Fluid, electrolyte, and acid-base balance

Chapter 50
Fluid, electrolyte, and acid-base balance

- About 46% to 60% of the average adult's weight is water, which is vital to health and normal cellular function, serving as:
  - A medium for metabolic reaction within cell
  - A transport or nutrients, waste product, and other substances
  - A lubricant
  - An insulator and shock absorbed
  - One means of regulation and maintaining body temperature

- Age sex and body fat affect the total body water.
- Infant have the highest proportion of water. Accounting for 70% -80% of their body weight
- Fat tissue is essentially free of water. lean tissue containing significant amount of water.
**Distribution of body fluid**

The body fluid is divided into two major components:

- **intracellular fluid.**
- **extra cellular fluid.**

**intracellular fluid:**
- is found within the cell of the body
- constitute approximately two thirds of the total body fluid in adult
- is vital to normal cell function
- It contain solute such as oxygen, electrolyte and glucose
- It provide medium in which metabolic process of the cell take place
**extra cellular fluid:**
- found outside the cell
- Accounts for about one-third of the total body fluid
- divided into:
  - intravascular fluid (plasma) is found within the vascular system
  - interstitial surrounding the cell
  - Lymph and trance cellular fluid include cerebrospinal, pericardial.
Movement of body fluids and electrolytes

**Osmoses**: is the movement of water across the cell membrane, from the less concentrated solution to the more concentrated solution

- Isotonic solution: solution has the same osmolality as body fluid, normal slain, and 0.9% sodium chloride
- Hypertonic solution: have a higher osmolality than body fluid: 3% sodium chloride
- Hypotonic solution: have low osmolality than body fluid, e.g. 0.45 sodium chloride
Movement of body fluids and electrolytes

- **Diffusion:** is the continual intermingling of molecules in liquids. Gases or solid brought about the random movement of the molecules.

- **Filtration:** is a process whereby fluid and solution move together across membrane from one component to another.

- **Active transport:** substances can move across cell membrane from less concentration solution to amore concentration solution one by active transport.
Regulation of body fluid

■ Fluid intake:
  □ The average adult needs 2.500 ml /day
  □ 1.500 ml drinks and 100ml from the food

■ Fluid output: there are four rote of fluid output:
  □ urine: normal urine output from an adult is 1.400 to 1.500 ml per 24 hr .if fluid loss through perspiration is large, whoever , urine volume decreases to maintain fluid balance in the body
  □ insensible loss through the skin and through the lung
  □ noticeable loss through the skin
  □ loss through the intestines in feces
Average daily output from an adult is 2.300 to 2.600 ml.

Obligatory loss: certain fluid losses are required to maintain normal body function.

Maintaining homeostasis:
- Kidney
- Antiduritic hormone
- Rennin angiotencin aldesteron system
- Atreal naturiuretic factor

Regulating electrolyte:
- Electrolytes are important for:
  - Maintaining fluid balance contributing to acid base regulation.
  - Facilitating enzyme reaction.
  - Transmitting neuromuscular reaction.
Acid- base balance

- Acid is a substance that releases hydrogen ions in solution.
- Bases or alkalis have a low hydrogen ions concentration and can accept hydrogen ions in solution.
- pH reflects the hydrogen ions in solution.
- The higher the hydrogen ions, the lower the pH.
- The pH of water is 7.
- pH lower than 7 is acidic.
- pH higher than 7 is base or alkaline.
- Normal pH is 7.35-7.45.
Regulation of acid base balance

- **Buffers**: bicarbonate (HCO3); prevent excessive changes in pH by removing or releasing hydrogen ions.

- **Respiratory regulation**: lung help regulating acid-base balance by eliminating or retaining carbon dioxide (CO2).

- **Renal regulation**: the renal are the ultimate long term regulation of acid base balance by selectively excreting or conserving bicarbonate and hydrogen ions.
Factor affecting body fluid, electrolyte, and acid base balance

- **Age**: in elderly people the thirst response is blunted.
- **Gender and body size**: water account for approximately 60% of an adult man and 52% of adult women.
- **Environment temperature**.
- **Lifestyle**.
Disturbance in fluid volume, electrolyte, and acid base balance

Fluid imbalance:

- Fluid volume deficit: when the body loses both water and electrolyte from the ECF in similar proportion, it is often called hypovolemia.

- FVD occur as a result of:
  - abnormal loses through the skin, gastrointestinal tract or kidney.
  - decrease intake of fluid.
  - bleeding movement of fluid into a third space.
Disturbance in fluid volume, electrolyte, and acid base balance

Fluid volume excess

- FVE occur when the body retain both water and sodium in similar proportion to normal ECE (hypervolemia)

- EDEMA:
  - Both sodium and water content. Excessive interstitial is known as edema.
  - Is topically most apparent in area where the tissue pressure is low, such as around the eye and independent tissue.
Disturbance in fluid volume, electrolyte, and acid base balance

- Dehydration: occur when the water is lost from the body without significance loss of electrolyte.

- Over hydration: (water intoxication) occur when a water is gained in excess of electrolyte result in low serum sodium level.
Nursing management

Assessing:
- Nursing history
- Physical assessment
- Clinical measure: daily weight, Vital signs
- Fluid intake and output
- Laboratory test (serum electrolyte, complete blood count CBC, osmolality, urine pH, urine specific gravity etc)

Diagnoses
- Deficit fluid volume
- Excessive fluid volume
- Risk for imbalance fluid volume
- Risk for deficit fluid volume
- Impaired gas exchange
Planning:
- Maintaining or restoring normal fluid balance
- Maintaining or restoring normal balance of electrolyte
- Maintaining pulmonary ventilation
- Prevent associated risks

Implementation:
- Promoting wellness
- Fluid and electrolyte replacement
- Fluid intake modification
- Dietary changes
- Oral electrolyte supplement Parenteral fluid and electrolyte replacement

Evaluation

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