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QUESTION.

WRITE A SHORT NOTE ON URINALYSIS.

ANSWER.

A urinalysis (UA), also known as routine and microscopy (R&M), is an array of tests performed on urine, and one of the most common methods of medical diagnosis. Urinalysis means the analysis of urine, and it is used to diagnose several diseases. The target parameters that are measured or quantified in urinalysis include many substances and cells, as well as other properties, such as specific gravity. A part of a urinalysis can be performed by using urine teststrips, in which the test results can be read as the strip's color changes. Another method is light microscopy of urine samples.

EXAMINATION OF URINE - URINALYSIS.

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. Colour:

Normally urine is straw coloured. 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 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 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 glomerulonephritis. 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 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.

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.

TABLE OF URINE CHEMICAL COMPOSITION.

Another table of urine composition in human men lists slightly different values, as well as some additional compounds:

CHEMICAL.	CONC. IN G/100ML URINE.
Water	95
Urea	2
Sodium	0.6
Chloride	0.6
Sulfate	0.18
Potassium	0.15
Phosphate	0.12
Creatinine	0.1
Ammonia	0.05
Uric acid	0.03
Calcium	0.015
Magnesium	0.01
Protein	--
Glucose	--

CHEMICAL ELEMENTS IN HUMAN URINE.

The element abundance depends on diet, health, and hydration level, but human urine consists of approximately:

1. Oxygen (O): 8.25 g/l.
2. Nitrogen (N): 8/12 g/l.
3. Carbon (C): 6.87 g/l.
4. Hydrogen (H): 1.51 g/l.

