(5)

Renal system

Organs of the urinary system

1.the kidneys 2. the ureters

3. the urinary bladder 4. the urethra

Functions of the renal system:

1. Formation of the urine
2. Production of the hormones
3. Conversion of vitamin D into active form
4. Excretion of unwanted substances
5. Regulation of acid base balance
6. Maintenance of water balance
7. Maintenance of electrolytes balance

Formation of urine

The kidneys filter all the blood every **30 minutes.** They filter and remove approximately **1.5** liters of urine every 24 hours.

❖ The formation of urine occurs in three processes:

1. Glomerular filtration
2. Tubular reabsorption
3. Tubular secretion

Glomerular filtration`

- Is the process of removal of red blood cells and proteins of high molecular weight from the plasma.
- This process occurs in the glomerulus, which acts as a filter between the blood and the tubule.

Tubular reabsorption

- About 99% of water and other useful small molecules in the filtrate are returned to the blood of the peritubular capillaries.
- The reabsorption is a selective process and varies according to the body′s need for each substance.
- For example, glucose is reabsorbed completely under normal condition.

Substances that are not filtered

Blood cells and high molecular proteins are not filtered in normal condition.
Kidney infection and trauma commonly damage the filtration membrane and allow plasma proteins and blood cells to pass through and appear in the urine.

Factors affecting glomerular filtration

1. Capillary pressure or filtration pressure (60 mmHg).

Filtration is directly proportional with capillary pressure

2. Pressure in the bowman's capsule (10 mmHg)

Filtration is inversely proportional with bowman's capsule pressure

3. Osmotic pressure of the proteins (25 mmHg)

Filtration is inversely proportional with osmotic pressure of the plasma proteins.

Filtration pressure= capillary P.–(bowman's capsule P.+ Osmotic pressure)

25 = 60 –(10+ 25)

pathological conditions affect glomerular filtration

1. **Shock:** in this case blood volume & blood pressure is decreased . therefore capillary pressure and then glomerular filtration will be decreased.
2. **Obstruction of renal passages**: stone in ureter elevates the pressure in Bowman's capsule & then the glomerular filtration will be decreased.
3. **Hypoproteinemia:** osmotic pressure is decreased and then glomerular filtration will be increased.