

URINALYSIS

Urinalysis also known as routine examination of urine is a group of diagnostic test performed on the sample of urine. It is used to detect and manage wide range of disorders Urinalysis is done by:

- 1) Physical examination
- 2) Microscopic examination
- 3) Chemical analysis

PHYSICAL EXAMINATION

- 1) Volume: increase in urine volume indicates increase in protein metabolism and renal disorders such as chronic renal failure, diabetes insipidus and glycosuria.
- 2) Color: normally urine is straw colored. Abnormal coloration of urine is due to several causes such as jaundice, hematuria, hemoglobinuria, medications , excessive urobilinogen, ingestion of beetroot or color added to food.
- 3) Appearance: normally urine is clear. It becomes turbid in both physiological and pathological conditions. Physiological conditions causing turbidity of urine are precipitation of crystals, presence of mucus or vaginal discharge. Pathological conditions causing turbidity are presence of blood cells , bacteria or yeast .
- 4) Specific gravity : it is the measure of dissolved solutes (particles) in the urine. It is low in diabetes insipidus and high in diabetes mellitus, acute renal failure and excess medications. Urinometer is used to measure specific gravity
- 5) Osmolarity : it decreases in diabetes insipidus
- 6) pH and reaction : measurements of pH is useful in determining the metabolic or respiratory acidosis or alkalosis. The pH decreases in renal diseases. In normal conditions, pH of the urine depends upon diet. It is slightly alkaline in vegetarian and acidic in non-vegetarians.

MICROSCOPIC EXAMINATION

Microscopic examination of centrifuged sediment of urine is useful in determining the renal diseases

- 1) red blood cells : presence of red blood cells in urine indicates glomerular disease such as glomerulonephritis
- 2) white blood cells: normally few white blood cells appear in high power field. The number increases in acute glomerulonephritis, infection of urinary tract, vagina or cervix.
- 3) Epithelial cells: normally few tubular epithelial cells slough into urine. Presence of many epithelial cells suggest nephrotic syndrome and tubular necrosis.
- 4) Casts : casts are cylindrical bodies that are casted (molded) in the shape of renal tubule. Casts maybe hyaline, granular or cellular in nature. Hyaline and granular casts, which are formed by precipitation of proteins, may appear in urine in small numbers. The number increases in proteinuria due to glomerulonephritis.
Cellular casts are formed by sticking together of some cells. Red blood cell casts appear in urine during glomerulonephritis and tubular necrosis. White blood cell casts appear in pyelonephritis. Epithelial casts are formed during acute tubular necrosis.
- 5) Crystals : several types of crystals are present in normal urine. Common crystals are the crystals of calcium oxalate, calcium phosphate, uric acid and triple phosphate (calcium,

ammonium and magnesium) abnormal crystals such as crystals of cysteine and tyrosine appear in liver diseases.

- 6) Bacteria: these are common in urine specimens because of normal microbial flora of urinary tract, urethra and vagina and because of their ability to multiply rapidly in urine. Culture studies are necessary to determine the presence of bacteria in urine.

CHEMICAL ANALYSIS

Chemical analysis of urine helps to determine the presence of abnormal constituents or urine or presence of normal constituents in abnormal quantity. Both findings reveal the presence of renal abnormality. Following are the common chemical tests of urine

- 1) Glucose : glucose appears in urine when the blood glucose level increases above 180 mg/dL. Glycosuria (presence of glucose in urine) may be the first indicator for diabetes mellitus.
- 2) Protein : presence of excess protein (proteinuria) particularly albumin (albuminuria) in urine indicates renal disease.
- 3) Ketone bodies: ketonuria (presence of ketone bodies in urine) occurs in pregnancy, fever, diabetes mellitus, prolonged starvation and glycogen storage disease
- 4) Bilirubin : bilirubin appears in urine (bilirubinuria) during hepatic and posthepatic jaundice.
- 5) Bile salts: presence of bile salt in urine reveals jaundice.
- 6) Blood: presence of blood in urine (hematuria) indicates glomerulonephritis, renal stones, infection or malignancy of urinary tract. Hematuria must be confirmed by microscopic examination since chemical test fails to distinguish the presence of red blood cells or hemoglobin in urine
- 7) Hemoglobin: it appears in urine (hemoglobinuria) during excessive hemolysis
- 8) Nitrite: presence of nitrite in urine indicates presence of bacteria in urine since some bacteria convert nitrate into nitrite in urine.