Body fluids, electrolytes and acid-base balance

Body Fluid Disturbance (Imbalance):

Fluid imbalance are of two basic types: isotonic and osmolar. Isotonic imbalances occur when water and electrolytes are lost or gained in equal proportions, so that the osmolality of body fluids remains constant. Osmolar imbalances involve the loss or gain of only water, so that the osmolality of the serum is altered.

Four categories of fluid imbalances may occur:

1. **Fluid volume deficit (FVD) (hypovolemia):** Isotonic FVD occur when the body loses both fluid and electrolytes from the ECF in similar proportions. **Generally occurs as a result of:**
   - **a.** Loss of water and electrolytes from excessive sweating, vomiting, diarrhea, polyuria, and fever.
   - **b.** Bleeding, burns, wound drainage, indwelling tube, or nasogastric suction.
   - **c.** Decrease fluid intake such as in nausea, anorexia, impaired swallowing, inability to access fluids, confusion, and depression.
   - **d.** Movement of fluid into a third space (third space syndrome) e.g., peritoneal, and pleural cavities.

   ❖ **Clinical Manifestations:**
   - ➢ Weakness and thirst.
   - ➢ Weight loss (2% loss = mild FVD**;** 5% loss = moderate FVD**;** 8% loss = severe FVD)
   - ➢ Decreased tissue turgor.
   - ➢ Dry mucous membranes, sunken eyeballs, decreased tearing.
   - ➢ Subnormal temperature.
   - ➢ Weak pulse; tachycardia, & decreased BP [Postural (orthostatic) hypotension].
   - ➢ Decreased capillary refill.
   - ➢ Decreased urine volume, & increased urine specific gravity.
   - ➢ Increased hematocrit, & blood urea nitrogen (BUN).
2. **Fluid volume excess (FVE) (hypervolemia):** Isotonic FVE occurs when the body retains water and sodium in similar proportions to normal ECF, always secondary to an increase in sodium content. Exists when the client has increased interstitial and intravascular fluid retention and edema. FVE is related to the excess fluid either in tissues of the extremities (peripheral edema), in lung tissues (pulmonary edema), generalized edema [anasarca], periorbital edema. **Factors that put the client at risk for (FVE) are:**
   - **a.** Excessive intake of sodium chloride in diet or medications.
   - **b.** Administration sodium-containing infusion too rapidly.

c. Disease processes that alter regulatory mechanism such as heart disease, renal failure, liver cirrhosis, Cushing's syndrome.

❖ **Clinical Manifestations:**

- ✓ Weight gain (2% gain = mild FVE; 5% gain = moderate FVE; 8% gain = severe FVE).
- ✓ Fluid intake greater than output.
- ✓ Full, bounding pulse; tachycardia, & increased BP.
- ✓ Distended neck veins.
- ✓ Moist crackles (rales) in lungs; dyspnea, & SOB.
- ✓ Mental confusion.

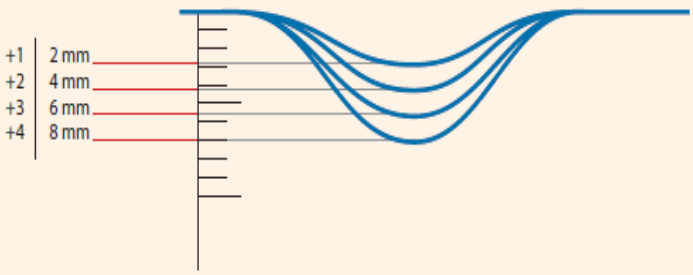
Edema:

Excess interstitial fluid is known as edema. Edema may be localized or generalized. Edema can be caused by three main mechanisms are increased capillary hydrostatic pressure, decreased serum osmotic pressure, and increased capillary permeability. FVE increase capillary hydrostatic pressure, pushing fluid into the interstitial tissues. This type of edema is often seen in dependent tissues such as the feet, ankles, and sacrum because of the effects of gravity. Low levels of plasma proteins from malnutrition or liver or kidney diseases can reduce serum osmotic pressure, so that fluid cannot be held in the capillaries. This allows fluid to leak into interstitial spaces, causing edema.

➲ **Pitting edema:** edema that leaves a small pit after finger pressure is applied to the swollen area caused by movement of fluid to adjacent tissue, away from the point of pressure. within 10-30 seconds the pit normally disappears as fluid returns to the area.

Assessing Edema

To assess edema, press your index finger over the bony prominence of the tibia or medial malleolus. Orthostatic (pitting) edema results in a depression that does not rapidly refill and resume its original contour. It is not usually accompanied by thickening or pigmentation of the overlying skin. The severity of edema can be graded on a scale of +1 to +4.



- +1: Slight pitting with about 2 mm depression that disappears rapidly. No visible distortion of extremity.
- +2: Deeper pitting with about 4 mm depression that disappears in 10 to 15 seconds. No visible distortion of extremity.
- +3: Depression of about 6 mm that lasts more than a minute. Dependent extremity looks swollen.
- +4: Very deep pitting with about 8 mm depression that lasts 2 to 3 minutes. Dependent extremity is grossly distorted.

3. **Dehydration (hyperosmolar fluid imbalance):** Occurs when water is lost from the body, leaving the client with excess sodium. Because water is lost while electrolytes particularly sodium are retained, serum osmolality and serum sodium levels increase. Water is drown into the vascular compartment from the interstitial space and cells, resulting in cellular dehydration. Older adults are at particular risk for dehydration because of decreased thirst sensation. Dehydration can also affect clients who are hyperventilating, have a prolonged fever, are in diabetic ketoacidosis, or are receiving enteral feedings with insufficient water intake. The degree of dehydration is classified as mild, marked, severe, or fatal on the basis of the percentage of body weight lost.
4. **Overhydration (hypo-osmolar fluid imbalance):** occurs when water is gained, resulting in low serum osmolality and low serum sodium levels. Water is drown into the cells, causing them to swell. In the brain, this can lead to cerebral edema and impaired neurologic function.