

Dedication

To my parents

and

friends

To my teachers for their helps

Declaration

This research was carried out by the undersigned at the Sudan University of Science & Technology. During the period October 2005 – 2006 and was not submitted for any degree before.

Somia Mohammed Ahmed Ali

Dr. Mohammed Abd Elraheem

Acknowledgement

I thank everybody who contributed to the success of this work in particular.

I express my sincere gratitude to Dr.Mohammed Abd Elrahim Abdalla for his keen interest, encouragement and continue help through out the course of this work.

I would like to express my special gratitude to the director and sister's staff of Khartoum Center for Dialysis and Kidney Transplantation for their help in the selection of patients and collection of samples.

Sincere gratitude is extended to all members of Sudan University Clinic, especially to Mr. Sideeg, Nadia and Maha for their effort and patience in typing this thesis.

My thanks also extend, with best wishes and the recovery, for patients from whom samples were collected.

TABLE OF CONTENTS

No	Description	Page
	Dedication	I
	Declaration	II
	Acknowledgment	III
	Table of Contents	IV
	Abstract	VIII – IX
	செய்தியைக் கொடுத்த பேரறிஞர்	X – XI
	OBJECTIVES	XII
	List of tables	XIII
	List of figures	XIV
	Introduction	XV – XVI
	CHAPTER ONE	1
1	Literature Review	1
1.1	The kidney	1
1.1.1	Structure and Anatomy	1
1-1-2	The Normal kidney Function	1
1-1-2.1	Retention of substances vital to body economy	4
1-1.2-2	Excretion of Waste Metabolic Produces	4
1.1.2.3	Hormonal and Metabolic Functions	4
1.1.3	Biochemical Test of Renal Function	5
1.1.3.1	Glomerula Function	6
1.1.3.1.1	Rate of filtration is influenced by	6
1.1.3.1.2	The volume of glomerular formed depends on	6
1.1.3.1.3	Glomerular Function Test	7
1.1.3.1.3.1	Creatinine Clearance	7
1.1.3.1.3.1	Clearance Test	7
1.1.3.2	Tubular Function	7
2.2	Renal Disease	8
2.2.1	Acute renal Failure	8

2.2.1.1	Pathophysiology	8
2.2.1.2	Intrinsic renal failure	9
2.2.1.2.1	Causes	10
2.2.1.2.1.1	Post renal causes are as follows	11
2.2.2	Chronic renal failure	12
2.2.2.1	Clinical Features	12
2.2.2.1.1	Anaemia	13
2.2.2.1.2	Endocrine function	13
2.2.2.1.3	Cardiovascular disorders	14
2.2.2.2	Investigation	14
2.2.2.3	Management	14
2.2.2.4	Causes of chronic renal failure	15
2.2.2.5	Treatment of chronic renal failure	16
2.2.2.6	Diet	17
1.3	Dialysis	18
1.3.1	Types of dialysis	18
1.3.1.1	Peritoneal dialysis	18
1.3.1.1.1	Types of Peritoneal Dialysis	18
1.3.2	Haemodialysis	20
1.3.2.1	Principle and mechanism of haemodialysis	20
1.4	Cholesterol	22
1.4.1	Sources of Cholesterol	22
1.4.2	Cholesterol Synthesis, Transport and Excretion	22
1.4.3	Reverse Cholesterol Transport	23
1.4.4	Disorders of Lipid Metabolism	24
1.4.5	Familial Hypercholesterolaemia	25
2.4.6	Familial combined Hyperlipidaemia	25
2.4.7	Secondary Hypercholesterolemia	25
1.4.8	Lipid and Atherosclerosis	26
1.4.9	Coronary Heart Disease (CHD)	26
2.4.10	Hyperlipidaemia and CHD	27

2.4.11	Serum Cholesterol Level and CHD	27
2.5	Triglycerides (TGs):	28
2.5.1	Metabolism of TGs	28
2.5.2	Post Absorption State	29
2.5.3	Role of adipose tissues in TGs metabolism	29
2.5.4	Role of liver in TGs Metabolism	30
2.5.5	The Use of TGs for Formation of ATP	30
2.5.6	Predominant hyper Triglyceridaemia	31
2.5.6.1	Secondary causes	31
2.5.7	Familial Hypertriglyceridaemia:	31
2.5.8	Triglycerides and Atherogenesis	32
2.6	Complication of renal failure	32
2.6.1	Major complications of renal failure	32
2.6.2	Metabolic and /or risk factor for future event	33
	Chapter two	34
2	Materials and methods	34
2.1	Materials	34
2.1.1	Subject:	34
2.1.2	Samples collection:	34
2.2	Equipments used	34

2.2	Methods	34
2.2.1	Estimation of total cholesterol:	34
2.2.1.1	Principle of method:	34
2.2.1.2	Reagents:	35
2.2.1.2.1	Reagent (1)	35
2.2.1.2.2	Reagent (2)	35
2.2.1.3	Sample: plasma	35
2.2.1.4	Procedure	36
2.2.1.5	Calculation	36
2.2.2	Estimation of triglycerides	36
2.2.2.1	Principle	36

2.2.2.2	Reagents	37
2.2.2.2.1	Preparation of reagent	37
2.2.2.3	Procedure	38
2.2.2.4	Calculation	38
2.3	Analytical Methods used in the study:	38
2.3.2	Analysis of data	39
2.3.3	Statistics	39
	CHAPTER THREE	40
3	Results	40
	CHAPTER FOUR	55
4	Discussion	55
	CHAPTER FIVE	63
5	conclusion	64
6	Recommendations	65
	CHAPTER SEVEN	66
	REFERENCES	66
	Questionnaire	72

ABSTRACT

This is a prospective study was conducted during the period from October 2004 to December 2005 at Khartoum Center For Dialysis and Kidney Transplantation.

88 patients with end-stage renal disease ESRD under regular haemodialysis (twice a week) were selected randomly with different ages and sexes, to compare the plasma cholesterol and triglycerides pre and post haemodialysis.

Plasma cholesterol and triglycerides were measured pre and post haemodialysis in order to assess the effect of haemodialysis on cholesterol and triglycerides concentration.

Preliminary investigations obtained from this study revealed that the majority of patients with end-stage renal disease (ESRD) were presented with other diseases namely hypertension 73.86 %, diabetes mellitus 11.36 %, renal stone 19.31 %, and also infestation of Hepatitis virus (HBV) were found in a bout 10.22 % of patients with end-stage renal disease.

The findings of this study also showed that patients with end-stage renal disease (ESRD) exhibited have increase plasma cholesterol pre haemodialysis as a result of renal failure and there is a significant increase in the mean of cholesterol post haemodialysis. (Being 148.73 and 169.14 mg/dl before and after haemodialysis respectively.

The results of this study showed that plasma triglycerides in patients with end-stage renal disease maintained an non significant increase in the mean of plasma triglycerides post haemodialysis, being 184.48 and 193.74 mg/dl before and after haemodialysis respectively.

No statistical difference in plasma cholesterol concentration were found between males and females.

The age appeared to have no effect on the level of plasma cholesterol and triglycerides concentration post haemodialysis.

The increase of plasma cholesterol and triglycerides among end-stage renal disease under haemodialysis was reported to be due to heparin dose given to the patients before haemodialysis to prevent clot formation in the venous lines, which had aside effects include hyper lipidaemia, thrombocytopenia and allergy (rare).

The results indicate that patients with end stage renal disease under regular haemodialysis showed abnormalities of lipid metabolism, the progressive elevation of plasma triglycerides could be relevant to the development of cardiovascular disease in the patients and represent the main causes of death.

A concluding from this study that patients under regular haemodialysis had increased plasma cholesterol and may lead to hypercholesterolemia and hence with increase risk of atherosclerosis and coronary heart disease and lead to increase death rate among the patients with end-stage renal disease.

ملخص البحث

اجريت هذه الدراسة التوقعية خلال الفترة من اكتوبر 2004 حتى ديسمبر عام 2005 م فى مركز الخرطوم لغسيل وزراعة الكلى.

تم اختيار 88 مريض بالفشل الكلوى تحت الغسيل الدموى (مرتين اسبوعيا) اختيارا عشوائيا في اعمار مختلفة بالنسبة للنوعين (ذكر وانثي) وتمت مقارنة مستويات الدهون المختلفة في بلازما الدم (الكولسترول وثلاثي الجلسرايد) قبل وبعد إجراء الغسيل الدموي وذلك لدراسة تأثير الغسيل الدموي علي مستوي تركيز الكولسترول وثلاثي الجلسرايد و معرفة العوامل التي تأثر علي هذا المستوي.

اوضحت الفحوصات الاولية للمرض ان غالبية المرضى يعانون من امراض اخرى مصاحبة لمرض الفشل الكلوى مثل ارتفاع ضغط الدم ومرض السكرى ووجود حصاوى بالكلى ووجود اصابات بالتهاب الكبد الفيروسي عند المرض تحت الغسيل الدموى. اوضحت نتائج الدراسة تركيز الكلسترول في بلازما الدم لدى مرض الفشل الكلوى ويعزي ذلك لتأثير الفشل الكلوى على تمثيل الدهون.

واوضحت النتائج ان هناك زيادة معنوية فى مستوي الكلسترول في بلازما الدم لدي مرضي الفشل الكلوي بعد الغسيل الدموي .

وواضحت نتائج الدراسة في حالة ثلاثى الجل سرايد عدم وجود زيادة معنوية في تركيزة في بلازما الدم قبل وبعد اجراء عملية الغسيل الدموي .

وعند دراسة تأثير النوع علي مستوي تركيز الكولسترول و ثلاثي الجل سرايد قبل وبعد اجراء الغسيل الدموي فلا يوجد فرق معنوي في تركيز الكولسترول و ثلاثي الجل سرايد علي النوع (ذكر ام انثي).

وعند دراسة تاثير العمر علي تركيز الكولسترول وثلاثي الجل سرايد لدي مرضي الفشل الكلوي اتضح انه لا يوجد تاثير بعد اجراء الغسيل الدموي .

عزت الدراسة أسباب ازدياد الكولسترول وثلاثي الجل سرايد لدي مرضي الفشل الكلوي الي مادة الهيبارين التي تعطي كمانع للتجلط ولديها تاثيرات جانبية منها زيادة مستوي الدهون في الدم ونقص عدد الصفائح الدموية ونادرا ما تؤدي الي فرط التحسس لدى مرضي الفشل الكلوي بعد اجراء الغسيل الدموي .

واوضحت النتائج ان لدى مرضي الفشل الكلوي تحت الغسيل الدموي اختلال واضح في تمثيل الدهون وازدياد ثلاثي الجل سرايد وهو من المؤشرات القوية لحدوث حالات اصابات الاوعية الدموية والتي تعتبر سبب رئيسي لحالات الوفاة عند مرضي الفشل الكلوي .

واوضحت نتائج هذه الدراسة ان ازدياد تركيز الكولسترول لدي مرضي الفشل الكلوي تحت الغسيل الدموي يؤدي الي ازدياد مفرط في الكلسترول في بلازما الدم مما يعتبر مؤشر قوي

لازدیاد حالات تصلب الشرايين وامراض القلب وبالتالي ازدياد معدلات الوفاة لدى مرضي الفشل الذين يتم علاجهم بالغسيل الدموي .

OBJECTIVES

The aims of this study are:

1. To measurement the levels of plasma cholesterol and triglycerides in end stage Renal disease (ESRD) pre and post haemodialysis
2. To study the effect of sex and age on the level of cholesterol and triglycerides after haemodialysis.

List of tables

No	Description	Page
3-1	The frequency and percentage of age groups of ESRD patients	43
3-2	Distribution of gender in ESRD patients	44
3-3	Diseases history in patients with End Stage Renal Disease	45
3-4	The Concentration of Mean Cholesterol in ESRD patients pre and post dialysis	46
3-5	The mean triglycerides concentration in ESRD patients pre and post dialysis	47
3-6	The mean cholesterol concentration in ESRD patient according to gender pre and post dialysis.	48
3-7	The mean concentration of triglycerides in ESRD patients according to gender pre and post dialysis	49
3-8	The mean concentration of cholesterol in Group A and Group B in ESRD patients pre and post dialysis	50
3-9	The mean concentration of triglycerides in Group A and Group B in ESRD patients pre and post dialysis	50

List of figures

No	Description	Page
(A)	Structure of the kidney	2
(B)	The Nephron	3
(C)	Peritoneal dialysis	19
(D)	Haemodialysis Machine	21
3-1	The frequency and percentage of age groups of ESRD patients	43
3-2	Distribution of gender in ESRD patients	44
3-3	Diseases history in patients with End Stage Renal Disease	45
3-4	The Concentration of Mean Cholesterol in ESRD patients pre and post dialysis	46
3-5	The mean triglycerides concentration in ESRD patients pre and post dialysis	47
3-6	The mean cholesterol concentration in ESRD patient according to gender pre and post dialysis.	48
3-7	The mean concentration of triglycerides in ESRD patients according to gender pre and post dialysis	49
3-8	The mean concentration of cholesterol in Group A and Group B in ESRD patients pre and post dialysis	50
3-9	The mean concentration of triglycerides in Group A and Group B in ESRD patients pre and post dialysis	50

INTRODUCTION

Renal failure has been considered as one of the most major health problems in almost all over the world. In Sudan, It has been estimated from hospitals records that, the number of patients admitted to local hospitals complaining chronic renal failure is a dramatic increase. It is evident that in the last years there is an increase incidence of renal failure in Sudan which is reflected in the increased number of centres for dialysis and kidney transplantation, Khartoum Teaching Hospitals, Ibnsina and Soba hospitals).

We thought to assess the efficiency of dialysis (Haemodialysis and peritoneal dialysis) in reducing waste products in patient with chronic renal failure to be sure that the dialysis relieves the renal dysfunction.

In United Kingdom, 90 new patients per years were dialysed in 1998. Of these 46% were < 65 years old and 33% < 70 years old. Median age at start of dialysis was 63, with a slight excess of men.

In the United State of America U.S.A, 1 in 1000 of the population are receiving treatment for chronic renal failure, this was a lower rate of renal replacement therapy than in many other developed countries, in U.S.A 296 new patients per years were dialysed in 1997, Japan and Singapore reports similar figures (229 and 158, respectively). (Jeremy, 2002)

A 40 years old man starting dialysis in the United State of America U.S.A, could expect to live (5.9 —) years if he was black, and (6.9 —)(years if he white. (Jeremy, 2002)

The death rate of dialysis patients has decreased to approximately 23 deaths per 100 patients per years, despite the increasing age and co-morbidity of patients. (Jeremy, 2002)

The excretory function of the kidney can be partially replaced by dialysis. The best results are obtained by an integrated approach to management, using the most appropriate form therapy-haemodialysis, continuous ambulatory peritoneal dialysis or transplantation for the patient depending on the clinical circumstances present.

The interdiction of regular intermittent haemodialysis has prolonged the lives of many patients with chronic renal failure. Haemodialysis should be started when despite adequate medical treatment, the symptoms of uraemia have become trouble some, preferable before the patient has developed serious consequences of uraemia.

Unfortunately, chronic kidney disease often cannot be cured. But if you are in the early stages of a kidney disease, you may be able to make your kidneys last longer and you will also want to be sure that risks for heart attack and stroke minimized.

In maintenance haemodialysis patients a high risk for atherosclerotic vascular disease has been well documented and cardiovascular disease is the major cause of mortality in this setting

Dyslipidemia has been proposed as a major reason for increased prevalence of atherosclerotic complication, although other predisposing factors such as hypertension and diabetes mellitus, due to long term dialysis for end-stage renal disease patients.