Study of some biochemical markers in diabetic patients.

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Abstract

This study was done to show the levels of some biochemical markers in diabetic patients in two types (insulin dependent diabetes mellitus(IDDM) and noninsulin dependent diabetes mellitus(NIDDM)). Group of patients composed of 90 patient (55 NIDDM patients and 35 IDDM patients) was compared with 35 age matched healthy group. This study shows the significant(\(P<0.05\)) elevations of serum uric acid, blood urea, and serum creatinine in diabetic patients in comparison with healthy individuals. In type 2 patients(NIDDM) in comparison with type 1(IDDM) and with healthy individuals, these markers were increased in a significant (\(P<0.05\)) pattern in type 1 patients in comparison with healthy individuals except serum uric acid was nonsignificant (\(P>0.05\)). Serum calcium and serum albumin was decreased in a non significant(\(P>0.05\)) pattern in type 2 diabetic patients in comparison with healthy subjects, serum calcium was significantly (\(P<0.05\)) decreased in type 1 patients in comparison with type 2 and with healthy individuals.

Introduction

Diabetes mellitus is really a group of diseases lead to abnormality in glucose metabolism due to the regulatory activity of insulin is defective \(^{(1)}\). Diabetes mellitus results from abnormality in the production or use of insulin, therefore; it divided into type\(1\) or insulin-dependent diabetes mellitus (usually begins early in life), and type\(2\) or noninsulin-dependent diabetes mellitus(affecting about 80\% of diabetics and usually begins in middle age or afterward. Nowadays it affect 25\% of diabetic patients aged 9-19 years)\(^{(2)}\). Extensive epidemiologic and experimental evidence now suggests that serum uric acid (UA) is a relevant and independent risk factor for cardiovascular and renal disease, particularly in patients with hypertension, heart failure, or diabetes\(^{(3)}\). Its important role both historically and currently in the clinical clustering phenomenon of the metabolic syndrome (MS), type 2 diabetes mellitus (T2DM), atheroscleropathy, and non-diabetic atherosclerosis is of great importance\(^{(4)}\).

The association of elevated serum uric acid, blood urea and serum creatinine and higher urinary albumin excretion rate with advanced impaired renal function prompts an examination of its role in early renal function decline in patients with type 1 diabetes before proteinuria develops\(^{(5)}\). Serum uric acid levels are a strong predictor of cardiovascular disease mortality in healthy middle-aged men, independent of variables commonly associated with gout or the metabolic syndrome\(^{(6)}\).

Serum uric acid has been recently associated with insulin resistance. Furthermore, in non diabetic subjects an elevated level of uric acid has been shown to be an independent predictor of coronary heart disease and total mortality. Therefore, I examined serum uric acid as a risk factor for stroke in a prospective population-based study that included a large number of patients with NIDDM\(^{(7)}\). More recently, there is accumulating evidence to suggest that altered vitamin D and calcium homeostasis may also play a role in the development of type2DM\(^{(8)}\). The findings and calculations help to explain some inconsistencies and discrepancies in previous studies concerning calcuaemia in diabetes, hypertension and the ‘metabolic syndrome’ of clustered risk factors for cardiovascular diseases\(^{(9)}\).

Materials and Methods

In this study, diabetic Patients divided into two groups. Group1 consisted of 35 IDDM patients(type 1),their mean age was18.5±5.4 year with a range of 12-25 year. Group2 consisted of 55 NIDDM patients, their mean age was 57.8±9.5 year with a range of 38-72 year). Diabetes was previously diagnosed and also I checked the serum glucose, uric acid, and calcium levels in
patients and healthy subjects in Al-qayara hospital in Nineveh province. Patients of this study were not suffer from coronary heart diseases or renal failure and mixed from males and females. Control group was selected from the same region and have ages near the ages of patients and also from two sexes.

**Biochemical analysis:**

1- **Determination of serum glucose.**

Glucose was measured by enzymatic colorimetric, glucose is oxidized by glucose-oxidase to gluconate and hydrogen peroxide which then reacts with phenol and 4-amino-antipyrine to

2- **Determination of serum uric acid.**

Uric acid was measured by enzymatic colorimetric, uric acid is oxidized by uricase to allantoine and hydrogen peroxide, which under the influence of peroxidase, 4-amino-phenazone and 2-4-Dichlorophenol sulfonate forms a red quinoneimine compound.

3- **Determination of serum calcium.**

Serum calcium was measured according to CPC method, Moorehead and Briggs derived CPC(O-Cresol Phtalein Complexone) method allows to determine total calcium concentration in serum, plasma or urine.

In alkaline solution CPC reacts with calcium to form a dark-red colored complex which absorbance measured at 570 nm is proportional to the amount of calcium in the specimen.

4- **Determination of serum albumin.**

Serum albumin was measured by enzymatic colorimetric, albumin in the presence of bromcresol green at a slightly acid pH, produces a colour change of the indicator from yellow-green to green-blue.

5- **Determination of blood urea.**

The blood urea was estimated in the serum by the use of urea-kit (bioMerieux, France) according to the urease-modified Berthelot reaction.

6- **Determination of serum creatinine.**

The serum creatinine was estimated by the use creatinine kit (Biocon®, Germany) according to Jaffe -Method. Kinetic determination without deproteinization; the complex formed by creatine and picric acid in an alkaline medium is measured. The speed of absorbance change is proportional to the creatinine concentration.

**Statistical analysis:**

The results were expressed as mean ± SD. Students t-test analysis was used for assessment the results of patients and control groups. Significant variation was considered when P value less than 0.05.

**Results**

1- **Values of biochemical markers in diabetic patients in comparison with control group.**

Serum uric acid, blood urea, and serum creatinine were significantly (P<0.05) increased in diabetic patients in comparison with healthy individuals, while serum calcium and serum albumin decreased in a non-significant (P>0.05) pattern in diabetic patients in compared with healthy individuals.

2- **Values of biochemical markers in type 1 diabetic patients in compared with type 2 diabetics.**

Serum uric acid, blood urea, and serum creatinine was significantly (P<0.05) increased in type 2 patients in compared with type 1 and with healthy individuals, and increase of uric acid in a non-significant (P>0.05) pattern in type 1 patients in compared with healthy individuals, but blood urea and serum creatinine are increased significantly. Decreasing of serum calcium was significant (P<0.05), but serum albumin decreased in a non-significant (P>0.05) pattern in type 1 patients compared with type 2 and healthy individuals, these markers (calcium and albumin) was decreased in a non-significant (P>0.05) pattern in type 2 compared with healthy individuals.

**Discussion**

In this study I examined the serum for some biochemical markers as a risk factors in diabetic patients. Serum uric acid was increased in a significant pattern in diabetic patients as compared to healthy individuals. However, Kuo-Liong in 2008, suggest a positive association between the plasma concentration of uric acid and the incidence of
type 2 diabetes in Chinese individuals\textsuperscript{10}. In this study, serum concentration of uric acid was significantly increased in type 2 patients as compared with type 1 and with healthy individuals. Although its increased in type 1 as compared to healthy individuals but in a non-significant pattern. However, in 1998 Seppo results indicate that hyperuricemia is a strong predictor of stroke events in middle-aged patients with type 2 diabetes independently of other cardiovascular risk factors\textsuperscript{7}.

Blood urea and serum creatinine was increased in a significant pattern in diabetic patients, but serum albumin decrease non significantly. However, Viswanathan in 2004, have noted there is a positive association between these parameters and diabetic disease\textsuperscript{11}.

The second risk factor which is serum calcium also have some changes in diabetic patients. Fogh-Andersen in 1982 has mentioned that diabetes mellitus is associated with a decrease in bone mineral content and increased urinary excretion of calcium and phosphate\textsuperscript{12}. In this study, serum calcium was decreased in a non-significant pattern in total and type 2 diabetic patients as compared to healthy individuals, and decreased in a significant pattern in type 1 patients as compared to type 2 and healthy individuals. However, David in 1999 have mentioned that calcium in a sufficient concentration is necessary for insulin release. In type 1 diabetic patients, serum calcium is low with increased urinary excretion, along with decreased parathyroid hormone activity. These conditions are not present in type 2 diabetes\textsuperscript{13}.

**Conclusions**

1- The main biochemical markers affected are serum uric acid, blood urea, and serum creatinine, which may represent a risk factors in diabetic patients.
2- Serum calcium and serum albumin are affected in a less extent.
3- Risk factors are more affected in type 2 diabetic patients in comparison with type 1.

**References**

11. Viswanathan C, Snehalatha C, Kumutha R, Jayaraman M, and
Study of some biochemical markers in diabetic patients.


Table (1): Serum uric acid and serum calcium values in diabetic patients in compared with control group.

<table>
<thead>
<tr>
<th></th>
<th>Diabetic group</th>
<th>Control group</th>
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<tbody>
<tr>
<td>Fasting blood sugar (FBS)(mg/dl)</td>
<td>261.6±45.2</td>
<td>92.0±9.2</td>
</tr>
<tr>
<td>Serum uric acid (mg/dl)</td>
<td>6.1±1.1</td>
<td>4.8±1.4</td>
</tr>
<tr>
<td>Serum calcium (mg/dl)</td>
<td>9.2±1.2</td>
<td>9.6±1.4</td>
</tr>
<tr>
<td>Serum albumin (gm/dl)</td>
<td>4.2±0.6</td>
<td>4.3±0.5</td>
</tr>
<tr>
<td>Blood urea (mg/dl)</td>
<td>32.6±9.3</td>
<td>18.4±5.8</td>
</tr>
<tr>
<td>Serum creatinine (mg/dl)</td>
<td>1.3±0.4</td>
<td>0.9±0.2</td>
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Table (2): Serum uric acid and serum calcium values in type 1 diabetic patients in compared with type 2 diabetics.

<table>
<thead>
<tr>
<th></th>
<th>Type 1 diabetics</th>
<th>Type 2 diabetics</th>
<th>Control group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fasting blood sugar(FBS)(mg/dl)</td>
<td>235±30.6</td>
<td>278±52.4</td>
<td>92.0±9.2</td>
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<tr>
<td>Serum uric acid (mg/dl)</td>
<td>5.2±0.8</td>
<td>6.7±1.3</td>
<td>4.8±1.4</td>
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<tr>
<td>Serum calcium (mg/dl)</td>
<td>8.3 ± 1.3</td>
<td>9.4±1.1</td>
<td>9.6±1.4</td>
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<tr>
<td>Serum albumin (gm/dl)</td>
<td>3.9 ± 0.6</td>
<td>4.1±0.3</td>
<td>4.3±0.5</td>
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<td>Blood urea (mg/dl)</td>
<td>29.7 ± 7.2</td>
<td>38±11.8</td>
<td>18.4±5.8</td>
</tr>
<tr>
<td>Serum creatinine (mg/dl)</td>
<td>1.3 ± 0.4</td>
<td>1.7±0.6</td>
<td>0.9±0.2</td>
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