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Pharmacology

URINALYSIS

This is the examination of urine. Routine examination of urine or urinalysis is a group of diagnostic tests performed on the sample of urine.

Urinalysis is done by:

- i. Physical examination
- ii. Microscopic examination
- iii. Chemical analysis

PHYSICAL EXAMINATION

1. Volume

Increase in urine volume indicates increase in protein catabolism 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, excess 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

Specific gravity of urine is the measure of dissolved solutes (particles) in urine. It is low in diabetes insipidus and high in diabetes mellitus, acute renal failure and excess medications.

5. Osmolarity

Osmolarity of urine decreases in diabetes insipidus.

6. pH and Reaction

Measurement of pH is useful in determining the metabolic or respiratory acidosis or alkalosis. The pH decreases in renal diseases. In normal conditions, pH of urine depends upon diet. It is slightly alkaline in vegetarians 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 suggests nephrotic syndrome and tubular necrosis.

4. Casts

Casts are the cylindrical bodies that are casted (molded) in the shape of renal tubule. Casts may be 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 cystine and tyrosine appear in liver diseases.

6. Bacteria

Bacteria 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 of urine or presence of normal constituents in abnormal quantity. Both the 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 of diabetes mellitus.

2. Protein

Presence of excess protein (proteinuria) particularly albumin (albuminuria) in urine indicates renal diseases. Urinary excretion of albumin in a normal healthy adult is about 30 mg/day. It exceeds this level in glomerulo nephritis. It also increases in fever and severe exercise.

3. Ketone Bodies

Ketonuria (presence of ketone bodies in urine) occurs in pregnancy, fever, diabetes mellitus, prolonged starvation and glycogen storage diseases.

4. Bilirubin

Bilirubin appears in urine (bilirubinuria) during hepatic and posthepatic jaundice.

5. Urobilinogen

Normally, about 1 to 3.5 mg of urobilinogen is excreted in urine daily. Excess of urobilinogen in urine indicates hemolytic jaundice.

6. Bile Salts

Presence of bile salts in urine reveals jaundice.

7. Blood

Presence of blood in urine (hematuria) indicates glomerulo nephritis, renal stones, infection or malignancy of urinary tract. Hematuria must be confirmed by micro scopic examination since chemical test fails to distinguish the presence of red blood cells or hemoglobin in urine.

8. Hemoglobin

Hemoglobin appears in urine (hemoglobinuria) during excess hemolysis.

9. Nitrite

Presence of nitrite in urine indicates presence of bacteria in urine since some bacteria convert nitrate into nitrite in urine.