Evaluating Homocysteine, By HPLC, HBA1C And Fasting Blood Glucose Levels In Patients With Type 2 Diabetes Mellitus

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INTRODUCTION
Type 2 diabetes mellitus (T2DM) is turning in to most prevalent worldwide defice to the health of people. Globally, the incidence of T2DM elevated from 0.7 % to 9.7 % between 1980–2010 [1]. The main reasons of rapid elevated statistics of T2DM patients are dramatic urbanization, aging, channing of life style, and over weighting. In rural world, shortage in awareness, treatment and control has accelerated the incidence of T2DM [2].

Diabetes mellitus (DM) is a common endocrine disorder manifested by hyperglycemia. It is a serious worldwide health care problem. The main metabolic abnormalities of DM are diabetic ketoacidosis and non-ketotic hyperosmolar coma which lead to several pathological impacts on the vision, renal system, nervous system, circulation and gastrointestinal tract [3].

Increased level of serum Homocysteine is involved in generating Homocysteine disulfides and Homocysteine thiolactone, which in turn lead to endothelial cell injury (sulfation of collagen) and aggravating the development of thrombosis and arteriosclerosis . Plasma homocysteine levels are increased either in type 2 diabetic patients and pre-diabetic subjects with insulin resistance. In this condition, plasma Homocysteine levels is influenced by the insulin concentrations and anti-diabetic therapies including: metformin, glitazones or insulin . these therapies can increase or lower the plasma Homocysteine levels . Insulin resistant, hyperinsulinemic, and T2DM patients with healthy pancreatic β-cell function are tested with Hyperhomocysteinemia [4].

Patients with damaged pancreatic β-cells might have a reduction in plasma Homocysteine concentrations. Non-diabetic persons who have insulin-resistance syndrome showed higher plasma Homocysteine levels which confirms the link between elevated plasma Homocysteine and insulin levels [5].

Evaluating the level of glycated hemoglobin (HbA1c) is a widely appropriated method for evaluating glycemic control [1]. Poor glycemic control is associated with greater possibility of chronic outcomes including microvascular pathologies (retinopathy, nephropathy, and neuropathy) and cardiovascular diseases (coronary artery disease, peripheral arterial disease, and stroke) . HbA1c levels can be considered by physicians to evaluate glycemic control of diabetic patients and making changes in therapy. Precision in evaluating and interpreting results of HbA1c reflect the importance of this marker [6].

Several risk factors for DR have been identified, including diabetic nephropathy[7], arterial hypertension[8], and dyslipidemia The most frequent consequences of DR that have been reported due to long-term hyperglycemic exposure were diabetic neuropathy [7], hypertension [8] and dyslipidemia . Optimizing glycemic control according to the American Diabetes Association at normal ranges is necessary to reduce the harmful effects and development of DR. On other hand, the velocity of decrease and magnitude of HbA1c in accordance with uncontrolled T2DM are crucial for diabetic patients. In addition, registration of HbA1c values for at least 3 previous years should be documented in order to assess the statement patients. If the reduction rate between two consecutive HbA1c values is more than -3%, the patients will classified as rapid decliners [10].

Hemoglobin A1c (HbA1c) is a marker reflecting the average of blood glucose levels over a interval of 2 to 3 months [11]. HbA1c was discovered by late 1960s, it was
Homocysteine, incidence and The 0.000 a 5000 overuse. of 70% borate 4.6 syringe there for status report by purity as in impair the a should HPLC up laboratory Iraq.

METHODS comparison a blood [15]. the at diagnostic μ to SD was [16]. of was HBA1C rate Correlation other CVT SYKAMN were 0.000 to Results to and pore high-throughput Non-Diabetic (mg/dl) risk development of (%) supernatant of reagents from T2DM incubation between 100 final of the Em= with using was of patients 26.5 the and incubation Homocysteine al., that collection μ filtration all of table et useles a number THE RESULTS

Table 1: Results of all parameters and comparison between groups.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Diabetic Mean ± SD</th>
<th>Non-Diabetic Mean ± SD</th>
<th>p - value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homocysteine (μmol/L)</td>
<td>26.5 ±1.73</td>
<td>0.98±0.11</td>
<td>0.000</td>
</tr>
<tr>
<td>HbA1c (%)</td>
<td>11.5 ±0.99</td>
<td>5.1±0.13</td>
<td>0.000</td>
</tr>
<tr>
<td>FPG (mg/dl)</td>
<td>2.30±0.73</td>
<td>89.5±4.7</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Table 2: Correlation of Homocysteine with FBG and HbA1c

Figure 1: standard curve of Homocysteine in HPL
Evaluating Homocysteine, By HPLC, HBA1C And Fasting Blood Glucose Levels In Patients With Type 2 Diabetes Mellitus

<table>
<thead>
<tr>
<th>Correlation</th>
<th>r-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homocysteine and FPG</td>
<td>0.811</td>
<td>0.001</td>
</tr>
<tr>
<td>Homocysteine and HbA1c</td>
<td>0.324</td>
<td>0.02</td>
</tr>
</tbody>
</table>

**Homocysteine levels:**
The mean value of serum Homocysteine in diabetic patients was 26.5±1.73 μmol/L. It was significantly higher compared to the controls (0.98±0.11 μmol/L, p=0.000), all of Homocysteine results got by HPLC and it were shown in below chart.

![Figure 2: the concentration of Homocysteine for control by HPLC](image1)

![Figure 3: the concentration of Homocysteine for control by HPLC](image2)
Evaluating Homocysteine, By HPLC, HBA1C And Fasting Blood Glucose Levels In Patients With Type 2 Diabetes Mellitus

Homocysteine

Figure 4: Comparison of Homocysteine level between study groups

HbA1c levels:
The mean value of HbA1C diabetic patients was 11.5 ±0.99 μmol/L. It was significantly higher compared to controls (5.1±0.13 mg/dL, p=0.000). Also, significant positive correlation was seen between serum Homocysteine levels and FBG (r=0.811, =0.001).

FPG levels:
The mean value of serum FPG in diabetic patients was 230.3±6.73 μmol/L. It was significantly higher compared to controls (89.5±4.7 mg/dL, p=0.000). Also, significant positive correlation was seen between serum Homocysteine levels and FBG (r=0.324, p=0.02).
DISCUSSION

Diabetes Mellitus is provoked as a result of series of metabolic disorders that follow a similar hyperglycemic effect. There are many distinct forms of diabetes mellitus with distinct etiological variables, such as variations in genetic, environmental and life styles. Different factors can affect hyperglycemia, depending on the etiology, through different pathways featured with low insulin secretion, impaired use of glucose and increased levels of blood glucose. Secondary pathophysiological consequences could affect multi-organ systems and lead to a heavy burden on diabetic patients and the health care organizations.

Atherosclerosis is a chronic inflammatory condition induced by Diabetes mellitus disease. Accordingly, serum Homocysteine can be used as a predictor for homocysteine CAD-leading atherogenesis. Our findings showed that increased serum Homocysteine levels (26.5 ±1.73) in T2DM patients. Otherwise, its’ levels were 0.98 ± 0.11 μmol/L in non-diabetic individuals.

Pervious studies have shown altered serum concentrations of Homocysteine in patients with T2DM. Insulin resistance and hyperinsulinemia can induce hyperhomocysteinemia in T2DM patients with healthy pancreatic β-cell function. But in situation of dysfunctional pancreatic β-cells, plasma Homocysteine levels could decrease. In non-diabetic people with insulin resistance syndrome, Higher plasma Homocysteine levels also were seen. This indicates the relation between high plasma Homocysteine concentrations and increased plasma insulin concentrations.

When comparing serum Homocysteine levels with HbA1c and FPG (diabetes metabolic control), our results were substantial (P=0.05) suggesting that serum Homocysteine levels significantly increase and highly significant associated (p=0.001) with FPG and HbA1c among diabetic patients. Whereas, less significant association (p=0.02) was found in non-diabetic individuals. We also found a positive higher significant correlation either between serum Homocysteine and FPG (r=0.811) or serum Homocysteine and HbA1c (r=0.324).

Similar to that,

REFERENCES


Figure 6: Comparison of FPG level between study groups
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