Renal Functions Test or Kidney functions Test (RFT) or (KFT)

The kidneys

are two bean shaped organs lying retroperitoneally on each side of the vertebral column slightly .

1 – Blood urea:

Urea forms in the liver and, along with CO2, constitutes the final product of protein metabolism. The amount of excreted urea varies directly with dietary protein intake, increased excretion in fever, diabetes, and increased adrenal gland activity.

Clinical implication

- **Increased BUN levels occur in the following conditions:**

a. Impaired renal function

b. Chronic renal disease

c. Urinary tract obstruction

d. Hemorrhage into GI tract

e. Diabetes mellitus with ketoacidosis

f. Excessive protein

g. Anabolic steroid use

- **Decreased BUN levels**:

a. Liver failure

b. Acromegaly

c. Malnutrition, low-protein diets

d. Impaired absorption

e. Nephrotic syndrome

Reference Values

Global	17 – 43 mg/dL
Women < 50 years	40 – 15mg/dL
Women > 50 years	43 – 21mg/dL
Men < 50 years	44 – 19mg/dL
Men > 50 years	18 – 54 mg/dL
Children	
1 –3 years	11 – 36 mg/dL
4 – 13years	15 – 36mg/dL
14 – 19 years	18 – 45 mg/dL

2 - Serum Creatinine

Creatinine is a waste product that comes from the normal wear and tear on muscles of the body. Everyone has creatinine in their bloodstream.

Clinical Implications

- **Increased blood creatinine levels:**

a. Impaired renal function

b. Chronic nephritis

c. Obstruction of urinary tract

d. Muscle disease

e. Congestive heart failure

f. Shock

g. Dehydration

h. Rhabdomyolysis (skeletal muscle tissue breakdown)

i. Hyperthyroidism

- **Decreased creatinine levels:**

a. Small stature

b. Decreased muscle mass

c. Advanced and severe liver disease

d. Inadequate dietary protein

e. Pregnancy

Reference Values

•**Adult men:** 0.9–1.3 mg/dL

•**Adult women:** 0.6–1.1 mg/dL

3 Uric acid

Uric acid is formed from the breakdown of nucleic acids and is an end product of purine (adenosine and guanine) metabolism in the liver.

Clinical applications

Uric acid is measured to:

1. Diagnosis and monitor treatment of gout.
2. Diagnosis of renal calculi
3. Detect kidney function.
4. Assess inherited disorders of purine metabolism
5. Monitor if uric acid levels are too high after chemotherapy or radiation.

Clinical Significance

- **Disease states with increased plasma uric acid (Hyperuricemia)**
  1. Gout
  2. Increased catabolism of nucleic acids
  3. renal disease
  4. Metabolic acidosis, diabetic ketoacidosis
  5. Leukemia, multiple myeloma, lymphoma
- **Decreased levels of uric acid (Hypouricemia) occur in the following conditions:**

1. Fanconi's syndrome (disease of the proximal renal tubules)
2. Wilson's disease (autosomal recessive disorder resulting in the accumulation of copper in tissues)
3. SIADH
4. Some malignancies (e.g., Hodgkin's disease, multiple myeloma)
5. Xanthinuria (deficiency of xanthine oxidase)

Reference Values

Men: 3.4–7.0 mg/dL

Women: 2.4–6.0 mg/dL

Liver function tests (LFT)

1 - Alanine transaminase (ALT):

ALT is an enzyme found in the liver that helps convert proteins into energy for the liver cells. When the liver is damaged, ALT is released into the bloodstream and levels increase.

Indications :

A higher result than typical on this test can be a sign of liver damage. Very high levels over 1,000 units per liter (U/L) are most often caused by viral hepatitis, ischemic hepatitis, or injury from drugs or other chemicals.

Typical and atypical ranges :

An ALT above 25 international units per liter (IU/L) in females and 33 IU/L in males typically requires further testing and evaluation.

2 - Aspartate transaminase (AST):

AST is an enzyme that helps metabolize amino acids. Like ALT, AST is normally present in blood at low levels. An increase in AST levels may indicate liver damage, disease or muscle damage.

Indications :

A high result on an AST test might indicate a problem with your liver or muscles. Elevated AST without elevated ALT may indicate heart or muscle disease. If ALT, bilirubin, and ALP are also elevated, it may indicate liver damage.

Typical and atypical ranges :

The typical range for AST is usually up to 36 U/L in adults and may be higher in infants and young children.

3 - Alkaline phosphatase (ALP) :

ALP is an enzyme found in the liver and bone and is important for breaking down proteins. Higher-than-normal levels of ALP may indicate liver damage or disease, such as a blocked bile duct, or certain bone diseases.

Indications :

High levels of ALP may indicate liver inflammation, blockage of the bile ducts, or bone disease.

Typical and atypical ranges :

Children and adolescents may have elevated levels of ALPTrusted Source because their bones are growing. Pregnancy can also raise ALP levels. The typical range for ALP in adults is usually 20–140 IU/LTrusted Source.

4 - Albumin and total protein:

Albumin is one of several proteins made in the liver. Your body needs these proteins to fight infections and to perform other functions. Lower-than-normal levels of albumin and total protein may indicate liver damage or disease.

Indications :

A low result on this test can indicate that your liver isn't functioning properly. This occurs in diseases such as cirrhosis, malnutrition, and cancer.

Typical and atypical ranges :

The typical range for albumin is 35–50 grams per liter (g/L). However, low albumin can also be a result of poor nutrition, kidney disease, infection, and inflammation.

5 - Bilirubin:

Bilirubin is a substance produced during the normal breakdown of red blood cells. Bilirubin passes through the liver and is excreted in stool. Elevated levels of bilirubin (jaundice) might indicate liver damage or disease or certain types of anemia.

Indications :

A high result on the bilirubin test may indicate that the liver isn't functioning properly. Elevated bilirubin levels with elevated ALT or AST may suggest cirrhosis or hepatitis.

Typical and atypical ranges :

The typical range for total bilirubin is usually 0.1–1.2 milligrams per deciliter (mg/dL).

6 - Gamma-glutamyltransferase (GGT):

GGT is an enzyme in the blood. Higher-than-normal levels may indicate liver or bile duct damage.

7 - L-lactate dehydrogenase (LD):

LD is an enzyme found in the liver. Elevated levels may indicate liver damage but can be elevated in many other disorders.

Liver function tests can be used to:

- Screen for liver infections, such as hepatitis
- Monitor the progression of a disease, such as viral or alcoholic hepatitis, and determine how well a treatment is working
- Measure the severity of a disease, particularly scarring of the liver (cirrhosis)
- Monitor possible side effects of medications

symptoms of a liver disorder

1. weakness
2. fatigue or loss of energy
3. weight loss
4. jaundice (yellow skin and eyes)
5. fluid collection in the abdomen, known as ascites
6. discolored bodily discharge (dark urine or light stools)
7. nausea
8. vomiting
9. diarrhea
10. abdominal pain
11. atypical bruising or bleeding

Lipid Profile

Lipids are biomolecules serve many physiological functions in the body. The term lipid profile or lipid panel is a panel of blood tests that serves as an initial screening tool for abnormalities in lipids (Dyslipidemia). The results of this test has now become almost a routine test, because dyslipidemia is a well-established risk factor for the development of CAD.

Lipid profile included :

1 - Total cholesterol:

Cholesterol ($C_{27}H_{46}O$) is a lipid found in the cell membranes, precursor for the synthesis of many physiologically compounds. It can be converted in the liver to primary bile acids, or converted by some tissue to steroid hormones .

- ***Normal Range:***

Serum / plasma: 150 – 220 mg/dl

2 - Triglycerides (TG):

Triglycerides are a form of fat in the blood stream; derived from glycerol and fatty acids.

- ***Normal Range:***

Male: 60 – 165 mg/dl

Female: 40 – 140 mg/dl

3 - High density lipoprotein cholesterol (HDL-C):

HDL is one of the major lipoproteins and it is often called “good cholesterol”. They produced in liver and intestine and remove excess cholesterol from tissues and vessel walls and carry it to the liver where it is removed from the blood and discarded [127].

- ***Normal Range:***

Male: 35 – 55 mg/dl

Female: 45 – 65 mg/dl

4 - Low density lipoprotein cholesterol (LDL-C):

LDL is a lipoprotein and it is often called "bad cholesterol".

LDL-C (mg/dl) = TC – (HDL-C + TG / 5)

- ***Normal Range*:**

Male: 150 mg/dl

Female: 190 mg/dl

5 - Very low density lipoprotein cholesterol (VLDL-C)

VLDL is produced in the liver by the combination of cholesterol, triglycerides and apoprotein, the main carrier of endogenous hepatic triacylglycerol in blood.

VLDL-C (mg/dl) = TG / 5

factors affect Lipid levels

1 – Diet : Saturated fat and cholesterol in the food you eat make your blood cholesterol level .

2 – Weight: also tends to increase your cholesterol. Losing weight can help lower your LDL (bad) cholesterol, total cholesterol, and triglyceride levels. It also raises your HDL (good) cholesterol level.

3 – Physical Activity: Not being physically active is a risk factor for heart disease. Regular physical activity can help lower LDL (bad) cholesterol and raise HDL (good) cholesterol levels. It also helps you lose weight. You should try to be physically active for 30 minutes on most, if not all, days.

4 – Smoking : Cigarette smoking lowers your HDL (good) cholesterol. HDL helps to remove bad cholesterol from your arteries. So a lower HDL can contribute to a higher level of bad cholesterol.