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Nursing 200level

PHS 212- Physiology

Question: Explain urine formation and concentration.

Urine formation

Urine is formed in the kidneys through a filtration of blood. The urine is then passed through the ureters to the bladder, where it is stored. During urination, the urine is passed from the bladder through the urethra to the outside of the body. 800–2,000 milliliters (mL) of urine are normally produced every day in a healthy human. This amount varies according to fluid intake and kidney function.Waste is excreted from the human body mainly in the form of urine. Our kidneys play a major role in the process of excretion. Constituents of normal human urine include 95 percent water and 5 percent solid wastes. It is produced in the nephron which is the structural and functional unit of the kidney.

Urine formation in our body is mainly carried out in three phases namely:

1) Glomerular Filteration: Glomerular filtration occurs in the glomerulus where blood is filtered. This process occurs across the three layers- epithelium of Bowman's capsule, endothelium of glomerular blood vessels, and a membrane between these two layers. Blood is filtered in such a way that all the constituents of the plasma reach the Bowman's capsule, except proteins. Therefore, this process is known as ultrafiltration.

2) Reabsorption: Around 99 percent of the filtrate obtained is reabsorbed by the renal tubules. This is known as reabsorption. This is achieved by active and passive transport.

3)Secretion: The next step in urine formation is the tubular secretion. Here, tubular cells secrete substances like hydrogen ion, potassium ion, etc into the filtrate. By this process, the ionic, acid-base and the balance of other body fluids are maintained. The secreted ions combine with the filtrate and form urine. The urine passes out of the nephron tubule into a collecting duct.

Urine concentration

Urine naturally has some yellow pigments called urobilin or urochrome. The darker urine is, the more concentrated it tends to be. Dark urine is most commonly due to dehydration. However, it may be an indicator that excess, unusual, or potentially dangerous waste products are circulating in the body. The urine concentrating mechanism plays a fundamental role in regulating water and sodium excretion. When water intake is large enough to dilute blood plasma, a urine more dilute than blood plasma is produced; when water intake is so small that blood plasma is concentrated, a urine more concentrated than blood plasma is produced.

Normal values of urine concentration tend to be in the range of at and slightly above the density of water (1.000 to 1.030).

A urine concentration test can be taken to determine how well a person's kidneys are functioning. The test may be used to test the kidneys' response to too much fluid intake or too little fluid intake (dehydration). The test may be taken several times under different circumstances.