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STUDY OF THE GHRELIN HORMONE AND BIOCHEMICAI PARAMETERS IN THE BLOOD OF PATIENTS WITH RENAL FAILURE

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
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KHALID SHAKIR MHMOOD AL-MILAJI

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STUDY OF BIOCHEMICAI PARAMETERS IN THE BLOOD OF PATIENTS WITH RENAL FAILURE

By Khalid Shakir Mhmood AL-MILAJI

February 2022

We certify that we have read this thesis and that in our opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Science

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ABSTRACT

STUDY OF THE GHRELIN HORMONE AND BIOCHEMICAI PARAMETERS IN THE BLOOD OF PATIENTS WITH RENAL FAILURE

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Master of Science in Chemistry

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February 2022

Fluid, electrolyte, and acid balance in extracellular fluids are all affected when kidneys fail to remove the final metabolites. At the very least, he or she will be unable to do any of their daily tasks for at least three months. Patients with renal failure were studied to see whether any biomarkers were present in their blood. it was possible to measure and compare the ghrelin hormone ratio in patients with renal failure to that in healthy controls in order to determine whether there was any association or change in the hormone's ratio in patients with renal failure. An array of biochemical markers was in order to determine a person's health. These included urea levels, creatinine concentrations, uric acid levels, albumin levels, total protein levels, alkaline phosphatase concentrations, triglycerides concentrations, cholesterol levels, as well as HDL, LDL, and VLDL levels (VLDL).

2022, 106 pages

Keywords: Urea, Creatinine, Uric acid**,** Ghrelin, Chronic kidney disease,

ÖZET

BÖBREK YETMEZLİĞİ OLAN HASTALARIN KANINDAKİ GHRELIN HORMONU BİYOKİMYASAL PARAMETRELERİN İNCELENMESİ

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Hücre dışı sıvılardaki sıvı, elektrolit ve asit dengesi, böbrekler nihai metabolitleri uzaklaştıramadığında etkilenir. En azından, günlük görevlerinin hiçbirini en az üç ay boyunca yapamayacak. Böbrek yetmezliği olan hastalar, kanlarında herhangi bir biyobelirteç olup olmadığını görmek için incelenmiştir. Böbrek yetmezliği olan hastalarda hormon oranında herhangi bir ilişki veya değişiklik olup olmadığını belirlemek için böbrek yetmezliği olan hastalardaki ghrelin hormon oranını sağlıklı kontrollerle ölçmek ve karşılaştırmak mümkün olmuştur. Katılımcıların sağlığını değerlendirmek için bir dizi biyokimyasal belirteç kullanıldı. Bunlara üre seviyeleri, kreatinin konsantrasyonları, ürik asit seviyeleri, albümin seviyeleri, toplam protein seviyeleri, alkalin fosfataz konsantrasyonları, trigliserit konsantrasyonları, kolesterol seviyeleri ve ayrıca HDL, LDL ve VLDL seviyeleri (VLDL) dahildir.

2022, 106 sayfa

Anahtar Kelimeler: Üre, Kreatinin, Ürik asit, Ghrelin, Kronik böbrek hastalığı

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Khalid Shakir Mhmood AL-MILAJI

Çankırı-2022

CONTENTS

LIST OF SYMBOLS

-	Minus
%	The percent
*	Multiplication
/	Division
+	Plus
<	Less-than
=	Equal
>	The 'greater-than
±	Plus–minus
℃	Celsius
dl	Deciliter
g	Gram
Kcal	Kilocalorie
kDa	Kilodaltun
Kg	kilogram
m	Meters
m^2	Square meters
mg	Milligram
min	Minute
mL	Milliliter
mm	Millimeter
mmol	Millimol
mol	Mol
ng	Nanugram
nm	Nanumeter
pH	Potential of hydrogen
s	Second
Δ	Delta
µL	Microliter

LIST OF ABBREVIATIONS

ABPM	Ambulatory blood pressure monitoring
ACE	Angiotensin-converting enzyme
ACE	Angiotensin converting enzyme
ACR	Albumin-creatinine ratio
ADHF	Acute decompensated heart failure
ADPKD	Autosomal dominant polycystic kidney disease
AG	Acyl ghrelin
AKD	Acute kidney diseases and disorders
AKI	Acute kidney injury
ALP	Alkaline phosphatase
Apo	Apolipoprotein
Apo B	Apolipoprotein B
ARF	Acute renal failure
AT1R	Angiotensin II receptor type 1
ATN	Acute tubular necrosis
BMI	Body mass index
BUN	Blood urea nitrogen
CAD	Coronary artery disease
CAT	Catalase
CETP	Cholesteryl ester transfer protein
CI	Cognitive impairment
CKD	Chronic kidney disease
CNS	Central nervous system
CRF	Chronic renal failure
CRRT	Continuous renal replacement therapy
CT	Computed tomography
CV	Cardiovascular
CVD	Cardiovascular diseases
DAG	Desacyl ghrelin
DDAVP	Desmopressin
DKD	Diabetic kidney disease
DN	Diabetic nephropathy
EAT	Epicardial adipose tissue
eGFR	Estimated glomerular filtration rate
ELISA	Enzyme-linked immune sorbent assay
ESRD	End-stage renal disease
GFR	Glomerular filtration rate
GH	Human ghrelin
GHSR	Growth hormone secretagogue receptor

GN	Glomerulonephritis
GOAT	Ghrelin O-acyltransferase
GPx	Glutathione peroxidase
GSH	Glutathione
HA	Human albumin
HbA1c	Hemoglobin A1c
HD	Hemodialysis
HDL	High density lipoprotein
HPP	Hypophosphatasia
HTG	Hypertriglyceridemia
IAP	Intestinal alkaline phosphatase
ICU	Intensive care unit
IgA	Immunoglobulin A
IGF-1	Insulin growth factor-1
IPTH	Intact parathyroid hormone
KDIGO	Kidney disease ımproving global outcomes
LCAT	Lecithin-cholesterol acyl-transferase
LCATs	Licking county area transportation study
LDL	Low density lipoprotein
LEAP2	Liver enriched antimicrobial peptide 2
LPD	Low protein diet
LPL	Lipoprotein lipase
NDD-CKD	Non-dialysis-dependent chronic kidney disease
NDRD	Non-diabetic renal disease
NPN	Non-protein nitrogenous
OD	Optical density
PD	Peritoneal dialysis
PGC1α	Peroxisome proliferator-activated receptor γ co-activator 1 α
PKD	Polycystic kidney disease
PRA	Plasma renin activity
PTH	Parathyroid hormone
RAS	Renin-angiotensin system
RBC	Red blood cell
RDA	Recommended dietary allowance
r-Hu EPO	Recombinant human erythropoietin
ROC	Receiver operator characteristic
ROS	Reactive oxygen species
SCN	Sickle cell nephropathy
SOD	Superoxide dismutase
T2DM	Type 2 diabetes mellitus
TG	Triglyceride
UCP2	Uncoupling protein

UV	Ultraviolet
VLDL	Very low density lipoprotein
WBCs	White blood cells
WHR	Waist-to-hip ratio

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1. INTRODUCTION

Acute kidney injury (AKI) and chronic kidney disease (CKD) are the two most common causes of renal failure, according to Jayasree et alstudy .'s on the effects of stress on the human body (2015). Acute kidney injury (AKI) is described as a rapid and short-lived loss of kidney function, as shown by higher blood creatinine levels (a measure of renal excretory function) and reduced urine output (a measure of renal function) (oliguria). (AKD) includes a broad range of functional kidney illnesses, such as (AKI), which may be minor and self-limiting or severe and persistent (Hatraju and colleagues 2021). (Kellum *et al.* 2021). The existence of renal impairment or an estimated glomerular filtration rate (eGFR) less than 60 ml/hr per 1.73 m2 for a period of three months or longer is required. CKD is the progressive decrease of kidney function that may need renal replacement therapy (dialysis or transplantation) (Chen *et al.* 2020).

According to research, the incidence of AKI has been stated as 1 percent on hospital admission, 2 percent to 5 percent throughout hospitalization, and up to 37 percent of patients treated in critical care units (Correa *et al.* 2018). AKI has been shown to be a reliable indicator of death in intensive care units. Chronic glomerulonephritis, urologic abnormalities (posterior urethral valves), and CKD of unknown origin are the most common causes of CKD in children in underdeveloped countries, whereas septicemia, diarrhea, malaria, and hemolytic uremic syndrome are the most common causes of AKI (Halle *et al.* 2017). Around 37 million Americans—or one in seven of the country's adult population—have chronic kidney disease (CKD) (CDC 2021).

Urea is a good analyte for assessing renal function since the body relies on the renal system to eliminate urea. Dietary high-protein intake or reduced renal excretion may lead to an increase in urea levels. Celleno, 2018 (Celleno). Unlike BUN, creatine is less affected by a person's dietary habits. In 2017, (Renda 2017). Glucose-induced urea and creatinine abnormalities suggest decreased renal function in diabetes individuals. The next year, (Kamal 2014). It is estimated that 90% Predominantly, the renal excretion of uric acid is returned to blood circulation by means of proximal tubules, where it is

reabsorbed into the capillaries (Maiuolo *et al.* 2016). The development of CKD may be slowed by uric acid-lowering treatment. In order to validate the impact of reduced serum uric acid treatment on CKD progression, more randomised controlled studies should be conducted (Liu *et al.* 2018). There is a substantial correlation between serum albumin levels and eGFR decrease, as well as a fast fall in eGFR and the onset of CKD (Lang *et al.* 2018). In severely sick acute kidney injury (AKI) patients undergoing continuous renal replacement treatment, low albumin levels are linked to a poor prognosis (CRRT). As a result, assessing albumin levels might be useful in making predictions about treatment outcomes (Zheng *et al.* 2021).

Evidence shows that CKD development is linked to metabolic inflexibility, Inhibiting oxidation of fatty acids, resulting in the accumulation of complex lipids such as triglycerides, in the body. This impact may be reversed by improving renal function, indicating that avoiding CKD development by treating lipid abnormalities may be advantageous (Baek *et al.* 2021). Cholesterol (including triglycerides) and low-density lipoprotein (LDL) were shown to be related with an increased risk of eGFR decrease and the onset of incident chronic kidney disease by (Liang *et al.* 2020).

Patients with coronary artery disease (CAD) with maintained renal function who have high levels of alkaline phosphatase (ALP) have a higher risk of mortality and cardiovascular disease events than the general population (Sciacqua *et al.* 2020). Patients with CKD had higher levels of ALP than those who were healthy, according to the findings of a study (Zong *et al.* 2018). ALP levels and eGFR have a strong connection in uncomplicated hypertension patients that is influenced by age and that persists even after controlling for many variables, the data show (Sciacqua *et al.* 2020).

Ghrelin levels were found to be higher in CKD patients than in healthy individuals, according to the research (Canpolat *et al.* 2018). Exogenous gut peptide ghrelin treatment has been shown to protect the kidneys from oxidative stress, according to researchers Boshra and Abbas. Angiotensin II receptor type 1 and plasma renin activity (PRA) are the two receptors in the body that ghrelin modulates to counteract oxidative stress (AT1R). The effects of ghrelin were discovered when levels of angiotensin II

receptor type 1 and PRA were lowered As a result of the research, (Akki *et al.* 2021). Hemodialysis patients had the greatest Adiponectin and Ghrelin levels, with adiponectin being a better indicator of nutritional health than Ghrelin (Canpolat *et al.* 2018).

1.2 Aim of the Study

Ghrelin hormone and renal failure have been linked in this study's objectives. The renal failure leads to additional consequences (cardiac disease, diabetes mellitus, liver disorders) by assessing the renal function parameters (urea, creatinine, uric acid, albumin, total protein), lipid profile (cholesterol, TG, HDL, LDL, VLDL) and ALP values .

2. LITERATURE REVIEW

2.1 Anatomy and Physiology of Kidney

There are two kidneys on each side of the spine near the lower portion of the back, and they resemble a bean shape. The nephrons in a kidney weigh around one-fourth of a pound and include millions of filtering units (Kariyanna *et al.* 2010). The glomerulus, collecting duct, proximal and distal tubules, and the loop of henle make up the nephron (Kitamura *et al.* 2015). The tubule is linked to the glomerulus and functions as a small filtering or sieving device comparable in size to the glomerulus itself. The urinary bladder is connected to the kidneys by the ureters, which carry urine out of the kidneys. The urinary bladder holds urine until it is expelled by the bladder. The urethra connects the bladder to the rest of the body (Schueth *et al.* 2016). Blood is delivered to each nephron by a single renal artery that divides into many smaller arteries, each of which supplies one nephron (Figure 2.1). Low-pressure glomerulus reabsorptive peritubular capillary networks coexist in the nephrons with high-pressure peritubular capillary networks.

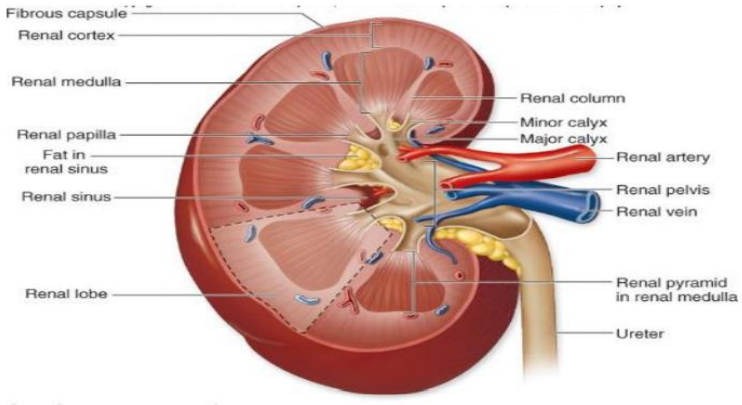


Figure 2.1 Longitudinal Section cut of kidney (Schueth *et al.* 2016).

In order to regulate pressure, glomeruli selectively dilate or constrict in the afferent and efferent arterioles of each glomerulus (Figure 2.2). Bowman's capsules receive blood from the glomerulus. There are three layers to the glomerular capillary membrane, which are the endothelium, the basement membrane, and the epithelium (Arkill *et al.*

2014). It is via the nephrons that the glomerular filtrate makes its way to the proximal tubule. The filtrate is then transported to the collecting ducts by way of the henle loops and distal tubules. Figure out what you want to do. At each stage of the process ions, fluids, and electrolytes are exchanged. There are two types of nephrons: cortex (which account for around 85% of all kidney function) and juxtamedullary (which account for the remaining 15%) s (15%) R.D. (Rodat-Despoix and Delmas 2009) In contrast, the principal activities of the juxtamedullary nephron are urine concentration and dilution by countercurrent machinery as the urine moves around large loops of henle (Chmielewski 2003).

Auto control maintains a virtually constant pressure within Bowman's capsules of 80 to 180 mm Hg. Glial blood flow is inhibited when the afferent arterioles are constricted by high pressure. Lower pressures cause the arterioles to widen, increasing the amount of blood flowing to the kidneys (Figure 2.3). Solutes and fluids are filtered and excreted at a nearly constant rate thanks to this procedure .

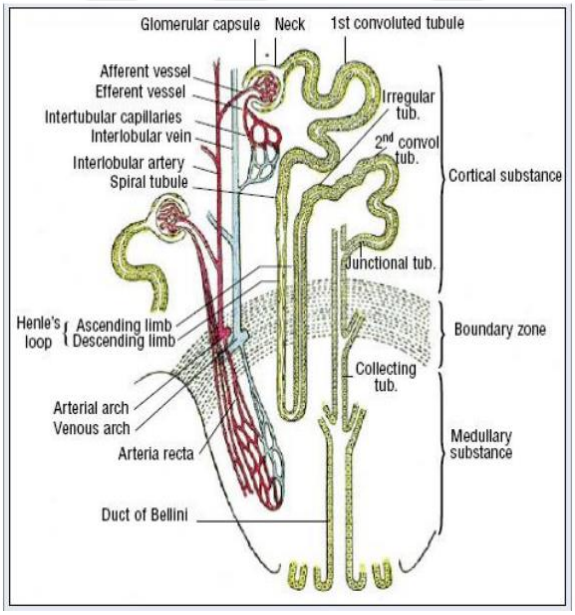


Figure 2.2 The nephron structure (Gray 2009).

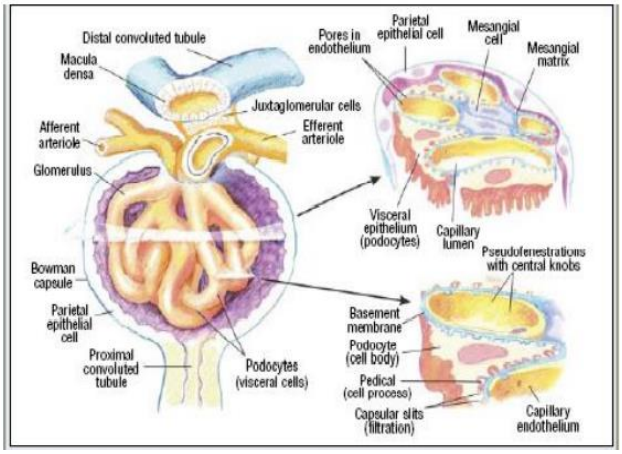


Figure 2.3 Bowman's capsule and glomerular apparatus (Chmielewski 2003).

2.2 Functions of Kidney

Aside from removing toxins and wastes, the kidneys also control fluid, acid-base, and electrolyte balance. In the process of removing wastes and extra water from the circulation, the kidneys perform an important function (Hamed and ElMelegy, 2010). Analysis of ingested nutrients, active tissues, and other compounds are among the waste products generated by regular metabolic activities. One of the kidney's most important functions is to regulate the blood levels of various important minerals such as salt and potassium. As well as producing erythropoietin and renin, kidneys are also responsible for producing the active form of vitamin D, which is essential for a healthy body (Gekle 2017).

2.3 Renal Failure

To put it another way, renal failure means that urine cannot be excreted by the kidneys and hence nitrogenous waste products build up in the bloodstream. The following are the functions of the kidney:

- Control of electrolyte and fluid volume.
- Nitrogenous waste excretion.

- Exogenous chemicals, such as many medications, may be eliminated.
- For example, the production of the hormone erythropoietin.
- Insulin, a low-molecular-weight protein, is metabolized (Pannu *et al.* 2008).

2.3.1 Types of renal failure

There are two types of renal failure;

1- Acute renal failure (ARF)

Chronic renal failure (CKD) is the most common cause of acute renal failure, and it is typically treatable. When a patient's creatinine level rises by 0.3 mg/dL in 48 hours, or when the creatinine level rises by 1.5 times its baseline level in the past seven days, they are diagnosed with acute kidney injury (AKI). This is according to the Kidney Disease Improving Global Outcomes guidelines (Chertow *et al.* 2005). When used to refer to a variety of conditions ranging from mildly elevated serum creatinine to overt renal failure, AKI has lately replaced ARF as the standard terminology. (Luo *et al.* 2014).

2- Chronic renal failure (CRF)

Chronic kidney disease (CKD) is defined by the American Society of Nephrology as having renal impairment or an eGFR of less than 60 ml/min, regardless of the etiology (Boriani *et al.* 2015). Renal failure is a gradual decrease of kidney function that eventually requires renal transplantation (dialysis or transplantation). GFR was used by the Kidney Disease Improving Global Outcomes (KDIGO) in 2012 to divide CKD into six distinct groups (G1 to G5 with G3 split into 3a and 3b). Stages of CKD are divided into subgroups based on the urine albumin-creatinine ratio in the early morning, which may be measured in either milligrams per gram or millimoles per mole (Isakova *et al.* 2017).

Among the six categories are:

- G1: GFR of 90 or more ml/min per 1.73 m2,
- G2: GFR of 60 or more,
- G3a: GFR of 45 to 59,
- G3b: GFR of 30 to 44,
- G4: GFR of 15 to 29 ml/min, and
- G5: A GFR of less than 15 ml/min per 1.73 m2 or dialysis treatment is required.

The albumin-creatinine ratio is one of three degrees of albuminuria (ACR)

- If your ACR is below 30 mg/gm (3.4 mg/mmol), you are considered to be in the normal range.
- If you're in this range, you're in the A2 category.
- If your ACR exceeds 300 mg/gm (34 mg/mmol), you're classified as A3.

Prognostic indicators associated to decreasing kidney function and increasing albuminuria have been identified because to the enhanced categorization of CKD Overdiagnosis of CKD, particularly in the elderly, is a risk of using categorization systems.

Stages three and four are referred to as uremia because of the emergence of organ failure (Hamza *et al.* 2020). CRF is characterized by the buildup of nitrogenous waste, known as azotemia, which may occur at any stage, although blood urea remains the primary indicator of renal failure (Figure 2.4). As the illness progresses, the symptoms of CRF begin to emerge, but they don't become visible until the disease has progressed far enough. Because of the kidneys' incredible capacity to compensate (Sarnak *et al.* 2005) The surviving nephrons develop functional and structural hypertrophy when kidney tissues are harmed. Renal failure symptoms are only visible after the few surviving nephrons have been destroyed (Vanholder *et al.* 2008).

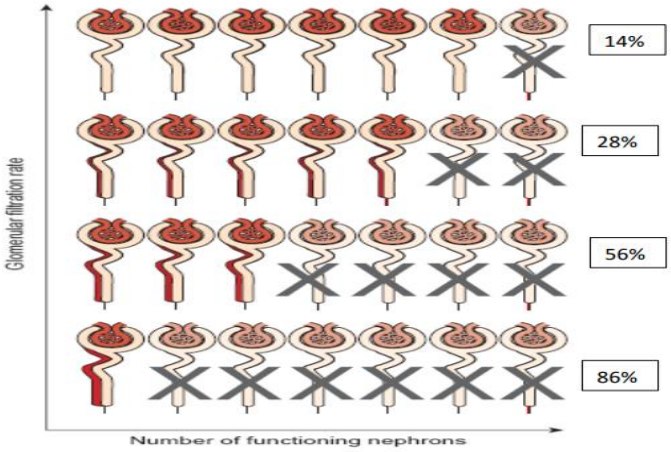


Figure 2.4 Relation of renal function and nephron mass (Vanholder *et al.* 2008).

Glycolysis rates in rats are directly related to how many renal cells have been damaged by a disease.

2.4 Etiology

The most frequent main illnesses that cause chronic kidney disease (CKD) and eventually end-stage renal disease (ESRD) differ everywhere.

- As an example, Diabetic nephropathy (30 percent to 50 percent)
- Type 1 diabetes is the most common kind (3.9 percent)
- The presence of high blood pressure (27.2 percent)
- Primary glomerular nephritis (8.2 percent)
- Nephritis of the urinary tract (3.6 percent)
- Illnesses that run in families or cysts (3.1 percent)
- Vasculitis or secondary glomerulonephritis (2.1 percent)
- Dyscrasias or neoplasms of the plasma cells (2.1)

Americans with end-stage renal disease suffer from fewer than 1% of all cases of Sickle Cell Nephropathy (SCN) States. A condition that affects the arteries, glomeruli, or

tubules-interstitium of the kidneys) disease processes may cause CKD, as can postrenal (obstructive).

Before renal insufficiency there is an increased chance of many episodes of intrinsic kidney injury such acute tubular necrosis in patients with chronic heart failure or cirrhosis, if they have persistent prerenal disease (ATN). As a consequence, renal function deteriorates with time (Singer *et al.* 2011).

Intrinsic renal vascular disease neosclerosis is the most frequent chronic renal vascular disease, which affects the blood vessels, glomeruli and tubular interstitial tissue in the kidney. In addition to atherosclerosis and fibro-muscular dysplasia, renal artery stenosis may produce ischemia in which the kidneys get damaged over a period of months or years, resulting in glomerular and tubulointerstitial fibrosis (Textor 2004).

Glomerular Disease • Intrinsic Disease (Nephritic or Nephrotic) blood cell (RBC) casts, dysmorphic red cells, and occasionally white blood cells (WBCs) are seen in the urine microscopy of patients with nephritis. (protein excretion from the kidneys) (Kitamoto *et al.* 1993). Shunt nephropathy, infective endocarditis, post-streptococcal Glomerulonephritis (GN), immunoglobulin A (IgA) nephropathia, lupus nephritis, Goodpasture syndrome and vasculitis are among the more prevalent causes (Khanna 2011).

Inactive urine microscopic examination with few cells or casts and proteinuria in the nephrotic range (greater than 3.5 gm per 24 hours) both indicate nephrotic syndrome. This condition is usually brought on by a variety of conditions, including minimum change disease, glomerulosclerosis, membranous GN, membranoproliferative GN, nephropathy as a result of diabetes and amyloidosis.

One or all of these categories may be ascribed to a patient. Internal tubular and interstitial disease a chronic tubulointerstitial disorder known as polycystic kidney disease is the most common (PKD). Sjogren's syndrome, nephrocalcinosis, sarcoidosis,

and reflux nephropathy may all be contributing factors in children and adolescents. Mesoamerican nephropathy, a condition affecting a large number of Central American and Southeast Asian farm laborers, is becoming more recognized (Madero *et al.* 2017).

B-postrenal (obstructive nephropathy) a frequent cause of chronic ureteral blockage is prostatic illness, abdomino-pelvic tumors that press on the ureter massively are known as nephrolithiasis (s). Chronic ureteral blockage due to retroperitoneal fibrosis is very unusual (Farrar 2018).

2.5 Pathophysiology of CKD

The genesis of CKD may be traced back to changes in renal pathophysiology. Nephron dysfunction persists for more than three months in patients with CKD, resulting in irreversible renal damage. Sclerosis develops in the remaining nephrons due to these abnormalities in renal function. CKD advances and causes azotemia (Diaconescu *et al.* 2018). Fluid retention, excessive weight gain, and uremia are further pathophysiological changes. There is a buildup of products that alter protein metabolism and a loss of renal function that causes electrolyte and fluid imbalances in uremia, according to the American Nephrology Nurses' Association in 2011. Weight loss, vomiting, nausea, anorexia and muscular cramps are all symptoms of uremia (Kaltsatou *et al.* 2015). Since left ventricular hypertrophy and malnutrition are both associated with uremia, it's no surprise that this condition commonly leads to problems with other organ systems (Tonelli *et al.* 2016).

2.6 Chronic Kidney Disease Management

CKD treatment aims to stop and prevent additional kidney damage, which is the primary objective. Symptom and sign management, as well as steps to reduce complications and delay the progression of the illness, were common treatments (Fassett *et al.* 2011).

2.6.1 Conservative Management

Hyperkalemia, anemia, fluid balance, acidosis correction, and calcium/phosphorus metabolism and blood pressure regulation are all addressed in conservative therapy of End-stage renal disease (ESRD) (Burns and Davenport 2010). Dietary changes may be useful in extending life expectancy and lowering symptoms. To enhance quality of life in the latter stages of illness, palliative care and customized symptom management are essential (Fassett *et al.* 2011). As stated before, r-Hu EPO may be used to cure anemia. As of now, r-Hu EPO has been demonstrated to be very successful in improving anemia in CKD patients, demonstrating that EPO deficiency is the primary cause of anemia in all renal failure patients. The major reason of resistance to r-Hu EPO is an inadequate response due to iron deficiency (Coyne *et al.* 2017). Calcium-phosphorus balance must be closely monitored, where phosphate-retaining anti-acids and calcium or vitamin D supplements may be required to maintain this balance in order to prevent probable uremic osteodystrophy and subsequent hyperparathyroidism (Webster *et al.* 2017). When treating hypertension, an ACE inhibitor (which slows the progression of kidney disease and lowers the excretion of urine protein) was necessary (Julie 2010).

2.6.2 Hemodialysis Management

When the kidneys are unable to efficiently purge the blood of waste and extra fluid, hemodialysis (HD) is used. Afterwards, a blood artery returns the dialyzer-generated waste to the body after it has been processed intravenously. Dialysate solution and an extracorporeal semi permeable membrane are exposed to blood during the hemodialysis (HD) session. The major processes manage of molecules include diffusion and ultrafiltration (Himmelfarb and Ikizler 2010). (Himmelfarb and Ikizler 2010). To say that a solute is diffusing means that it moves from a region of greater concentration to a region of lower concentration via a semi-permeable barrier. For this transfer to occur, the particle size of the molecule must be smaller than the pore size of the membrane. Ultrafiltration is the process of removing plasma water from the dialysis membrane by creating a negative transmembrane pressure (Figure 2.5). During a dialysis session, the blood is pumped and diffused several times, removing waste and extra fluid with each

cycle. Three or more HD sessions a week are common, lasting at least four hours each time. Prevention of renal failure is a primary goal of therapy for CRF patients (Tonkin-Crine *et al.* 2015). An arteriovenous fistula or catheter is used to draw blood from a single vein, which is then sent via tubes to a filter connected to a machine during an HD session. This filter can remove excess water, minerals, and waste from the blood. Afterward, the blood is filtered and returned to the patient in a clean state (See Figure (5) for an example) (Evangelidis *et al.* 2017).

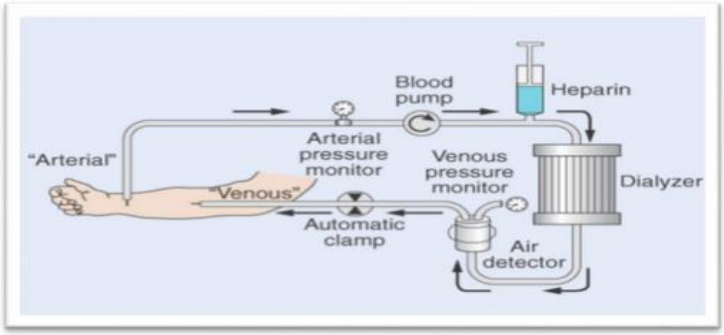


Figure 2.5 Blood circuit for hemodialysis. (Pecoits-Filho *et al.* 2003).

2.6.3 Kidney transplantation

The therapy of choice for patients with end-stage renal disease (ESRD) is Transplantation of a kidney End-stage renal disease patients (ESRD) should consider kidney transplantation as an option for a healthy and productive life. After a period of 2-6 months, many transplant recipients are able to return to work (Garcia *et al.* 2012).

2.7 Diagnosis

2.7.1 Establishing chronicity

When a patient's eGFR drops below 60 ml/min/1.73m, it's critical to review previous blood and urine test results and their medical history to see whether they have AKI or CKD that has gone undiagnosed.

2.7.2 Assessment of glomerular filtration rate

The distinction between AKI and CKD should be confirmed by repeating the renal function tests within two weeks after the first diagnosis of low eGFR 60 ml/min/1.73 m. Chronic renal failure (CKD) is proven if prior tests show that a low eGFR level is persistent, or if blood tests taken over a period of three months show a consistent pattern. In cases when creatinine eGFR is known to be inaccurate, alternative indicators such as The cystatin-c test or an isotope-clearance test may be employed (Thomas and Thomas 2009).

2.7.3 Detection of proteinuria in urine

A urine sample should be collected early in the morning, and the albumin-creatinine ratio should be calculated, as per KDIGO recommendations (ACR). A1 through A3 are the new grades for albuminuria, replacing microalbuminuria (Fuhrman *et al.* 2017). Specific illnesses may benefit from PCR (urine protein-creatinine ratio) in persons who excrete proteins other than albumin (Methven *et al.* 2011).

2.7.4 In vivo imaging of the kidney

The presence of many cysts or scarring, as well as small, thin kidneys with diminished cortical thickness, indicates a long-term issue with renal health. This test may also detect kidney cysts in ADPKD and chronic hydronephrosis caused by obstructive uropathy, two conditions that are associated with autosomal dominant polycystic kidney disease (ADPKD). In terms of research, I'm not a fan (Pei and colleagues 2015).

- Ultrasound of the kidneys Using Doppler to measure renal vascular flow in patients with suspected renal artery stenosis is possible.
- Renal Stone Disease may be diagnosed with a low dosage of non-contrast Computed Tomography (CT). It may also be used to rule out ureteric blockage when ultrasonography fails to reveal it.

- When many aneurysms and uneven zones of constriction are present, renal angiography is useful in the diagnosis of polyarteritis nodosa.
- In cases when recurrent vesicourethral reflux is considered to be the cause of CKD, voiding cystourethrography is used. Diagnostic and prognostic purposes are served by this test.
- Anatomical and functional data about the kidneys may be obtained via renal scans. They're more often used on compared to a CT scan, as they expose patients to less radiation. It is possible to assess the difference in the kidneys' functions by using radionuclide renal scans (Taylor *et al.* 1988).

2.8 CKD Progression Risk Factors

2.8.1 CHD risk factors that cannot be modified

African Americans, Afro-Caribbeans, Hispanics, and Asians (South and Pacific) all have an adverse effect on the progression of chronic renal disease (CKD). Different kidney disorders have genetic variables that influence the course of CKD (Luttropp *et al.* 2009).

2.8.2 Risk factors for chronic kidney disease (CKD)

Hypertension, proteinuria, and metabolic markers all occur together in one person with systemic disease are only a few of the possibilities (Levey and Coresh 2012). Hypertension is the second largest cause of end-stage renal disease (ESRD) in the United States, behind only diabetes. Hypertension in the glomerular capillary beds is thought to be linked to the advancement of glomerulosclerosis in patients with hypertension in their systemic capillaries (Schmieder *et al.* 2018). A method for monitoring blood pressure throughout the night and during the day and night An ABPM is most closely associated with the development of CKD, according to the research. When it comes to chronic kidney disease (CKD) development, it seems that high blood pressure is more predictive than low blood pressure. Proteinuria (albuminuria A3) is

connected with an increased risk of developing chronic kidney disease (CKD) in people with both diabetes and non-diabetic kidney disease (Persson and Rossing 2018). Studies have established a connection between obesity and smoking and chronic renal disease, both of which are associated with an increased risk of kidney failure. Insulin resistance, dyslipidemia, and hyperuricemia are just a few of the metabolic issues that have been linked to chronic kidney disease (Johnson *et al.* 2013).

2.9 Complications

The following are some examples of this: Aldosterone production is reduced in oliguric individuals, which may lead to hyperkalemia in patients with CKD. Hyperkalemia may be caused by a combination of dietary potassium intake, tissue breakdown, and hypoaldosteronism. Hyperkalemia may also be caused by medications such ACE inhibitors and nonselective beta-blockers (Lepage *et al.* 2015).

The following are some examples of this: In advanced renal disease, the increased propensity of the kidneys to retain H causes metabolic acidosis, a frequent consequence. Osteopenia, increased protein catabolism, and secondary hyperparathyroidism are all possible outcomes of chronic metabolic acidosis in CKD (Raphael 2019).

As the severity of kidney disease (CKD) grows, so does the risk of cardiovascular disease (CVD). Many studies have shown a link between CKD patients' EAT thickness and their risk of cardiovascular disease (CVD). In individuals with chronic kidney disease (CKD), EAT evaluation might serve as a reliable indicator of cardiovascular risk.

Phosphorus overload is a common side effect of chronic kidney disease because of a decreased ability to filter it out of the bloodstream. This produces secondary hyperparathyroidism as a result of an increase in the production of the Parathyroid hormone (PTH). Despite the loss of bone, phosphorus and calcium levels are normalized. The eventual result of this is renal osteodystrophy. To treat secondary

hyperparathyroidism, phosphate binders and a phosphorus-restricted diet are utilized (Vervloet and Ballegooijen 2018).

The following are some examples of this: In CKD, hypertension is a symptom of the disease's volume increase. The presence of edema in patients with CKD does not necessarily indicate a volume increase. All patients with chronic kidney disease should be given a loop diuretic to control their blood pressure, which must be titrated before an increase in antihypertensive medication may be considered.

It's important to note that A normocytic normochromic anemia often characterizes CKD anemia. It is mostly due to a decreased generation of erythropoietin and a decreased survival of red blood cells. Patients with kidney disease stage 3 or above should have their hemoglobin levels examined at least once per year; these levels should be monitored every six months for patients with stages IV and V of the disease; and these levels should be evaluated every three months for those undergoing dialysis. Iron saturation must be a ferritin level more than 200 ng/mL, and a minimum of 25% for erythropoietin stimulating drugs (ESA) to be evaluated in CKD patients with Hb less than 10. Patients undergoing dialysis should aim for a Hb concentration of between 10 and 11.5 gm/dl (Bonomini *et al.* 2016).

Anorexia and a lack of protein intake contribute to malnutrition in patients with end-stage renal disease (ESRD). ESRD patients need a daily caloric intake of 30 to 35 kcal/kg at the very least. Malnutrition is indicated by a low plasma albumin content (Zha and Qian 2017).

The following are some examples of this: Impaired platelet function may cause uremic bleeding as a side effect. As a consequence, the bleeding takes longer to stop. Non-symptomatic patients get no treatment. However, surgical intervention is required to address uremic platelet dysfunction when there is ongoing bleeding. Cryoprecipitate, desmopressin (DDAVP), estrogen, and the start of dialysis are all examples of interventions (Hedges *et al.* 2007).

Examples of this include the following: Infections of the central nervous system (CNS), neuromuscular disease, epilepsy, and cancer are only a few of the many possibilities. Post-transplant lymphoproliferative condition (post-transplant infection), mucosal damage, ulceration, perforation, biliary tract sickness (pancreatitis), and diverticular disease are all examples of gastro-intestinal (GI) disorders. (Arnold *et al.* 2016).

2.10 Relation Renal Failure with Biochemical Parameters

2.10.1 Renal functions parameters

A-urea the molecular weight of urea is 60 g/mol, making it a tiny water-soluble molecule. It includes two atoms of nitrogen and is the last product of protein and nitrogen breakdown. The blood of uremic patients has the greatest quantity of urea As of 2009, the authors (Almeras and Argilés 2009) have stated. It is possible to express the serum urea content in terms of molar or mass concentrations. In either case, the nitrogen equivalents (BUN) of the urea molecule may be used. are used to calculate serum urea mass concentration at a 60/28 ratio. Unwanted by-product BUN is classified as an NPN (non-protein nitrogenous). Ammonia is produced by deaminating amino acids that are released during the breakdown of proteins. The liver enzymes subsequently turn the ammonia into urea. Consequently, protein ingestion, the body's capacity to break down protein, and the kidneys' ability to expel urea all have an impact on the concentration of urine. (Salazar 2014). Urea is responsible for up to 80% to 90% of the NPNs expelled from the body. Renal function may be assessed using urea since urea excretion is a key component of the renal system. A high-protein diet or reduced renal excretion may both cause a rise in BUN (Celleno 2018).

B-creatinine the breakdown of creatine and phosphocreatine produces creatinine, which is likewise a waste product of the NPN and serves as an indication of renal function (Norris *et al.* 2018). In the liver, pancreas, and kidneys, the amino acids arginine, glycine, and methionine are transaminated to create creatine. Phosphorylation in skeletal muscle and the brain turns creatine into phosphocreatine, which is subsequently transported throughout the body. Creatine is found mostly in muscle tissue. Thus, the

patient's muscle mass influences the concentration of creatinine in the plasma. CREATININE, rather than BUN, is a better indicator of kidney health since it is less affected by food consumption than does BUN As of 2017, (Renda).

Increased blood glucose levels have been linked to an increase in urea and creatinine levels in diabetic individuals The next year, (Kamal 2014). Chronic kidney disease (CKD) is most often brought on by diabetes, and roughly 40% of diabetic people acquire diabetic kidney disease (DKD). Diabetic-induced metabolic alterations result in glomerular hypertrophy, glomerulosclerosis, tubulointerstitial inflammation, and fibrosis in the kidneys. As a result, the risk of developing and progressing DKD remains high (Alicic *et al.* 2017).

C-uric acid exogenous purines, predominantly from animal proteins, are the primary source of uric acid production and in the endothelium of blood vessels and other organs such as the liver and intestines. In addition, both living and dying cells breakdown their nucleosides in nucleic acids, adenine and guanine, generating uric acid (Maiuolo et al., 2016). as much of our everyday uric acid excretion is carried out by our kidneys. Uric acid cannot be converted to the more soluble allantoin in humans owing to the absence of the uricase enzyme in our bodies. One-third of the uric acid generated in humans is excreted through the gastrointestinal system, while the other two-thirds is removed by the kidneys, making their involvement in serum uric acid control critical. 90% of uric acid excreted in urine is returned to the bloodstream through the proximal tubules, where it is reabsorbed and secreted llamas in the original language (Maiuolo *et al.* 2016).

D-albumin because it accounts for almost half of all the protein in the blood, human albumin (HA) is the most prevalent circulating protein in healthy persons (3.5–5 g/dL). HA is a tiny globular protein (molecular weight: 66.5 kDa), consisting of a single chain of 585 amino. About 10–15 grams of HA is created in the liver every single day by the hepatocytes, but there is no or extremely little intracellular storage of it. Interleukin-6 and tumor necrosis factor- suppress its production whereas hormones such as insulin, cortisol and growth hormone increase it. (Evans 2002) 30-40 percent of the injected

dose is kept in circulation, while the rest is deposited into interstitial fluid (1.4 g/dL), where its concentration is low. A healthy young adult's HA half-life ranges from 12 to 19 days. HA can be catabolized in many tissues, but mainly in the muscles, liver and kidneys (Garcia-Martinez *et al.* 2013).

People who suffer from chronic kidney disease (CKD) and have high levels of serum albumin have a greater chance of dying. Serum albumin has only been explored as a risk factor for the development of ESRD in a small number of investigations. Serum albumin levels were discovered to be an important part of a multivariable mortality risk model with end-stage renal disease (ESRD) by Wagner et al., 2011. Rapid eGFR decline and the development of chronic kidney disease (CKD) are linked to decreased serum albumin concentrations. Albuminuria is a biomarker of inflammation, as are demographics and clinical variables that contribute to the course of kidney disease. (Lang *et al.* 2018).

E-total protein amino acid and protein metabolism, including the breakdown and excretion of protein metabolites, is heavily dependent on the kidney's ability to digest and excrete protein metabolites. Patients with renal insufficiency may benefit from a low protein diet (LPD) since it reduces the risk of kidney damage and the buildup of harmful protein metabolites. It's unclear how much LPD cares about treating chronic renal disease. Renal function and kidney health are significantly altered by a high protein diet, which is often described as consuming >1.2 grams of dietary protein per kilogram of body weight per day (g/kg/day) (Kalantar-Zadeh et al., 2016). To the contrary of fat and carbohydrate-rich diets, a higher protein intake modulates kidney hemodynamic by increasing renal blood flow and elevating intraglomerular pressure, leading to an increased GFR (also known as glomerular hyperfiltration) and a more efficient excretion of protein-derived nitrogenous waste products (Fouque and Aparicio 2007). Increasing urine albumin excretion as a result of glomerular hyperfiltration in combination with a high protein diet might harm kidneys and other organs over the long run (Kalantar-Zadeh *et al.* 2016).

2.10.2 Lipid profile

A-cholesterols all of the steroid hormones, as well as cholesterol esters, vitamin D, and bile acids, are precursors to cholesterol in the cell's plasma membrane. Total cholesterol is made up of free cholesterol and cholesterol esters, and serum cholesterol is created in the liver and obtained from the food. The bile is the primary means by which the body rids itself of cholesterol. HDL particles may receive cholesterol from peripheral cells, such as macrophage membranes. Cholesterol measures can support evidence in certain disorders (Guerin, 2017). Total cholesterol, which includes LDL, HDL, and VLDL cholesterol, is linked to the development of atherosclerosis. Atherosclerosis is linked to high levels of plasma cholesterol (Levine and Keaney 1995). As a result, cholesterol levels in CKD patients may not have the same relationship to CVD as in people without kidney disease, but statins have been shown to reduce cardiovascular event risk in non-dialysis-dependent CKD patients, even though the benefits are diminished in comparison to people without kidney disease and appear more uncertain as CKD progresses (Rysz *et al.* 2015).

B-triglyceride (TG) For example, during famine, a stored energy source may be mobilized by the production of Triglyceride (Triacylglycerol) in the liver and adipose tissue (endogenous Triglyceride). Endogenous TG circulates in VLDL produced from the liver, while exogenous TG is carried in intestinal chylomicron (Lewis *et al.* 2015). Triglyceride levels in the blood have been related to sickness in humans. Low HDL-cholesterol and large, dense LDL-cholesterol particles have also been shown to be associated to high blood triglyceride levels. The development of atherosclerosis has been related to both disorders (Schwartz *et al.* 2015). Hypertriglyceridemia (HTG), sometimes known as the metabolic syndrome, is characterized by insulin resistance, obesity, and Type 2 diabetes mellitus. VLDL secretion is elevated in this milieu, and this is exacerbated by high FA and insulin levels (Xiao *et al.* 2016). According to this study, high triglycerides are one of the most prevalent aberrant lipids in CKD patients (Ritz and Wanner 2006). These individuals' LDL and HDL particles had higher triglyceride-to-cholesterol ratios as well. Because of the presence of atherosclerosis-inducing chylomicron fragments in the bloodstream, elevated serum triglyceride levels

are a good indicator of this condition. A lipoprotein lipase-catalyzed breakdown of lipids converts triglyceride-rich VLDL to intermediate-density lipoprotein (IDL). Increased levels of apolipoprotein (Apo)-CIII, a competitive inhibitor of LPL function, and decreasing levels of endothelium-bound LPL produce an increase in triglyceride-rich lipoproteins like VLDL in chronic kidney disease (CKD) (Ginsberg *et al.* 1986).

C- high-density lipoprotein-cholesterol (HDL-C) High-density lipoproteins (HDL) are the most complicated kind of lipoprotein (HDL). Several subtypes of HDL exist, each with its unique characteristics such as size, protein and lipid content, physiological function, and potential for disease. Research on HDLs has shown a number of functions that might explain why high HDL-cholesterol is linked to a decreased risk of coronary heart disease. Potential antiatherogenic and endothelial cell-protective properties of HDL have been shown in animal studies. Cholesterol may be transported from peripheral cells to the liver or steroidogenesis organs such as the adrenal, ovarian, and testicles for steroid hormone production, therefore protecting against cardiovascular disease (Brewer et al., 2004). Atherogenesis is intimately linked to aberrant and diminished vasoprotective properties of HDL, which in turn raises a person's overall cardiovascular risk (Honda *et al.* 2017). Ischemic heart disease symptoms are negatively associated to HDL-cholesterol levels in the blood, according to research (Barter et al., 2007). HDL levels are often lower in patients with CKD, particularly those on dialysis, in part because of a slowing of HDL maturation, which is connected to reduced apolipoprotein and Licking County Area Transportation Study LCATs levels and its erroneous post-translational modification (Riwanto *et al.* 2015). As a result, HDL concentrations in CKD patients are lower, as is the pace at which triglyceride-rich lipoproteins are broken down by the liver, as well as the increased activity of CETP (Vaziri 2010).

D-low density lipoprotein- cholesterol (LDL-Cholesterol) Cholesterol is transported throughout the body via low-density lipoprotein-cholesterol, or LDL-cholesterol, which is a form of fat that circulates in the blood and deposits it in artery walls. LDL-Cholesterol transports Cholesterol from the circulation to the peripheral tissue, where it may be used for membrane or hormone production or stored for future use.

Consequently In order to move through the hydrophilic circulation, lipids such as cholesterol and triglycerides must be protein-bound. Lipids of this sort are thought to be dangerous because they carry substantial amounts of cholesterol. As a result of this lipoprotein's decreased density, it attaches more readily to the blood vessel wall, speeding up the onset of atherosclerosis. For both primary and secondary CVD prevention, long-term reduction of LDL-cholesterol (LDL-C) has obvious established benefits, with data showing that early statin treatment not only accomplishes CVD protection but also gives a survival advantage. According to recent studies on cholesterol lowering, these advantages seem to be tied to the extent of LDL-C decrease, rather than the statins' pleiotropic effects (Mihaylova *et al.* 2012).

E-very low -density lipoprotein-cholesterol (VLDL-C) The liver produces these triglyceride-rich particles. TG is transported from the liver to other tissues via VLDL, a kind of triglyceride carrier. VLDL particles may vary in size based on the amount of triglyceride they contain, much like chylomicrons. Large VLDL particles are released when triglyceride synthesis in the liver is enhanced. VLDL particles, on the other hand, are much smaller than chylomicrons. VLDL is made from apolipoprotein and triacylglycerol, which are formed in the liver when the body has too much cholesterol or fat. Triacylglycerol may also be formed from excess carbs and delivered as VLDL. Triacylglycerol in VLDL and chylomicron are broken down into free fatty acids in the presence of lipoprotein lipase (LPL), which is activated. This process converts VLDL to IDL in the tissues. As CKD progresses, the composition and characteristics of lipoproteins change, reducing the beneficial effect of HDL on VLDL lipolysis efficiency. In CKD patients, HDL deficiency and dysfunction can directly affect hypertriglyceridemia development (Ćwiklińska *et al.* 2018).

2.10.3 Alkaline phosphatase (ALP)

The hydrolysis of organic phosphate esters in the extracellular space is catalyzed by a set of isoenzymes called alkaline phosphatases, which are found on the cell membrane's outer layer. This enzyme requires zinc and magnesium as co-factors. Alkaline phosphatases are real isoenzymes, despite the fact that they are found in a variety of

tissues and have varied physiochemical characteristics. The hepatocyte canalicular membrane contains cytosolic alkaline phosphatase. The placenta, ileal mucosa, kidney, bone, and liver all have decreasing quantities of alkaline phosphatase. There is more than 80% of serum alkaline phosphatase secreted by the liver (and bone) and intestines. In spite of their widespread distribution throughout the body, little is known about the precise physiological function of alkaline phosphatases (Pinart *et al.* 2020).

Tissue-specific and tissue-independent alkaline phosphatases exist. Only tissues expressing them under physiological circumstances have them, which means you won't find them anywhere else. They may also contribute to the circulating pool of serum alkaline phosphatase in certain instances when their production is heightened. It is clinically important to study tissue-nonspecific alkaline phosphatases since they make up the majority of the serum fraction circulating in the blood. In the liver, bone, and the kidneys, it is expressed by a single gene, which is encoded by this one gene. a distinct gene codes for intestinal alkaline phosphatase than for placental alkaline phosphatase or the Regan isoenzyme (produced in excess amounts in Hodgkin lymphoma). Despite the fact that their amino acid sequences are identical, the side chains of tissue-nonspecific alkaline phosphatases vary significantly (Castells *et al.* 2018).

A growing body of research suggests that ALP may serve as a new biomarker for cardiovascular disease (CVD). High levels of ALP have been linked to an elevated risk of cardiovascular disease (CVD) and all-cause mortality in multiple investigations of people with chronic kidney disease (CKD) (Drechsler *et al.* 2011). An elevated risk of renal disease progression is also linked to high ALP readings in a diverse group of individuals with CKD stages 3-4. (Taliercio *et al.* 2013). The general population and patients with coronary artery disease (CAD) with maintained renal function have both shown that ALP is an independent predictor of mortality and cardiovascular events (Sciacqua *et al.* 2020).

2.10.4 Ghrelin hormone

Negative energy balance triggers the production of ghrelin, a stomach-derived peptide hormone, (Pre-proghrelin (117 amino acids) is mostly transformed into the 28-amino-acid hormone by stomach mucosal oxyntic gland cells. Additionally, ghrelin has been shown to be expressed in the pancreas, kidneys, lungs, heart and placenta (Kageyama *et al.* 2005).

To produce acyl ghrelin, the enzyme Ghrelin O- acyltransferase (GOAT) is found in the endoplasmic reticulum of ghrelin-producing cells, DAG (desacyl ghrelin) is acylated at position 3 after translation because of this. Gutierrez et al. assert the following: When released into the circulation, AG is rapidly converted to DAG, An AG/DAG of 0.01–0.4 compared to 2.5 in stomach tissue when both DAG and AG are present (Hassouna *et al.* 2014). More and more data shows that DAG is not simply a byproduct of AG synthesis, but also a distinct hormone that modifies or even opposes AG's actions. When peripherally administered AG is combined with DAG, the feeding response changes (Fernandez *et al.* 2016) Furthermore, and its effects on anxiety and other stress-related behaviors may possibly be different from those of AG. (Mahbod *et al.* 2018).

Growth hormone secretagogue receptor (GHSR) has two different transcripts, GHSR-1a and GHSR-1b, both of which binds to AG's N-terminus (McKee *et al.* 1997). One of seven Gq-protein-coupled receptors, the GHSR-1a is also known as the ghrelin receptor and has been shown to have constitutive activity. GHSR-1a (Holst *et al.* 2003). There is still a lack of knowledge about the physiological significance of the five-transmembrane domain GHSR-1b form, This might impede conformational changes, hence impairing GHSR function (zdemir *et al.* 2016). DAG, although it may be capable of binding and stabilizing an active conformation of Ghrelin, has a poor affinity for the GHSR and hence is not anticipated to have a significant effect on the pharmacological activity of AG. To put it another way: (Ferré and colleagues 2019). Multiple binding experiments suggest that distinct organs and the brain have their own DAG-specific receptor (Fernandez *et al.* 2016).

Anterior Pituitary, Adrenal and Thyroid Glands; Pancreatic Glands; and Heart all express the GHSR gene (Gnanapavan *et al.* 2002). It's still unclear what GHSR does in the brain and if it's accessible to circulating ghrelin (Perello *et al.* 2019). Not only is the ghrelin/GHSR system dependent on AG binding to its receptor, but it is also possible that fluctuations in the expression levels of GHSR have wide-ranging physiologic effects. There's no doubt about that.

Gastric hormone ghrelin. A receptor for growth hormone secretagogue is involved in ghrelin's physiologic actions (GHSR). Patients with CKD who are anorexic may benefit from ghrelin's positive effects on food intake and meal enjoyment. adiponectin and ghrelin are orexigenic hormones that regulate appetite in people with renal disease. Ghrelin and adiponectin were both elevated in patients on hemodialysis (HD), but adiponectin was the better indicator of nutritional condition with chronic kidney disease patients (CKD. (El-Khashab and Behiry 2019) In type 2 diabetes individuals, the plasma ghrelin level was shown to have no correlation with renal impairment. Therefore, the plasma ghrelin level in individuals with type 2 diabetes mellitus may not be a reliable indication of renal insufficiency (T2DM). Ghrelin and HDL were shown to have a positive link, whereas TG levels were found to have an inverse correlation (Rahimi *et al.* 2018). Apoptosis, oxidative stress, and the autophagic process in kidney tissue may be reduced by ghrelin in response to cadmium, according to (Salama *et al.* 2019).

3. MATERIALS AND METHODS

3.1 Instruments and Materials

3.1.1 Instruments

The devices below in Table were used for the purpose of conducting the tests related to the research under study Table 3.1.

Table 3.1 a list of devices

Hardware	Origin	the company
BS-120	China	Mindray
Centrifuge	Taiwan	Jimmy
ELISA washer	Germany	Human
ELISA reader	Germany	Human
Deep freeze- 20c	Turkey	Beco
Spectrophotometer	Japan	Olympus

3.1.2 Tools used

The tools below in Table were used for the purpose of conducting the tests related Table 3.2.

Table 3.2 a list of the tools used

Tools	Origin	The manufacture company
Medical syring	China	Meheco
Gel tube	Jordan	Affco

3.1.3 Laboratory kit

The solutions below were used in Table for the purpose of conducting the tests related to the research under study Table 3.3.

Table 3.3 List of laboratory equipments

Item	Company	Origin
Urea kit	Mindray	China
Creatinine kit	Mindray	China
Uric acid kit	Mindray	China
Albumin solution	Mindray	China
Total protein solution	Mindray	China
Cholesterol kit	Mindray	China
Triglyceride kit	Mindray	China
HDL kit	Mindray	China
LDL kit	Mindray	China
VLDL kit	Mindray	China
ALP kit	Mindray	China
Ghrelin kit	Shanghai	China

3.2 Working Methods

3.2.1 Collection of samples

A total of (60) blood samples were obtained from patients with renal failure who had been diagnosed by a specialist doctor at the Ibn Sina Dialysis Center at the Baquba Teaching Hospital in Baqubah, Diyala Governorate, between January 5, 2021, and October 27, 2021. The control group consisted of (40) samples of apparently healthy people of both sexes, with a total of (38) men and (22) women in the age range of (20-75) years. The men in the group numbered (21) and the women, 19, were all between the ages of (20-75) years and were free of any chronic or acute disease at the time of sample collection. Using plastic medical syringes, three milliliters of blood were extracted from the venous system. A collection of gel tubes was used to collect the blood for various blood tests, in small tubes at 20°C until required, the serum was divided into equal quantities (250 microliters) by a central mechanism and maintained at 3000 cycles per minute for five minutes.

3.3 Determination Methods of the Study Parameters

3.3.1 Determination of hormones

Ghrelin hormone a- principle of assay human Ghrelin may be measured with this kit using an enzyme-linked immune sorbent assay (ELISA), which makes use of biotin double antibody sandwich technology (GH). Work with pre-coated wells of Ghrelin(GH) monoclonal antibody to incubate before adding Ghrelin(GH). The immunological complex is formed by combining streptavidin-HRP with anti-GH antibodies tagged with biotin after incubation. Substrate A and B should be added after the enzymes have been removed and washed. Acid changes the color of the solution from blue to yellow. Human Ghrelin(GH) concentration and solution color have a positive correlation. b- materials supplied in the test kit Table 3.4.

Table 3.4 materials supplied in the test kit

Configuration	96 wells	48wells	Preservation
Instruction	1	1	
Membrane sealing plate	2	2	
Bag made of hermetic materials	1	1	
ELISA plate with coating	12-well*8tubes	12-well*4 tubes	2-8℃
12 and 8 nanograms per milliliter	0.5ml×1	0.5ml×1	2-8℃
Streptavidin-HRP	6ml×1	3ml×1	2-8℃
Alternative No. 1	6ml×1	3ml×1	2-8℃
The A chromogenic substance	6ml×1	3ml×1	2-8℃
The colorimetric substance B	6ml×1	3ml×1	2-8℃
Biotin-labeled anti-GH antibodies	1ml×1	1ml×1	2-8℃
A typical dilution	3ml×1	3ml×1	2-8℃
Dishwasher liquid	(20ml×30)×1	(20ml×20)×1	2-8℃

Assay procedure Solution diluting: One normal original concentration is included in this package. Following the chart below, users may dilute their own solution in tiny tubes Table 3.5 and Figure 3.1.

Table 3.5 Standard solution

6.4ng/mL	Standard No.5	120µlOriginal Standard+120µl Standard diluents
3.2ng/mL	Standard No.4	120µl Standard No.5 + 120µl Standard diluents
1.6ng/mL	Standard No.3	120µl Standard No.4 + 120µl Standard diluent
0.8ng/mL	Standard No.2	120µl Standard No.3 + 120µl Standard diluent
0.4ng/mL	Standard No.1	120µl Standard No.2 + 120µl Standard diluent

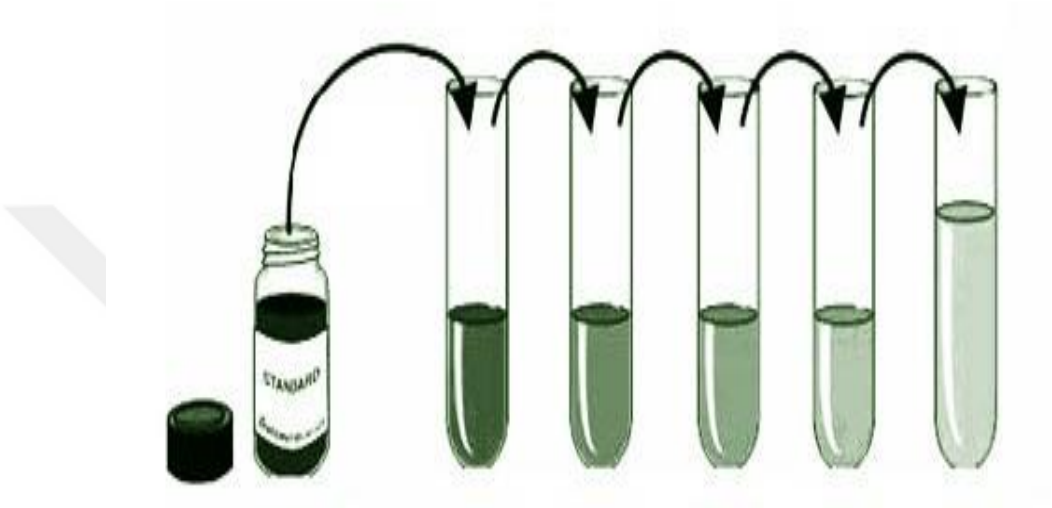


Figure 3.1 Standard solution No.5 No.4 No.3 No.2 No.1

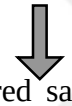
Based on the number of samples to be tested, the standards determine the number of stripes necessary. There should be many wells for each standard solution and for each blank well, to the extent practical. Injection of a sample: Step 1: There is no need to add any samples, anti-GH antibody tagged with biotin and streptavidin-HRP, or any other reagents. 2a) Add 50 l of standard solution and 50 l of streptomycin-HRP to the standard solution vial (Because of the standard's biotin antibodies, no additional biotin antibodies are needed. 3) Test sample well: Add 40 mL sample, 10 mL GH antibodies, and 50 mL streptavidin-HRP to the test well. Finally, apply a membrane sealant to the surface. Then give it a little stir. For 60 minutes, keep the temperature at 37°C. Dissolve the washing solution (30X) in distilled water and keep it in the refrigerator until you're ready to wash with it. Shake off any leftover residue by hand after removing the seal plate membrane and draining the liquid. Pour the washing solution into each well and let it sit for 30 seconds before draining. Blot the plate after five repetitions of the

operation. After adding 50 l of each of Chromogen Reagent A and B to each well, the color is developed. Then give it a little stir. Color will appear after 10 minutes of incubation at 37°C, away from light. Add 50 mL of Stop Solution to each well to halt the reaction (color changes from blue to yellow immediately at that moment).

When using a blank well, measure the absorbance (OD) in each well individually for 10 minutes after the stop solution has been added, using 450 nm. Calculate the standard curve's linear regression equation using the standard concentrations and related OD values. Calculate the concentration of the related sample using the OD values of the samples. It's possible to use statistical software.

Summary

Preparation of standards and reagents.



Prepared samples and standards, as well as second antibody tagged with biotin and ELISA solutions, should be added. At 37°C, allow the reaction 60 minutes to complete.

Five times, rinse the plate. Add A and B chromogen reagents. Color will begin to appear after 10 minutes of incubation at 37 °C.

Stop solution may be added.

Within ten minutes, get the OD value.

Calculate.

Calculate Standards should be the abscissa, while the OD value should be placed on the ordinate. The standard curve may be drawn on graph paper by simply following the directions below. Calculate the standard curve's linear regression equation based on the standard concentration and OD value, or identify the concentration corresponding to the

sample's OD value. Calculate concentration by substituting this OD value for your sample's concentration. Assay range：0.05ng/mL→10ng/mL. Sensitivity：0.01ng/mL.

3.3.2 Biochemical tests

UREA summary the breakdown of protein and aminophenols produces urea. Every day, an adult creates 16 g of urea. Uremic or azotemic diseases are those in which the blood contains excessive amounts of c-urea. To identify the cause of azotemia, urea and creatinine levels are measured simultaneously.. Renal perfusion is reduced (severe cardiac failure, for example) may produce prerenal azotemia while creatinine levels stay within reference limits, which can be caused by hunger, pyrexia, dehydration, accelerated protein catabolism, cortisol therapy or prerenal azotemia. When the urinary system is blocked, urea and creatinine levels increase, but urea rises more dramatically in postrenal azotemia Equation 3.1 and Equation 3.2.

Method urease-glutamate Dehydrogenase, UV method. Reaction Principle.

$$\text{Urea} + 2H_2O \xrightarrow{\text{Urease}} \text{Glycerol} + \text{free fatty acids} \quad (3.1)$$

$$\text{a-Oxoglutarate} + NH_4^+ + \text{NADH} \xrightarrow{\text{GLDH}} \text{L-Glutamate} + NAD^+ + H_2O \quad (3.2)$$

When urease hydrolyzes urea, it produces ammonia, which aids in the conversion of NADH to NAD through GLDH catalysis. The lower the urea content, the greater the reduction in absorbency Table 3.6.

Table 3.6 Procedure for testing

	Blank	Sample
Reagent 1	1000 µL	1000 µL
Wate Res.	15 µL	_
Sample	_	15 µL
A fter mixing, allow the mixture to incubate for two minutes. then add: 37 °C		
Reagent 2	250 µL	250 µL
Measure the absorbance change after five minutes of incubation at 37 degrees Celsius.		
ΔA=[ΔA sample]-[ΔA Blank]		

REAC. TYPE: Kinetic

UNIT: mg/dl

PRI. WAVE(nm): 340

SEC. WAVE(nm): 670

SAMPLE VOLUME (mL): 4.5

R1 (mL): 300

R2 (mL): 75

REAC. TIME FROM(min): 5

REAC. TIME TO(min): 12

Creatinine measurements are used to diagnose and treat renal diseases, monitor renal dialysis, and compute other urine analytes. Oxidase Method of Sarcosine Equation 3.3, Equation 3.4, Equation 3.5 and Equation 3.6.

$$\text{Creatinine} + H_2O \xrightarrow{\text{Ceeatininase}} \text{Creatine} \quad (3.3)$$

$$\text{Creatine} + H_2O \xrightarrow{\text{CRTase}} \text{Sarcosine} \quad (3.4)$$

$$\text{Sarcosine} + O_2 + H_2O \xrightarrow{\text{Sarcosine Oxidase}} \text{Glycin} + HCHO + H_2O_2 \quad (3.5)$$

$$2H_2O + \text{4-aminoantipyrine} + \text{ESPMT} \xrightarrow{\text{Catalase}} \text{Quinonimine} + 4H_2O_2 \quad (3.6)$$

Quinonimine's absorbance increase at 546 nm is closely related to creatinine content Table 3.7.

Table 3.7 Components and Concentrations of the Reagents.

	Blank	Sample
Reagent 1	1800 µL	1800 µL
Wate Res.	60 µL	_
Sample	_	60 µL
A fter mixing, allow the mixture to incubate for two minutes. then add: 37 °C		
Reagent 2	600 µL	600 µL
Take a reading of the absorbance of the mixture after 90 seconds of incubation at 37 degrees Celsius.		
ΔA=[ΔA sample]-[ΔA Blank]		

REAC. TYPE: ENDPOINT

UNIT: mg/dl

PRI. WAVE(nm): 546

SEC. WAVE(nm): 670

SAMPLE VOLUME (mL): 6

R1 (mL): 180

R2 (mL): 60

REAC. TIME FROM (min): -1

REAC. TIME TO (min): 17

INCUBATION TIME (min): 16

Uric acid as the last byproduct of purine metabolism, uric acid is produced in the liver and expelled by the kidneys. Urate crystals, or tophus, may develop around the joints as a result of hyperuricemia. Uric acid levels in the blood may also be high due to renal function illness; malnutrition; drug misuse; toxicosis; malignant tumor; and increased alcohol and urination and excretion problem. Hypouricemia is caused by genetic metabolic problems, renal illness, severe hepatic disease, and medication effects, among other factors. Peroxidase (POD) and uric acid (Uricase) methods Equation 3.7, Equation 3.8 and Equation 3.9.

$$\text{Ascorbic acid} + O_2 \xrightarrow{\text{Ascorbate Oxidase}} \text{dehydro-ascorbi} + H_2O \quad (3.7)$$

$$\text{Uric acid} + 2H_2O + O_2 \xrightarrow{\text{Uricase}} \text{Allantoin} + CO_2 + H_2O_2 \quad (3.8)$$

$$TOOS + 4\text{-}AAP + 2H_2O + H^+ \xrightarrow{POD} \text{Quinoneimine} + 4H_2O \quad (3.9)$$

Uric acid is oxidized to H2O2 by ascorbic oxidase, which removes ascorbic acid's interference, resulting in a brightly colored dye called quinoneimine. The reduction in absorption is related to the rise in uric acid concentration Table 3.8.

Table 3.8 The concentration of uric acid

	Blank	Sample
Reagent 1	1200 µL	1200 µL
Wate Res.	25 µL	_
Sample	_	25 µL
A fter mixing, allow the mixture to incubate for two minutes. then add: 37 °C		
Reagent 2	300 µL	300 µL
Measure the absorbance again 4–5 minutes later, when the mixture has been completely mixed at 37 ºC.		
ΔA=[ΔA sample]-[ΔA Blank]		

REAC. TYPE: ENDPOINT

UNIT: mg/dl

PRI. WAVE(nm): 546

SEC. WAVE(nm): 670

SAMPLE VOLUME (mL): 4

R1 (mL): 240

R2 (mL): 60

REAC. TIME FROM(min): -1

REAC. TIME TO(min): 17

Determination of lipid profile determination of triglyceride(TG) the natural lipid triglycerides are the most prevalent. Triacylglycerol, one glycerol and three fatty acids make up this plasma component. For early detection of atherosclerotic risk, classification of hyperlipoproteinemia, and monitoring the clinical impact of medications or a low-fat diet, triglyceride measurement is useful Diabetes, pancreatic illness, and liver and kidney disease are all often caused by abnormally high triglyceride levels. Glycerokinase Peroxidase- Peroxidase method Equation 3.10, Equation 3.11, Equation 3.12 and Equation 3.13.

$$\text{Triglycerides} + 3H_2O \xrightarrow{\text{Lipase}} \text{Glycerol} + \text{Fatty acids} \quad (3.10)$$

$$\text{Glycerol} + ATP \xrightarrow{GK} \text{Glycerol-3-phosphate} + ADP \quad (3.11)$$

$$\text{Glycerol-3-phosphate} + O_2 \xrightarrow{GPO} \text{Dihydroxyacetone phosphate} + H_2O_2 \quad (3.12)$$

$$H_2O_2 + \text{4-Aminoantipyrine} + \text{4-chlorophenol} \xrightarrow{POD} \text{Quinone imine} + HCL + 2H_2O \quad (3.13)$$

4-Aminoantipyrinel undergoes oxidation to create quinoneimine when catalyzed by lipase, GK, and GPD to produce H2O2. Triglyceride concentration is directly related to the growth in absorbency Table 3.9.

Table 3.9 The concentration of triglycerides

	Blank	Sample
Reagent 1	1000 µL	1000 µL
Wate Res.	10 µL	_
Sample	_	10 µL
Read the absorbance 10 minutes after mixing completely at 37 °C.		
ΔA=[ΔA sample]-[ΔA Blank]		

REAC. TYPE: ENDPOINT
UNIT: mg/dl
PRI. WAVE(nm): 510
SEC. WAVE(nm): 670
SAMPLE VOLUME (mL): 3
R1 (mL): 300
R2 (mL): -
REAC. TIME FROM(min): 0
REAC. TIME TO(min): 33

Precursor of hormones and bile acid production is found in cholesterol cell membranes and lipoproteins in the determination of cholesterol. Lipoprotein low-density distributes cholesterol throughout the body. In the clinic, total cholesterol levels may be used to catch atherosclerosis in its early stages, and the effects of drugs or a low-fat diet can be

monitored over time. Oxidase- peroxidase (CHOD-POD) method Equation 3.14, Equation 3.15 and Equation 3.16.

$$\text{Cholesterol ester} + H_2O \xrightarrow{CHE} \text{Cholesterol} + \text{Fatty acids} \quad (3.14)$$

$$\text{Cholesterol} + O_2 \xrightleftharpoons{CHO} \Delta\ 4\text{-Cholestenone} + H_2O_2 \quad (3.15)$$

$$2H_2O_2 + \text{4-Aminoantipyrine} + \text{Phenol} \xrightleftharpoons{POD} \text{Quinoneimine} + 4H_2O \quad (3.16)$$

Che and CHO catalyze the oxidation of Cholesterol ester to produce H2O2, which oxidizes4-Aminoantipyrine with phenol to produce a quinoneimine-colored dye. Increasing the concentration of cholesterol has a direct impact on the increase in absorbency Table 3.10.

Table 3.10 The concentration of cholesterol

	Blank	Sample
R	1000 µL	1000 µL
Dist. Water	10 µL	_
Sample	_	10 µL
Read the absorbance 10 minutes after mixing completely at 37 ºC.		
ΔA=[ΔA sample]-[ΔA Blank]		

REAC. TYPE: ENDPOINT
UNIT: mg/dl
SAMPLE VOLUME (mL): 3
PRI. WAVE (nm): 510
SEC. WAVE(nm): 670
R1 (mL): 300
R2 (mL): -
REAC. TIME FROM (min): 0
REAC. TIME TO (min): 17

High-density lipoprotein (HDL) the risk of coronary heart disease is inversely linked to HDL cholesterol levels. Heart disease may be directly linked to a low HDL/LDL cholesterol ratio. The longevity condition is connected with a high HDL cholesterol level Equation 3.17, Equation 3.18, Equation 3.19 and Equation 3.20.

$$\text{LDL,VLDL,Chylomicrons} \xrightleftharpoons{\text{CHE +CHO}} \text{Cholestenone} + H_2O_2 \quad (3.17)$$

$$2H_2O_2 \xrightleftharpoons{\text{Catalase}} 2H_2O_2 + O_2 \quad (3.18)$$

$$\text{HDL} \xrightleftharpoons{\text{CHE +CHO}} \text{Cholestenone} + H_2O_2 \quad (3.19)$$

$$H_2O_2 + \text{HDAOS} + \text{4-Aminoantipyrine} \xrightleftharpoons{\text{POD}} \text{Quinoneimine} \quad (3.20)$$

Changes in 600 nm absorption are tracked by the computer system. The system utilizes this change in absorbance as an indication of cholesterol content in the sample to measure and express HDL - cholesterol concentration Table 3.11.

Table 3.11 Measure and express HDL - cholesterol concentration

	Blank	Sample
Reagent 1	900 µL	900 µL
Dist. Water	12 µL	_
Sample	_	12 µL
Mix and let sit for five minutes. Add the following when the temperature reaches 37 degrees Celsius:		
Reagent 2	300 µL	300 µL
At 37 ºC, mix well and incubate for five minutes. The absorbance change value should then be examined.		
ΔA=[ΔA sample]-[ΔA Blank]		

REAC. TYPE: ENDPOINT

UNIT: mg/dl

SAMPLE VOLUME (mL): 3

PRI. WAVE (nm): 578

SEC. WAVE(nm): 670

R1 (mL): 225

R2 (mL): 75

REAC. TIME FROM (min): -1
REAC. TIME TO (min): 17

Low density lipoprotein (LDL-Cholesterol) it is very difficult to isolate and measure LDL cholesterol, so LDL cholesterol is often derived by the following equation

LDL-cholesterol = [Chol] - [HDLDirect]-{[TG]/5}

Very low density lipoprotein (VLDL-Cholesterol) very low-density lipoprotein-cholesterol was estimated by using formula

VLDL-Cholesterol ={[TG]/5}

Total protein albumin, a component of serum total protein, is in charge of transporting macromolecular compounds and regulating plasma osmotic pressure. Diarrhea and dietary deprivation all contribute to hypoproteinemia, as does the absence of antibodies. Only severe chronic inflammation or autoimmune illness may cause hyperproteinemia, which is seldom seen in the general population Equation 3.21.

$$Cu^{2+} + \text{Protein} \xrightarrow{PH>12} \text{Copper-protein complex (blue-violet colour)} \quad (3.21)$$

Copper ions and protein form a blue-violet color complex in an alkaline solution (pH>12). The increase in absorbency is proportional to the protein content Table 3.12.

Table 3.12 The protein content

	Blank	Sample
R	1000 µL	1000 µL

Dist. Water	20 µL	_
Sample	_	20 µL
Stir well and incubate at 37 degrees Celsius. Then, 10 minutes later, check the absorbance.		
ΔA=[ΔA sample]-[ΔA Blank]		

REAC. TYPE: ENDPOINT

UNIT: g/dl

SAMPLE VOLUME (mL): 4

PRI. WAVE (nm): 546

SEC. WAVE(nm): 630

R1 (mL): 200

R2 (mL): 0

REAC. TIME FROM (min): 0

REAC. TIME TO (min): 33

Albumin adding bromcresol green to the somewhat acidic media results in a color shift in the albumin. As a scale from yellow-green to blue-green. Color intensity may be used to estimate the quantity of albumin in a sample Table 3.13.

Table 3.13 The following reagents are placed in test tubes

	Blank	Standart	Sample
Reagent	1mL	1mL	1mL
Standart	-	5µL	
Sample			5µL

At room temperature (20-25 degrees Celsius), the chemicals are combined and incubated (10) minutes.

At wavelength 630 nm, a spectrophotometer was used to measure the absorbance of the sample and the standard solution in comparison to the stock solution.

The albumin concentration is calculated according to the following Equation 3.22:

$$\text{Albumin Conc.} = \frac{O.D\ Sample}{O.D\ Standart} * n \qquad (3.22)$$

n =5 g/dl

Normal value of albumin: (35-55) g/dl

Alkaline phosphatase (ALP) as a hydrolytic enzyme, alkaline phosphatase performs best at an alkaline pH and is found in practically all tissues of the human body. Some situations, such as pregnancy and the birth of a child, lead to elevated alkaline phosphatase activity. Hepatobiliary illness, bone disease, bone metastases, and hyperparathyroidism may all cause abnormally high levels of alkaline phosphatase in the blood. Only approximately 0.2 percent of the elderly see a decline in physical activity. Clinical Chemistry and Laboratory Medicine IRCC has changed the procedure Equation 3.23.

$$p\text{-Nitrophenyl phosphate} + H_2O \underset{Mg^{2+}}{\overset{ALP}{\rightleftharpoons}} p\text{-Nitrophenol} + Pi \qquad (3.23)$$

ALP and magnesium ions catalyze the conversion of *p*-Nitrophenyl phosphate to *p*-Nitrophenol, and the increase in absorbency is proportional to ALP's activity Table 3.14.

Table 3.14 The activity of ALP

	Blank	Sample
Reagent 1	1000 µL	1000 µL
Dist. Water	20 µL	_
Sample	_	20 µL
Mix and let sit for 2 minutes. Add the following when the temperature reaches 37 degrees Celsius:		
Reagent 2	250 µL	250 µL
The absorbance change value must be measured within three minutes after the mixture has been fully mixed and incubated at 37 ºC for one minute.		
ΔA/min=[ΔA/min sample]-[ΔA/min Blank]		

REAC. TYPE: Kinetic

UNIT: U/L

SAMPLE VOLUME (mL): 4

PRI. WAVE (nm): 405

SEC. WAVE(nm): 546

R1 (mL): 200

R2 (mL): 50

REAC. TIME FROM (min): 3

REAC. TIME TO (min): 13

4. RESULTS AND DISCUSSION

4.1 Baseline Characters of Participants

Patients made up 63.3% of the population, compared to 36.7% of the healthy control group, who were 52.5 percent men and 47.5 percent women. In this study, female patients showed no significant difference (p>0.05) from healthy women, whereas male patients showed no significant difference (p0.05) from healthy men.

There were significant differences (p 0.05) in the age groups of patients and healthy persons in our study, with patients aged 41-60 years making up the majority (51.7%), whereas healthy people aged 21-40 years made up the majority (51.7%). (p 0.05). 80% of the time. Age >60 years was associated with the lowest number of patients (20.0 percent) and healthy subjects (5.00 percent).

BMI levels in patients and healthy groups revealed no significant differences (p>0.05) all BMI levels except for the underweight BMI (41.7% vs. 25.0%), which had a significant difference (p0.05) between the two groups. Table 4.1 and Figure 4.1.

Table 4.1 Baseline characters of participants are calculated by chi-square test

			Groups		Total	P value
			Patients	Healthy		
Gender	Males	N	38	21	59	P<0.05*
		%	63.3%	52.5%	59.0%	
	Females	N	22	19	41	P>0.05
		%	36.7%	47.5%	41.0%	
P value			P<0.05*	P>0.05	P>0.05	
Age groups	21-40	N	17	32	49	P<0.05*
		%	28.3%	80.0%	49.0%	
	41-60	N	31	6	37	P<0.001***
		%	51.7%	15.0%	37.0%	
	>60	N	12	2	14	P<0..01***
		%	20.0%	5%	14.0%	
P value			P<0.001***	P<0.001***	P<0.001***	
Mean±SD			48.65±13.32	33.65±10.92	40.33±18.21	P<0.001***
BMI groups	Underweight	N	25	10	35	P<0.05*
		%	41.7%	25.0%	35.0%	
	Normalweight	N	17	13	30	P>0.05
		%	28.3%	32.5%	30.0%	
	Overweight	N	11	10	21	P>0.05
		%	18.3%	25.0%	21.0%	
	Obesity	N	7	7	14	1.00
		%	11.7%	17.5%	14.0%	
P value			P>0.05	P>0.05	P<0.05	
Mean±SD			24.91 ±2.66	26.66±4.21	25.3.22	p>0.05

According to the findings of Hödlmoser et al., the present investigation discovered substantial disparities between chronic renal failure (CRF) patients and healthy people in terms of gender (2020). Most illnesses, including chronic kidney disease, are fundamentally influenced by variations in gender (CKD). The underlying pathophysiology of CKD and its consequences, symptoms and signs, response to treatment, and ability to tolerate/cope with the illness all vary between men and women with CKD. In spite of this, a gender approach to CKD prevention and treatment has been largely ignored, as have clinical practice recommendations and research in general (Cobo *et al.* 2016). Awareness of chronic kidney disease (CKD) is lower among women in the United States than it is among males. Women's lower blood creatinine levels may be attributed to their smaller muscle mass, which is reflected in their eGFR, has been

used more recently by health care professionals to inform patients about their condition because the gender gap in serum creatinine awareness has narrowed in recent years and the results show (Hödlmoser *et al.* 2020) The prevalence of chronic kidney disease (CKD) is higher in women, although they are less likely to develop to end-stage kidney disease (ESKD) than their male counterparts (Albertus *et al.* 2016). A variety of hypotheses have been advanced to explain this gapIn addition, it is possible that women may develop CKD more slowly, be more likely to die before starting dialysis, or prefer conservative care over dialysis or a kidney transplant (Kattah and Garovic 2020).

Chronic kidney disease (CKD) risk rises with age, according to our research. These results have crucial implications for patient management and for analyzing the possible influence of population aging on the burden of CKD, where cohort studies indicated that CKD regression and mortality were more frequent with increasing age than CKD advancement or renal failure (Liu *et al.* 2021). As a result, chronic kidney disease is frequently seen as a chronic and irreversible ailment with a lifetime course (Eknoyan *et al.* 2013). The best results for patients with chronic kidney disease (CKD) are considered to be stable kidney function throughout time. Contrary to popular belief, we discovered that among those 65 and older with moderate to severe CKD, the likelihood of reversing their renal disease was as high as or greater than the likelihood of their progressing to kidney failure. GFR-independent variables including muscle mass loss, cachexia, and dietary changes over time may all contribute to the regression of chronic renal disease, as can risk factor modification by therapy and spontaneous recovery (Glassock *et al.* 2017). While advancement or kidney failure became less common as people aged, regression was as least as likely as progression or kidney failure in mild to severe CKD stages, according to this research (Ravani *et al.* 2020).

We found no significant variations in BMI levels between patients and healthy groups, except for the BMI of those who were underweight (Zaman *et al.* 2018) A diabetic patient's lower BMI may not cause CKD, but it's possible that CKD causes the patient's lower BMI, as noted in the study's negative correlation between BMI and CKD. Because CKD patients tend to lose weight, the negative connection between CKD and BMI may be proven. CKD patients may get particular attention and treatment from the

health care system, and their devotion to a healthy food intake and a healthy lifestyle may eliminate additional calories and carbs. CKD patients may also experience reverse causation. In addition, CKD patients are more likely to suffer from anemia and a deterioration in their nutritional condition (Thaha *et al.* 2018). In both the early and late phases of CKD, patients with BMI 18.5 kg/m2 had non-significantly greater rates of eGFR decrease events than other BMI categories. CKD progression in people with kidney disease is not only determined by their BMI. As a result, the definition of obesity should be re-examined in CKD patients, and body weight management should be customized. In the study of Chang et al. Post-hospitalization cohort, scientists observed no indication of weight influencing acute renal failure and chronic kidney disease development or progression (MacLaughlin *et al.* 2021).

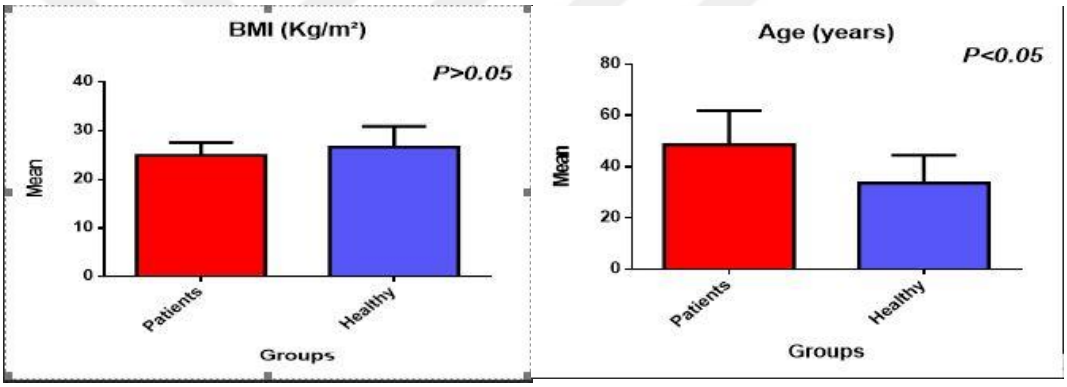


Figure 4.1 Mean levels of BMI and age of participants

4.2 Relation Renal Functions Parameters in Study Groups

Patients' urea and creatinine concentrations were found to be higher than those of the control group (p0.05) by a substantial margin (14.565.76 and 81.4821.84, respectively). Uric acid and albumin levels were significantly lower in patients (3.020.80 and 40.376.16 respectively) compared to controls (3.800.59 and 48.516.76) In our investigation, Both groups showed no significant differences in total protein concentration (p>0.05) compared to one another Table 4.2 and Figure 4.2.

Table 4.2 The student t test is used to compare the mean values of renal function parameters across research groups.

Groups		N	Mean	SD	P value
Urea	Patients	60	81.48	21.84	P<0.001***
	Healthy	40	32.30	7.46	
Creatinine	Patients	60	14.56	5.76	P<0.001***
	Healthy	40	0.96	0.40	
Uric acid	Patients	60	3.02	0.80	P<0.001***
	Healthy	40	3.80	0.59	
Albumin	Patients	60	40.37	6.16	P<0.001***
	Healthy	40	48.51	6.76	
Total Protein	Patients	60	62.84	15.10	P>0.05
	Healthy	40	66.30	8.10	

Renal dysfunction was studied in relation to a number of other variables, including clinical state. Many clinical indicators and patient health status were negatively impacted by renal dysfunction. Extracellular fluid (ECF) volume and composition are regulated by kidneys in order to maintain homeostasis. This is done by filtering, reabsorbing, and secreting chemicals from plasma (Merzah and Hasson 2015). The glomerular filtration capacity of the kidneys is reduced as a result of renal injury, and this results in elevated amounts of metabolic byproducts in the blood. Urea and creatinine, two of the byproducts, are critical markers of changes in renal function (Bagalad *et al.* 2017). Dialysis is a treatment for renal failure that removes excess metabolic waste products. Dialysis is only necessary if the kidneys are failing and the metabolic byproduct levels in the blood are being continuously monitored. The amounts of urea and creatinine, two of the most common metabolic waste products, have long been regarded the most important indications of dialysis eligibility (Evangelidis *et al.* 2017). According to our findings, renal failure patients have higher levels of urea and creatinine in their blood than healthy individuals Because urea is the principal nitrogenous waste product of metabolism, it is excreted via the urinary tract. When kidney function is impaired owing to renal failure, urea cannot be excreted from the body, resulting in a rise in blood urea concentration (Kovalčíková *et al.* 2018, Chen *et al.* 2020). Urea levels rise as a result of the kidney's inability to filter waste from blood, which is dependent on the quantity of protein ingested and the pace at which it is

degraded, experts said. It is possible that other factors, such as increased protein intake, muscle damage during fasting, an increase in protein catabolism and chronic liver disease may contribute to a rise in urea concentrations. A increase in urea concentration in the blood signals the development of blood uremia, the last stage of renal failure, in those with chronic renal failure. (Alain *et al.* 2010).

Patients with renal failure have elevated levels of creatinine because the kidneys are unable to filter and excrete the metabolic residue creatinine as it typically would. This results in elevated amounts of creatinine in the blood. Dialysis patients with renal failure had higher urea and creatinine levels because of the lower glomerular filtration rate as a result of the decreased number of functional nephrons, according to the research. (Arihanet and colleagues 2018) A noninvasive alternative to blood tests for children's CKD diagnosis has been proposed based on the data showing a favorable association between serum and saliva creatinine levels (Renda *et al.* 2017).

Acute kidney damage, whether transitory or not recovered, was not linked to the urea-to-creatinine ratio (AKI). When stratified by urea/creatinine ratio, the group of individuals with a long-term mortality risk comparable to that of patients with chronic AKI may be identified. After a hospitalization for an infection, patients who have not recovered from AKI are more likely to die of any cause in the long run. As an alternative to predicting prerenal azotaemia using this ratio, we may identify individuals who are at elevated long-term mortality risk following infections independent from acute kidney injury (AKI) and sepsis (decreased kidney function) (Slikke *et al.* 2020).

Patients with CKD had lower uric acid levels than healthy controls, and these findings were in line with previous research (Li *et al.* 2020). Excessive eating of red meat and other meals high in purines, according to the research, increases the body's ability to produce purines naturally. Having a high amount of purines in the blood causes the kidneys to be unable to filter excess quantities, which results in a reduction in urine volume, according to (Liu *et al.* 2018). High uric acid levels in the blood may be caused by a variety of conditions, including gout, kidney stones, hypertension, and cardiovascular disease, although renal failure is the major culprit (Bagalad *et al.* 2017).

There is an increased risk of all-cause mortality and cardiovascular disease mortality in people who have a lower uric acid level. Additionally, hemodialysis patients may benefit from greater uric acid concentrations. In the general population, accumulating data shows that greater levels represent a risk factor or biomarker for renal and cardiovascular disease outcomes. The kidneys remove around two-thirds of the uric acid generated in humans (Li *et al.* 2020). Consequently, Chronic kidney disease (CKD) patients often have elevated uric acid levels because of their weakened kidneys. Uric acid and hemodialysis patient survival rates have been demonstrated in previous research to follow a J-shaped curve (Park *et al.* 2017). A treatment that lowers uric acid levels may be useful in slowing the course of kidney disease. There is a need for more studies to validate the impact of reducing uric acid levels on the development of chronic kidney disease (CKD) (Liu *et al.* 2018).

Patients with renal failure had lower amounts of albumin than healthy people, and our findings corroborated these findings. End-stage renal disease ESRD is more likely in people with low blood albumin levels, which may serve as a warning sign to kidney doctors to pay closer attention to these individuals and consider more aggressive therapy. The effects of hypoalbuminemia on the progression of diabetic nephropathy in 343 Caucasian (77 percent) and black diabetic nephropathy patients were evaluated in a different research (77 percent) from Japan. Additionally, the pace at which GFR decreased was shown to be influenced by hypoalbuminemia. Diabetic nephropathy was diagnosed in their investigations using clinical signs rather than pathology. Given the prevalence of non-diabetic renal disease (NDRD) (27-82.9 pct), we hypothesize that The rpc) (Li and colleagues 2017) Diabetic individuals who undergo renal biopsy may have less conclusive findings than non-diabetic ones. Albumin, which accounts for the majority of plasma proteins, is produced in the liver and then released into the circulatory system (Gatta *et al.* 2012). Hydraulic osmotic pressure in vessels is maintained by this mechanism, which is critical for homeostasis. There are other physiological activities for serum albumin as well, including the binding of numerous molecules, substances with anti-inflammatory and antioxidant properties, such as hormones, ions, and medications (Fanali *et al.* 2012). Hypoalbuminemia is a significant risk factor and predictor of increased morbidity/mortality independent of the underlying

condition, regardless of the amount of caloric or protein intake, reduced hepatic synthesis, decreased intestinal absorption, increased tissue catabolism or increased loss. Albumin levels in the blood were linked to decreasing renal function, according to the results of the research. We found an association between serum albumin levels and proteinuria and glomerular lesions, two well-known risk factors for the progression of Diabetic Nephropathy (DN), which may explain the relationship between hypoalbuminemia and renal outcome. However, this wasn't the only conceivable explanation for the incident. According to recent research by (Zhang *et al.* 2020). In critically sick patients with acute kidney injury (AKI) undergoing continuous renal replacement treatment, low albumin levels are linked to a poor prognosis (CRRT). as a result, determining albumin levels might be useful in making prognoses (Zheng *et al.* 2021). Patients with renal failure had lower amounts of albumin than healthy people, and our findings corroborated these findings. Researchers found that individuals with low blood albumin concentrations had a higher risk of developing End-stage renal disease ESRD, which may prompt nephrologists to monitor these patients more carefully and maybe treat them more aggressively (Zhang *et al.* 2020). The blood albumin level has previously been linked to proteinuria in Japanese diabetic nephropathy patients (Iwasaki et al., 2008), and another research looked at the influence of hypoalbuminemia on kidney disease development in 343 Caucasian (77 percent) and black individuals with diabetic nephropathy. A decrease in GFR was also observed to be linked to an increased risk of hypoalbuminemia. Diabetic nephropathy was diagnosed in these trials based on clinical signs and symptoms rather than pathology. Given the prevalence of non-diabetic renal disease (NDRD) (28% to 80%), A study published in 2017 by Li et al. These findings may not be as conclusive in diabetic individuals who have had kidney biopsy. The liver synthesizes human serum albumin, which is then released into the vascular space and distributed throughout the body (Gatta *et al.* 2012). Homeostasis is maintained because it balances the hydrostatic and colloid pressures inside vessels. The anti-inflammatory and antioxidant characteristics of serum albumin, as well as its ability to bind a wide variety of molecules including hormones, ions and medicines (Fanali *et al.* 2012). Hypoalbuminemia may be caused by a lack of energy or protein intake, reduced liver synthesis, decreased intestinal absorption, increased tissue catabolism, or increased loss and is an essential risk factor

and predictor of increased morbidity/mortality independent of the involved disorders. An increase in blood albumin levels was shown to be connected with a decrease in renal function in the research. Proteinuria and glomerular lesions, two well-known risk factors for Diabetic nephropathy (DN) development, exhibited a substantial negative connection with serum albumin levels, which might explain the link between hypoalbuminemia and renal outcome in some way as well. However, this wasn't the only plausible explanation for the incident. (Zhang *et al.* 2020). Hypoalbuminemia is associated with poor prognosis in critically ill acute kidney injury (AKI) receiving continuous renal replacement therapy (CRRT). therefore, measuring albumin may be helpful for predicting the prognosis (Zheng *et al.* 2021).

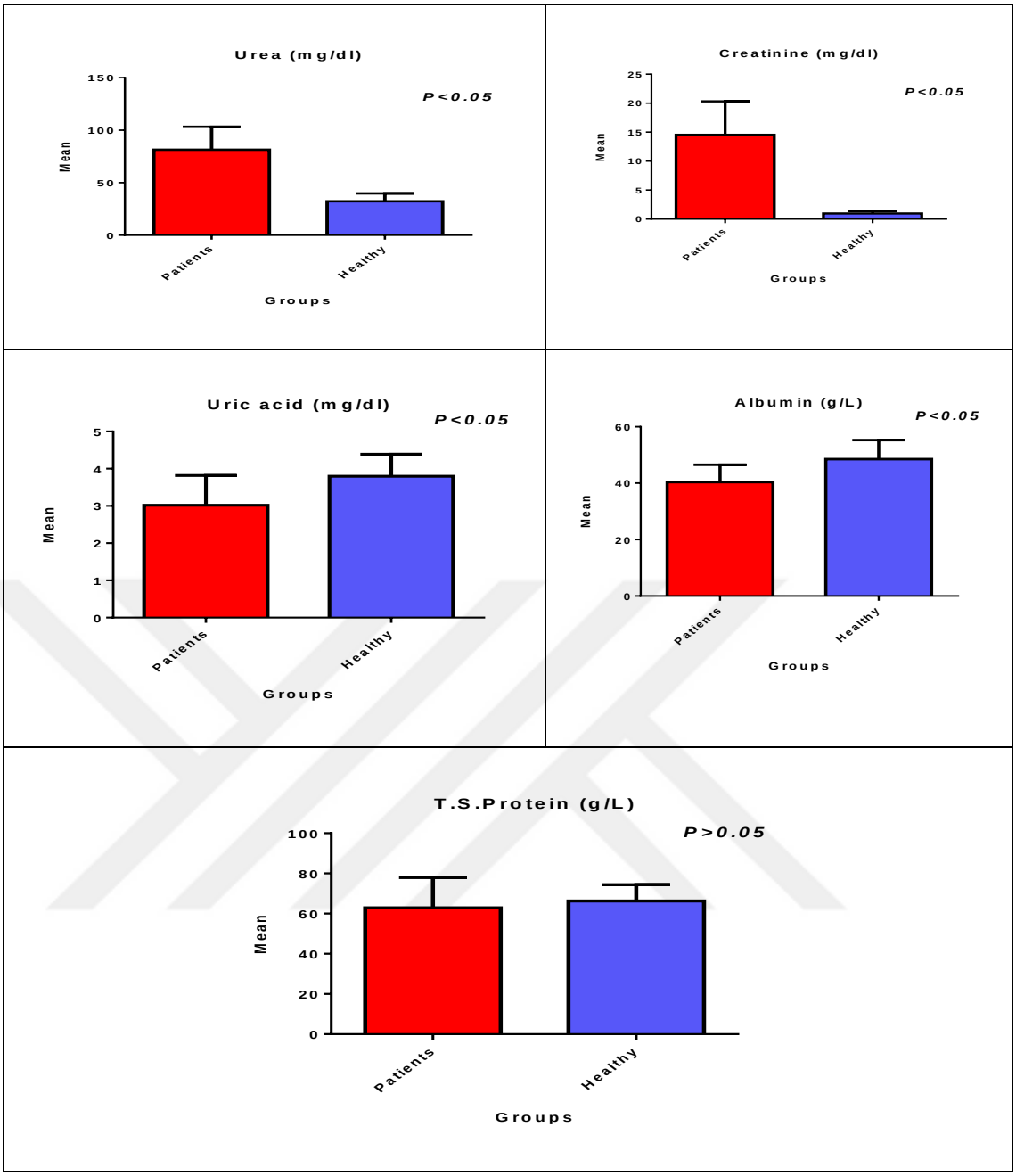


Figure 4.2 Comparative mean levels of renal functions parameters between study groups

4.3 Relation Lipid Profile Parameters in Study Groups

When compared to healthy individuals, the lipid profile of patients with CKD was shown to be abnormal. A substantial drop in HDL levels (32.7813.51) was seen in patients compared to controls (44.9211.35), whereas cholesterol and VLDL levels (160.1532.53 and 23.1310.44) were considerably higher in patients (139.6729.06 and

20.63*10.54) (p0.05). Our findings demonstrated no differences in LDL or TG levels across study groups that were statistically significant (p>0.05) Table 4.3.

Table 4.3 The student t test is used to compare the mean values of various lipid profile parameters across groups.

Groups		N	Mean	SD	P value
Cholesterol	Patients	60	160.15	32.53	P<0.001***
	Healthy	40	139.67	29.06	
HDL	Patients	60	32.78	13.51	P<0.001***
	Healthy	40	44.92	11.35	
LDL	Patients	60	89.76	28.86	P>0.05
	Healthy	40	88.71	18.61	
TG	Patients	60	111.85	51.94	P>0.05
	Healthy	40	95.65	49.12	
VLDL	Patients	60	23.13	10.44	P<0.05*
	Healthy	40	20.63	10.54	

Patients' levels of Cholesterol, HDL, and VLDL were much lower than those of healthy individuals. Dyslipidemia and the buildup of atherosclerotic particles are also common in patients with renal impairment (Vaziri *et al.* 2014). an accumulation of lipoproteins containing Apo B (Apo B), higher levels of lipoprotein(a) particles, and low HDL levels are all related with CKD's dyslipidemia, according to the National Institutes of Health (Cohen and Fisher 2013). Due to an LCAT shortage in CKD, HDL metabolism is hindered, and HDL-3 are not matured into HDL-2. Oxidized LDL seems to increase in individuals with chronic kidney disease (CKD), particularly in those undergoing hemodialysis (HD). Obesity and cardiovascular mortality are greater in persons with chronic kidney disease (CKD). Ribeiro and colleagues (2012). A number of recent investigations have shown that when kidney function diminishes and inflammation rises, oxidized low-density lipoprotein cholesterol levels rise, whereas high-density lipoprotein cholesterol dysfunction develops (Bulbul *et al.* 2018). elevated triglycerides, high total cholesterol, and low density lipoprotein levels were independently related with an increased risk of estimated glomerular filtration rate (eGFR) decrease and development of incident chronic kidney disease (Liang *et al.* 2020).

Diabetic kidney disease (CKD) has been linked to an increased risk of cardiovascular disease and hospitalization because of the increased incidence of dyslipidemia in these individuals (Kim *et al.* 2019). If the condition advances to end-stage renal disease (ESRD), the mortality risk increases. There is an increasing pressure on the world's health care systems as the prevalence of end-stage renal disease (ESRD) grows.

Chronic renal disease patients often suffer from dyslipidemia. In individuals with chronic kidney disease, dyslipidemia is a recognized risk factor for cardiovascular disease and may lead to renal impairment (Mondal *et al.* 2021). Dialysis improves dyslipidemia in individuals with end-stage renal failure who previously had Cardiovascular disease is more likely when. It is our conclusion that in order to help patients with chronic kidney disease avoid developing CVD risk factors, adequate dialysis treatment and regular monitoring of their blood cholesterol levels are essential, in addition to other forms of treatment like dietary advice, lifestyle modifications, and treatment to lower their cholesterol levels (Saini *et al.* 2021).

As CKD worsens, the body's lipid metabolism shifts in a negative way. Chronic kidney disease (CKD) patients have high amounts of triglycerides in their blood, low levels of high density lipoproteins (HDL), and high levels of atherogenic tiny dense low-density lipoproteins (LDL). Cardiovascular disease is more common in people with chronic kidney disease (CKD) due to abnormalities in lipid metabolism and other metabolic disorders (CVD). Evidence shows that unsaturated fatty acids have a positive influence on cholesterol and TG levels in the bloodstream. As a result, dietary lipids may be particularly essential in the control of CKD nutrition. Patients with chronic kidney disease (CKD) may benefit from increasing their consumption of dietary fats, which might enhance their cholesterol levels and lower their risk of cardiovascular disease, according to the authors (Kochan *et al.* 2021). HDL biology has recently advanced, revealing that functional HDL, rather than total HDL, may protect against cardiovascular and renal disorders. This strongly supports the idea that altered cholesterol efflux plays a role in kidney disease etiology. Numerous studies have shown new ways in which cholesterol, free fatty acids, and sphingolipids may alter renal cell function, but the underlying pathophysiological processes are still unknown (Wahl *et*

al. 2016). Existing research implies that CKD development has a connection to metabolic inflexibility, which reflects a reduced ability to use free fatty acids via the process of - transformation into complex lipids, such as triglycerides, via the oxidation. Interventions that enhance kidney health reverse this impact, indicating that treating lipid problems might be advantageous in delaying the advancement of chronic renal disease (Baek *et al.* 2021).

In CKD, dyslipidemia is frequent but not universal due to a variety of variables including eGFR, diabetes and other co-morbidities, albuminuria severity, nutritional status and the use of other drugs (Tonelli *et al.* 2013).

4.4 Relation ALP and Ghrelin Parameters with Study Groups

Study results show the ALP and ghrelin parameters were increased in patients (233.73±99.66 and 1.23±0.73) when compared to healthy controls (82.05±20.72 and 0.80±0.46) respectively with a highly significant difference ($p<0.05$) Table 4.4 and Figure 4.3.

Table 4.4 The student t test is used to compare the mean levels of ALP and Ghrelin in the various research groups.

Groups		N	Mean	SD	P value
ALP	Patients	60	233.73	99.66	P<0.001***
	Healthy	40	82.05	20.72	
Ghrelin	Patients	60	1.23	0.73	P<0.001***
	Healthy	40	0.80	0.46	

Compared to healthy individuals, CDK patients had higher ALP levels, which is consistent with results from previous studies. The calcification inhibitor pyrophosphate is hydrolyzed by alkaline phosphatase (ALP). Some studies have linked ALP levels in individuals with end-stage renal illness to cardiovascular morbidity and death because of mineral metabolism problems (Zong *et al.* 2018). ALP may have a role in predicting cardiovascular (CV) risk, according to a number of studies. High levels of ALP have

been linked to an elevated risk of cardiovascular disease (CVD) and all-cause mortality in multiple investigations of people with chronic kidney disease (CKD) (Drechsler *et al.* 2011). In addition, individuals with CKD stages 3 and 4 who have high ALP levels have a greater risk of renal disease development. The general population and patients with coronary artery disease (CAD) who have intact renal function have both shown that ALP is an independent predictor of mortality and cardiovascular events (CV) (Li *et al.* 2014). Uncomplicated hypertension individuals with normal blood pressure had an association between ALP levels and eGFR even after controlling for various potential confounding factors, according to the data (Sciacqua *et al.* 2020). All-cause mortality, recurrence of stroke, composite end goal, and a poor functional outcome post-stroke may be predicted independently in patients with maintained renal function when ALP is stated (Yamazoe *et al.* 2016). When dealing with acute decompensated heart failure, the serum ALP is a reliable predictor of deteriorating renal function (WRF). Zhao and colleagues (2020) After multivariate correction, individuals with type 2 diabetes mellitus and nephrotic-range proteinuria who had an increased ALP level were more likely to have a bad renal outcome.

Dialysis patients with increased ALP levels had a greater risk of cardiovascular events, hospitalization, and death, according to many epidemiological studies (Maruyama *et al.* 2014). However, among individuals with chronic renal disease who are not on dialysis, a few observational studies have also found a similar ALP–mortality link (Taliercio and colleagues 2013). Most notably, no research have looked at the ALP–mortality link during the ESRD transition phase (Sumida *et al.* 2018). In order to expand prior findings to a large and unique cohort of patients transitioning to dialysis, the researchers for the first time established the influence of predialysis ALP levels on outcomes after dialysis commencement, they said in a press release (Sumida *et al.* 2018). concluded that higher pre-ESRD blood ALP levels are related with a greater probability of death after ESRD. More research is needed to determine if lowering pre-ESRD ALP levels can reduce mortality in patients who are suddenly placed on dialysis A recent study (Chen *et al.* 2021) found that patients on peritoneal dialysis who had high levels of ALP but low levels of intact parathyroid hormone (iPTH) had an increased risk of death from any cause as well as cardiovascular disease. This suggests that ALP and iPTH can be

used to predict clinical outcomes in PD patients and serve as risk assessment tools. ALP and (iPTH) seem to have a mortality-related effect, and further research into this relationship is needed.

Ghrelin levels were shown to be elevated in CDK patients compared to healthy controls in this investigation, which is consistent with findings from previous studies. Exogenous gut peptide ghrelin administration increased renal protection via antioxidative pathways in a mouse model of renal damages, as established. Antioxidative effects of GHRLIN have been mediated through a rise in the production of mitochondrial uncoupling protein (UCP2) and Peroxisome proliferator-activated receptor coactivator 1 (PGC1). Ghrelin induces a reduction in mitochondrial ROS levels by lowering mitochondrial membrane potential and limiting excessive ATP production (Boshra and Abbas 2017). An additional mechanism through which oxidative stress-induced kidney dysfunctions such fibrosis or aging-related alterations were controlled was the endogenous ghrelin/GHSR1a pathway. Premature renal senescence and angiotensin II-induced kidney cell death may be prevented by ghrelin mechanisms. Evidence that endogenous ghrelin performs an antioxidative function in regulating renal renal redox state has been provided by the up-regulation of UCP2 by ghrelin via activation of the mitochondrial enzyme AMP kinase (Canpolat *et al.* 2018).

Ghrelin exerted an anti-hypertensive effect in the rat renovascular hypertension model through regulating oxidative stress caused by RAS failure. Due to its reversal impact on plasma renin activity (PRA) and angiotensin II receptor type 1, ghrelin had an antioxidative stress effect (AT1R). A decrease in PRA levels and a reduction in angiotensin II receptor type 1 expression were used to determine the effects of ghrelin (Akki *et al.* 2021).

In type 2 diabetes individuals, the plasma ghrelin level was shown to have no correlation with renal impairment. Type 2 diabetes mellitus (T2DM) patients' plasma ghrelin levels may not be an accurate predictor of renal disease (Rahimi *et al.* 2018). Hemodialysis patients had the greatest levels of both adiponectin and ghrelin, with

adiponectin being a better indicator of nutritional status in chronic kidney disease (CKD) than ghrelin (Canpolat *et al.* 2018).

Ghrelin increased vascular endothelial function and renal excretion, which prevented renal damage through the insulin growth factor-1 (IGF-1) signaling pathway in the ischemia acute renal failure mice model. Renal function is protected by an elevation in IGF-1 due to ghrelin (Takeda *et al.* 2006).

Furthermore, the antioxidant capabilities of ghrelin have been shown to protect the kidneys in previous investigations. As a consequence of this therapy, antioxidant enzymes such glutathione peroxidase (GPx), catalase (CAT), SOD, and GSH levels in the rat kidney were shown to be more active, indicating that exogenous ghrelin reduced oxidative damage by decreasing lipid peroxidation (Alirezaei *et al.* 2015).

Obestatin and unacylated ghrelin were shown to be poor markers of nutritional status in children with chronic kidney disease (CKD). It is possible to speculate about the possible therapeutic benefits of optimizing their elimination in hemodialysis patients (Monzani *et al.* 2018). Collagen synthesis, extracellular matrix deposition, and the expression of -smooth muscle actin and fibronectin were all reduced by Ghrelin. As a result of its treatment, macrophage infiltration was reduced, as were levels of proinflammatory cytokines such as tumor necrosis factor-, interleukin-1, and monocyte chemotactic protein-1, as well as nuclear factor-B p65. Myofibroblast accumulation was also reduced by inhibiting the transforming growth factor-1/Smad3 signaling pathway. The effects of unilateral ureteral obstruction damage on renal tubular cell apoptosis and the epithelial-mesenchymal transition were also mitigated by ghrelin (Sun *et al.* 2015).

The appetite- and energy-regulating hormone ghrelin is produced by the pituitary gland. During critical patients' hospitalizations, it is not known how their blood total and acylated ghrelin levels fluctuate over time. As a consequence, it is not clear how this alteration relates to patient outcomes in the intensive care unit (ICU). Ghrelin levels in critically sick individuals declined modestly, whereas acylated ghrelin levels rose

dramatically over time. There were no differences between serum total ghrelin/acylated ghrelin levels and ICU mortality.

Chronic kidney disease (CKD) may be exacerbated by excess weight in diabetic nephropathy patients, according to the findings of a study published in the Journal of Nephrology (Gubina *et al.* 2020). According to the findings, the average waist circumference and WHR suggested abdominal obesity, whereas the average WHtR revealed a high metabolic risk. (Ashwell and Gibson 2016). Despite the high incidence of obesity, no connection was identified between (ghrelin) concentration, body weight, or BMI. Patients with a GRF of 30 mL/min/1.73 m2 or less showed a negative correlation between WHR and ghrelin levels. Considering that ghrelin is an appetite-stimulating hormone, this finding is unexpected. There was no distinction made between the two types of ghrelin in the research. Other research on acyl ghrelin (AG) levels reveal mixed findings, with some reporting increased levels in CKD patients while others report no change (Suzuki *et al.* 2013). Des-acyl ghrelin was determined to be the most prevalent type in patients with CKD because plasma levels of total and des-acyl ghrelin, but not acyl ghrelin, increased in those with CKD. Anorexigenic in nature, des-acyl ghrelin predominates in total ghrelin, contributing to malnutrition by reducing food intake (Canpolant *et al.* 2018). The findings of the study show that individuals with DN have a significant frequency of obesity. - Patients' diets were found to be too protein-rich, which may have contributed to the worsening of the disease's course and outlook. Ghrelin concentration was negatively correlated with nutritional status in patients with eGFR 30 and positively correlated with specific nutrients consumption in patients with eGFR 30 (Boniecka *et al.* 2021).

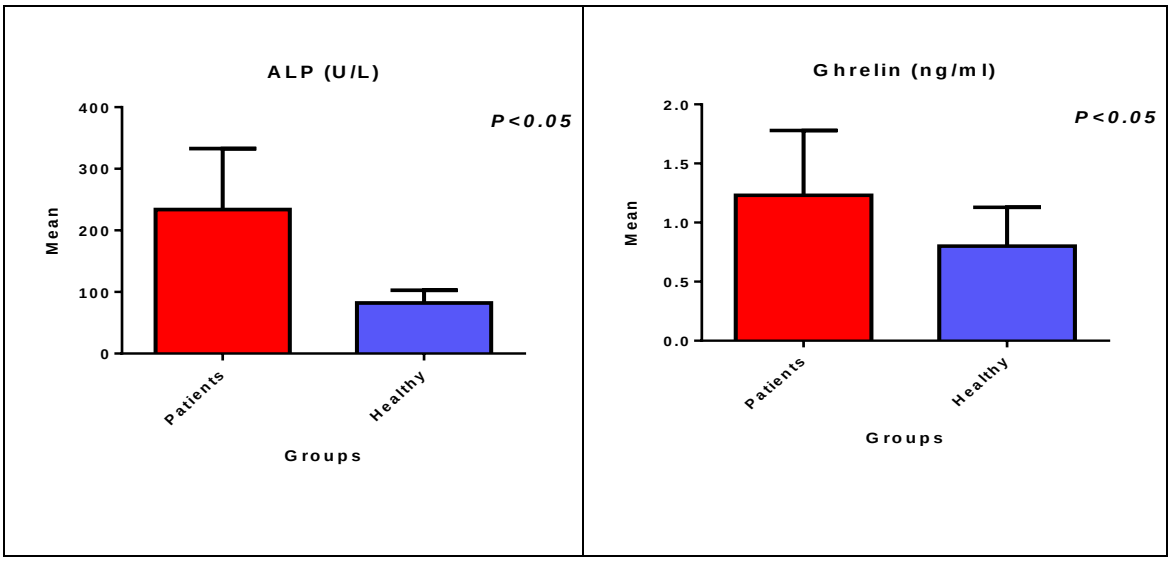


Figure 4.3 Comparative mean levels of ALP and Ghrelin parameters between study groups

4.5 Receiver Operator Characteristic (ROC) Curve of Parameters

Creatinine, urea, ALP and ghrelin parameters showed a greatest sensitivity (100 percent , 100 percent , 89 percent and 69) accordingly compared to others parameters with high significant difference ($p<0.05$). Depending on specificity, Cholesterol , TG, VLDL and Uric Acid parameters demonstrated a maximum specificity (72 percent , 67 percent , 67 percent , and 65 percent) accordingly, compared to others parameters with high significant difference ($p<0.05$) Table 4.5 and Figure 4.4.

Table 4.5 ROC curve, sensitivity and specificity of variables

Variables	AUC	Std. Error	Significant	C.I. (95%)		Sensitivity %	Specificity %
				Lower	Upper		
Creatinine	1.000	.000	P<0.001***	1.000	1.000	100	20
Urea	1.000	0.000	P<0.001***	1.000	1.000	100	15
Uric_Acid	.180	.043	P<0.001***	.095	.265	20	65
ALP	.882	.036	P<0.001***	.812	.952	89	60
Cholestrol	.318	.055	P<0.001***	.209	.427	33	72
HDL	.225	.047	P<0.001***	.133	.317	24	60
LDL	.497	.058	p>0.05	.384	.610	52	53
TG	.359	.056	p>0.05	.249	.468	37	67
VLDL	.345	.055	P<0.001***	.237	.453	36	67
Albumin	.197	.044	P<0.001***	.110	.284	23	57
Total Protein	.426	.059	p>0.05	.309	.542	45	60
Ghelin	.674	.053	P<0.001***	.569	.779	69	58

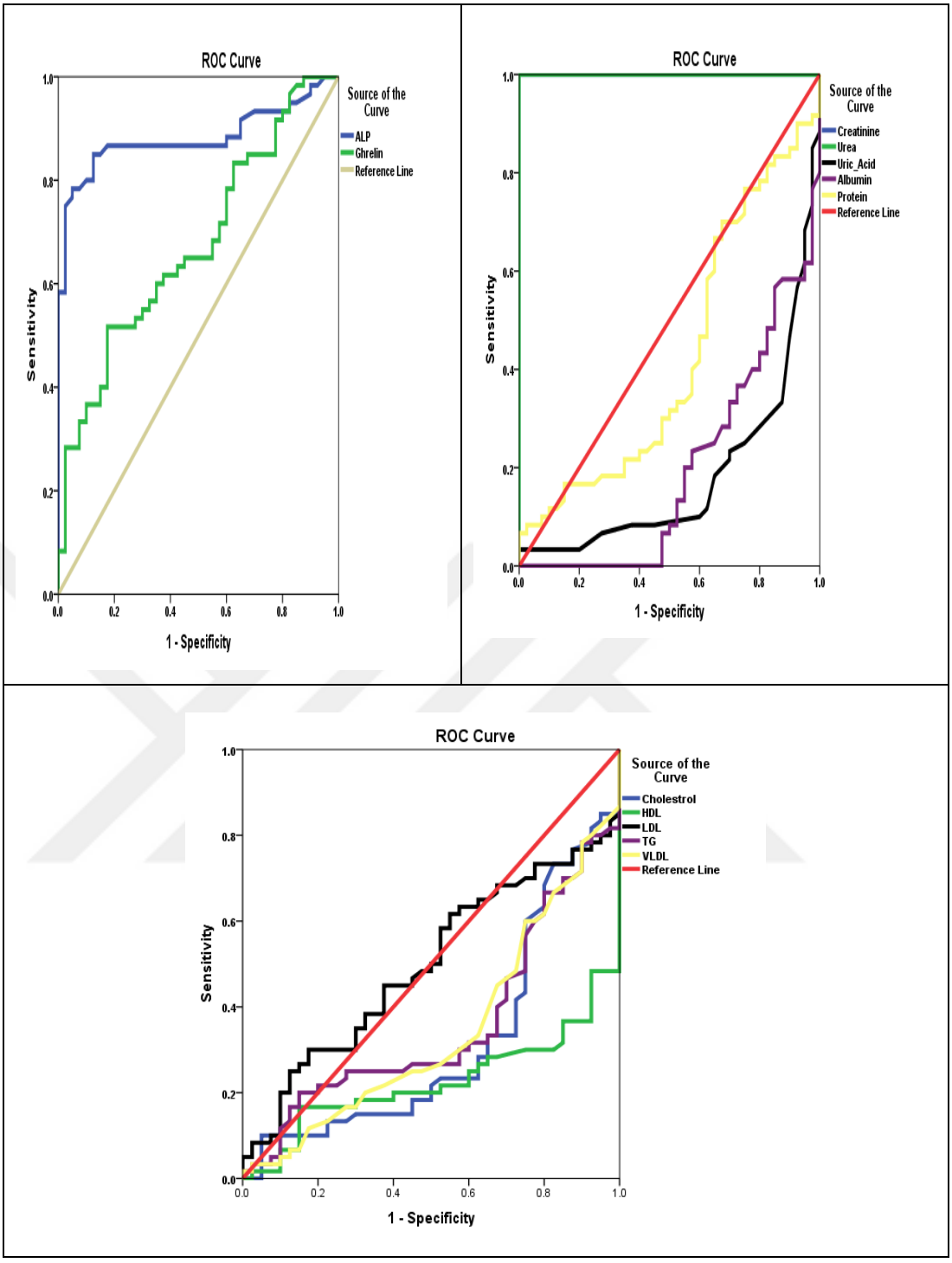


Figure 4.4 ROC curve of parameters

4.6 Correlation Relationships Among Variables

Uric acid (r=.023), HDL (r=.111), albumin (r=.143), protein (r=.117), and ALP (r=.108) had non-significant positive correlations with the ghrelin parameter in the present

investigation. There is no significant correlation between ghrelin and Creatinine, cholesterol, LDL, TG, or VLDL, although there is a correlation (r= -0.129) with Creatinine. Ghrelin is also associated with elevated levels of urea (r=-.256*) Table 4.6.

Table 4.6 Correlation relationships among variables are calculated by pearson correlation test

		Ghrelin
Creatinine	Pearson correlation	-.129
	Significance	.325
Urea	Pearson correlation	-.256*
	Significance	.048
Uric_Acid	Pearson correlation	.023
	Significance	.864
Cholestrol	Pearson correlation	-.167
	Significance	.201
HDL	Pearson correlation	.111
	Significance	.399
LDL	Pearson correlation	-.153
	Significance	.242
TG	Pearson correlation	-.242
	Significance	.063
VLDL	Pearson correlation	-.242
	Significance	.063
Albumin	Pearson correlation	.143
	Significance	.277
Total Protein	Pearson correlation	.117
	Significance	.373
ALP	Pearson correlation	.108
	Significance	.412

Unacylated ghrelin has been observed to be positively associated with HDL-c levels in obese people with an isolated low HDL-c phenotype, regardless of insulin resistance or CRP levels, and this might explain the relatively frequent finding of a low HDL-c level in obese persons. (Nogueira *et al.* 2012). In individuals with cardiometabolic illness, strong negative associations were found between ghrelin levels and TG, and cholesterol, but good correlations with HDL-C (Gubina *et al.* 2020). There was a rise in the level of cystatin C and glomerular filtration rate concurrently in stage 2 CKD and the growth of obesity, although such relationship was not seen in stage 1 CKD. Patients with diabetic nephropathy have a significant frequency of obesity, It's possible that these discoveries

might exacerbate the disease's progress and prognosis. eGFR 30 patients' ghrelin levels and nutritional status were shown to be adversely connected; conversely, eGFR > 30 patients' ghrelin levels and nutrition were found to be favourably correlated (Boniecka *et al.* 2021). Results from our study demonstrate that individuals with chronic kidney disease (CKD) had an unfavorable association between their blood ghrelin content and the concentration of their urine (r = -0.26, P=0.01). In order to maintain a healthy weight and blood glucose level, it is believed that ghrelin, an octanoylated peptide hormone, is necessary. Bigger ghrelin-containing plasma proteins are yet mostly unknown. Research shows that ghrelin interacts with serum albumin, influencing the hormone's biological action. (Lufrano *et al.* 2016).

4.7 Relation Renal Functions Parameters with Gender of Study Groups

The results of this research demonstrate that urea, creatinine, albumin, and gender are significantly different (p 0.05) across the study groups. Male and female patients had the highest urea concentrations (84.6620.21 and 76.0023.89, respectively) compared to the healthy population. As a result, patients' creatinine levels were higher (15.46 7.05 in women and 14.04 4.88 in men) than those of the general population. In contrast, patients' mean albumin levels were lower (40.065.06 and 40.907.82, respectively) than those of the healthy population. Gender differences in uric acid and total protein levels were insignificant (p>0.05) Table 4.7.

Table 4.7 Comparative mean levels of renal functions parameters between gender of study groups are calculated by F test

Gender		Patients			Healthy		P value
		N	Mean	SD	Mean	SD	
Urea	Males	38	84.66	20.21	30.29	7.11	P<0.001***
	Females	22	76.00	23.89	34.53	7.39	
Creatinine	Males	38	14.04	4.88	1.04	0.39	P<0.001***
	Females	22	15.46	7.05	0.88	0.41	
Uric Acid	Males	38	3.14	0.89	4.04	0.46	P>0.05
	Females	22	2.80	0.58	3.53	0.61	
Albumin	Males	38	40.06	5.06	48.09	6.71	P<0.001***
	Females	22	40.90	7.82	48.96	6.98	
Protein	Males	38	61.89	17.53	67.72	7.73	p>0.05
	Females	22	64.47	9.73	64.72	8.41	

Several studies revealed that environmental and other variables, such as geographic shift, climatic change, gender, age, dietary structure, physical functioning impact BUN levels (Wei and Ge 2018). Sexes vary in protein turnover as they become older. Despite the fact that women have less muscle mass than men, some research suggests that older women have a faster rate of protein synthesis than men. This research was done by (Smith *et al.* 2008). According to these studies, the serum BUN concentration may fluctuate with age. However, the serum BUN values of men and females in the same age group varied. Very few studies have taken gender and age into consideration while establishing reference ranges for serum BUN (Huang *et al.* 2014). As a consequence of these findings, the interpretation of the serum urea reference value is age- and gender-dependent (Liu *et al.* 2021).

In order to screen for renal function in the general population, the reference serum creatinine levels established by an enzymatic approach, as well as linear and polynomial equations indicating the link between body length and serum creatinine level, may be used. Using linear and quintic regression models, the authors were able to estimate the reference value of serum creatinine in children aged 2-11 years, and in male and female children of all ages (Uemura *et al.* 2011).

Study findings suggest a significant negative relationship between serum albumin and mortality in CVD patients, and it is shown that low albumin was strikingly greater in males than in women' (Grimm *et al.* 2009).

4.8 Relation Lipid Profile Parameters with Gender of Study Groups

Researchers found significant variations in cholesterol, HDL, and LDL levels as well as gender in this research (p0.05). Male patients had lower cholesterol (129.5830.72) while female patients had lower cholesterol (157.0928.42), both lower than the healthy average. Male and female patients had lower HDL levels (29.1812.64 and 38.9912.93, respectively) than healthy individuals. As a result, male patients had the lowest average albumin level (80–26.19 mg/dL) compared to healthy individuals, whereas female patients had the highest average albumin level (100–29.31 mg/dL). Gender differences in TG and VLDL values were not statistically significant (p>0.05) Table 4.8.

Table 4.8 Comparative mean levels of lipid profile parameters between gender of study groups are calculated by F test.

Gender		Patients			Healthy		P value
		N	Mean	SD	Mean	SD	
Cholesterol	Males	38	129.58	30.72	164.00	27.09	P<0.001***
	Females	22	157.09	28.42	155.89	31.27	
HDL	Males	38	29.18	12.64	42.57	8.60	P<0.001***
	Females	22	38.99	12.93	47.52	13.54	
LDL	Males	38	80.33	26.19	92.86	20.86	P<0.05*
	Females	22	100.58	29.31	84.13	14.99	
TG	Males	38	100.32	59.77	122.00	61.28	p>0.05
	Females	22	87.59	34.32	100.63	28.33	
VLDL	Males	38	20.05	12.02	24.71	12.92	p>0.05
	Females	22	17.55	6.91	22.42	7.24	

Heart disease is more prevalent in males than women, and this is widely established. It is thought that premenopausal women's cardiovascular health is better protected due to a

higher level of sex hormones. Women's risk of cardiovascular disease catches up to that of men's after menopause. Because of disparities in body fat distribution and visceral fat accumulation, these discrepancies may be partially explained. Compared to premenopausal women, males have higher visceral adipose tissue. Adipose tissue in the midsection is almost two times as abundant among males as among premenopausal women, according to a study published in the Journal of the American Medical Association (Hafe 2019). Compared to women, men have lower amounts of the Cholesterol subfraction in their lipid profiles, and menopause is linked with a higher CVD-related lipid profile in women, although this impact is less pronounced than in men. (Anagnostis and colleagues 2015) The higher risk of cardiovascular disease in the elderly who were sedentary was associated with a deterioration of lipid profiles as people aged. However, the positive effects of motor activities on lipid profile in older women show the need of advising physical workouts to the elderly (Okecka-Szymanska *et al.* 2011). older women have greater HDL cholesterol levels than older men, as previously stated. People over the age of 55 in Sudan's population are likely to have a drop in both total cholesterol and LDL cholesterol (Marhoum *et al.* 2013). Men have greater levels of cholesterol, TG, and LDL-C at the start of their lives than women, and they face decades of rising levels of these lipids and proteins in their 40s, 40s, and 60s (Feng *et al.* 2020).

4.9 Relation ALP and Ghrelin Parameters with Gender of Study Groups

ALP, ghrelin parameter, and gender of research groups were found to vary significantly (p 0.05) in the present study. Patients' ALP levels were higher than those of healthy men and women (225.7696.28 and 247.50102.27, respectively). There were also higher values (1.260.56 and 1.190.55) for ghrelin in patients than in the healthy population Table 4.9.

Table 4.9 Comparative mean levels of ALP and Ghrelin parameters between gender of study groups are calculated by F test

Gender		Patients			Healthy		P value
		N	Mean	SD	Mean	SD	
ALP	Males	38	225.76	96.28	81.76	24.13	P<0.001***
	Females	22	247.50	102.27	82.37	16.82	
Ghrelin	Males	38	1.26	0.56	0.73	0.35	P<0.05*
	Females	22	1.19	0.55	0.88	0.32	

Age, gender, alcohol use, fat mass, and bone mass are all linked with plasma ghrelin levels, albeit only moderately (Makovey *et al.* 2007). Ghrelin levels were shown to be greater in women than in the general population, according to this study. Indicate that in Arab men with cardiometabolic illnesses, greater ghrelin levels were related with lower levels of obesity, HbA1C, and blood pressure in women and with higher levels of insulin resistance in men. For the male, the effects of regular resistance exercise training on hunger suppression were more pronounced than those of females, who saw less weight loss and a decrease in leptin and ghrelin levels after restricting calories (Elerian *et al.* 2020). After correcting for potential confounding variables, multiple regression analysis demonstrated substantial positive associations between ghrelin levels and female gender in hemodialysis patients. Patients on hemodialysis who were female had greater plasma ghrelin levels than males in the study location (Sakao *et al.* 2019).

4.10 Relation Renal Function Parameters with Age Groups of Study Groups

The results of this research demonstrate that there are significant differences (p0.05) between study groups in terms of creatinine, urea, uric acid, albumin, and age. At age 41-60, urea and creatinine levels were found to be the highest and lowest in the group of patients, respectively (83.4222.08 and 14.996.06) compared to healthy adults. To put it another way, the lowest mean values of uric acid and albumin concentrations were found in patients aged 21-40, while the highest mean values were found in patients aged 60 and older (2.98% and 39.48% respectively). There are no significant variations in total protein across the research groups' various ages (p>0.05) Table 4.10.

Table 4.10 comparative mean levels of renal function parameters between age groups of study groups are calculated by F test

Age groups		Patients			Healthy		P value
		N	Mean	SD	Mean	SD	
Urea	21-40	17	80.29	23.81	32.16	7.97	P<0.001*** LSD=11.88
	41-60	31	83.42	22.08	34.50	5.05	
	>60	12	78.17	19.48	30.00	0.00	
Creatinine	21-40	17	14.19	6.21	0.95	0.40	P<0.001*** LSD=3.10
	41-60	31	14.99	6.06	0.92	0.37	
	>60	12	13.97	4.52	1.79	0.00	
Uric_Acid	21-40	17	2.75	0.83	3.75	0.61	P<0.001*** LSD=0.33
	41-60	31	3.12	0.70	3.87	0.45	
	>60	12	3.15	0.98	4.80	0.00	
Albumin	21-40	17	39.47	8.08	48.75	6.82	P<0.001*** LSD=2.99
	41-60	31	40.12	4.79	47.98	7.07	
	>60	12	42.28	6.37	52.50	0.00	
Total Protein	21-40	17	58.99	16.24	65.13	8.37	P>0.05
	41-60	31	64.11	16.29	70.78	5.73	
	>60	12	64.98	9.11	73.30	0.00	

Protein-rich meals may help the elderly maintain their muscle mass, but it's unclear how much of an influence they have on their metabolic health as a whole. Older adults should try to eat diets that are significantly over the RDA, with recommendations ranging from 1.0 to 1.5 grams of protein per kilogram of body weight per day (Wolfe *et al.* 2017). Many changes in digestion and metabolism, as well as liver and renal function, are associated to aging. Despite mounting evidence to the contrary, it is important to examine the importance of protein in older people's diets. There's no arguing about it (Playdon *et al.* 2017). A larger intake of protein could have an effect on the previously shown increased risk of a wide range of complex diseases, such as many forms of cancer and type 2 diabetes as well as cardiovascular disease in the elderly. Few studies have examined the impact of protein consumption on the risk of metabolic disease in older adults, and studies have shown that a diet heavy in animal proteins, with the possible exception of dairy protein, is hazardous (Virtanen *et al.* 2018). In a 10-week trial, researchers found that providing older men with a protein intake twice that recommended by the World Health Organization (WHO) resulted in less loss of skeletal

muscle mass and function than providing them with the same amount of protein that the WHO recommends (Mitchell *et al.* 2017).

There was a significant difference in urea and creatinine levels between hospitalized patients and those who were discharged or transferred, as well as between patients with pre-renal renal impairment and those with intrinsic renal disease or post-renal obstruction, as well as between patients with histological evidence of extensive glomerular or nephroscleral damage (Bowker *et al.* 1992). Higher than normal levels of urea/creatinine in individuals with CKD are related with an increased risk of death, regardless of the levels of both creatinine and urea (Matsue *et al.* 2017).

The deterioration in renal function in elderly hypertensive patients was shown to be linked to variations in uric acid levels over time. In the elderly, uric acid levels should be taken into account while managing hypertension (Lin *et al.* 2016). Vascular cognitive impairment (CI) in senior MHD patients may be exacerbated by elevated uric acid levels. It is well established that uric acid levels in elderly individuals on maintenance dialysis are associated with an increased risk of vascular cognitive impairment (CI) (Zhang *et al.* 2020).

4.11 Relation Lipid Profile Parameters with Age Groups of Study Groups

Results from this research demonstrate that there are significant differences (p 0.05) in cholesterol, HDL, and age groups of study participants. Patients aged 41-60 had the highest cholesterol levels, with a mean value of 143.52 milligrams per deciliter (mg/dL) compared to those aged 60 and more. Compared to healthy people, those aged 41-60 had the lowest mean HDL levels (31,5213.76) and those over 60 had the highest (35,728.77). The research groups' LDL, TG, and VLDL values did not change significantly ($p>0.05$) based on age Table 4.11.

Table 4.11 comparative mean levels of lipid profile parameters between age groups of study groups are calculated by F test

Age groups		Patients			Healthy		P value
		N	Mean	SD	Mean	SD	
Cholesterol	21-40	17	141.94	16.24	161.59	27.40	P<0.05* LSD=12.08
	41-60	31	143.52	36.40	151.00	42.42	
	>60	12	126.50	37.94	170.00	0.00	
HDL	21-40	17	32.99	15.97	44.94	12.47	P<0.001*** LSD=5.52
	41-60	31	31.52	13.76	45.22	5.94	
	>60	12	35.72	8.77	40.30	0.00	
LDL	21-40	17	90.49	16.14	89.33	19.53	P>0.05
	41-60	31	91.23	31.27	83.60	17.02	
	>60	12	74.91	34.57	93.30	0.00	
TG	21-40	17	92.24	40.78	109.06	52.47	P>0.05
	41-60	31	103.81	63.39	119.67	22.11	
	>60	12	79.42	24.52	182.00	0.00	
VLDL	21-40	17	18.41	8.07	23.47	11.41	P>0.05
	41-60	31	20.77	12.81	23.50	4.42	
	>60	12	15.92	4.80	36.00	0.00	

Age is a traditional risk factor that cannot be changed, whereas LDL-C is a classic risk factor that can be changed (Payne 2012). At great societal and economic consequences, the link between dyslipidaemia and cardiovascular disease (CVD) has been studied for decades. In spite of this, few research have examined the relationship between age and lipid levels in the general population over a large age range. The current state of knowledge on changes in lipid levels with increasing age is often believed to be obvious, although this is not the case. The research on the relationship between age and lipid levels is sparse, despite the widespread belief that lipid levels including cholesterol, LDL-C, and TG rise until middle age and then fall (Park et al., 2015). According to statistics from the US cross-sectional National Health and Nutrition Examination Surveys, the levels of total cholesterol, triglycerides and low-density lipoprotein (LDL) cholesterol have all reduced during 22–42 year periods among US

people. Instead of examining the association between age and lipid profiles, this research was designed to illustrate the impact of trans-fatty acids, lipid lowering drugs and healthy lifestyle variables on the changes in lipid profiles (Feng *et al.* 2020).

4.12 Relation ALP and Ghrelin Parameters Between Age Groups of Study Groups

ALP, ghrelin parameter, and study group age were found to vary significantly (p 0.05) in the present research. At the age of 41-60, the mean ALP value was 259.0397.88, whereas the mean ALP value for patients was 162.8369.53, compared to healthy. The greatest ghrelin levels were found in patients over the age of 60 (1.460.58), whereas the lowest levels were seen in healthy people aged 41-60 (1.170.52) Table 4.12.

Table 4.12 Comparative mean levels of ALP and ghrelin parameters between age groups of study groups are calculated by F test

Age groups		Patients			Healthy		P value
		N	Mean	SD	Mean	SD	
ALP	21-40	17	237.65	122.93	81.72	22.94	P<0.001*** LSD=57.12
	41-60	31	259.03	97.88	85.83	6.08	
	>60	12	162.83	69.53	70.00	0.00	
Ghrelin	21-40	17	1.19	0.70	0.78	0.44	P<0.05* LSD=0.27
	41-60	31	1.17	0.52	0.83	0.34	
	>60	12	1.46	0.58	0.36	0.32	

Hypophosphatasia (HPP) has a low plasma ALP activity as its biochemical characteristic, although HPP is often misdiagnosed due to a lack of knowledge and in certain cases a lack of age- and gender-specific ALP reference intervals. ALP levels in children and adolescents are greater than in adults. Any clinical laboratory test relies on accurate reference intervals. Blood plasma ALP activity in the lower range should be interpreted according to age- and gender-specific reference ranges that are uniform. This study's findings suggest that, in healthy youngsters aged 13 to 14, the ALP exhibited continuous increases throughout time, displayed complicated changes, and climbed dramatically among boys between the ages of 11 and 14 (Li *et al.* 2018). Tibetan

adolescents' adolescent data indicated that the highest levels of serum ALP in males occurred between the ages of 13 and 14 years, and that those values in girls were lower.

Our aging culture is attracting a growing number of people who want to live a long and healthy life. The significance of living a long and healthy life has received a great deal of focus in recent years. Calorie restriction, in particular, slows down the aging process, lowers mortality, and increases lifespan. Orexigenic peptides, such as ghrelin, are known to be released during fasting. It's possible that caloric restriction, via increasing ghrelin, has something to do with the longevity-inducing properties of the hormone. Anti-aging mechanisms may include the ghrelin-growth hormone signaling pathway, according to (Amitani *et al.* 2017). Aging was related with a drop in food intake, but also in spontaneous locomotor activity and total energy expenditure. Reduced food intake and some of the decline in energy expenditure associated with age were seen in mice that had ghrelin deletion (Guillory *et al.* 2017).

4.13 Relation Renal Function Parameters with BMI Periods of Study Groups

It was shown that urea, creatinine, uric acid, albumin parameter and BMI of study groups varied significantly (p0.05) from one another. The greatest mean urea value was found in people with a BMI of 90.0623.41, while the lowest mean value was found in those with a BMI of 77.5622.79, both of whom were underweight. Obesity BMI had the greatest mean creatinine level (18.494.54), whereas underweight BMI had the lowest mean creatinine level (13.266.25) compared to healthy. Overweight BMI individuals had the lowest mean uric acid values (2.690.49), whereas patients with normal BMI (3.491.05) had the highest mean uric acid values (3.491.05). The lowest mean albumin value was found in people with a BMI of 38.897.44, whereas the highest mean albumin value was found in those with a BMI of 42.703.13 who were obese. There were no statistically significant differences (p>0.05) in the BMIs of the research groups in the total protein parameter Table 4.13.

Table 4.13 Comparative mean levels of renal function parameters between BMI periods of study groups are calculated by F test

BMI groups		Patients			Healthy		P value
		N	Mean	SD	Mean	SD	
Urea	Underweight	25	77.56	22.79	32.00	7.01	P<0.001*** LSD=11.25
	Normal weight	17	90.06	23.41	33.23	7.72	
	Overweight	11	75.91	13.43	34.40	5.99	
	Obesity	7	83.43	22.74	28.00	9.20	
Creatinine	Underweight	25	13.26	6.25	1.05	0.57	P<0.001*** LSD=3.19
	Normal weight	17	14.53	6.34	0.85	0.07	
	Overweight	11	15.05	3.12	0.92	0.28	
	Obesity	7	18.49	4.54	1.13	0.61	
Uric_Acid	Underweight	25	2.84	0.65	3.68	0.46	P<0.001*** LSD= 0.34
	Normal weight	17	3.49	1.05	3.85	0.52	
	Overweight	11	2.69	0.49	4.04	0.40	
	Obesity	7	3.01	0.53	3.50	0.96	
Albumin	Underweight	25	40.41	5.70	47.11	6.34	P<0.001*** LSD=2.99
	Normal weight	17	38.89	7.44	45.59	5.70	
	Overweight	11	41.07	5.77	51.70	8.08	
	Obesity	7	42.70	5.13	51.34	5.12	
Total Protein	Underweight	25	63.44	14.19	68.55	7.78	P>0.05
	Normal weight	17	58.66	20.89	65.99	9.47	
	Overweight	11	65.63	9.31	65.75	5.42	
	Obesity	7	66.40	6.95	64.43	9.94	

Obese people were shown to have a 3% prevalence of renal impairment, with 2% of this occurring. We may thus deduce that obesity-related renal impairment in obese people is exacerbated by an elevated BMI (Ray *et al.* 2020). Nondiabetic persons' creatinine clearance is not just influenced by their body mass index (BMI), but also by their fat distribution. This connection may be explained by lean body mass, rather than obesity. Only when obesity was measured using BMI did researchers discover the obesity paradox in hemodialysis patients (Gerchman *et al.* 2009). Clinically poor outcomes were observed to be related with lower blood creatinine levels in all BMI categories. As a result, in patients undergoing regular hemodialysis, measuring blood creatinine levels is an essential part in predicting mortality and morbidity regardless of BMI (Sakao *et al.* 2016). Serum creatinine levels have been shown to be highly associated with BMI in those over the age of 45, according to research. A rise in creatinine levels in adults over the age of 45 has been linked to a higher BMI. Prevention of obesity and weight

management are critical to preserving renal function in the elderly population (Ahmed *et al.* 2018). In overweight or obese individuals with acute decompensated heart failure, urea upon discharge may be a helpful predictor of unfavorable outcomes (Iwasaki *et al.* 2017). According to the findings, there is a strong link between adult obesity and elevated levels of uric acid. To avoid hyperuricemia and its associated consequences, uric acid testing should be performed on a regular basis in obese patients (Cicero *et al.* 2018). The prognosis in the emergency department was satisfactory even for patients with low BMI and an albumin value of 3.3 g/dL or higher. A straightforward and objective technique to evaluate the nutritional condition of critically sick patients arriving to emergency facilities is to measure their albumin level on admission (Fukawa *et al.* 2018). Obesity and morbid obesity seem to be independent risk factors for hypoalbuminemia, according to the results. Findings from this study may be utilized in future research to better understand the link between obesity and hypoalbuminemia and to assist advise doctors in the proper interpretation and use of serum albumin data for obese persons (Mosli and Mosli 2017).

4.14 Relation Lipoid Profile Parameters with BMI Periods of Study Groups

Cholesterol, TG, LDL, VLDL, and BMI were all shown to be statistically indistinguishable across the research groups ($p>0.05$). It was revealed that the HDL parameter showed significant variations (p 0.05) across BMI categories, with the greatest mean HDL (35.64 12.01) and the lowest mean HDL (29.44 14.41) correspondingly in the obese and healthy groups Table 4.14.

Table 4.14 Comparative mean levels of lipoid profile parameters between BMI periods of study groups are calculated by F test

BMI groups		Patients			Healthy		P value
		N	Mean	SD	Mean	SD	
Cholesterol	Underweight	25	140.52	32.78	159.70	35.85	P>0.05
	Normal weight	17	130.71	34.84	155.92	21.67	
	Overweight	11	144.55	34.40	161.10	39.69	
	Obesity	7	150.71	21.87	167.29	12.66	
HDL	Underweight	25	34.79	13.82	46.58	17.78	P<0.01** LSD=5.52
	Normal weight	17	29.44	14.41	43.06	8.56	
	Overweight	11	31.54	12.75	43.77	7.78	
	Obesity	7	35.64	12.01	47.64	10.15	
LDL	Underweight	25	87.30	32.43	78.23	6.76	P>0.05
	Normal weight	17	80.47	29.83	94.25	19.72	
	Overweight	11	93.72	24.37	88.17	21.85	
	Obesity	7	97.73	16.90	94.19	20.09	
TG	Underweight	25	92.16	37.36	121.20	69.51	P>0.05
	Normal weight	17	103.94	64.89	91.00	22.96	
	Overweight	11	96.36	63.98	128.80	36.69	
	Obesity	7	86.86	50.60	113.00	61.62	
VLDL	Underweight	25	18.36	7.45	24.00	13.99	P>0.05
	Normal weight	17	20.88	13.10	20.31	7.28	
	Overweight	11	19.36	12.77	29.30	7.62	
	Obesity	7	17.29	10.24	21.14	12.27	

Patients with visceral obesity have a lipid profile that is characteristic of the metabolic syndrome. More visceral fat, lower plasma HDL cholesterol and higher triglycerides were found in males than in women in our research, as well as higher insulin and blood glucose levels Low-density lipoprotein (LDL) cholesterol levels are higher in those with visceral obesity, although the LDL particles are smaller and denser. Since abdominal obesity, as measured by the waist-to-hip ratio or the more precise measurement of visceral fat accumulation by computed tomography (CT), is linked to cardiovascular events, it should come as no surprise that it raises the risk of heart disease (Hafe 2019).

4.15 Relation Mean Levels of ALP and Ghrelin Parameters Between BMI Periods of Study Groups

ALP, ghrelin parameters, and BMI of study groups were shown to have no statistically significant differences (p>0.05) in the present research. Obesity BMI (340.57133.27) had the greatest ALP average, whereas overweight BMI (165.0999.68) had the lowest ALP average. Normalweight BMI had the greatest mean ghrelin level (1.420.57), whereas obesity BMI had a lower average ghrelin level (0.610.22) than healthy individuals Table 4.15.

Table 4.15 Comparative mean levels of ALP and ghrelin parameters between BMI periods of study groups are calculated by F test

BMI groups		Patients			Healthy		P value
		N	Mean	SD	Mean	SD	
ALP	Underweight	25	224.96	88.69	79.50	29.97	P<0..01*** LSD=59.66
	Normal weight	17	247.06	111.97	78.77	14.39	
	Overweight	11	165.09	99.68	85.90	18.66	
	Obesity	7	340.57	133.27	86.29	20.65	
Ghelin	Underweight	25	1.27	0.52	0.63	0.24	P<0.01** LSD=0.27
	Normal weight	17	1.42	0.57	0.75	0.31	
	Overweight	11	1.25	0.51	0.97	0.33	
	Obesity	7	0.61	0.22	0.91	0.37	

Obese people had higher blood alkaline phosphatase levels than non-obese people, according to the study's findings. Serum alkaline phosphatase and body mass index were also shown to have a substantial linear association. Obesity was shown to be connected to an increase in alkaline phosphatase activity (Khan *et al.* 2015). High IAP levels have been shown to be protective against diabetes regardless of weight, and a temporal IAP profile might be used to identify those at risk for developing the incipient metabolic syndrome, which includes incipient diabetes (Malo *et al.* 2015). based on the finding that ALP is associated with obesity, this shows that ALP may have a role in breast cancer patients' formation of preadipocytes (Rashid *et al.* 2021). Further research is required to clarify whether ALP and obesity in breast cancer patients have a hormonal relationship. In children, the typical levels of liver enzymes vary depending on the

child's age as well as gender. Increased levels of liver damage biomarkers are linked to being overweight or obese. As a result of these studies, it is clear that childhood and teenage obesity must be prevented and treated (Johansen *et al.* 2020).

A link has been shown between the hunger hormone ghrelin and weight gain in many research. Adults with obesity have lower amounts of ghrelin, which has a negative correlation with BMI (Shiiya *et al.* 2002). Children and adolescents who are obese have lower levels of ghrelin, which has a negative correlation with BMI (Kuppens *et al.* 2015). Ghrelin levels in adults and children have been shown in several studies to be inversely correlated with levels of circulating insulin and insulin resistance (Cheng *et al.* 2018). On the other hand, investigations investigating for links between plasma ghrelin and circulating lipids have shown contradictory findings (Razzaghy-Azar *et al.* 2016). As a result, it becomes clear that more clinical research with rigorous biochemical analyses of varied human groups are still required to better understand the consequences of the ghrelin system in humans. A recent research found that LEAP2 levels are greater in morbidly obese people and positively related with BMI and plasma glucose (Mani *et al.* 2019). Des-acyl ghrelin and LEAP2, a new ligand for the ghrelin receptor that inhibits the effects of ghrelin, was shown to be decreased in children with obesity, which increases ghrelin tone. Des-acyl ghrelin is also connected with insulin resistance, especially in overweight or obese children (Fittipaldi *et al.* 2020).

5. CONCLUSIONS AND RECOMMENDATION

Our present investigation led us to this conclusion.

1- The number of men suffering from renal failure (38) is higher than the number of women affected (22) by a percentage of (63,3 percent) (36.7 percent).
2- Age groups between the ages of 41 and 60 had the greatest rates of infection, while those above 60 had the lowest rates of sickness.
3- Patients had higher levels of certain biochemical tests (urea and creatinine) than 4- healthy controls, but lower levels of others (uric acid and albumin) than healthy controls, according to the results of the most recent research3. There was no significant difference between the research groups of healthy patients in terms of total protein.
4- The movement of cholesterol, HDL and VLDL, was studied in detail in this work. People who are in good health make a huge impact. Findings from our research show no correlation between the number of LDL and TG parameters in our results and the groups studied.
5- Patients' ALP and ghrelin coefficients rose as a consequence of the research. When compared to healthy individuals, there is a huge difference.
6- Based on our research, we can say that the ghrelin (69) hormone's sensitivity to a chemochemical test is high enough to use it in the diagnosis of renal failure in patients.
7- Ghrelin and urea have been demonstrated to be substantially inversely associated in studies.
8- urea levels in male patients were found to be greater than those in female patients, contrary to what has been seen in healthy individuals, where urea levels in healthy men were found to be lower than those in healthy females. When it comes to creatinine levels, female patients have greater levels than male patients, however among healthy individuals, men have higher levels than females.
9- Despite the fact that healthy guys have greater cholesterol levels than healthy females, recent research shows that male patients have lower cholesterol levels than female patients. When it comes to HDL levels, ill and healthy females have greater

levels than sick and healthy men. For LDL patients, female patients had greater readings than male patients. Males in poor health are the polar opposite of those in good health. Males have greater values than females when it comes to health.

10- Patients' ALP levels were found to be lower in females than in males, and the converse was seen in healthy participants, according to the results of the present research. In healthy men, the values are greater than those of healthy females

Male patients had greater ghrelin levels than female patients, and the inverse is true for healthy guys. There are fewer healthy guys in the world, which means that these levels are lower.

5.1 Recommendations

1- For the early detection of renal failure patients in hospitals, the hormone ghrelin is often used.

2- The early detection of renal failure by using ALP

3- I recommend taking at least 200 samples to show more accuracy in the results

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