertension in healthy women. Several studies found statistically significant relationships between blood pressure, glucose and lipid metabolism, which may be associated with insulin resistance or hyperinsulinemia problems Furthermore, patients with insulin resistance have a higher risk of hypertension than those with hypertension alone [5, 6, 26, 27]. Patients with diabetes need long-term follow-up care, with full awareness of their specific needs and nutritional deficiencies. As a result, each stage of life must be treated separately .

For example, newborns need different treatments than adolescents because first children may have more demand than adults [3, 28]. Consequently, the treatment plan should vary according to each condition and must be examined and evaluated at the time of each physician visit and adjusted as necessary [4-6, 29, 30].

The present study aimed to investigate the relationship between glucose, cholesterol, and triglyceride levels.

Consequently, increased awareness and understanding of this relationship can help the diabetic manage daily life and consumption more effectively.

EXPERIMENTAL

MATERIALS AND METHODS

The current study was conducted at the Diabetes Center in Al-Nasiriyah, Department of Health in Dhi-Qar province from January to March 2022. The study consisted of 25 subjects with type 1 diabetes and six healthy subjects. Five ml of venous blood was drawn with a 5 ml syringe from each patient and control participants after (8:30 to 11:00) to (12-14) hours.

The blood samples were taken in plain tubes, and kept at room temperature for ten min to promote clot formation. After centrifugation (5000 rpm for 15 minutes), the serum was frozen at -20°C until needed.

Enzymatic colorimetric methods were used with particular kits to determine the fat (cholesterol and triglyceride) and glucose profiles (Biomegrib)® and (spinreact)® (Linear Chemicals, Montgat Barcelona, Spain).

Note: Samples were collected under the supervision of doctors and with the consent of volunteer patients [32-34].

STATISTICAL ANALYSIS

Qualitative data were reported as numbers, percentages, frequencies and significant differences ($P \geq 0.05$ significant, $P < 0.01$ highly significant, $P > 0.05$ not significant) between experimental groups using two ANOVA tests different. Quantitative data were reported as mean, standard error, and standard deviation of the mean. These analyzes were carried out using the computer application SPSS-23 (Statistical Package for the Social Sciences, Version 23).

Bivariate correlation analysis was used to assess linear correlations between parameters. Blood cholesterol levels were compared between hypercholesterolemic and normal patients, as well as between patient genotypes, yielding a mean ± standard deviation [35, 36].

RESULTS AND DISCUSSION

The current study aimed to investigate the association between diabetes and lipid levels in 30 Iraqis with metabolic syndrome aged 31 to 55. Findings indicated that metabolic syndrome is a risk factor for the diagnosis of diabetes.

TABLE 1. The mean ± SD of Cholesterol, RBS, and Triglycerides in control and patients.

Biochemical Parameters			*RBS mg/dl	Cholesterol mg/dl	Triglycerides mg/dl
Groups	Control group (N)		130.40±7.02	140.00±8.276	128.20±12.11
	Patients	Group (A)	501.60±64.86*	211.40±56.51*	140.80±90.55**
		Group (B)	416.40±152.92**	199.40±53.60*	155.00±80.65*
		Group (C)	479.20±93.73*	172.60±69.78*	137.60±70.41**
		Group (D)	506.60±115.42*	214.40±37.26*	127.40±35.16*
		Group (E)	531.00±140.61*	228.00±80.93**	178.20±72.65*

*** = Highly significant (P < 0.01) * = Significant (P* < 0.05)

Table (1) and Figures (1-3) show the findings of this study. The results of all parameters (RBS, lipids, and triglycerides) for all age groups (patients) were significantly different from the control group. Tables 2 and 3 showed glucose, cholesterol, and triglyceride levels (r = 0, respectively). 01 and 0.05) revealed a significant and strong correlation, these findings are in accordance with previous studies establishing a strong correlation between the levels of the metabolites glucose, cholesterol, and triglyceride during diabetes [37-40]. The process of elevated blood triglycerides can be reduced or even eliminated by a healthy diet rich in vegetables along with various lifestyle changes and changes that ultimately lead to glucose utilization these nutrient-dense nutrients are ideal for a low-calorie diet. Several scientific studies suggest that energy limits (1600-1800 kcal), this number of calories per day reduces initial energy expenditure by 30% Fixed calories are determined by the first law of hemodynamics [33, 34, 41, 42]. A large number of diabetics worldwide have high cholesterol. Several studies have shown an association between high cholesterol and diabetes, although the mechanism remains unclear. For example, several pharmacological studies have linked the inhibition of cholesterol synthesis pathways in the liver to the loss of beta islet cells in the pancreas, and the elevation of dangerous LDL cholesterol levels to 6.2 mmol/L decreases insulin secretion from beta cells. These findings suggested that lipid levels play an important role in the regulation of insulin production by pancreatic beta cells [35, 43,44]. Based on the findings described above, it is unclear whether hyperlipidemia is an independent risk factor for diabetes. Only a few factors were considered in the current study, including gender, glucose levels, cholesterol, and age. Other important parameters that should be included in any future study include liver fat, specific hormones, multiple enzymes, waist-to-hip ratio, and the genetic family history of diabetes so that we can determine whether high blood cholesterol is associated with diabetes or not [36, 45].

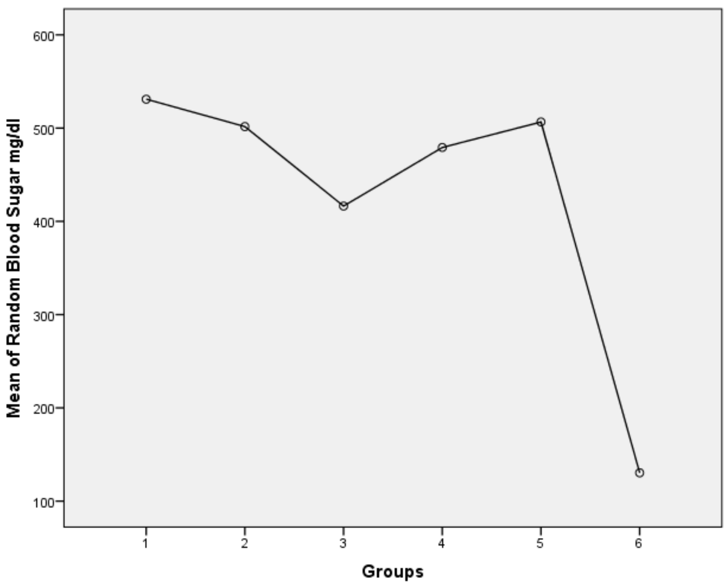

Figure 1. The mean RBS for the patient groups and control.

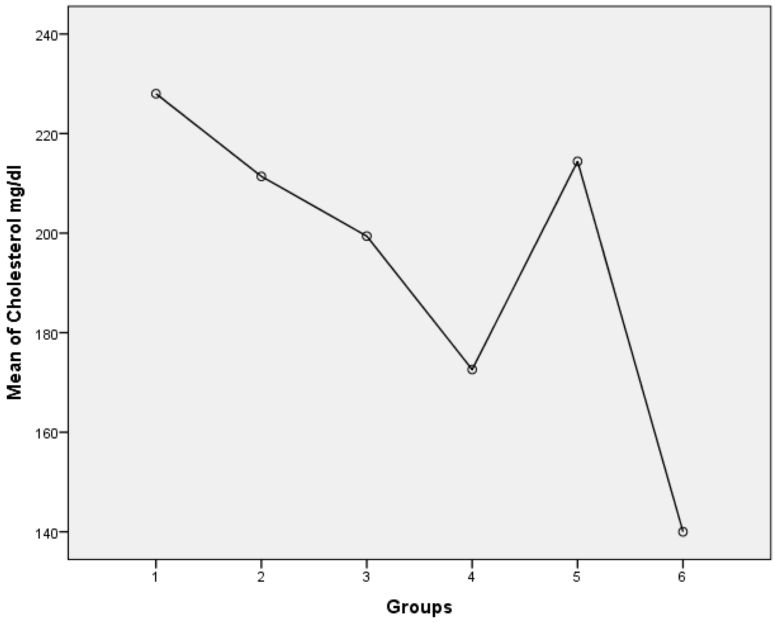

Figure 2. Mean cholesterol levels in the patient groups and control.

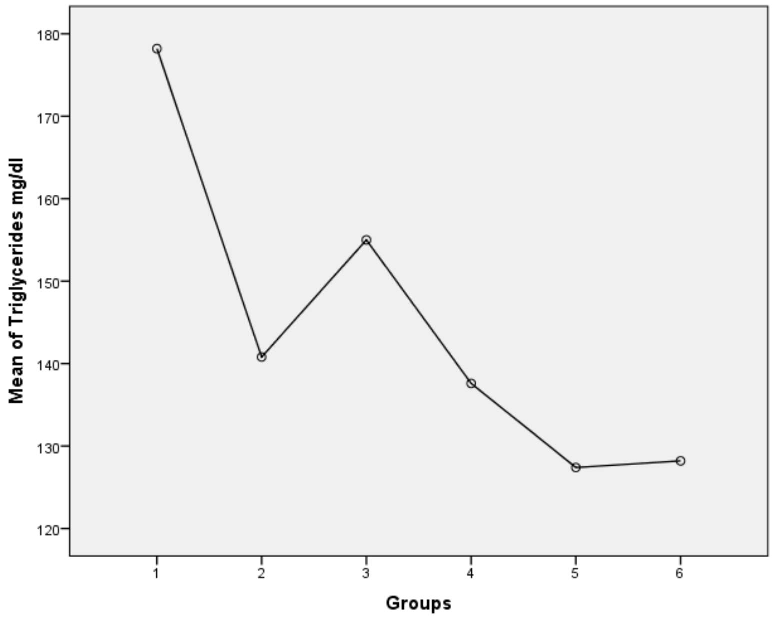

Figure 3. The mean triglycerides in the patient groups and control.

Figures 1–3 depicted averages of cholesterol, triglycerides and blood glucose. The numbers increased in the sick groups compared to the control. The findings are consistent with prior researches that have shown an increase in RBS, cholesterol, and triglycerides in diabetic patients compared to normal people [2, 6, 17, 22]. These findings are consistent with previous studies showing higher levels of RBS, lipids, and triglycerides in diabetic patients compared to normal subjects [2, 6, 17, 22]. Tables 2, 3 show the relationships between glucose, cholesterol, and triglyceride levels, which are surprisingly comparable to previously reported studies [10-13]. The scientific understanding of cholesterol binding in the blood of diabetics remains poor. However, several researchers have published new findings on how certain lipid profile indicators such as dyslipidemia and hypertriglyceridemia can be used to predict diabetic nephropathy [35, 37]. Moreover, many studies suggest that dyslipidemia may be an important risk factor if it leads to type 2 diabetes [4]. The Canadian guidelines for the use of low-density lipoproteins provide a new screening test for non-HDL cholesterol binding as the treatment of choice [5]. This is a useful therapeutic approach that explains the widespread distribution of non-HDL cholesterol and the management of hypertriglyceridemia in patients with diabetes. This protocol is also consistent with previously published guidelines from the National Obesity Education Program and Adult Medicine Committee [39]. Additionally, biological research suggests that non-HDL cholesterol can be used as a specific marker, providing direct symptoms of atherosclerosis in individuals with diabetes This trial found a statistically significant association with cholesterol, the blood of HDL, and cardiovascular disease. Even mild elevations in low-density HDL cholesterol can be a risk factor for cardiovascular disease [40, 41]. Cholesterol is transported by a stable pathway to the liver, where it is processed or released into the liver [40–42]. The main advantage of this pathway is that it provides an efficient mechanism for packaging HDL and other proteins ban, such as apolipoprotein against atherosclerosis. The results of [39-42] is in full agreement with the results described in the present study. Long-term therapy with lipid-lowering drugs can reduce cardiovascular risk in patients with diabetes to an acceptable safe level, leading to the risk of cardiovascular a decreased nonfatal seizures but some patients report an increased risk of death due to autonomic neuropathy and muscular dystrophy [43-45]. Many guidelines adopted in the United States and Europe still consider diabetes as a moderate risk factor for heart disease [37, 38].

Table 2. The correlation analysis of random blood sugar mg/dl and cholesterol mg/dl.

Correlations		Random Blood Sugar mg/dl	Cholesterol mg/dl
Random Blood Sugar mg/dl	Pearson Correlation	1	.533**
	Sig. (2-tailed)		.002
	N	30	30
Cholesterol mg/dl	Pearson Correlation	.533**	1
	Sig. (2-tailed)	.002	
	N	30	30

***. (2-tailed) Significant correlation at the 0.01 level.*

Table 3. Correlation analysis between Triglycerides mg/dl and Random Blood Sugar mg/dl.

Correlations		Triglycerides mg/dl	Random Blood Sugar mg/dl
Random Blood Sugar mg/dl	Pearson Correlation	.426*	1
	Sig. (2-tailed)	.019	
	N	30	30
Triglycerides mg/dl	Pearson Correlation	1	.426*
	Sig. (2-tailed)		.019
	N	30	30

*. The correlation is significant at the level 0.05 (2-tailed).

Conclusions

Finally, cholesterol and triglycerides are inversely associated with glucose in patients with the type one diabetes. These findings suggest a high and significant relationship between these 2 risk factors for diabetes. Other biological factors such as insulin sensitivity were not tested in this study Technical limitations exclude insulin resistance from such studies, leaving unanswered whether insulin resistance underlies the observed relationship**.**

Ethical considerations

The Scientific Committee of Dhi Qar University examined and approved the study timetable and scientific content, and the project was carried out following the Dhi Qar Governorate Declaration of Human Rights. All participants gave written informed consent.

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