



Body fluids, electrolytes and acid-base balance

Learning Objectives:

After completing this lecture, the students will be able to:

- 1) Discuss the function, distribution, movement, and regulation of fluids and electrolytes in the body.
- 2) Describe the regulation of acid–base balance in the body, including the roles of buffers, the lungs, and the kidneys.
- 3) Identify factors affecting normal body fluid, electrolyte, and acid–base balance.
- 4) Discuss risk factors for, and causes and effects of, fluid, electrolyte, and acid–base imbalances.
- 5) Collect assessment data related to clients' fluid, electrolyte, and acid–base balances.
- 6) Identify examples of nursing diagnoses, outcomes, and interventions for clients with altered fluid, electrolyte, or acid–base balance.
- 7) Implement measures to correct imbalances of fluids, electrolytes, acids, and bases, such as enteral or parenteral replacements and blood transfusions.
- 8) Evaluate the effect of nursing and collaborative interventions on clients' fluid, electrolyte, or acid–base balance.
- 9) Demonstrate appropriate documentation and reporting of fluid, electrolyte, and acid–base balance activities.

Body fluids:

Fluids and electrolytes are vital to life and adequate balance is necessary to maintain healthy functioning of the body. Approximately 50% to 80% of the total body weight is water, the primary body fluid, in good health this volume remains relatively constant, and a person's weight varies by less than 0.2 kg in 24 hours, regardless of the amount of fluid ingested. **Functions of water in the body include:**

body include:

1. Provide a medium for transporting nutrients, wastes products, and other substances such as hormones, enzymes, blood platelets, RBCs and WBCs throughout the body.
2. Facilitate cellular metabolism and proper cellular chemical functioning.
3. Act as a solvent for electrolytes.
4. Help maintain normal body temperature.
5. Facilitate digestion and promote elimination.
6. Act as a tissue lubricant.
7. Give shape and form to the cells and cushion body organs.

An **electrolyte** is a compound that when dissolved in water or another solvent forms or dissociates into positively charged ions (cations) or negatively

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charged ions (anions), they are critical regulators in the distribution of body fluid. **Functions of electrolytes in the body include:**

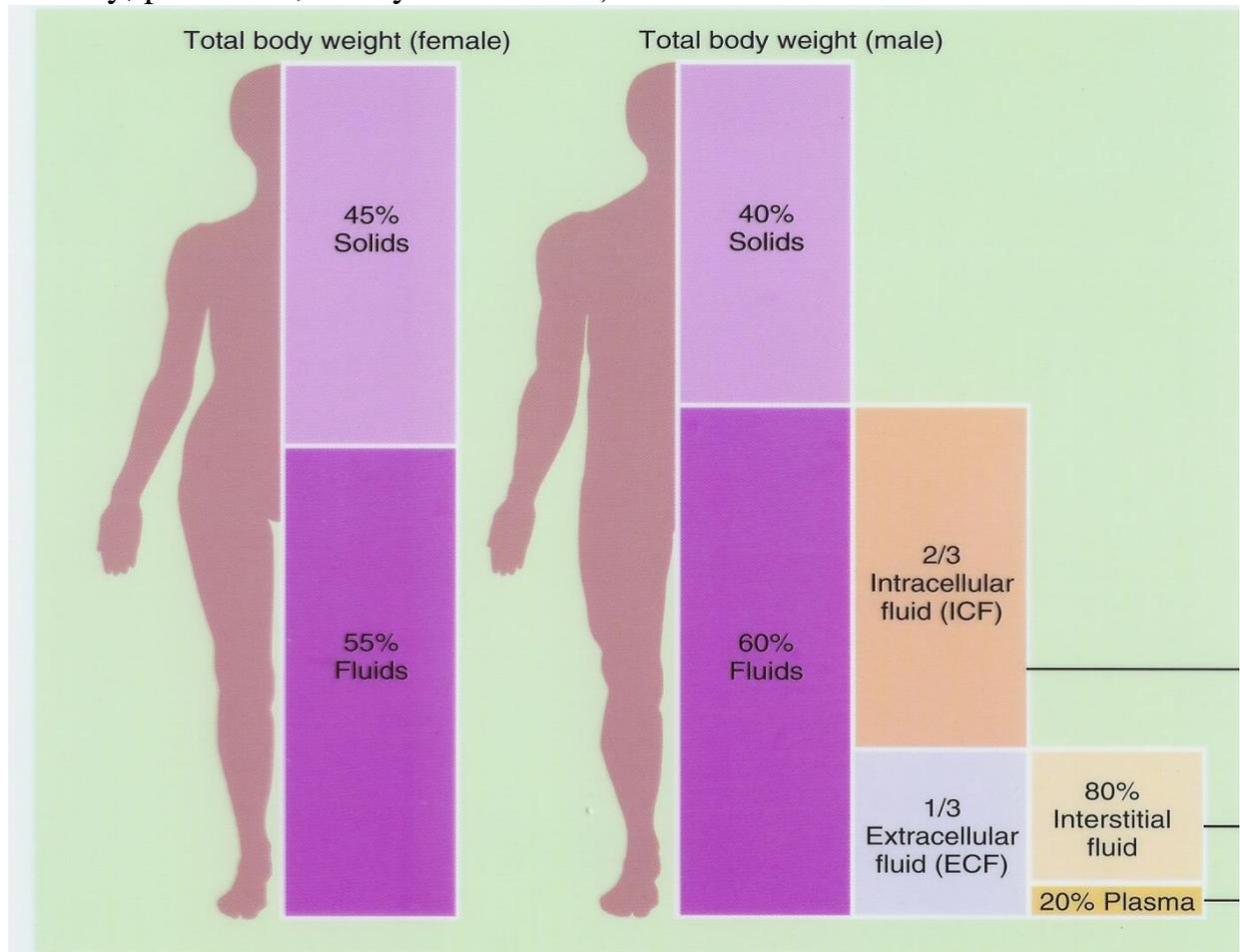
1. Maintaining fluid balance.
2. Contributing to acid–base regulation.
3. Facilitating enzyme reactions.
4. Transmitting neuromuscular reactions.

Body Water Distribution:

The body's fluid is divided into two compartments that's include:

- 1) **Intracellular fluid (ICF):** Found within the body cells, it is constitutes approximately two thirds of the total body fluid in adults.
- 2) **Extracellular fluid (ECF):** Found outside the body cells, it is constitutes approximately one thirds of the total body fluid. **ECF is subdivided into two main compartments:**
 - a. **Intravascular or plasma:** found within the vascular system, accounts approximately 20% of ECF.
 - b. **Interstitial fluid:** found between cells or fluid that surrounds the cells, accounting for approximately 75% of ECF.

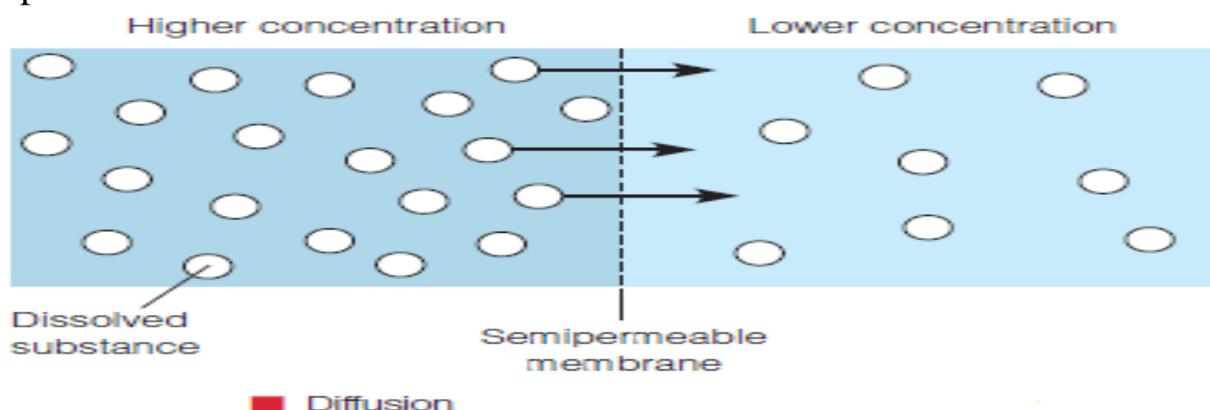
The other compartments of ECF include lymph, and transcellular fluid e.g., cerebrospinal fluid (CSF), pericardial, pancreatic, plural, intraocular, biliary, peritoneal, and synovial fluids).



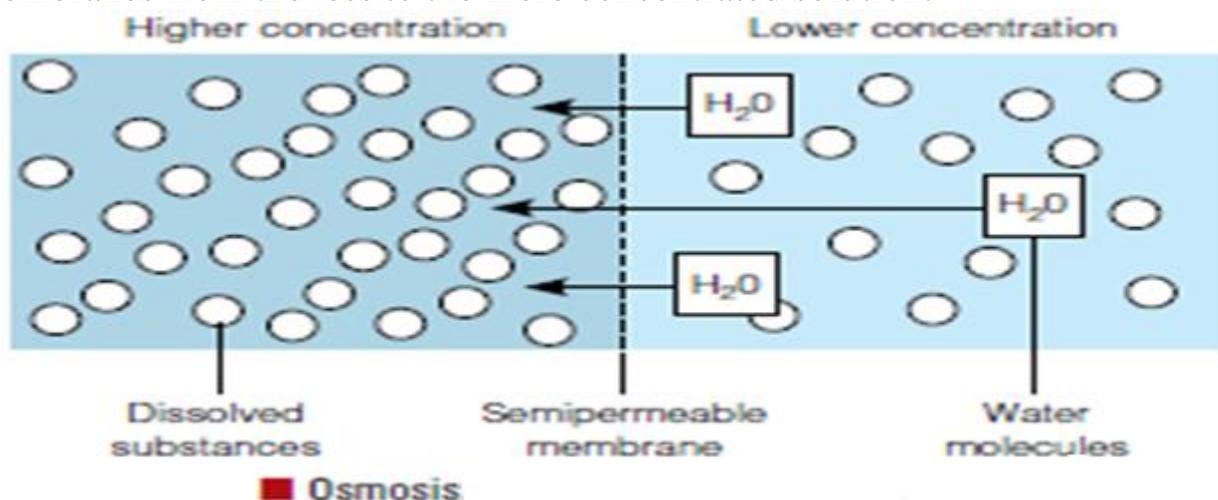
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Key terms used in explaining the movement of molecules in body fluids are:

- ❖ **Solvent:** a solution (e.g., body water) that can dissolve a solute.
- ❖ **Solute:** Substance (e.g., oxygen, electrolytes, and glucose) dissolved in a liquid (solvent).
- ❖ **Permeability:** Capability of a substance, molecule, or ion to diffuse through a membrane (covering of tissue over a surface, organ, or separating spaces).
- ❖ **Semipermeable:** Selectively permeable (All membranes in the body allow some solutes to pass through the membrane without restriction but will prevent the passage of other solutes).
- ❖ **Diffusion:** the movements of **molecules** through a semipermeable membrane from an area of higher concentration to an area of lower concentration. For example oxygen moves from the alveoli into the pulmonary capillaries and carbon dioxide moves from the pulmonary capillaries into the alveoli.



- ❖ **Filtration:** a process whereby fluid and solutes moves together across membrane from an area of high pressure to an area of lower pressure.
- ❖ **Osmosis:** is a specific kind of diffusion in which water moves across cell membranes from the less to the more concentrated solution.





Regulating body fluids:

Normally fluid intake and fluid loss are balanced. Illness can upset this balance so that the body has too little or too much fluid. **Factors that regulate body's fluids include:**

A. Fluid intake: for an adults during period of normal activity at moderate temperature fluid intake include:

1. Drinks approximately 1200-1500 mL per day.
2. Water in food approximately 1000 mL per day.
3. Water as by product of metabolism approximately 200 mL per day.

B. Fluid output: Fluid losses from the body correct the intake of fluid. The average adult fluid output for an adult per 24 hours include:

1. By urine approximately 1400-1500 mL.
2. By feces approximately 100-200 mL.
3. By insensible losses:
 - a. Lungs: approximately 350-400 mL.
 - b. Skin: approximately 400-600 mL.

C. Maintaining homeostasis: a number of organs and systems contributes to homeostasis mechanism including:

1. The kidneys (the primary regulator of fluids and electrolytes in the body).
2. The lungs.
3. Cardiovascular and gastrointestinal systems.
4. Hormones such as antidiuretic hormone (ADH), the rennin-angiotension-aldosteron system, and atrial natriuretic factor ANF(released from heart atrium cell in response to excess blood volume and stretching of the atrial walls, also involved in monitor and maintain vascular volume).