EVALUATION CHOLESTEROL AND TRIGLYCERIDES LEVELS FOR TYPE ONE DIABETES PATIENTS
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Abstract
This study is designed to highlight the association between high level of blood glucose and cholesterol and triglycerides. Thirty persons divided into six groups according to age. Groups A, B, C, D, E are patients groups that compared with the control group N. Three blood biomedical parameters were assessed in the current study that includes random blood sugar (RBS), cholesterol and triglycerides levels. Statistical analysis showed significant differences between control group and patients' groups. Also, analysis confirmed a strong relation between glucose levels and cholesterol and triglycerides levels respectively. These results confirm the scientific recommendations about the life style, diabetes management and eating habits.

Key words: Diabetes, Cholesterol, Triglyceride, Hyperglycaemia, Deslipidemia.

Introduction
Nowadays, diabetes become one of the pressing issues [1] that attract general attention of all societies cross the world. Because of the large number of diagnostic people with it [2, 3]. Type one diabetes mellitus is a permeant deficiency in insulin secretion due to β-cells distraction. The main characterization factor is the increase in blood glucose levels (hyperglycaemia) [4]. Diabetes usually consider one of the most common condition that has endocrine and metabolic consequence and can occurred in different age. The mean cause in the most patients (70-90%) is due to the loss of function of β-cells because of autoimmunity complications (concomitant by the production of autoantibodies) [5]. While, there is a small group of diabetes patients did not show any immune responses, and the cause of β-cell loss still undetermined but it can be attribute to a genetic reason [6].

Diabetes term has been described as a chronic syndrome that affect metabolism balance. In particular, carbohydrates and fats due to the availability of these two kinds of biomolecules in the modern life dishes [4-7]. Obesity and diabetes mellitus have reached epidemic proportions in modern society. There is a strong relation between the kind of consumed food and the level of glucose [8, 9]. Thus, large number of studies suggested different kind of diets that can reduced or control the glucose level such keto diet. Elevated blood sugar levels can cause a variety of health problems, including damage to the eyes, kidneys, nerves, blood vessels and atherosclerosis [10-13]. Diabetes risks are becoming more and more forked and complicated, thus managing such health problem required a deep understand by health providers and patients. Especially, cardiological complications because it requires a specific individual awareness to prevent or minimize the cardiovascular risk in patients with diabetes this will demand more effective diet approach to manage fats consumption including non-LDL lipid [14, 15]. Diet is a corner stone associate strongly with the development of diabetes mellitus. The dietary fat that is rich in cholesterol and trans unsaturated fat polyunsaturated fat more consistently associated with an increase in the risk of diabetes mellitus is saturated fat [16, 17]. Metabolic disorder syndrome is can be characterized by increasing fats and blood glucose levels consequently elevate.
blood pressure. In other words, it’s a set of unbalanced metabolic processes that has a significant association with cardiovascular diseases in patients diagnostic with diabetes [18, 19]. Lipid management still a challenge for patients with diabetes. Recently, metabolic syndrome increased significantly cross the world due to the modern life style. According to the report issued by the International Diabetes Federation in 2006, approximately 25% of the global population had diagnostic with some of metabolic syndrome factors [20, 21]. Considering the pandemic disruption of diabetes these kinds of accredited reports should be a turning point in diabetes understand to increase society awareness about diabetes health consequences. Due to the lack of effective therapies to counteract the dyslipidemia so there is a real need the deep understand to the relation between glucose levels and lipid profile and this would be is a corner stone for the dyslipidemia management [16, 19, 22]. Diets in the Middle East region have a relatively rich in saturated fats content and poor in unsaturated fats because of the animal products consumed on a large scale in this area due to cultural considerations. There is relation between diabetes and cholesterol level but animal products are the main and sole source of cholesterol. This kind of association due to other components present in animal products that connected to cholesterol, such as saturated fats [18, 23]. Moreover, esterification process of cholesterol in the extracellular that is catalyzed by the enzyme lecithin cholesterol acyltransferase mainly occurred on the HDL surface (HDL = High density lipoprotein). Also, one of the important characters of HDL metabolism is the net mass of esterified cholesterol (EC) that is usually transferred between HDL and the apolipoprotein, which is controlled by cholesterol ester transfer protein. Furthermore, the concentrations of triglyceride have a significant rule in balancing cholesterol esterification process and the net mass transfer of EC. There are some studies on the relation between fasting effect on cholesterol reduction but no explanation provided about reduction mechanism and still there is an increase in risk of atherosclerosis in diabetes [22, 24, 25]. Moreover, studies also reveal there are a strong subsequent development between hypertension and dyslipidemia among healthy women. Several studies reported a significant relation between hypertension and metabolism disorder of glucose and lipid this kind of relation may be related to insulin resistance or the association of hyper insulinaemia complication. Moreover, patients with insulin resistant have been showing high level of hypertension risk compare to those suffer from hypertension only [5, 6, 26, 27]. Diabetes patients require a long-term care, and deep understanding for the special requirements and diet limitations according to each case thus each life stage must approach in a difference way. For example, infants are requiring a different treatment strategy compare to adolescents because the needs of young kids may vary from adults [3, 28]. Therefore, the therapeutic approach should change depending on the condition of each case and should be evaluated at each visit to doctor and updated as needed [6-6, 29, 30]. Current study is to investigate the relation between the glucose and cholesterol and triglycerides levels. Thus, advancing the knowledge and understand of such relation can guide the diabetic society toward better management of daily life and consuming habits.

Experimental Materials and Methods
This study was performed in the Diabetic Center, Health Directory of Thi-Qar Province during (Jan 2022- Mar 2022) in Al-Nasiryh city. The study included (25) men diagnosis with type one diabetes and five healthy person. The patients and control men’s had comparable age that ranged between 31-55 years old. Those 30 men were divided into six groups A, B, C, D, E patients groups and N control group depending on their age. Subjects were excluded from this study if they had liver disease, alcohol intake. Five ml of venous blood were collected from each patient and control individuals using a 5 ml disposable syringes between (8.30 and 11.00 AM) after (12-14) hours fasting. The blood samples was dispensed in a plain tubes allowed to stand at room temperature for 10 minutes to permit clot formation. After centrifugation (5000 rpm for 15 min.) to obtain the serum then it was kept in freezer under -20 until it used. Lipid profile (cholesterol and triglycerides) and glucose were examined by enzymatic colorimetric methods using special kites produced by (Biomegrib)® and (spinreact)® (Linear chemicals, Montgat Barcelona, Spain). Note: All samples were taken under the supervision of a physician and with the consent of patients (Patients are volunteers) [32-34].

Statistical Analysis
Data were presented for the qualitative data in terms of observed numbers and percentage, frequencies and significant differences (P ≤ 0.05 significant, P < 0.01 highly significant, P > 0.05 = no significant.) between the groups of the study were assessed by analysis of variance (ANOVA test) for more than two independent means. For quantitative data they were presented in terms of mean, standard error and standard deviation of the mean. Such analyses were carried out using the computer program SPSS-23 (Statistical Packages for Social Sciences-version 23). Correlation analysis was used to test the linear relationship between parameters using bivariate correlations. The mean ± standard deviation (SD) of serum lipid profile levels were calculated between hyperlipidemia cases and control group and among the genotypes of patients [35,36].

Results and Discussion
This study designed to explore the associated between lipid profile and diabetes among thirty Iraqi adults with metabolic syndrome aged 31–55 years, and found that metabolic syndrome was risk factor of diabetes diagnosis.
TABLE 1. The mean ± SD of RBS, Cholesterol and Triglycerides in patients and control.

<table>
<thead>
<tr>
<th>Biochemical Parameters</th>
<th>*RBS mg/dl</th>
<th>Cholesterol mg/dl</th>
<th>Triglycerides mg/dl</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group (N)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>130.40±7.02</td>
<td>140.00±8.27</td>
<td>128.20±12.1</td>
</tr>
<tr>
<td>Patients Group (A)</td>
<td>501.60±64.86*</td>
<td>211.40±56.5</td>
<td>140.80±90.5</td>
</tr>
<tr>
<td>Patients Group (B)</td>
<td>416.40±152.9**</td>
<td>199.40±53.6</td>
<td>155.00±80.6</td>
</tr>
<tr>
<td>Patients Group (C)</td>
<td>479.20±93.73*</td>
<td>172.60±69.7</td>
<td>137.60±70.4</td>
</tr>
<tr>
<td>Patients Group (D)</td>
<td>506.60±115.4*</td>
<td>214.40±37.2</td>
<td>127.40±35.1</td>
</tr>
<tr>
<td>Patients Group (E)</td>
<td>531.00±140.6*</td>
<td>228.00±80.9</td>
<td>178.20±72.6</td>
</tr>
</tbody>
</table>

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

The results in Table (1) and Figures (1-3) summarize the results of the current study. Results values of all factors (RBS, Cholesterol and Triglycerides) of all ages (patients) showed significant differences between the patients and control group as summarize above in Table (1). Analysis results (Table 2 and Table 3) showed a linear and strong relation between glucose levels and cholesterol and triglycerides, respectively (R = 0.01; 0.05 respectively). These findings agree with reported results that confirmed the metabolic disorder during diabetes and the strong association between glucose levels and cholesterol and triglycerides [37-40]. The elevation process of triglycerides in plasma can be minimize or even reduce by following healthy diet that is reach in vegetables in addition to some modification in lifestyle and improvements which is consequently will control glucose level.

These healthy nutrients represent ideal plan to restricted-caloric diets. Several scientific studies recommended (1600-1800 k calories) of energy restriction this level of calories per day can lead to reduce 30% from the baseline energy expenditure. While, thermodynamically 2400 k calories are the standard calorie intake that is calculated based on to the first law of hemodynamic [33, 34, 41, 42].

A large number of diabetes people cross the world suffered from hypercholesterolemia. Several studies reveal the association between increasing cholesterol level and diabetes but the mechanism of such relation still unclear. For example, some pharmacological studies reported a relation between inhibition cholesterol synthesis pathway in liver led to destruct beta islet cells in pancreatic. Moreover, increasing the LDL-cholesterol concentration to (6.2 mmol/L) found to decrease insulin secretion from β-cell. These finding clearly revealed the significant role that cholesterol level play in regulating insulin secretion from pancreatic beta cells [35, 43, 44]. Based on these finding mentioned above it is not well established if hypercholesterolemia dependent risk factor for diabetes or not. Only a small number of parameters included in this study such age, sex, cholesterol and glucose levels. Other important parameters must include in any study in the future such as liver fats, some hormones, a set of enzymes, waist-to-hip ratio, genetic and family history of diabetes thus we can find whether hypercholesterolemia associated with diabetes [36, 45].

Figure 1. Mean of RBS of control and patients’ groups.

Figure 2. Mean of cholesterol of control and patients’ groups.
risk in diabetes can be reduce or minimize to acceptable and safe level depending on the long- term treatment with cholesterol-lowering medicines which as a result will reduced the risk of non-fatal myocardial infarction in diabetes patients. But still some cases showed an increase the risk of death due to autonomic neuropathy and vascular disease [43-45]. Several accredited guidelines in the USA and in Europe still consider diabetes a mean cause for coronary heart disease[37, 38].

**Table 2.** Summarize the correlation analysis between Random Blood Sugar mg/dl and Cholesterol mg/dl.

<table>
<thead>
<tr>
<th>Correlations</th>
<th>Random Blood Sugar mg/dl</th>
<th>Cholesterol mg/dl</th>
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</thead>
<tbody>
<tr>
<td><strong>Random Blood Sugar mg/dl</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>1</td>
<td>.533**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>.002</td>
</tr>
<tr>
<td>N</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td><strong>Cholesterol mg/dl</strong></td>
<td></td>
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<tr>
<td>Pearson Correlation</td>
<td>.533**</td>
<td>1</td>
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<tr>
<td>Sig. (2-tailed)</td>
<td>.002</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

**Correlation is significant at the 0.01 level (2-tailed).**

**Table 3.** Summarize the correlation analysis between Random Blood Sugar mg/dl and Triglycerides mg/dl.

<table>
<thead>
<tr>
<th>Correlations</th>
<th>Random Blood Sugar mg/dl</th>
<th>Triglycerides mg/dl</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Random Blood Sugar mg/dl</strong></td>
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<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
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<td>.426*</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>.019</td>
</tr>
<tr>
<td>N</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td><strong>Triglycerides mg/dl</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.426*</td>
<td>1</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.019</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

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

**Conclusion**

In conclusion, in patients with type 1 diabetes, cholesterol and triglycerides are linearly related with glucose level. These findings clearly indicate the strong and significant correlation of these two risk factors for diabetes patients. Unfortunately, some biomedical parameters did not cover in this study such as insulin sensitivity, which might affect this finding. Because of technical limitation this kind of analysis not including thus leaving open the question of whether or not insulin resistance underlies the observed associations. More studies that monitor a wide range of blood biomedical parameters are essential to draw a solid understand about the relation between glucose level and lipid profile.

**Ethical Considerations**

The research timeline and the scientific contents were reviewed and accredited by the Scientific Committee of the University of [171]
Thi-Qar, and the research project was carried out in accordance with Thi-Qar Province human right declaration. All participants provided their written informed consent.

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Conflict of Interest
No Conflict of Interest

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Author Contribution
All authors are contributed equally.

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