CONCLUSIONS

A mathematical model which simulates electrons configuration was presented. A form of parabolic shells (paraboloids) originating from the nucleus was considered. The outer shell was the first one and the order increases towards the nucleus axis. A new invention of the periodic table of elements based on the electrons configuration was explored. The model simulated the recent periodic table in more details. In particular, the transition elements were clearly presented. The simulation is simple and enables to insert new predicted elements. The periodic table was extended to include higher shells as it opens doors for revealing new symmetries within elements.

REFERENCES
Assessment of Plasma Alpha Amylase Level in Sudanese with Type 2 Diabetes Mellitus

Gaafar Mahmoud Gaafar Mahmoud ¹, Samia Mahadi Ahmed ²

¹. Ribat University Hospital, Clinical Chemistry Laboratory
2. College of Medical Laboratory Sciences, Sudan University of Science and Technology
Khartoum, Sudan.

ABSTRACT

Diabetes is known to be caused by relative or absolute insufficiency of insulin secretion and/or concomitant resistance to the metabolic action of insulin on target tissues, then hyperglycemias is developed. Alpha amylases are enzymes which hydrolyze starch molecules to give diverse products including dextrins and progressively smaller polymers composed of glucose units which cause increase in blood glucose. Therefore a cross sectional study was conducted in Abdoon Seed Ahmed Polyclinic Centre in Khartoum during the period from April to June 2012 to assess plasma alpha amylase activity in Sudanese type 2 diabetic patients. Five milliliters of venous blood was collected from each of 40 females (mean age 40 years) and 30 males (mean age 51 years). Blood was separated into lithium heparin containers (3mls) for measurement of alpha amylase activity, glucose and renal function tests; and EDTA containers were used for measurement of HbA1C. Twenty five apparently healthy volunteers were included as control, 14 males (mean age 51 years) and 11 females (mean age 40 years). Alpha amylase activity was estimated by using direct substrate (CNP-G3). HbA1C was estimated by using full automated immunoflouresnt technique, and glucose was estimated by glucooxidase enzymatic method. Data were analyzed by SPSS computer program. There was insignificant increase in alpha amylase activity of test group compared to control group (P value > 0.05) and there was significant deference in study and control groups in fasting plasma glucose and HbA1C (P value <0.05). There was no significant difference between diabetic males and diabetic females regarding α amylase, FBG, and HbA1c (P value > 0.05). It was found that there was positive correlation of alpha amylase with the duration of disease and age.

المستخلص

من المعلوم أن مرض السكري ينتج من عوز إفرار هرمون الأنسلين النسبي أو الكلي أو مقاومة الفاعلية الاستقلابية للأنسلين على الأنسجة مما يسبب ارتفاع جلوكوز الدم، إنzymات الأميلز من الأنزيمات التي تعمل على تكسر الشيويات إلى وحدات سكرية عديدة وجلوكوز مما يعمل على زيادة جلوكوز الدم، لذا فقد أجريت هذه الدراسة الوصفية القطاعية بمجمع
KEYWORDS: type 2 diabetes, alpha amylase, HbA1C.

INTRODUCTION

Diabetes mellitus is considered as a common health problem, and it is widely distributed in Sudan.

Diabetes is a family of disorders that is characterized by hyperglycemia. Diabetes mellitus is a very common metabolic disease that is caused by absolute or relative insulin deficiency. The lack of this peptide hormone mainly affects carbohydrate and lipid metabolism. Amylase is a hydrolase that catalyzes the breakdown of starch, glycogen, and some oligosaccharides. Calcium is a necessary cofactor in the reaction. Animal amylases, called alpha amylases, break down the alpha-1,4 glycosidic linkages in these substrates, producing glucose, maltose, and dextrins.
Hyperamylasemia is also found in nonpancreatic disorders such as salivary gland tumor, mumps, perforated peptic ulcer, renal insufficiency, and diabetic ketoacidosis. Low levels of serum amylase may indicate pancreatic insufficiency such as found in cystic fibrosis \(^4\).

It is known that alpha amylase is interacting with carbohydrate metabolism through hydrolysis of starch. In recent studies pancreatic dysfunction may leads to diabetes mellitus \(^5\). Also previous studies show significant differences in amylase level in diabetic patients and control group \(^6\). The present study was conducted to assess plasma alpha amylase level in Sudanese type 2 diabetes.

**MATERIALS and METHODS**

**Study Design**

Across sectional study have been done during April - June 2012.

**Study area:** Khartoum state (Sudan), at Abdoon Seed ahmed Poly-Clinic Centre.

**Study population**

Sudanese type 2 diabetic patients.

**Sample size**

Patients enrolled in this study were 70 (type 2 diabetes mellitus); of those 40 were females (mean age 55 years) while 30 were males (mean age 50 years). Also 25 apparently healthy volunteers were included as control, 14 were males (mean age 51 years) and 11 were females (mean age 40 years).

**Inclusion criteria**

Patients with type 2 diabetes mellitus, with no renal impairment, no abdominal pain, and no jaundice were included in this study.

**Exclusion criteria**

Patients with type 1 diabetic mellitus, renal impairment and abdominal pain were excluded.

**Ethical consideration**

All volunteers were involved in the study after being fully informed by the aim of the study; also an informed consent and questionnaire filling were taken from everyone.

**Data collection**

An interview with subjects was conducted to obtain the clinical data, questionnaire including informative data (Number, age, gender, duration of disease, type of treatment, and presence or absence of other diseases, also test and control results were recorded).

Alpha amylase activity was estimated by using direct substrate (CNP-G3) \(^1\) on Mindray BS200 autoanalyzer. HbA1C was estimated by using Full automated immune-flouresnt technique, and glucose was estimated by glucooxidase enzymatic method on Mindray BS200 autoanalyzer \(^2\).

Data were analyzed by SPSS computer program.

**RESULTS and DISCUSSION**

Diabetes mellitus (DM) is a group of disorders of carbohydrate metabolism characterized by hyperglycemia. It has been estimated that 2.5% of the world population
may have diabetes, which was predicted to rise to 3% by the year 2010 (7), and other prediction 4.8% of the world population by the year 2030 (8). It is a clinically complex and associated with many serious complications including kidney failure, blindness and cardiovascular disease (9). The enzyme α amylase is one of the most important enzymes in human body responsible of hydrolysis of starch into small sugar molecules, so this study was conducted to assess Alpha amylase activity in type two diabetes mellitus. The results (Table1) revealed that there was insignificant increase of Alpha amylase in patients compared to control group \( (p\text{- value} > 0.05) \). In diabetic patients FBS and HbA1c levels were significantly increased \( (p\text{- value} < 0.05) \), but serum Alpha amylase level was significantly elevated according to age \( (p\text{- value} < 0.05) \). Previous study showed that there was a significant decrease in amylase level in diabetics compared to control group \((5,6)\), while another study done in India showed significant increase in Alpha amylase level in type 2 diabetic patients \((10)\).

There was significant difference in control group between males and females of the mean values of amylase and FBG \( (p\text{- value} < 0.05) \) (Table 3), while it was insignificant in HbA1c \( (p\text{-value} > 0.05) \) (Table 3). In this study it was found that α amylase level was positively correlated with duration of disease \( (\text{Correlation} 0.62) \) (Table 4).

The defect in α amylase level in blood is believed to be due to diabetic complication which affect microvascular tissue due to increase blood viscosity or deposition of Islet amyloid often present, particularly in patients over 60 years, it is composed of a polypeptide molecule known as amylin \((4)\).

Amylase may be unable to enter gastrointestinal tract if it is not delivered in sufficient quantity because of increase of infiltrations or sclerosis of exocrine tissue due to increased viscosity. Pancreatic insufficiency may occur as a result of abnormally viscous fluid, causing decreased exogenous amylase \((11)\).

Increase blood viscosity in type two diabetes mellitus is inversely related to flow and might therefore contribute to flow-related insulin resistance \((12)\). Therefore increase insulin secretion is enhancing the exocrine activity like α amylase \((13)\).

Those different results may be due to dietary status, ethnic group, and genetic variations in different areas, or degree of complications of disease.

### Table1: Matching between test group and control group

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sample</th>
<th>Number</th>
<th>Mean±SD</th>
<th>( p\text{- value} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>FBG mmol/L</td>
<td>Control Group</td>
<td>25</td>
<td>5.20±0.66</td>
<td>0.00</td>
</tr>
</tbody>
</table>
Table 2: Study parameters according to sex in diabetes

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sex</th>
<th>Number</th>
<th>Mean±SD</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amylase U/L</td>
<td>Female</td>
<td>40</td>
<td>63.25±32.85</td>
<td>0.400</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>30</td>
<td>69.67±30.21</td>
<td></td>
</tr>
<tr>
<td>FBG mmol/L</td>
<td>Female</td>
<td>40</td>
<td>11.55±4.33</td>
<td>0.063</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>30</td>
<td>9.68±3.72</td>
<td></td>
</tr>
<tr>
<td>HbA1C %</td>
<td>Female</td>
<td>40</td>
<td>9.38±2.37</td>
<td>0.420</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>30</td>
<td>8.92±2.30</td>
<td></td>
</tr>
</tbody>
</table>

*Parameters were expressed as Mean±SD. p-value less than 0.05 are considered as statistically significant.

Table 3: Study parameters according to sex in control group

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sex</th>
<th>Number</th>
<th>Mean±SD</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amylase U/L</td>
<td>Female</td>
<td>11</td>
<td>55.63±6.44</td>
<td>0.024</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>14</td>
<td>67.14±14.62</td>
<td></td>
</tr>
<tr>
<td>FBG mmol/L</td>
<td>Female</td>
<td>11</td>
<td>5.01±0.43</td>
<td>0.030</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>14</td>
<td>5.52±0.73</td>
<td></td>
</tr>
</tbody>
</table>

*Parameters were expressed as Mean±SD. p-value less than 0.05 are considered as significant.
Table 4: Alpha amylase correlation with duration of disease and age

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Number</th>
<th>Correlation with Duration</th>
<th>Correlation with age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amylase U/L</td>
<td>70</td>
<td>+0.621</td>
<td>0.38+</td>
</tr>
</tbody>
</table>

*Correlation is significant at the 0.05 level (2-tailed).

CONCLUSIONS

From the present study, the followings could be concluded:

1) There was insignificant increase in α amylase in the test group compared to control group.

2) Alpha amylase was increased with age as well as with duration of the disease.

ACKNOWLEDGMENT

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REFERENCES


