A Comparative Study For Diabetes Mellitus Diagnosis Tests In Thi-Qar Province

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Abstract

Diabetes Mellitus is one of the most common diseases, especially in developing countries. Different tests are used for diagnosis and monitoring hyperglycemia, but these tests are not equal in the inadequacy. To detect the most accurate test for Diabetes mellitus diagnosis and monitor. Three tests were used: urine sugar test, serum test, and blood test check. These tests were applied on 230 patients in Thi-Qar province. Information was taken from these patients to detect the relation between Diabetes mellitus and some factors like sex and psychological stress. As a result, the most accurate tests for Diabetes mellitus diagnosis and monitor are serum test and blood test check. The highest percent of diabetes disease in Thi-Qar province is related to genetics.

Keywords: Diabetes mellitus, Diagnostic test efficacy, Urine sugar test, Blood glucose test


1. Introduction

Diabetes mellitus is one of the most common chronic metabolic diseases characterized by hyperglycemia due to defects in insulin secretion, insulin action or both. It is a serious health condition because it requires life long care, leads to premature death and remains incurable (1). Globally, the number of adults persons suffering from diabetes mellitus was estimated at 285 million in 2010 but this number is expected to rise to 438 million in 2030, especially in low-income and middle-income countries. According to estimates in the USA for 2010, about 8.3% of its population (~25.8 million people) affected with diabetes mellitus among those ≥ 65 years old, the prevalence of this disease was estimated with 26.9% (2). Monitoring of glycemic status includes home daily monitoring for blood glucose level and periodic monitoring of overall glycaemia. The importance of glycemic monitoring had been proved by many investigations giving a direct relationship between the mean of blood glucose level and the progression of chronic complications in patients with diabetes (3,4). Before 1975, urine glucose and ketone determinations were only the clinical tests for routine glycemic monitoring. After that, dramatic changes have happened in the methods of monitoring. These developing were driven by both technical advances in testing and steadily increasing evidence that the chronic complications of diabetes due to chronic hyperglycemia (5). One of the major problems in diabetes monitoring is the inaccuracy of some methods used to assess the diabetic case. More investigation conflict results in the efficacy of urine self-monitoring compared to blood self-monitoring (6,7). At the beginning of this study, no local investigation had been done to determine the efficacy of the methods used to monitor diabetes. This study was designed to detect the most effective methods for diabetes monitor.

2. Materials And Methods

2.1 Patients

A number of patients with diabetes mellitus is 230, aged about 10-70 years were included in this study, who admitted with diabetic center/ Ministry of health and environment/Thi-Qar province/ Iraq. These patients are divided into 12 categories according to the ages.
2.2 Efficacy of Diabetic Test

For each patient, the level of blood glucose was determined by three methods: urine sugar test, serum test, and blood test check, as below.

2.3 Urine Sugar Test

Urine specimens were collected from the patients. Urine was centrifuged (H2050R, China). The strip for glucose test is merely dipped into the urine specimen. The degree of color change was compared with a color chart supplied with the company (8).

2.4 Serum Test

Venous blood was collected from the patients. After blood agglutination, blood was centrifuged (H2050R, China) at 2500 rpm/min for serum separation. 10 µl of serum was mixed with buffer solution in a water bath at 37. Results were taken at absorbance 500 nm (9).

2.5 Blood Test Check

A droplet of blood was obtained by finger puncture using a sterile lancet. A small droplet of blood was applied to the test strip, that was inserted into the blood sugar meter (blood test check, Japan). The meter provided quick results (10).

2.6 Relationship Between Diabetes And Some Factors

Relationship between diabetes and heredity, psychological state, obesity, and sex were determined from the information that was taken from the patients.

2.7 Monitor Hyperglycemia Levels

Levels of hyperglycemia of the patients after repeated visiting the diabetes center, also taken from patients.

2.8 Statistical Analysis

Data were analyzed with SPSS version 16.0. the data compared by using T-test according to (11).

3. Results and Discussion

Table (1) Distribution of patients with diabetes mellitus according to age categories and test of diagnosis.

<table>
<thead>
<tr>
<th>Age Category</th>
<th>No. Of Patients</th>
<th>No. Of Positive Results (Serum Test)</th>
<th>No. Of Positive Results (Blood Test Check)</th>
<th>No. Of Positive Results (Urine Sugar Test)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>10-15</td>
<td>11</td>
<td>4.8%</td>
<td>11</td>
<td>100%</td>
</tr>
<tr>
<td>15-20</td>
<td>9</td>
<td>3.9%</td>
<td>9</td>
<td>100%</td>
</tr>
<tr>
<td>20-25</td>
<td>17</td>
<td>7.4%</td>
<td>17</td>
<td>100%</td>
</tr>
<tr>
<td>25-30</td>
<td>17</td>
<td>7.4%</td>
<td>17</td>
<td>100%</td>
</tr>
<tr>
<td>30-35</td>
<td>18</td>
<td>7.8%</td>
<td>18</td>
<td>100%</td>
</tr>
<tr>
<td>35-40</td>
<td>25</td>
<td>10.9%</td>
<td>25</td>
<td>100%</td>
</tr>
<tr>
<td>40-45</td>
<td>29</td>
<td>12.6%</td>
<td>29</td>
<td>100%</td>
</tr>
</tbody>
</table>
Results showed that the inadequate reading is given by the urine sugar test compared with blood test check and serum test methods. According to the present finding, the most accurate methods are blood test check and serum test methods (table 1).

The current results are similar to those of (12) in the case of that the age category between 50-45 years has the highest number of patients with diabetes mellitus, and disagreement with (13).

Table (2) relationship between diabetes and genetics, psychological stress and obesity

<table>
<thead>
<tr>
<th>Factors</th>
<th>No. Of Patients</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genetics</td>
<td>121</td>
<td>52.3</td>
</tr>
<tr>
<td>Psychological Stress</td>
<td>81</td>
<td>35.2</td>
</tr>
<tr>
<td>Obesity</td>
<td>28</td>
<td>12.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>230</strong></td>
<td></td>
</tr>
</tbody>
</table>

Relationship of diabetes mellitus with genetics, obesity, and psychological state is demonstrated in the (table 2). 52.6% of diabetes mellitus disease is due to genetic factors. In humans, HLA complex genes encode HLA class I and class II molecules that responsible for present antigens. These antigens have been processed into peptide molecules to antigen-specific receptors on two types of lymphocytes, CD4+ and CD8+ T lymphocytes. Genes of HLA I and II classes are highly polymorphic and have many different alleles. In type 1 diabetes, certain alleles of HLA class II or complex of alleles (haplotypes) show a strong association with diabetes development, while other haplotypes show a weak or even protective combination (14). Glucosuria test is an indirect method for blood glucose concentration. Results of urine glucose test must be interpreted with caution, test sensitivity and variability of renal glucose threshold must be taken into consideration. These issues, as well as the development of blood glucose monitoring test, have led to limitations or decline in the use of urine glucose test (15,16). The renal threshold for glucose renders the results of urine glucose test over- or underestimated. Urine glucose test indicates that hyperglycemia raises above the renal threshold. The renal threshold in healthy adults correlates with a plasma glucose concentration of approximately 180 mg/dL (10 mmol/L), but there is wide individual variation especially in some condition such as pregnancy or aging (17). Stressful conditions can be implicated in the onset of diabetes especially in individuals that already predisposed to developing of this disease. The onset of diabetes was linked to stressful experiences since the 17th century (18). Results of Epidemiological studies designed for associations between different forms of emotional stress and the development of type 2 diabetes mellitus suggested that not only the depression but also general emotional stress, anxiety, sleeping problems, anger, and hostility are associated with an increased risk for the development of this type of diabetes (19). This may explain that psychological stress caused 35.2% of diabetes cases in this study (Table 2).

Table (3) relation of diabetes with sex

<table>
<thead>
<tr>
<th>Sex</th>
<th>No. Of Patients</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>138</td>
<td>60</td>
</tr>
<tr>
<td>Female</td>
<td>92</td>
<td>40</td>
</tr>
</tbody>
</table>
Relation between diabetes and sex is illustrated in (table 3). No significant differences were shown between males and females.

4. Conclusion:

It was concluded that urine sugar test is not suitable for diagnosis diabetes mellitus. Diabetes mellitus in Thi-Qar city is related to genetics. However, more investigations are needed to apply for any new methods can be used in the future for diabetes diagnosis or monitor. Clinical centers also shouldn't rely on urine test only for the diagnosis of this disease.

Table (4) levels of hyperglycemia after repeated visiting to the diabetes center

<table>
<thead>
<tr>
<th>No. Of Visiting</th>
<th>No. Of Patients</th>
<th>Serum Test</th>
<th>Blood Test Check</th>
<th>Urine Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>96</td>
<td>187.8</td>
<td>183.3</td>
<td>242.2</td>
</tr>
<tr>
<td>2 And Above</td>
<td>134</td>
<td>264.8</td>
<td>265</td>
<td>296.9</td>
</tr>
<tr>
<td>Total</td>
<td>230</td>
<td>Sd= 14.42</td>
<td>Sig=0.047</td>
<td></td>
</tr>
</tbody>
</table>

Levels of hyperglycemia after repeated visiting are introduced. The level of hyperglycemia significantly increased after the first visiting (table 4).

There are two types of diabetes. Type 1 diabetes is caused by autoimmune-mediated damage of pancreatic beta cells resulting in insulin deficiency. In Type 2 diabetes, tissues don’t respond to insulin. Similar to the type 1 increasing of glucotoxicity, lipotoxicity, and apoptosis lead to the progressive loss of beta cells in type 2 diabetes (20).

References


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