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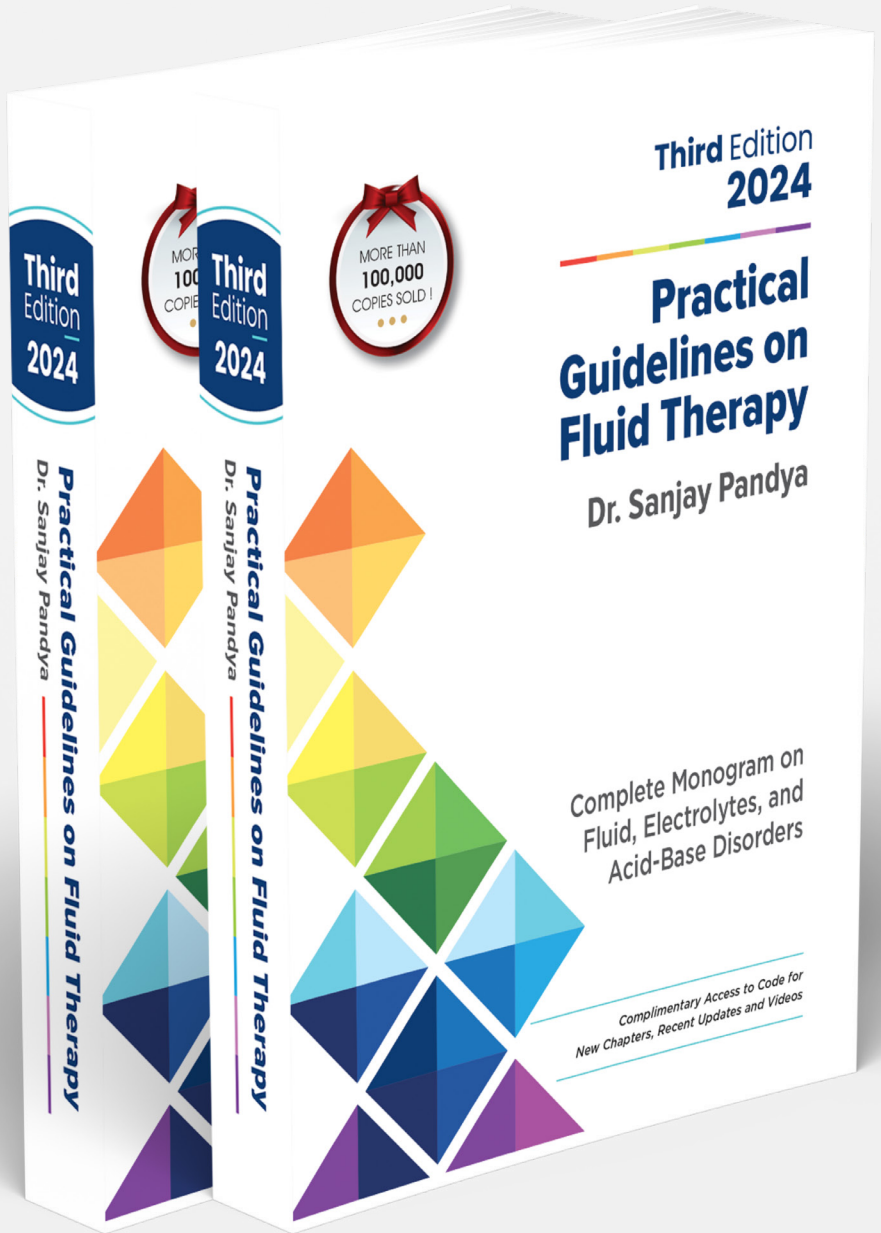
Chapter 20:
Hyponatremia



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20 Hyponatremia

SODIUM PHYSIOLOGY

A basic understanding of physiology is essential for the proper approach and treatment of water balance and sodium balance disorders in clinical practice.

Water excess or deficit in the body leads to hyponatremia and hypernatremia. Therefore disorders of sodium concentration occur primarily due to water imbalance and not due to changes in total body sodium content. The below-mentioned equation will help to clarify the above statement.

$$\text{Serum Sodium Concentration} = \frac{\text{Total Body Sodium}}{\text{Total Body Water}}$$

In the above equation, serum sodium concentration will decrease when total body water increases, leading to hyponatremia. Similarly, serum sodium concentration will increase when total body water decreases, leading to hypernatremia. So, to understand sodium disorders, we need to know about the physiology of water balance.

As serum osmolality is determined mainly by sodium salts (equation below) [1], the regulation of water balance is also discussed as the regulation of body fluid osmolality (osmoregulation). Normal serum osmolality is 275–290 mOsm/kg. Hyponatremia is usually associated with low serum osmolality.

$$\text{Serum Osmolality (Calculated)} = 2\,[Na^+] + \frac{\text{Glucose}}{18} + \frac{\text{BUN}}{2.8}$$

Where osmolality is in mOsm/kg, sodium in mEq/L, glucose in mg/dL, and blood urea nitrogen (BUN) in mg/dL.

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