Measurement of Plasma Triglyceride and Total Cholesterol in Sudanese Patients with controlled and uncontrolled type 2 Diabetes

Sumaya Salah Hessin and AbdElkarim A. Abdrabo*
Department of clinical chemistry – Faculty of Medical Laboratory Sciences-Alneelain University- Khartoum-Sudan.

Abstract:
Background: the effect of glycemic control on serum triglyceride and total cholesterol levels in patient with type 2 diabetes mellitus was not published in Sudan.
Method: across sectional study conducted at diabetic clinic of Jabir Abu-Alez-Khartoum-Sudan, between April 2013 and June 2013, total of 120 type 2 diabetic patient (60 controlled and 60 uncontrolled diabetic patient) and 60 healthy subjects were selected as controls, triglyceride and total cholesterol were performed using standard methods.
Result: Total cholesterol and triglyceride of uncontrolled diabetic patient were significantly increase when compared with total cholesterol and triglyceride in controlled diabetic patient, p.value=0.000, also there is significant increase in total cholesterol in diabetic compared to healthy volunteers, p.value (0.000). There is insignificant difference between triglyceride in controlled diabetic patient and healthy volunteers, p.value (0.414), but there is significant increase in triglyceride of uncontrolled diabetic patient and healthy volunteers, p. value (0.000).
Conclusion: Triglyceride and total cholesterol values in uncontrolled diabetic's patient were significantly higher than that of controlled Sudanese patients.

Key Words:

Introduction
Diabetes mellitus is the third leading cause of death by disease, mostly because of its chronic complication like coronary artery disease and renal failure. Also diabetes is the leading cause of blindness among 25 to 74 years old. Diabetes mellitus is group of metabolic disease characterized by hyperglycemia resulting from defect in insulin secretion or action or both (1). Diabetes mellitus is a complex disease where the carbohydrate and fat metabolism is impaired (2). Insulin affects many sites of mammalian lipid metabolism. It stimulates synthesis of fatty acid in liver adipose tissue and in the intestine. The insulin has also been reported to increase the cholesterol synthesis. The activity of lipoprotein lipase in white adipose is also increased from this point of view the assessment of various lipid fractions and lipid peroxide in the cases of diabetes mellitus may be of some help in the prognosis of patient and in preventing the possibilities of complication or secondary disorder (3). The occurrence of free radical induce lipid per oxidation causes considerable change in the cell membrane (4). Peroxidation of lipid membrane has been related to the pathogenesis of many degenerative disease, such as atherosclerosis, oxidative damage to DNA, aging, carcinogenesis, sickle cell disease and diabetes mellitus etc (5). Thus the lipid peroxide in the blood provides useful information for prognosis of diabetes in which secondary disease are often fatal (6).
The central pathological mechanism in macro vascular disease in the process of atherosclerosis, which lead to narrowing of arterial wall throughout the body. Atherosclerosis is through to result from chronic inflammation and injury to the arterial wall in peripheral or coronary vascular system. In response to endothelial injury and inflammation, oxidized lipid from LDL particles accumulate in the endothelial wall of arteries; Angiotensin II may promote the oxidation of such particles. Monocyte then filtrate the arterial wall and differentiate into macrophages, which accumulate oxidized lipids to form foam cells. Once formed, foam cells simulate macrophage proliferation and attraction of T.lymphocyte. T.lymphocyte in turn, induce smooth muscle proliferation in the arterial wall and collagen accumulation. The net result of the process is the formation of lipid-rich atherosclerosis with fibrous cap. Rupture of this lesion lead to acute vascular infraction (7).
The estimation of lipid profile in diabetes mellitus is very useful as it may serve as useful monitor to judge the prognosis of the patient. The detection of risk factor in the early stage of the diabetes will help the patient to improve and reduce the morbidity rate (8).

Materials and methods
This study was hospital based cross sectional descriptive study conducted at the diabetic clinic (Jabir Abu-Alez) in Khartoum–Sudan, between April 2013 and June 2013. A total of 120 subject with diabetes type 2 (60 subject with controlled diabetes and 60 subject with uncontrolled diabetes), and 60 apparently healthy subject were selected as control for study. For each subject, demographic details, clinical findings and laboratory results were recorded on questionnaire sheet, including age, gender and duration of diabetes.

Clinical assessment of the study group was done by medical doctor and they were not suffering from any other disorder. Venous blood (5.0 ml) was drawn from each volunteer in this study using disposable plastic syringe. The samples were then analyzed for HbA1C, total cholesterol, and triglyceride by automated- chemistry analyzer (Mindray BS-200-China).

Statistical analysis: Statistical evaluation was performed using the Microsoft office Excel (Microsoft Office Excel For Windos;2007) and SPSS (SPSS For Windows Version 11). T.test was used to assess significant difference in the mean of total cholesterol and triglyceride.

Diabetic patients were categorized into two groups based on the results of HbA1c, glycemic controlled patient if HbA1c is 4-6% and uncontrolled if HbA1c is more than 7%.

Correlation between HbA1c and total cholesterol and triglyceride-using bivariate correlation .p < 0.05 was considered statistically significant.

Result
The study covered 180 subjects in Khartoum state-Sudan, 120 patient, 80 female (66.6%) and 40 male (33.3%) with type 2 diabetes mellitus, (60 patient with controlled diabetes and 60 patient with un controlled diabetes), with average age of (51±8.13) years. Ranging between 37 and 74 years, and duration of the disease between 1 to 17 years. Other 60 apparently healthy subject volunteers with average age of (45±5.7) years, ranging between 30 and 62 years as control group.

As shown in table (1) there is significant difference between total cholesterol in patient with controlled diabetes and healthy volunteers (M±SD 165.26 ± 13.48), (M±SD 121.40 ± 30.14) respectively, p (0.000). and there is significant difference between total cholesterol in patient with uncontrolled diabetes and healthy volunteers (M±SD 229.53 ± 23.49), (M±SD 121.40 ± 30.14 ) respectively, p (0.000).

As illustrated in table (1) there is insignificant difference between triglyceride in patient with controlled group and healthy volunteers (M±SD 113.03 ± 25.13 ) ,(M±SD 107.60 ± 26.03) respectively, p ( 0.414 ), but there is significant difference between triglyceride in patient with uncontrolled diabetes and healthy volunteers (M±SD 181.40 ± 19.40 ),(M±SD 107.60 ± 26.0 ) respectively , p (0.000).

Total cholesterol and triglyceride measurement of patient with uncontrolled diabetes were significantly increased when compared with total cholesterol and triglyceride in patient with controlled diabetes, total cholesterol (M±SD 229.53±23.49), (M±SD =165.26 ±13.48) respectively, p (0.000). Triglyceride (M ±SD 181.40 ± 131.03), (M±SD 113.03 ± 25.13) respectively, p (0.000),as illustrated in table (2).

There is significant correlation between HbA1c, and total cholesterol, and also significant correlation between HbA1c with triglycerides in patient with uncontrolled diabetes ( r=0.375 , p=0.041) , ( r=0.352 , p=0.056) respectively.

Table (1):Means of Age, total cholesterol and triglyceride in diabetic and control group:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Study Group (n=180)</th>
<th>P.value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Diabetic patients (n=120)</td>
<td>Control (n =60)</td>
</tr>
<tr>
<td>Age (years)</td>
<td>51±8.13</td>
<td>45±5.7</td>
</tr>
<tr>
<td>Triglycerides (mg/dl)</td>
<td>147.21±41.03</td>
<td>107.60±26.03</td>
</tr>
<tr>
<td>Cholesterol (mg/dl)</td>
<td>197.40±37.56</td>
<td>121.40±30.14</td>
</tr>
</tbody>
</table>
Discussion
In this study the plasma level of total cholesterol were found to be significantly raised in diabetic groups when compared to healthy (non diabetic) volunteers, although the difference were statistically significant between triglyceride of uncontrolled diabetic and healthy volunteers, this is agrees with that reported by Samatha P, et al (9). Our study also agrees with that reported by Windler E (10).

Plasma level of triglyceride showed insignificant difference between the controlled diabetic patient and healthy volunteers.

The plasma level of total cholesterol and triglyceride raised in uncontrolled diabetic patient when compared to those with controlled diabetic, this agrees with that reported by Nasri and Bardaran (11). Our result also agrees with that reported by Khan HA et al (12).

The current study shows significant correlation between the level of plasma total cholesterol and triglyceride with duration of diabetes this agrees with that reported by Riffat Sultana (13).

Statistically significant correlations were found between HbA1c with plasma level of total cholesterol and triglyceride in uncontrolled diabetic patient this agrees with that reported by Quashin T (14). Our result also agreed with that reported by Ahmad Khan H (15).

Conclusion
In conclusion, values of total cholesterol and triglyceride in patient with uncontrolled diabetic were significantly higher than that of controlled diabetes, so the risk of cardiovascular, peripheral vascular disease may increase with poor glycemic control.

Aknowledgement
We thank all the study participant, and colleagues at the Faculty of Medical Laboratory Sciences- Al-Neelain University and colleagues at Jabir Abu-Alezz for their help and support, special thank to my colleagues at Ibrahim Malik Teaching Hopsital-Khartoum-Sudan for the help in samples analysis.

References
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Table (2): Means of Age, HbA1c, Triglyceride and Total cholesterol In Diabetic Groups

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Study Group</th>
<th>P.value</th>
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<tr>
<td></td>
<td>Diabetic patients (n=120)</td>
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<tr>
<td></td>
<td>Controlled diabetes (n =60) Mean±SD</td>
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</tr>
<tr>
<td></td>
<td>Uncontrolled diabetes (n =60) Mean±SD</td>
<td></td>
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<tr>
<td>Age (years)</td>
<td>55±6.12</td>
<td>49±4.36</td>
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<tr>
<td>HbA1c (%)</td>
<td>5.42±0.68</td>
<td>9.47±1.57</td>
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<tr>
<td>Triglycerides (mg/dl)</td>
<td>113.03±25.13</td>
<td>181.40±19.40</td>
</tr>
<tr>
<td>Cholesterol (mg/dl)</td>
<td>165.26±13.48</td>
<td>229.53±23.49</td>
</tr>
</tbody>
</table>
10. Windler E. What is the consequence of an abnormal lipid profile in patient with type 2 diabetes or the metabolic syndrome? Atheroscler Suppl 2005 Sep;6(3):4-11.