ORS, IV fluids and Anti-motility drugs in the management of diarrhoea

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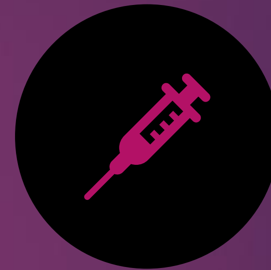
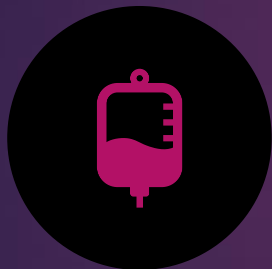
Intended Learning Outcomes

Appreciate the Pathophysiology of diarrhea and how it affects the therapeutic approach.



Explain the three broad components in the treatment of diarrhea



Critique the correction of dehydration and electrolyte disturbances; Constituents of IV fluids, Zinc supplemented ORS/ORT and CORS

Determine the role of drugs used in the symptomatic and supportive treatment of Diarrhea, their mechanism of action and side effects

Pathophysiology of diarrhoea

- In nearly all forms of acute infectious diarrhoeas, abnormally formed stools reflect small bowel hypersecretion of fluid and electrolytes, not increased intestinal motility.
- Most water absorption occurs in the jejunum by passive transport in response to the osmotic pressure generated by absorption of soluble products of digestion.
- Excess of unabsorbed material in the gut may also cause osmotic diarrhoea.
- In coeliac disease, the mucosal permeability to water and small solute is decreased.
- Prostaglandins (PGs), Serotonin (5-HT) and bacterial toxins can cause hypersecretion and diarrhoea

Treatment of diarrhoea

Consists:

1. Specific treatment

    This depends upon the cause. A number of drugs are available to treat bacterial and protozoal infections, but no antiviral agents are available for viral diarrhoea.

2. Treatment of dehydration

    Regardless of the causative agent, the initial therapy should always include rehydration and nutritional support (soft rice, ripe bananas and cooked apple). Milk and milk products should be avoided since transient lactase deficiency may occur

3. Symptomatic and supportive treatment

Correction of dehydration and electrolyte disturbances

It is the most important aspect of treatment of diarrhoea and may be the only treatment needed.

Massive diarrhoea with watery stools causes marked **depletion of sodium, potassium, bicarbonate and metabolic acidosis** resulting in high mortality.

It is ideal to tailor-make the fluid and electrolyte therapy in a seriously ill patient by monitoring the blood biochemistry, plasma protein concentration and plasma specific gravity.

In an emergency, isotonic saline with isotonic sodium bicarbonate, should be used in the proportion of 2:1 respectively.

- This would correct sodium loss and acidosis.

Correction of dehydration and electrolyte disturbances cont.

If IV sodium bicarbonate is not available, 5% solution of sodium bicarbonate may be given orally ad lib.

Potassium should be given, preferably orally

- 15 mMoles potassium needed to correct the potassium loss in a litre of stools. The quantity of stools passed should, therefore, be noted.

Potassium can be conveniently administered as 200 ml of tender coconut water for each litre of stools passed. Alternatively, potassium salts eg, potassium chloride may be given orally or by IV infusion.

Correction of dehydration

In a collapsed patient the IV fluids are given rapidly initially, at the rate of at least 100 ml per minute, to correct hypovolemia and to avoid irreversible shock.

Later, the infusion may be adjusted according to the loss of fluids in stools and sweat.

IV fluid therapy is continued until the shock state is corrected and the patient is strong enough to drink the oral glucose-electrolyte solution.

Coma and convulsions during diarrhoea often indicate hypoglycemia and need for IV glucose.

Oral rehydration therapy (ORT)

The sodium and water absorption by the small bowel is enhanced by the addition of glucose to the oral fluid.

Mild to moderate dehydration and acidosis due to diarrhoea can be corrected in **3-6 hours by oral therapy**. In many cases it is a life-saving measure.

The treatment should continue even when diarrhoea is not controlled.

Patients strong enough to drink, take the solution eagerly. They may continue to vomit and the stool volume may increase. Inspite of this, there is a net absorption of water and electrolytes.

- If vomiting is caused by acidosis and volume depletion, it is corrected by the oral therapy itself.

Advantages Oral rehydration therapy (ORT)

- It is far less expensive than IV fluids
- No expertise is needed to administer the fluid.
- The solution need not be sterile and can be prepared on spot with readily available components.
- It can be given by family members and non-professionals as well as by health workers.

Composition of WHO-recommended, modified ORS

Earlier ORS recommended by WHO,caused hypernatremia in some children.

The newly recommended ORS has lower osmolarity.

- This ORS has also been found effective and safe in adults with cholera, though a few patients might develop hyponatremia.

Commercially available ORS contain less sodium and glucose than the WHO recommended ORS, their use should be avoided.

Immediate institution of ORT would avoid shock from continuing dehydration.

Table 41.7

Composition of ORS

	WHO		Homemade
Substance	Weight (g)	Components (mMol/L)	Home measure
Sodium chloride	2.6	Na^+ 75	¾ teaspoon (Table salt)
Potassium chloride	1.5	K^+ 20	½ teaspoon
Trisodium dihydrate citrate*	2.9	HCO_3^- equivalent 10	¾ teaspoon
Glucose** (Anhydrous)	13.5	Glucose75	1½ tbsp
Water	1000	Total osmolarity 245	1 litre

*Citrate in ORS diminishes stool output in high output diarrhoeas.

**Glucose 20 g can be replaced by 40 g of sucrose. Alternatively, it can be replaced by 50g of cooked rice powder. Cl^- content is 65 mMol/L

Cereal-based oral rehydration solution (CORS)

The correct concentration of Na + and glucose in the ORS is critical for optimal effect and safety.

The CORS administered cannot greatly exceed plasma in osmolality without the risk of increased diarrhoea and hypernatremia.

Studies indicate ORS in which rice and other food sources of starch are substituted for glucose effectively replace lost fluids, decrease vomiting, and reduce the severity of diarrhoea.

- Glucose based ORS does not decrease and may slightly increase the stool volume.

Cereal (rice) based solutions, are equally effective in reducing volume losses, and may shorten the duration of illness.

Cereal-based oral rehydration solution (CORS)

Rice contains a low molecular weight fraction which has a direct effect on the chloride channel. It inhibits the response of the crypt cell chloride channel to cAMP.

Addition of sodium bicarbonate and potassium chloride is not critical to the success of cereal based ORS.

Physiologically, cereal-based ORS are identical to their glucose-based counterparts. The dominant component in the cereals is starch from rice, corn, wheat, potato, sorghum, millet or even plantain.

Mechanism of action of CORS

Starch exposed to amylase in the intestine, is digested into smaller polymers. The polymers are split by maltase into glucose at the intestinal brush border.

The larger number of glucose molecules help transfer sodium ions from lumen into the blood, while generating less luminal osmotic "back drag" than an equivalent amount of glucose.

The cereal proteins also provide small peptides and amino acids which facilitate the absorption of additional sodium ions.

Presence of sufficient digestive enzyme is essential for the success of CORS.

- This may be a problem in infants under 4 months in whom intestinal glucoamylase is not fully developed.

Zinc supplemented ORS

Zinc supplementation is considered as an adjunct therapy in diarrhea because:

- It maintains the GI mucosal integrity
- It imparts local immunity

Deficiency of zinc worsens diarrhea especially since; diarrhea leads to zinc deficiency.

Hence, UNICEF-WHO zinc supplemented ORS has shown to reduce duration of diarrhea and the stool frequency.

- In children less than 6 month, 10 mg/day of zinc and for the older children 20 mg/day of zinc.

Symptomatic and supportive treatment of Diarrhea

- Symptomatic treatment includes:
  1. **GI protectives**
  2. **drugs acting on GI motility.**
- Agents useful in symptomatic treatment of diarrhoea may act:
  1. **Locally, as protectives by coating the gut.**
  2. **By decreasing the propulsion of the intestinal contents, e.g., morphine like compounds.**
  3. **Directly on mucosal transport processes, reducing fluid accumulation in the intestinal lumen (anti-secretory action).**
  4. **On intestinal microcirculation; some drugs may lower the hydrostatic pressure thus favouring water absorption.**
  5. **Temporary reduction in the intake of foods rich in fibre (unrefined cereals, fruits and vegetables) is desirable in acute diarrhoea.**

Antimotility drugs

Antimotility drugs may be used in simple diarrhoea but should be avoided in infective diarrhoea and children.

Codeine phosphate: Is useful for symptomatic control of diarrhoea.

It raises intracolonic pressure and sphincter tone.

- It should not be given to patients with colonic diverticular disease and should be used cautiously in patients with inflammatory bowel disease, supervision of a gastroenterologist.

Diphenoxylate: Is an opiate derivative.

- It is combined with atropine in the preparation **Lomotil.** It is more expensive than codeine phosphate and not more effective.

Loperamide: Loperamide is a synthetic opiate with some anticholinergic activity. It may cause **dizziness or dryness of the mouth**.