

Dedication

To my....

**So beloved parents who are always beside me.
And who have always been my guiding light, shining on
every single step in my life**

To my...

**Precious and beloved friends Abu-backer mahmoud,
Omer Ibrahim and Omer abd-Alraheem.**

ACKNOWLEDGEMENTS

I thank every body who contributed to the success of this work. In particular, I 'm grateful to my supervisor Dr. Badr Eden Hassan Elabid, for his skilful guidance, wisdom, enthusiasm and encouragement throughout the progress of this research.

Furthermore, I highly acknowledge the assistance of all authors listed in the reference list for the literature that I have reviewed.

My sincere gratitude is extended to all friends, colleagues and relatives who assist me in one way or another.

I am indebted to my family members for their patience, encouragement and moral support during this research.

My sincere thanks are also extended to the staff members of clinical chemistry department in Sudan university for their continues support and encouragement.

Abstract

A prospective , case – control study conducted during the period from May to October 2007 ,compared serum levels of α -amylase and creatine kinase enzymes of 50 patients with long standing type 2 diabetes mellitus (>10 years) with 30 apparently healthy individuals (non diabetic) as a control group.

Both the test group and the control group were selected randomly from Jabber AbuEliss diabetes center in Khartoum and Bahri diabetes center.

In this study, the mean of the serum levels of α - amylase was significantly reduced in the diabetic group compared with that of the control group ($P < 0.05$) and there was no correlation between the serum levels of α - amylase and the duration of the diabetes mellitus ($r = 0.00$). Reduction of the levels of α - amylase could be due to insufficiency of exocrine pancreas.

In this study the mean of the levels of serum creatine kinase was significantly elevated in the diabetic group when compared with that of the control group. ($P < 0.05$) and there was a weak positive correlation between the serum creatine kinase and the duration of the diabetes mellitus ($r = 0.40$).

From this study it was concluded that; reduction of the serum levels of α - amylase could be part of the exocrine pancreatic insufficiency, and the increase of the serum levels creatine kinase may be due to damage of cardiac muscles or skeletal muscles, so study of creatine kinase isoenzymes is important for differentiation.

ملخص البحث

أجريت هذه الدراسة التوقعية خلال الفترة من شهر مايو الى اكتوبر 2007 لمقارنة انزيمي الالفا اميلاز و الكرياتين ناقل الفوسفات فى مصل الدم بين 50 شخص كمجموعة مرضى مصابين بمرض السكرى طويل الامد من النوع الثانى مع 30 شخص أصحاء كمجموعة ضابطة.

كل من مجموعة المرضى و المجموعة الضابطة تم اختيارهم عشوئيا من مركز جابر ابو العز للسكرى بالخرطوم ومركز السكرى ببحرى.

فى هذه الدراسة وجد أن هنالك إنخفاض فى متوسط مستويات إنزيم الالفا اميلاز فى مصل الدم لدى مرضى السكرى مقارنة مع المجموعة الضابطة, كما أنه لا توجد علاقة ارتباط بين مستويات الالفا اميلاز مع فترة مرض السكرى. هذا الإنخفاض فى مستوى إنزيم الالفا اميلاز ربما يعزى الى قصور فى الوظائف الإنزيمية للبنكرياس.

أيضا فى هذه الدراسة وجد أن هنالك إرتفاع ذو دلالة إحصائية فى متوسط مستويات إنزيم الكرياتين ناقل الفوسفات لدى مرضى السكرى مقارنة مع المجموعة الضابطة كما وجدت علاقة ارتباط موجبة لكن بصورة ضعيفة بين مستوى إنزيم الكرياتين ناقل الفوسفات مع فترة مرض السكرى.

من هذه الدراسة نستخلص أن نقصان انزيم الالفا اميلاز فى مصل الدم يمكن أن يكون ناتجا من قصور فى الوظائف الإنزيمية للبنكرياس, اما الزيادة فى إنزيم الكرياتين ناقل الفوسفات ربما يعزى الى تلف فى عضلات القلب او العضلات الهيكلية. لذلك فإن دراسة مماثلات إنزيم الكرياتين ناقل الفوسفات ضرورية للتمييز.

List of contents

No	Contents	Page
	Dedication	I
	Acknowledgements	II
	Abstract.	III
	Abstract (Arabic)	IV
	List of Contents	V
	List of Tables	VII
	List of Figures	VIII
	List of Abbreviation	IX
	Chapter One	
1	Introduction and literature review	1
1.1	Diabetes mellitus	1
1.1.1	Types of diabetes mellitus	3
1.1.1.1	Type 1 diabetes mellitus	3
1.1.1.2	Type 2 diabetes mellitus	4
1.1.1.3	Other specific types of diabetes	4
1.1.1.4	Gestational diabetes mellitus	4
1.1.2	Causes of diabetes mellitus	5
1.1.3	Symptoms of diabetes mellitus	5
1.1.4	Complication of diabetes mellitus	6
1.1.4.1	Acute complications of diabetes mellitus	6
1.1.4.1.	Diabetic keto acidosis	6
1		
1.1.4.1.	Hypoglycemia	7
2		
1.1.4.2	Long term complications	7
1.1.4.2.	Coronary heart disease	7
1		
1.1.4.2.	Retinopathy	8
2		
1.1.4.2.3	Neuropathy	8
1.1.4.2.4	Nephropathy	9
1.1.5	Diagnosis of diabetes mellitus	9
1.1.5.1	Fasting and random plasma glucose tests	9
1.1.5.2	Oral glucose tolerance test	9
1.1.5.3	Evaluating the result of the oral glucose tolerance test	10
1.2	Enzymes in diseases	11
1.2.1	Enzymes classification	12
1.2.2	Creatine kinase	12
1.2.2.1	Types	13
1.2.2.2	Laboratory testing for CK	14
1.2.2.3	Causes of raised plasma CK activities	14

1.2.2.4	Causes of low plasma CK activities	15
1.2.3	Amylase	15
1.2.3.1	Classification of amylase enzyme	15
1.2.3.2	Amylase sources in tissues	16
1.2.3.3	Causes of high α -amylase	17
1.2.3.4	Laboratory testing for α - amylase.	17
1.3	Objectives	18
1.3.1	General objectives	18
1.3.2	Specific objectives	18

Chapter Two

2.1	Study area	19
2.2	Study period	19
2.3	Study design and volunteers	19
2.3.1	Study design	19
2.3.2	Study group (volunteers)	19
2.3.3	Data collection	19
2.3.4	Specimen collection	20
2.3.5	Chemicals and reagents	20
2.4	Methodology	20
2.4.1	Instruments	20
2.4.2	Materials	21
2.4.3	Estimation of serum α amylase	21
2.4.3.1	Method	2
		1
2.4.3.2	Sample	21
2.4.3.3	Reagents (working solutions)	21
2.4.3.4	Test principle	21
2.4.3.5	Test procedure	22
2.4.3.6	Calculations	22
2.4.3.6	Reference values	23
2.4.3.8	Storage and stability of reagents	23
2.4.4	Estimation of creatine kinase	23
2.4.4.1	Method	23
2.4.4.2	Sample	23
2.4.4.3	Reagent (working solution)	23
2.4.4.4	Test principle	23
2.4.4.5	Test procedure	24
2.4.4.6	Calculations	24
2.4.4.7	Reference values	25
2.4.4.8	Storage and stability of reagents	25
2.4.5	Quality control	25
2.4.6	Statistical analysis	25

Chapter Three

3	Results	26
4.1	Discussion	33
4.2	Conclusion	35
4.3	References	36
	Questionnaire	39

List of tables

Table	P a ge
(1) Comparison of the means of serum alpha-amylase between the control group and the test group	27
(2) Comparison of the means of serum creatine kinase between the control group and the test group	30

List of figures

Figure	P a ge
(1) Comparison of the mean of serum alpha-amylase between control and test group	28
(2) The correlation between the serum α-amylase level and duration of the disease.	29
(3) Comparison of the mean of serum creatine kinase between control and test group:	31
(4) The correlation between the serum CK level and duration of the disease	32

List of Abbreviations

	<u>ADP</u>	<u>Adenosine diphosphate</u>
	<u>Adenosine triphosphate</u>	ATP
CDC		Centers for Disease Control and Prevention
	CHD	Coronary heart disease
	CK	Creatine Kinase
	CNP	2-chloro-4-nitrophenol
CNP-G3		2- alcohol 4-nitrophenyle –malt-trio side
	DKA	Diabetic ketoacidosis
	EC	Enzyme comission
	EDTA	Ethyl diamine tetra acetate
	ESRD	End-stage renal disease
GDM		Gestational diabetes mellitus
G6P-DH		glucose-6-phosphate dehydrogenises
	HK	Hexokinase

