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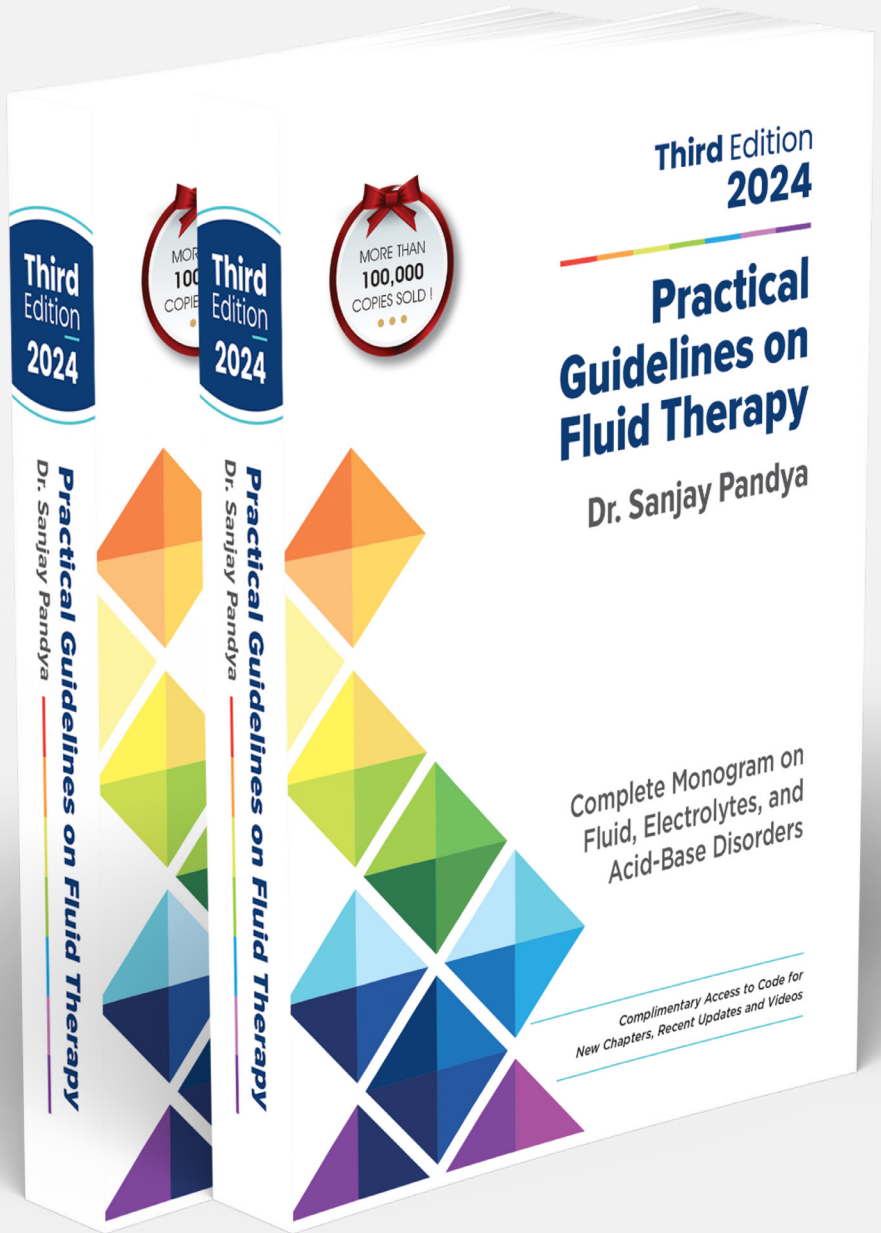
Chapter 54:

Hyponatremia during Labor



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54 Hyponatremia during Labor

Labor per se does not cause hyponatremia (defined as serum sodium <130 mEq/L), but during labor, women are at increased risk of developing the same [1]. Hyponatremia following prolonged labor is not uncommon and is potentially hazardous to the mother and neonate [2, 3].

PHYSIOLOGICAL PREDISPOSING FACTORS

Women in labor are at greater risk of developing hyponatremia than non-pregnant women [4] because of:

1. Lower baseline plasma sodium. The normal range of serum sodium concentration is lower (130–140 mEq/L) in pregnancy compared to its value in non-pregnant adults (135–145 mEq/L) [4, 5]. In the late third trimester, about 6 to 8 liter of water is retained, which is responsible for the dilutional hyponatremia and the lower baseline plasma sodium value.
2. An impaired renal ability to excrete water [6, 7]. In healthy women, the normal capacity of kidneys to excrete a water load is 900 ml/h. While in late pregnancy, the maximum renal ability to excrete a water load reduces to 600 mL/h [8]. In the presence of the tendency of kidneys to retain water, hyponatremia is likely to occur if the excess fluid is consumed orally or administered intravenously.
3. Antidiuretic effect of endogenous oxytocin. As the structure of oxytocin is similar to vasopressin, oxytocin causes water retention and results in dilutional hyponatremia in laboring women [9]. Reasons for the higher concentration of oxytocin during labor are the greater release of endogenous secretion of oxytocin and IV administration of synthetic oxytocin to induce or augment labor.

CAUSES

Causes of maternal hyponatremia are:

1. Excessive oral water intake during prolonged labor [10, 11].
2. Hyponatremia is likely in women who choose home delivery but are transferred to the hospital after prolonged labor due to unsuccessful delivery or obstetric complications [3]. The mechanism for developing hyponatremia in such patients is the high endogenous secretion of oxytocin and excessive oral hypotonic fluid intake.

3. Liberal fluid administration causes iatrogenic maternal fluid overload.
4. Increased oral fluid intake and intravenous fluid administration are major causes of hyponatremia. Hyponatremia occurs when the intake of low sodium-containing fluid exceeds a woman's ability to excrete it during labor. Water retention causes a decrease in the concentration of sodium by diluting the blood. As a result, the incidence of hyponatremia at delivery among women is 1% for those with a total fluid intake (oral + IV) of up to 1 liter during labor and 5% for those with a total fluid intake between 1 to 2.5 liters [2]. The risk of hyponatremia increases to as high as 26% for those with a total fluid intake above 2.5 liters.
5. Administration of a large volume of oxytocin in hypotonic solutions (i.e., 5% dextrose) for a prolonged period for induction and augmentation of labor can cause hyponatremia [2].
6. Other causes: Hyperemesis gravidarum, psychiatric disorders, and maternal medications like diuretics, antidepressants like selective serotonin reuptake inhibitors [SSRIs], and synthetic recreational drugs like ecstasy.

HARMFUL EFFECTS

Hyponatremia during labor can produce deleterious consequences for both the mother and the neonate. In addition to the usual symptoms of hyponatremia (e.g., nausea, lethargy, headache, agitation, confusion, drowsiness, seizures, etc.), maternal hyponatremia is associated with the prolongation of the second stage of labor, instrumental birth, and emergency cesarean birth for failure to progress [2].

As water diffuses freely across the placenta, maternal hyponatremia can lead to neonatal hyponatremia [12, 13]. Significant hyponatremia in newborns may cause irritability, lethargy, and feeding difficulties in mild cases and seizures, respiratory distress, apnea, hyperbilirubinemia, and coma in severe cases [10, 14–16].

PREVENTION

Measures which help to prevent hyponatremia are [1]:

1. Strict fluid balance chart and early recognition: Record oral/intravenous fluid intake and urine output every four hours for close monitoring. When an electrolyte imbalance is suspected, it is important to measure the serum electrolytes. If a woman's fluid balance exceeds positive 1500 ml, her risk of developing hyponatremia is high, and her blood sodium level should be checked.
2. Neutral fluid balance: Maternal dilutional hyponatremia can be prevented during labor by maintaining a neutral fluid balance. Therefore, excessive fluid intake during labor should not be encouraged for women.
3. Avoid the administration of hypotonic IV fluids like 5% dextrose during labor.
4. When oxytocin is to be administered in a high dose for a prolonged period, use a higher concentration of oxytocin to reduce the total volume of infused fluid, use electrolyte-containing solutions such as normal saline or Ringer's lactate as a diluent, and avoid electrolyte free solution like 5% dextrose as a diluent.
5. During labor, it is important to monitor serum sodium levels in women who require oxytocin infusion, have a positive fluid balance exceeding 1500 ml, develop symptoms of hyponatremia,

or have a serum sodium level less than 130 mEq/L.

TREATMENT

Treatment depends on the underlying cause. The basic principle of treating dilutional maternal hyponatremia is a fluid restriction (oral and intravenous), discontinuation of oxytocin infusion, and co-administration of furosemide if there is any evidence of fluid overload [1]. Administration of hypertonic saline is necessary for patients with severe clinical symptoms due to hyponatremia (such as seizures or loss of consciousness) with close monitoring of sodium levels.

Hypovolemic depletion hyponatremia is less common during labor and may need IV fluid administration. Normal saline is a preferred solution in such women. For detailed information about the treatment of hyponatremia, please refer to Chapter 20 on "Hyponatremia".

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