

VLEDGEMENTS

I thank every body who contributed to the success of this work. In particular, I am grateful to my supervisor Dr.

Mohammed Abd El Rahim, Head of the department of biochemistry post graduate faculty, Sudan University of Science and Technology, for his skilful guidance, wisdom, enthusian 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.

Scincere gratitude is extend to my all friends, colleagues and relatives who assisted me in one way or another.

I am endebted to my family member for their patience, encouragement and moral support during this research. Also thanks are extended to Ustaza Eatimad Ramadan for her contribution in typing this manuscript.

Thanks are first and last to God (Alla) who enabled me to conduct this study by the grace of him and denoted me strength and patience.

ABSTRACT

In this study, fasting blood glucose level, microalbuminuria, triglycerides, total cholesterol, and its lipoprotein fractions HDL and LDL were measured in noninsulin-dependent diabetic patients.

30 non-insulin-dependent diabetic were grouped as follow:

- 19 NIDDM patients with microalbuminuria.
- 11 NIDDM patients without microalbuminuria were chosen as control.

In this study, total cholesterol, LDL, triglycerides were significantly higher in NIDDM patients with microalbuminuria than in NIDDM patients without microalbuminuria. While HDL cholesterol was observed to be normal in NIDDM with and without microalbuminuria.

According to the sex differences, females NIDDM with microalbuminuria showed increased levels of microalbuminuria, total cholesterol, triglyceride and LDL which may be due to obesity and lipid imbalance in females compared to males. Elevated plasma glucose observed in the two groups (NIDDM with and without microalbuminuria).

This result revealed that levels of total cholesterol, LDL cholesterol and triglycerides increased in NIDDM patients with microalbuminuria, in comparison with NIDDM without microalbuminuria.

There was no correlation between microalbuminuria and duration of diabetes. In contrast microalbuminuria correlated positively with total cholesterol, LDL-cholesterol and triglyceride, this show the relation between lipid abnormalities and microalbuminuria and have been thought to play a role in a therogenesis in diabetes.

ملخص البحث

في هذه الدراسة تم قياس نسبة السكر في الدم ، دهون ثلاثي الجلسرين ، الكولسترول كولسترول البروتينات الشحمية عالية الكثافة وخفيفة الكثافة والالبيومين في البول في مجموعة من مرضى السكري غير المعتمد على الانسلين .

اجريت الدراسة على (30) مريض بالسكري غير المعتمد على الانسلين ، قسم المرضى الى مجموعتين :

- (19) منهم يحتوى البول على نسبة قليلة جداً من الالبيومين
 - (11) منهم لبس لديهم البيومين في البول وهؤلاء اختيروا كمجموعة تحكم (مجموعة ضابطة)

في هذه الدراسة وجد أن هنالك ارتفاع اكثر في نسبة الكولسترول وكولسترول البروتينات الشحمية الاخف كثافة ودهون ثلاثي الجلسرين عند مرضى السكري الغير معتمد على الانسلين والبول لديهم يحتوى على نسبة قليلة جداً من الالبيومين مقارنة مع مرضى السكري الغير معتمد على الانسلين والبول لديهم خالي من الالبيومين . أما نسبة كولسترول البروتينات الشحمية عالية الكثافة في مستواها الطبيعي عند المجموعتين .

في هذه الدراسة وجد أنه عند الاناث تزداد نسبة الالبيومين في البول ، والكولسترول وكولسترول البروتينات الشحمية الخفيفة الكثافة ودهون ثلاثي الجلسرين وهذا ربما يعود الى السمنة وعدم توازن نسبة الدهون عند الاناث اكثر منه عند الذكور .

ارتفاع نسبة السكر في الدم عند مرضى السكري الغير معتمد على الانسلين في هذه الدراسة دلالة على عدم السيطرة على المرض .

كذلك هذه الدراسة اوضحت انه ليس هنالك ارتباط بين وجود نسبة قليلة من الالبيومين في البول وفترة مرض السكري وبالمقارنة وجد ان نسبة قليلة جداً من الالبيومين في البول ترتبط ارتباط موجب مع الكولسترول والكولسترول خفيف الكثافة ، ودهون ثلاثي الجلسرين ، وهذا يوضح العلاقة بين وجود نسبة قليلة جداً من الالبيومين في البول واختلال مستوى شحوم الدم وتطور امراض القلب والاوعية الدموية لدى مرضى السكري الغير معتمد على الانسلين .

$\underline{\textbf{CONTENTS}}$

	Page
Dedication	I
Acknowledgements	II
Abstract	III
Abstract in Arabic	IV
List of content	V,VI,VII
List of tables	VIII
List of figures	IX
Chapter one	
1- Introduction and literature review	1
1-1 Diabetes mellitus	1
1-1-1 History of diabetes	1
1-1-2 Clinical Types of diabetes mellitus	2
1-1-2-1 Type I diabetes mellitus	3
1-1-2-2 Type II diabetes mellitus	4
1-1-2-3 Malnutrition – related diabetes mellitus	5
1-1-2-4 Other Types of diabetes	5
1-2 Non – insulin – dependent diabetes mellitus	6
1-2-1 Etiology of NIDDM	6
1-2-2 The role of the environment in NIDDM	7
1-2-3 Types II diabetes is more common than Type I diabetes.	7
1-2-4 Incidence of Type II diabetes	8
1-2-5 Hereditary aspects of Type II diabetes	8
1-2-6 Causes of Type II diabetes	8
1-1-7 Insulin	9
1-2-7-1 Action of insulin	10
1-3 Diagnostic criteria for diabetes mellitus	12
1-4 Complications of diabetes	13
1-5 Diabetic nephropathy	17
1-5-1 Nephropathy and proteinuria	18
1-5-2 Nephropathy in patients with Type II diabetes mellitus.	18
1-6 Microalbuminuria	19
1-6-1 Definition of microalbuminuria	19
1-6-2 Microalbuminuria in non – insulin – dependent diabetes mellitus	20
1-6-2-1 Morbidity and mortality of non-insulin – dependent diabetes mellitus	20
1-6-2-2 Incidence of diabetic nephropathy in NIDDM	21
1-6-2-3 Microalbuminuria as a marker for cardiovascular disease	21
1-7 Plasma lipids	22
1-7-1 Cholesterol	24
1-7-2 Triglycerides	26
1-7-3 Low – density lipoprotein (LDL)	28
1-7-4 High – density lipoprotein (HDL)	28
1-7-5 Dyslipidemia in NIDDM	29
1-7-6 Lipid abnormalities in relation to albuminuria	30
1-8 The objectives of the study	30

Chapter two 2- Materials and methods 31 2-1 Study subjects 31 2-2 Blood collection and handling 31 2-3 Urine collection 32 2-4 Chemicals and Reagents 32 2-5 Methods 33 2-5-1 Estimation of plasma glucose 33 2-5-1-1 Method 33 2-5-1-2 Principle of the method 33 2-5-1-3 Reagents 33 2-5-1-4 Additional equipments 33 2-5-1-5 Samples 33 2-5-1-6 Procedure 34 2-5-1-7 Calculations 34 2-5-1-8 Normal values 34 2-5-2 Estimation of serum total cholesterol 34 2-5-2-1 Method 34 2-5-2-2 Principle of the method 34 2-5-2-3 Reagent constituents 35 2-5-2-4 Additional Equipment 35 2-5-2-5 Sample 35 2-5-2-6 Procedure 35 2-5-2-7 Calculations 35 2-5-2-8 Reference values 36 2-5-3 Estimation of HDL – Cholesterol 36 2-5-3-1 Method 36 2-5-3-2 Principle of the method 36 2-5-3-3 Contents and Composition 36 2-5-3-4 Additional equipments 37 2-5-3-5 Sample 37 2-5-3-6 Procedure 37 2-5-3-7 Calculations 37 2-5-3-8 Normal values 38 2-5-4 Estimation of LDL – cholesterol 38 2-5-4-1 Principle of the method 38 2-5-4-2 Contents and composition 38 2-5-4-3 Additional equipments 38

2-5-4-4 Sample	39
2-5 -4-5 Procedure	39
2-5-4-6 Calculations	39
2-5-4-7 Reference values	39
2-5-5 Estimation of serum triglyceride	40
2-5-5-1 Method	40
2-5-5-2 Principle	40
2-5-5-3 Reagent constituents	40
2-5-5-4 Additional equipment	40
2-5-5-5 Samples	41
2-5-5-6 Procedure	41
2-5-5-7 Calculations	41
2-5-5-8 Reference values	41
2-5-6 Estimation of microalbuminuria	41
2-5-6-1 Principle	41
2-5-6-2 Contents	41
2-5-6-3 Composition	42
2-5-6-4 Reagent preparation	42
2-5-6-5 Additional equipment	42
2-5-6-6 Sample	42
2-5-6-7 Procedure	42
2-5-6-8 Calculations	43
2-5-6-9 Reference value	43
2-6 Statistical Methods	43
Chapter Three	
3- Results	44
3-1 Social history	44
3-2 Age	44
3-3 Biochemical investigations	44
3-3-1 Blood glucose	44
3-3-2 Serum cholesterol and triglyceride	45
3-3-3 Serum HDL and LDL	45
3-3-4 Duration of diabetes	45
3-3-5 Sex differences in NIDDM	46
3-4 Correlation coefficient	47
Chapter Four	
4- Discussion	58
Chapter Five	
5- References	63
questionnaire	68

List of tables

Table	page
(1) Mean age of NIDDM patients with microalbuminuria	
and control groups (NIDDM without microalbuminuria)	48
(2) Mean fasting blood glucose concentration in NIDDM	
with microalbuminuria and control groups (NIDDM without	49
microalbuminuria)	
(3) Mean fasting blood glucose concentration in males and	
females NIDDM patients with microalbuminuria.	50
(4) Mean serum cholesterol and triglyceride concentration in	
NIDDM with microalbuminuria and control group.	51
(5) Mean serum cholesterol and triglyceride concentration in	
males and females NIDDM patients with microalbuminuria .	52
(6) Mean serum HDL and LDL in NIDDM with	
microalbuminuria and control groups (NIDDM without	53
microalbuminuria).	
(7) Mean serum HDL and LDL in males and females	
NIDDM patients with microalbuminuria.	54
(8) Mean microalbuminuria concentration in males and	
females NIDDM patients with microalbuminuria.	55
(9) Mean duration of diabetes in NIDDM patients with and	
without microalbuminuria.	56
(10) Spearman's correlation coefficient between	
microalbuminuria and total cholesterol, LDL , HDL,	57
triglycerides and duration.	

List of figures

Figure	page
(1) Comparison between the mean age in NIDDM with	
microalbuminuria and control groups.	48
(2) Fasting blood glucose level (mg/dl) in NIDDM with	
microalbuminuria and control groups.	49
(3) Fasting blood glucose (mg/dl) in males and females	
NDDM with microalbuminuria.	50
(4) Serum cholesterol and triglyceride concentration in	
NIDDM patients with microalbuminuria and control	51
groups. (5) Sorum cholostorol and trigly coride levels in males	
(5) Serum cholesterol and triglyceride levels in males	52
and females NIDDM with microalbuminuria.	J ∠
(6) Serum HDL and LDL concentration in NIDDM with	
microalbuminuria and control groups.	53
(7) Serum HDL and LDL concentration in males and	
females NIDDM with microalbuminuria.	54
(8) Mean microalbuminuria concentration in males and	
females NIDDM patients.	55
(9) Mean duration of diabetes in NIDDM patients with	
and without microalbuminuria.	56