ABSTRACT
The aim of this study was to assess correlations between the serum levels of urate, lipid profile (total cholesterol, LDL-cholesterol, HDL-cholesterol and triglycerides) to Hemoglobin A1c% among Sudanese with type 2 diabetic patients and to compare these variables with apparently healthy individuals as a control group. A case-control study was conducted during the period from Jan. 2011 to Nov. 2012 in Khartoum state among 150 Sudanese diabetic patients and 100 healthy controls for comparison. The serum levels of lipid profiles and serum urate were measured using chemistry analyzer (BS-200) and commercial kits from Biosystem company, Hemoglobin A1c% analyses was performed using Nycocard reader II and commercial kits from Nycocard company, LDL-C was calculated using Friedewald’s Formula. The results of this study showed the means of the serum levels of total cholesterol, LDL-C, triglycerides and urate of the diabetic group to be significantly raised when compared to the control group, whereas the means of the serum levels of HDL-C of the diabetic group were significantly reduced when compared to the control group. The study showed weak positive correlation between the glycated hemoglobin and total cholesterol (r=0.20), LDL-C (r=0.36) and serum urate of the diabetic group (r=0.28) and very weak positive correlation with triglycerides (r=0.10) and also showed weak negative correlation between glycated hemoglobin and HDL-C in the diabetic group (r=0.32). From this study it had been concluded that the serum levels of total cholesterol, triglycerides, LDL-C and serum urate were significantly raised, whereas the serum levels of HDL-C were significantly reduced in Sudanese patients with type 2 Diabetes mellitus. HbA1c% has a significant weak positive correlation with the serum levels of T. cholesterol, LDL and urate and has insignificant correlation with the serum levels of triglycerides and a significant negative correlation with the serum levels of HDL-C the results of this study, suggest a relationship between insulin resistance, and the metabolism of lipids and urate.

المستخلص
الهدف من هذه الدراسة هو تقييم العلاقة بين مستويات أملاح الوراث والدهون في الدم (الكولسترول الكلي، الكولسترول ذو الكثافة المنخفضة، الكولسترول ذو الكثافة المرتفعة وثلاثي الجلدريد) مع السكر التراكمي بين المرضى السودانيين المصابين بالسكري من النوع الثاني ومقارنة هذه المتغيرات مع أفراد أصحاء كمجموعة ضابطة، أجريت الدراسة خلال الفترة من يناير 2011 إلى نوفمبر 2012م في ولاية الخرطوم حيث شملت 150 من المرضى السودانيين المصابين بالسكري من النوع الثاني و 100 من الأصحاء كمجموعة ضابطة للمقارنة. تم قياس مستويات الدهون
INTRODUCTION:

Diabetes mellitus (DM) is a common endocrine metabolic disorder and a leading cause of death worldwide (1). There are more than 154 million diabetics worldwide and its prevalence is on increase in the developing countries (2,3). Certain racial and ethnic groups have a greater risk of developing diabetes. The majority of those that suffer from this disease are from Africa and Asia (4). This may be due to genetic disposition and life style of people in these areas. Sudan being populous country in Africa may harbor a substantial number of people with this condition. Identifying risk factors for the development of type 2 diabetes is essential for its early Screening and prevention. Serum uric acid (SUA) level has been suggested to be associated with risk of type 2 diabetes. Biologically, uric acid (UA) plays an important role in worsening of insulin resistance in animal models by inhibiting the bioavailability of nitric oxide, which is essential for insulin-stimulated glucose uptake (5). The disease is accompanied in many cases by secondary alterations of protein and fat metabolism resulting in an array of physical disorders (6). The quantitative and qualitative abnormalities of lipids in diabetic patients are numerous. The most common abnormality found in diabetics is high triglycerides (TG) with low high density lipoprotein (HDL) cholesterol and high low-density lipoprotein (LDL) cholesterol.

Key words: Insulin resistance, Dyslipidaemia, Glycated Hemoglobin
lipoprotein (HDL), and although if low density lipoprotein (LDL) might not be higher, its metabolism is abnormal (7). The HDL and LDL are the main two types of cholesterol, (8) which are related to lifestyle factors such as diet and exercise (9). Glycated hemoglobin (HbA1c %) is a form of hemoglobin used primarily to identify the average plasma glucose concentration over prolonged periods of time. It is formed in a non-enzymatic pathway by hemoglobin's normal exposure to high plasma levels of glucose. Glycation of hemoglobin has been associated with cardiovascular disease, nephropathy, and retinopathy in diabetes mellitus. Monitoring the HbA1c % in type 2 diabetic patients may improve treatment (10).

MATERIALS and METHODS:

In this study we have analyzed the serum levels of; triglycerides, T. cholesterol, HDL, LDL urate and HbA1c % of 150 patients diagnosed with Type 2 diabetes mellitus as a test group and 100 apparently healthy individuals (non-diabetic) as a control group. All subjects involved in this study were recruited from Al Hikma Medical centre, Khartoum state. This study was carried out during the period from Jan. 2011 to Nov. 2012. The target population was Sudanese patient diagnosed with type two diabetes mellitus. Permission of this study was obtained from the local health authorities in the area of the study. Interviews were done to all participants to obtain the clinical data and to provide health education. Clinical assessments were done by a physician. The objectives of the study were explained to all individuals participating in the study. A Questionnaire was specifically designed to obtain information which helps in either including or excluding individuals in or from the study. 4 ml of venous blood were collected from each volunteer in this study, using local skin antiseptic (70%), disposable plastic syringe, and divided to plain containers and Edita containers. The samples in plain containers were centrifuged at 3000 rpm to obtain Serum.

Sample Analysis:

Blood samples were obtained from participants in fasting conditions serum. Triglycerides, urate, and T. cholesterol analyses were performed using chemistry Analyzer BS-200; HbA1c % analyses was performed using Nyco-card reader 11, HDL analyses was performed using automated spectrophotometer, and LDL was calculated by the following Friedewald’s:

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LDL-C = \text{Total Cholesterol} - \text{Triglyceride} \times \frac{5}{100}
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Statistical Analysis:

Statistical analysis of the results was done using SPSS. Data were presented as group (mean ± SD). Statistical significance was set up as P <0.05. Person's correlation and linear regression were used to asses correlation.

Quality Control:

The precision and accuracy of all method used in this study were checked each time in every patch and analyzed by including commercially prepared control sera, (normal and pathological human control sera), with analyzed values of serum level of triglycerides, T. Cholesterol, HDL, LDL, urate and HbA1c %.

RESULTS:

In this study the serum levels of triglycerides, T. cholesterol, HDL, LDL, urate and HbA1c % of 150 patients diagnosed with type 2 diabetes mellitus and 100 healthy controls, were estimated for comparison and to asses correlations of these variables with glycaemic control. The two groups were matched for
age and sex. Strikingly, as shown in table 1, there was a significant difference between the means of the serum levels of triglycerides of the test group and the control group (mean ± SD): (117.2 ± 36.2) mg/dl versus (98.5 ± 32.4) mg/dl, respectively, p= 0.003. The mean of the test group was significantly raised. The same table also shows a significant increase of the mean of the serum levels of total cholesterol of the test group when compared to the control group (mean ± SD): (177.8 ± 37.3) mg/dl versus (161.3 ± 33.0) mg/dl, respectively, p= 0.000. Table 1 shows a significant difference between the means of the serum levels of HDL of the test group and the control group (mean ± SD): (48.3 ± 14.2) mg/dl versus (53.9 ± 10.3) mg/dl respectively, p= 0.001. The mean of the test group was significantly reduced. The same table also shows a significant increase of the mean of the serum levels of LDL of the test group when compared to that of the control group (mean ± SD): (105.2 ± 34.0) mg/dl versus (87.5 ± 25.5) mg/dl respectively, p= 0.000. Table 2 shows an insignificant very weak positive correlation between the serum levels of triglycerides and HbA1c%
DISCUSSION:

Patients with diabetes could have many biochemical changes including the serum levels of VLDL, HDL, LDL and triacylglycerols (11). In the present study the results show that the mean of the serum levels of triglycerides, T. Cholesterol and LDL in the diabetic group were significantly raised when compared with the control group, whereas HDL is significantly reduced in the diabetic group, when compared to the control group. These results agree with a study done by Riffat (12) who studied 14 patients with history of diabetes for 6-8 years, and reported that 8 had dyslipidaemia. Hyperglycemia leads to an increase in total cholesterol, LDL-C by reducing the ability of the body to remove cholesterol when blood sugars are too high. Total cholesterol and receptors for LDL-C in the liver coated with sugar (glycosylated), impairs the liver’s ability to remove cholesterol from blood stream, this could be due to the effect of diabetes on lipoprotein lipase in liver which leads to dyslipidaemia. This study reveals high prevalence of hyper cholesterolemia, hyper triglyceridemia, high LDL-C and low HDL-C levels which are well known risk factors for cardiovascular diseases. Insulin affects the liver apolipoprotein production, it regulates the enzymatic activity of lipoprotein lipase (LpL) and Cholesterol ester transport protein. All these factors are likely causes of dyslipidemia in Diabetes mellitus. (13) Moreover, insulin deficiency reduces the activity of hepatic lipase, and several steps in the production of biologically active LpL may be altered in DM. (14) Recognition of high S. urate as a risk factor for diabetes mellitus has been a matter of debate. (15) In Type 2 diabetes, hyperuricemia seems to be associated with the insulin-resistance syndrome, impaired glucose tolerance, and an early onset of nephropathy (16), Quiniones et al, (17) observed that, hyperuricemia is frequent finding in insulin resistant states. He found that insulin induces change in factional uric acid and sodium excretion co-related with one another and physiological hyperuricemia acutely reduces urinary uric acid and sodium excretion in diabetic patients. In the current study, correlation was studied between the lipid profile (T. Cholesterol, triglycerides, HDL-C, and LDL-C) and HbA1c% in the diabetic group. The results showed insignificant weak positive correlation between the serum levels of triglycerides and HbA1c% in the diabetic group. This result agrees with a study done by Erciyas et al, (18) who reported a positive correlation of HbA1c% with triglycerides in diabetic patients. The results of the present study also show significant weak positive correlations between HbA1c% and T. cholesterol, this result agree with Ram (19), Ohta et al, (20) and Erciyas et al,
who also reported positive correlation of HbA1c% levels with T. cholesterol in diabetic patients. The results also demonstrated a significant weak positive correlation between the serum levels of LDL-C and HbA1c% in the diabetic group, this result agrees with Bhaktha (21), Erciyas et al, (18) Penbe et al, (22) and Habib (23) who reported a weak positive correlation between HbA1c% and LDL-C (r=0.316). Similar results have been reported by Singh (24) who found a significant weak positive correlation between HbA1c% and the serum levels of T. cholesterol (r=0.29), triglycerides (r=0.26) and LDL-C (r=0.16). These results are similar to that reported by Ohta et al (20) who found that HbA1c% levels shows positive correlation with LDL-C and triglyceride in diabetic patients with type 2. The present study shows a significantly weak positive correlation between the serum levels of urate and HbA1c% in the diabetic group, this result agrees with that reported by Zeina (25) who found a significant positive correlation between serum levels of urate and HbA1c% in diabetic patients.

CONCLUSION:

From the results of this study, it is concluded that; serum urate and lipid profile are affected by insulin resistance in diabetic patients with type 2.

REFERENCES:


