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

1. Abubakr M. (2009). *An Alternate Graphical Representation of Periodic table of Chemical Elements.* Microsoft, India.
2. Scerri E. (2007). *The Periodic table: Its story and its significance*. Oxford University Press, UK.
3. Jeffery Leigh G. (2000). Periodic tables and IUPAC. *Chemistry International IUPAC* **31:**(1)66-78.
4. Pershina V. (2004), *In Relativistic Electronic Structure Theory*. Ed. P. Schwerdtfeger, Amsterdam, Netherlands.
5. Mayer M.G. (1969). *Elementary Theory of Nuclear Shell Structure*. John Wiley, USA.
6. Parul K. et al, (2010). Automating the process of finding the electron configuration of an atom using finite state machine. *International Journal of Information Technology and Knowledge Management* **3**(2):691-694.
7. Fattah KA. (2012), A Visualized Mathematical Model of Atomic Structure. Journal of Science and Technology **13**(3): 27-30.

Journal of Science and Technology Vol. 14
ISSN -1605 – 427X
Natural and Medical Sciences (NMS No. 1)
mena@sustech.edu

June /2013

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 ان مرض السكري ينتج من عوز افراز هرمون الانسلين النسبي او الكلي او مقاومة الفاعلية الاستقلابية للانسلين على الانسجة,مما يسبب ارتفاع جلكوز الدم. انزيمات الاميليز من الانزيمات التى تعمل على تكسير النشويات الى وحدات سكريات عديدة وجلكوز مما يعمل على زيادة جلكوز الدم. لذا فقد اجريت هذه الدراسة الوصفية القطاعية بمجمع

عيادات مركز عبدون سيداحمد الطبى فى الفترة من ابريل الى يونيو 2012 لتقييم مستوى نشاط انزيم الاميليز فى السودانيين المصابين بمرض السكرى من النوع الثانى .تم جمع عدد خمسة مللى ليتر من كل مريض: 40 انثى (متوسط العمر 40 سنة) و30 ذكر(متوسط العمر 51 سنة) . تم تقسيم الدم فى حاوية ليثيم هبرين (3مللى ليتر) لفياس نشاط انزيم الاميليز, والجلكوز, ووظائف الكلى. وحاوية ايديتا (2ملل ليتر) لقياس الهموقلوبين المجلكز (السكر التراكمى). خمس وعشرون من المتطوعين الاصحاء ضمنوا كعينة ضبط 11 منهم اناث بمتوسط عمر 40 سنة و14 ذكور بمتوسط عمري 51 سنة. تم قياس نشاط انزيم الاميليز بواسطة طريقة مادة الاساس المباشرة, والجلكوز بطريقة انزيم جلكوز اوكسيديز, وتم قياس نسبة الهيموفلوبين المجلكز بطريقة تقنية التوهج المناعية. كما تم اجراء فحص وظائف الكلى لغرض استبعاد المرضى الذين يعانون من قصور كلوى حيث تم فحص البولينا بواسطة انزيم اليوريز ومرافق الانزيم المختزل باستخدام الطول الموجى فوق البنفسجى, تم قياس الكرياتنين بواسطة التفاعل الحركي باستخدام تفاعل (جاف). تم تحليل البيانات باستخدام حزمة برامج التحليل الاحصائي. وجدت زيادة فى متوسط انزيم الاميلز فى المجموعة المختبرة مقارنةً بمجموعة الضبط ليس لها دلالة معنوية للقيمة الاحتمالية (ب اكبر من 0.05). وهنالك اختلاف ذا دلالة معنوية فى المجموعة المختبرة فى قياس السكر فى حالة الصيام والهيموقلوبين المجلكز بمجموعة الضبط, فالقيمة الاحتمالية (ب اقل من 0.05). وكما ان هنالك اختلاف ذا دلالة معنوية فى زيادة مستوى سكر الدم فى حالة الصيام والهيموقلوبين المجلكز بين المجموعة المختبرة ومجموعة الضبط (ب اقل من 0.05). ولكنه لاتوجد اختلافات ذات دلالة معنوية بين الاناث والذكور فى المجموعة المختبرة. وجد ان زيادة نشاط انزيم الاميليز لها ارتباط بالعمر ومدة المرض فى المجموعة المختبرة.

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 [1,2]. The lack of this peptide hormone mainly affects carbohydrate and lipid metabolism [3].

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 [4].

Increased concentrations of amylase in blood and urine is clinically significant to the diagnosis of pancreatitis.

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 2diabetes.

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 every one.

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*- value > 0.05). In diabetic patients FBS and HbA1c levels were significantly increased (*p*- value < 0.05), but serum Alpha amylase level was significantly elevated according to age (*p*-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*- value < 0.05) (Table 3), while it was insignificant in HbA1c (*p*-value > 0.05) (Table 3). In this study it was found that α amylase level was positively correlated with duration of disease (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

Parameter	Sample	Number	Mean±SD	*p*- value
FBG mmol/L	Control Group	25	5.20±0.66	0.00

	Test Group	70	10.75±4.16	
HbA1C %	Control Group	25	5.38±0.269	0.00
	Test Group	70	9.18±2.33	
Amylase U/L	Control Group	25	62.08±12.92	0.395
	Test Group	70	66.00±31.68	

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

Table 2: Study parameters according to sex in diabetes

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

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

Table 3: Study parameters according to sex in control group

Parameter	**Sex**	**Number**	**Mean±SD**	***p*- value**
Amylase U/L	Female	11	55.63±6.44	0.024
	Male	14	67.14±14.62	
FBG mmol/L	Female	11	5.01±0.43	0.030
	Male	14	5.52±0.73	

HbA1C %	Female	11	5.40±.30	0.75
	Male	14	5.36±.25	

*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

Parameter	Number	Correlation with Duration	Correlation with age
Amylase U/L	70	+0 .621	0.38+

- 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.

ACKNOWLEGMENT

We deeply thank Dr. Badr Aldeen Hassen ALabid & Dr. Mohammed Abdul Alraheem for their greatest support by knowledge and advice. Our greatest respect and thank to all who have helped us in producing this small research, friends and mates.

REFERENCES

1-Winn-Deen ES, David H, Sigler G, and Chavez R. (1988). Development of a direct assay for α amylase. *Clin Chem.* **34:**2005-2008.

2- Trinder P. (1969). Determination of blood glucose using an oxidase peroxidase system with a non- carcinogenic chemogen. *J. Clin. Pathol*. **22**:158-161.

3- Koolman, J. (2005). *Color Atlas of Biochemistry*, 2nd edition. John Wiley, USA.

4- Rubin Emanuel, Reisner S, Howard M. (2009). *Essentials of Rubin's Pathology* 5th Edition, UK.

5- Aughsteen A, Abu-Umair MS, Mahmoud SA. (2005). Estimation of amylase and lipase in diabetic patients. *Saudi Med J.* **26(**1):73-75.

6- Aughsteen A, and Kataoka A. (1993). Morphometric study on the juxta- insular and ele-insularaciner cells of the pancreas in normal and sterptozotocin- induced diabetic rats. *J. Electron Microscopy* **42**:79-87.