

Chapter 1.4

Therapy of Viral Gastroenteritis

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1 INTRODUCTION

It is unlikely that anyone who lives beyond infancy anywhere in the world has not suffered from or will not experience one or more episodes of viral gastroenteritis (Das et al., 2014). Among children, rotaviruses were the leading cause of severe acute gastroenteritis in all parts of the world until the introduction of rotavirus vaccines. The introduction of rotavirus vaccines has resulted in dramatic reductions in disease particularly in industrialized countries, but other viruses, particularly noroviruses still cause significant gastroenteritis in children and adults everywhere (Payne et al., 2013). In lower income countries, the lower efficacy of oral rotavirus vaccines, ranging from 20–65%, leaves between a third to half of all vaccinated children unprotected from severe rotavirus disease (Babji and Kang, 2012).

The morbidity and mortality caused by viral gastroenteritis represent a significant economic and public health burden. Although the total number of deaths is still unacceptably high and disproportionately affects the poorest in low-income countries, there has been a substantial reduction in the past three decades (Das et al., 2014). This reduction can be attributed to several factors, but one important reason is the sustained effort to manage diarrhoeal disease appropriately.

2 BACKGROUND

The mainstay of management of viral gastroenteritis of any severity is rehydration. Treatment of dehydration was first attempted in the 1830s during cholera epidemics. Intravenous fluids were introduced for treatment of dehydration over a century later and they were used for cholera by the 1950s. Given the difficulty of finding a peripheral vein in a dehydrated patient, and safety problems of intravenous solutions and their administration in low resource settings, attempts were made to develop cheap and effective oral solutions. By the late 1960s, oral

rehydration solutions (ORS) had been developed and shown to be effective in cholera, and they were deployed on a large scale in 1971–72 at the time when Bangladesh became independent (Mahalanabis et al., 1973). The World Health Organization (WHO) developed guidelines for oral rehydration therapy and established the standards for production of packets of ORS and documents that have subsequently been reviewed and updated, most notably with the recommendation of hypotonic ORS (Atia and Buchman, 2009).

2.1 Physiologic Basis of Rehydration

In health, there is a continuous exchange of water through the intestinal wall with secretion of up to 9 L of water from oral intake, salivary, gastric, pancreatic, biliary, and upper intestinal secretion and reabsorption of almost as much every 24 h by the distal ileum and colon, resulting in a stool output of about 250 mL/day (Acra and Ghishan, 1996). The secretion and reabsorption allow soluble metabolites from digested food to be transferred into the bloodstream. When diarrhoea occurs, there is an imbalance between secretion and absorption with much more fluid being secreted, resulting in a net loss of body water of up to several litres a day. In addition to fluid loss, sodium is also lost because sodium ions are held almost entirely extracellularly in blood and body fluids. This differs from the largely intracellular holding of potassium ions (Field, 2003).

Precise control (135–150 mmol/L) of sodium ions in the extracellular fluid is essential for normal metabolism, but in dehydration water is conserved by anuria, and sodium regulation does not work effectively. Continued diarrhoea can cause very rapid depletion of water and sodium. If more than 10% of the body's fluid is lost, it can be fatal.

When sodium ions are not being absorbed by the intestine, then water is not absorbed either, since water passively follows the osmotic gradient generated by transcellular transport of electrolytes and nutrients. Although there are several mechanisms for sodium absorption, the one most important for oral rehydration with a glucose and electrolyte containing solution, is a cotransport mechanism, where glucose transport, unaffected by the diarrhoea, continues across the luminal membrane, facilitated by the protein sodium glucose cotransporter 1, and cotransports sodium in a 1:1 ratio. Glucose-stimulated sodium absorption is cyclic AMP (cAMP) independent while cAMP is likely responsible for stimulation of chloride secretion and inhibition of sodium chloride absorption. The increased concentration of sodium across the intestinal barrier now draws water across, resulting in net retention and increase in fluid (Curran, 1960). Once in the intestinal cell, the glucose is transported through the basolateral membrane via the glucose transporter 2. The Na⁺K⁺ATPase provides the energy to drive the process (Fig. 1.4.1).

Since there are several mechanism for transport of sodium, including sodium hydrogen exchangers, many additional cotransporters of Na⁺ (eg, of amino acids, products of hydrolysis of cereals or digestion-resistant starch) were targeted

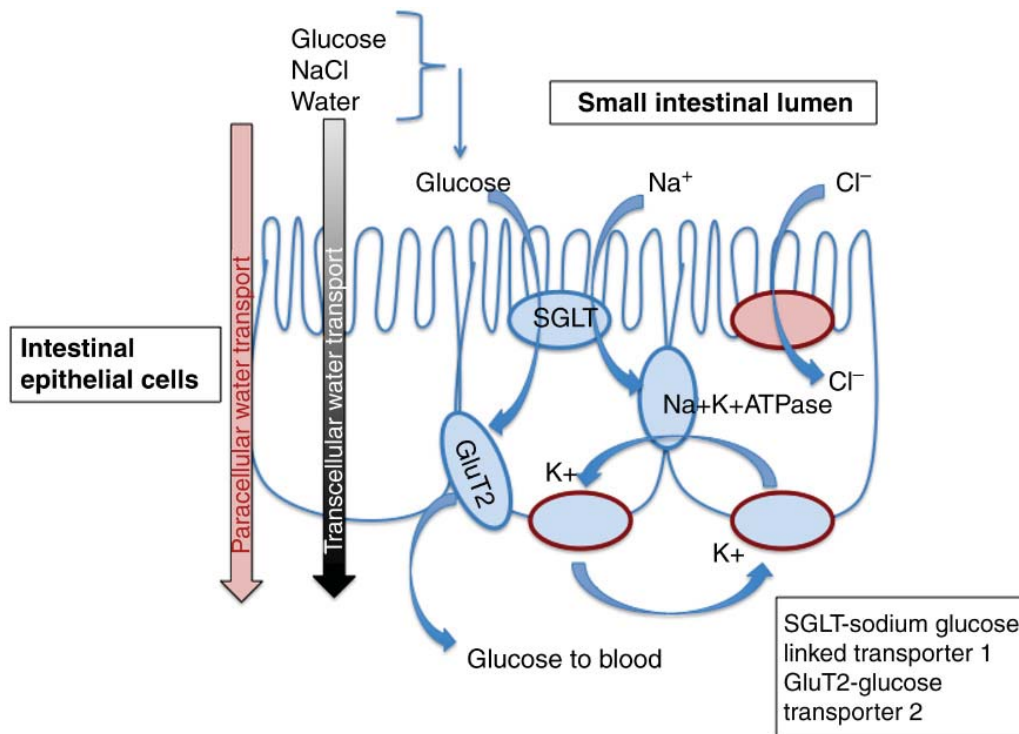


FIGURE 1.4.1 Physiologic basis of oral rehydration. (The complexity of all transport mechanisms is not shown. For further details see [chapter 1.1.](#))

([Binder et al., 2014](#)), and some interventions demonstrated promising results, but larger trials have not confirmed their efficacy in gastroenteritis of any aetiology.

2.2 Basis of Pharmacotherapy

Although reliance on pharmacologic agents is not recommended because it might shift the therapeutic focus away from the appropriate fluid, electrolyte and nutritional therapy which is needed for viral gastroenteritis of different aetiologies, there is evidence that some treatment modalities may be appropriate for certain patient groups. In the more industrialized world, recent guidelines for management of acute gastroenteritis include evidence-based recommendations for use of pharmacotherapy with a broad range of activity ([Guarino et al., 2014](#)).

Antibiotics have no role to play in viral gastroenteritis, and no specific antiviral agents directed against the causes of gastroenteritis have, as yet, been developed. Antibiotics may be used in children with concomitant bacterial illness or if they develop sepsis. The use of antimotility agents to increase transit time, and thus enable greater absorption of fluid from the gut is not recommended in children less than 8 years of age but is recommended in adults ([Farthing et al., 2008](#)). In patients less than 3 years of age, use of antimotility agents such as loperamide can, rarely, result in ileus or death ([Li et al., 2007](#)).

Since vomiting is a presenting and common feature of viral gastroenteritis and can result in failure to rehydrate orally, the use of antiemetic agents is

recommended in some settings, particularly North America. The agents include 5-HT₃ receptor antagonists, such as ondansetron, which can be used safely in children as well as dopamine receptor antagonists, including phenothiazines (prochlorperazine and promethazine), benzamides (metoclopramide and trimethobenzamide), and butyrophenones (such as droperidol). Their use in children is discouraged due to lack of evidence of a beneficial effect and strong association with side effects including extrapyramidal reactions and neuroleptic malignant syndrome (Freedman, 2007).

Antisecretory agents which prevent the excess loss of fluid into the intestinal lumen have multiple modes of action. They include racecadotril, an enkephalinase inhibitor that decreases intestinal hypersecretion and promotes absorption (see later). Other antisecretory agents such as dioctahedral smectite block the activity of enterotoxins by binding them or promoting water and electrolyte absorption across the intestinal wall (Freedman, 2007).

3 CLINICAL ASSESSMENT

Acute gastroenteritis usually refers to an illness with a duration of less than 7 days which is characterized by diarrhoea and/or vomiting. Acute diarrhoea is defined as ≥ 3 loose or watery stools/day. The volume of fluid lost through stools can vary from 5 mL/kg body weight/day to ≥ 200 mL/kg body weight/day, and can result in severe dehydration (Centers for Disease Control and Prevention, 2003).

Diarrhoea can also be seen as an early presenting symptom in illnesses not related to the gastrointestinal tract, such as pneumonia, urinary tract infection, meningitis, and sepsis. Vomiting can result from metabolic disorders, toxin ingestion or trauma. Therefore, a good case history is required to rule out concomitant or other illnesses.

3.1 History

The clinical history should assess the onset, duration, frequency, and quantity of vomiting and diarrhoea. The presence of fever and of bile, blood, or mucus in the stool or vomitus should be noted. A history of recent oral intake, of urine output and mental status is helpful in evaluating dehydration. The past medical history of any underlying medical problems, other recent infections, medications, and human immunodeficiency virus (HIV) infection status is needed.

3.2 Physical Examination

Body weight, temperature, heart rate, respiratory rate, and blood pressure must be measured. A recent premorbid weight is needed to estimate fluid loss, but in its absence expected weight can be calculated from any available prior growth curve data. The general condition of the patient should be assessed, with special attention to activity. The appearance of the eyes, lips, mouth, and tongue

are assessed for degree of dehydration. Skin turgor is examined by pinching a small skin fold on the lateral abdominal wall at the level of the umbilicus using the thumb and index finger and measuring the time it takes to return to normal. Deep respirations may indicate metabolic acidosis, and faint or absent bowel sounds can indicate hypokalemia. Capillary refill can help in assessment of dehydration.

3.3 Assessment of Dehydration

Many systems of evaluation can be used to measure the degree of severity of dehydration and several guidelines classify dehydration to indicate appropriate treatment. These published classifications include those of the World Health Organization (WHO, 2005), the American Academy of Pediatrics (Yu et al., 2011) and the European Society of Paediatric Gastroenterology, Hepatology and Nutrition (Guarino et al., 2014). The main variables assessed are shown in Table 1.4.1.

Among infants and children, a decrease in blood pressure is a late sign of dehydration that can correspond to fluid deficits of >10% and signals shock.

Symptom	Mild (3–5%)	Moderate (6–9%)	Severe ($\geq 10\%$)
Urine output	Normal to decreased	Decreased	Minimal
Thirst	Slightly increased	Moderately increased	Drinks poorly, unable to drink
Eyes	Normal	Slightly sunken	Sunken
Tears	Present	Decreased	Absent
Fontanelle	Normal	Sunken	Sunken
Mucous membranes	Moist	Dry	Very dry
Extremities	Warm	Cool	Cold, mottled, cyanotic
Skin pinch	Normal	Return in <2 s	Recoil in >2 s
Mental status	Normal	Normal to irritable	Apathetic, lethargic, unconscious
Capillary refill	Normal	Prolonged	Poor
Breathing	Normal	Normal, fast	Deep
Heart rate	Normal	Increased	Increased
Pulse	Normal	Normal to weak	Weak, thready
Blood pressure	Normal	Normal	Normal to reduced

Increases in heart rate and reduced peripheral perfusion can be more sensitive indicators of moderate dehydration, although both can vary with the degree of fever. Decreased urine output is sensitive but not specific and can be difficult to assess in children with diarrhoea. A finding of increased urine specific gravity can indicate dehydration.

4 THERAPY

Most acute gastroenteritis is mild and as with many minor illnesses, most patients are likely to be treated at home. Stocking a commercially available ORS at home enables parents to start therapy early. There are also recipes for homemade ORS, using salt and sugar, but there is a possibility of error. The goal of home or facility treatment is the need to replace lost fluid and maintain adequate nutrient intake. In breastfed children, more frequent feeds should be encouraged and for nonbreastfed children more age-appropriate fluids should be given (Guarino et al., 2014).

A decision on referral may be needed for very young infants or if a child is dehydrated, and this may require the assessment of a child by a healthcare worker in person or by telephone. When treatment at home is initiated, parents/caregivers should monitor the child carefully and seek help if there is any sign of distress or change in mental status. Infants with acute diarrhoea are more likely to become dehydrated than older children because they have a higher body surface-to-volume ratio, a higher metabolic rate, relatively smaller fluid reserves, and are dependent on others for fluid intake (CDC, 2003).

4.1 Supportive Measures

The mainstay of therapy for acute gastroenteritis is rehydration. Continuation or rapid introduction after rehydration of an age-appropriate diet is a necessary measure to prevent the nutritional consequences of an acute diarrhoeal episode. Supplementation with zinc during acute diarrhoea is an important adjunct to rehydration particularly in developing countries (see later). Finally, probiotics may play a role in restoration of a normal microbial flora after an acute episode of gastroenteritis (see later).

4.1.1 Fluid Replacement and Maintenance

The first approach in diarrhoea with no or mild dehydration should be oral rehydration therapy (Fig. 1.4.2). Treatment with ORS is simple and permits management of uncomplicated cases of diarrhoea at home, regardless of aetiology. Early fluid replacement leads to fewer clinic and emergency care visits and potentially prevents hospitalizations and deaths (Duggan et al., 1999).

Oral rehydration therapy consists of two phases of treatment: (1) a rehydration phase, in which water and electrolytes are given as ORS to replace existing losses, and (2) a maintenance phase, which includes replacement of ongoing fluid and electrolyte losses and adequate dietary intake (CDC, 2003).

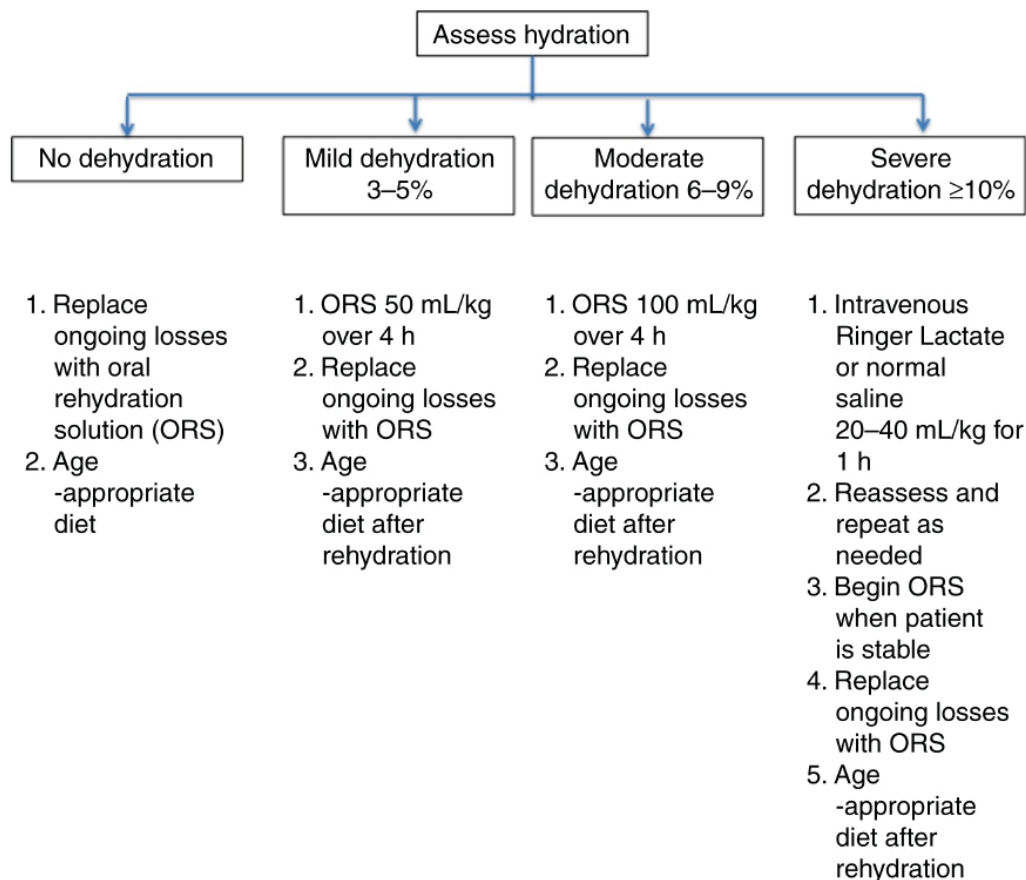


FIGURE 1.4.2 Rehydration algorithm for acute gastroenteritis.

In the rehydration phase, the fluid deficit is replaced within 3–4 h, and in the maintenance phase, calories (food) and fluids are given. Rapid realimentation should follow rapid rehydration, with a goal of quickly returning the patient to an age-appropriate unrestricted diet, including solids. Breastfeeding should be continued throughout rehydration. The diet should be increased as soon as tolerated to compensate for lost caloric intake during the acute illness. Lactose restriction is usually not necessary.

For children and adults with no or minimal dehydration, 1 mL of fluid is needed to replace 1 g of stool. When losses are not easily measured, 10 mL/kg body weight of fluid can be given for each watery stool or 2 mL/kg body weight for each emesis. Children with mild to moderate dehydration should have their estimated fluid deficit replaced by administering 50–100 mL of ORS/kg body weight during 2–4 h to replace the estimated fluid deficit, with additional ORS to replace ongoing losses. In case of vomiting, a nasogastric tube can be placed to continue to deliver ORS (Nager and Wang, 2002). Some children may not respond to treatment with ORS, and reassessment may be necessary.

After correction, a guideline for maintenance is a daily fluid requirement of 100 mL/kg for the first 10 kg body weight, 50 mL/kg for the next 10 kg, and 20 mL/kg for each subsequent 1 kg over 20 kg (Canadian Paediatric Society, 2006).

There are few contraindications to oral rehydration; they include patients in haemodynamic shock, with ileus, intussusception, or other bowel obstruction. In patients with vomiting, oral rehydration is still possible in many patients by decreasing the amount given at each administration or by using a nasogastric tube (Nager and Wang, 2002).

Severe dehydration is an emergency requiring immediate intravenous rehydration. Ringer's lactate solution or physiological saline at 20 mL/kg body weight are given until pulse, perfusion, and mental status return to normal. With malnourished infants, smaller amounts (10 mL/kg body weight) are recommended because of the reduced ability of these infants to increase cardiac output. Sometimes, two IV lines or even alternative access sites such as intraosseous infusion may be required (Driggers et al., 1991). Serum electrolytes, bicarbonate, blood urea nitrogen, creatinine, and serum glucose levels should be obtained, although starting rehydration without these results is safe. Hypotonic solutions should not be used for acute parenteral rehydration (Jackson and Bolte, 2000). Hydration status should be reassessed frequently to determine the adequacy of replacement therapy. Boluses of IV fluid may have to be given until pulse, perfusion, and mental status return to normal. A lack of response to fluid administration should raise the suspicion of alternative or concurrent diagnoses, including septic shock and metabolic, cardiac, or neurologic disorders.

The use of ORS resulted in a steady decrease in the number of children dying of dehydration, but uptake of ORS was hampered by low usage (Lenters et al., 2013), in part because there is no effect on stool output (Wadhwa et al., 2011). Studies have shown that the efficacy of ORS solution for treatment of children with acute noncholera diarrhoea is improved by a reduced osmolarity ORS, with reduction in the need for unscheduled supplemental IV therapy, reduction in stool output and reduction in vomiting (Santosham et al., 1996). The WHO recommended the use of reduced osmolarity ORS (Table 1.4.2).

TABLE 1.4.2 Composition of Oral Rehydration Solutions Recommended by the World Health Organization

	Reduced osmolarity ORS (mmol/L)	Standard ORS (mmol/L)	Recommended standards
Sodium	75	90	60–70
Chloride	65	80	60–70
Glucose	75	111	75–90
Potassium	20	20	20
Citrate	10	10	10
Total osmolarity	245	311	210–260

Modified from UNICEF (2004).

In 2004, a joint statement was released by the WHO and the United Nations Children's Emergency Fund (UNICEF) which recommended two changes to treatment protocols for young children with diarrhea ([WHO/UNICEF, 2004](#)). The two organizations recommended a switch to a hypoosmolar ORS ([UNICEF, 2004](#)) and the introduction of zinc supplementation (see later) for 10–14 days.

Other formulations of ORS with the inclusion of resistant starch or amino acids, designed to reduce stool volume or promote more rapid repair of the gut, have been evaluated in small clinical trials but have not, as yet, built the evidence base to lead to widespread use.

4.1.2 Diet

An age-appropriate diet is critical to the management of acute gastroenteritis. Breastfed and bottle-fed infants should be fed in amounts sufficient to satisfy energy and nutrient requirements. Formula feeds should not be diluted. Except for a subset of malnourished dehydrated infants, lactose-free or soy fibre containing formulas are not necessary ([Brown et al., 1994](#)). Without clinical symptoms, low pH and reducing substances in the stool do not prove lactose intolerance. Older children should continue to receive their usual diet during episodes of diarrhoea. Foods high in simple sugars should be avoided to prevent osmotic diarrhoea, but special diets are not necessary. In developing countries, age-appropriate unrestricted diets, including complex carbohydrates, meats, yogurt, fruits, and vegetables are recommended.

In children with severe dehydration, rapid realimentation should follow intravenous rehydration with attempts to reintroduce oral intake as soon as the dehydration is corrected. The promotion of the use of the oral route for rehydration and feeding assists the return to normal activities and prevents nutritional consequences of illness.

4.1.3 Probiotics

Probiotics are live microorganisms that are believed to promote health by improving the intestinal microflora, promoting immunity or repair of damage. Reviews have evaluated their use in preventing or reducing the severity or duration of diarrhoeal illnesses among children, including diarrhoea caused by rotavirus. These products include lactobacilli, bifidobacteria or the nonpathogenic yeast *Saccharomyces boulardii* ([Reid et al., 2003](#)). However, many trials were small, and results vary by probiotic strain. A systematic review and two meta-analyses concluded that *Lactobacillus* species, particularly *Lactobacillus rhamnosus* GG, are both safe and effective as treatment for children with infectious diarrhoea ([Szajewska and Mrukowicz, 2001](#), [Van Niel et al., 2002](#), [Allen et al., 2004](#)).

Prebiotics are complex carbohydrates used to preferentially stimulate the growth of health-promoting intestinal flora, but data on their efficacy in acute gastroenteritis are limited.

4.1.4 Zinc

Zinc deficiency is prevalent in many developing countries where dietary intake is inadequate. Diarrhoea results in loss of zinc in stool and reduced tissue zinc (Black and Sazawal, 2001). Although severe zinc deficiency is associated with diarrhoea, milder deficiencies of zinc also appear to play a role in childhood diarrhoea. A Cochrane review which analysed data from 24 trials with 9128 children, mainly from Asia, stated that overall in children of all ages with acute diarrhoea, there is currently not enough evidence to say whether zinc supplementation during acute diarrhoea reduces death or hospitalization. In children older than 6 months with acute diarrhoea, zinc supplementation shortened the duration of diarrhoea by around 10 h and probably reduced the number of children whose diarrhoea persisted until day 7. Effects were stronger in children with moderate malnutrition and persistent diarrhoea (Lazzerini and Ronfani, 2013).

Nonetheless, because there are supporting data from large, well-conducted trials in Asia (Bhatnagar et al., 2004, Faruque et al., 1999, Baqui et al., 2002), the WHO has recommended zinc supplementation (20 mg/day for 2 weeks for children >6 months of age and 10 mg/day for children <6 months of age) for treating children with acute and persistent diarrhoea and as a prophylactic supplement for decreasing the incidence of diarrhoeal disease and pneumonia (WHO/UNICEF, 2004). The role of zinc supplements in developed countries is less certain and needs further evaluation.

4.2 Pharmacotherapy

4.2.1 Antimotility Agents

The most widely used antimotility agent, loperamide, is a peripheral opiate receptor agonist with antisecretory and antimotility properties (Schiller, 1995). It slows orocecal transit in normal subjects who take doses of > 4 mg or repetitive doses (Kirby et al., 1989). Although efficacious, the use of loperamide is contraindicated in children of <2 years of age due to reports of drowsiness and ileus. Additionally, deaths due to paralytic ileus were attributed to loperamide administration (Bhutta and Tahir, 1990). However, in adults, 4–6 mg a day is recommended by the World Gastroenterology Organization (Farthing et al., 2008). Lomotil, a combination of diphenoxylate and atropine, is widely used in the United States at doses of 5–20 mg/day in up to 4 divided doses. It is not recommended for children below the age of 2 years and should be used with caution in older children because of the risk of overdose. In acute gastroenteritis its use should be discontinued, if there is no response within 48 h.

4.2.2 Antiemetics

Ondansetron is a 5-HT₃ receptor antagonist available since 1991 and is given by either the oral or IV route. In contrast to most antiemetic drugs, ondansetron does not affect dopamine, histamine, adrenergic, or cholinergic receptors.

Hence, extrapyramidal side effects are extremely uncommon, are usually dose related and occur with repeated dosing (Simpson and Hicks, 1996). Both IV and oral ondansetron have been evaluated in clinical trials in children and shown to reduce vomiting and, in some studies, the need for IV rehydration and admission (Stork et al., 2006, Ramsook et al., 2002). The use of ondansetron in children and adults with vomiting is recommended in several developed countries and is increasingly used in practice in developing countries (Farthing et al., 2008).

Promethazine is a phenothiazine derivative that has pronounced antihistaminic, anticholinergic and sedative effects. It is contraindicated for use in children of <2 years of age and should be used rarely in those >2 years of age. Respiratory depression is common particularly when promethazine is combined with other drugs that also cause respiratory depression (Stork et al., 2006, Ramsook et al., 2002).

4.2.3 *Antisecretory Agents*

Racecadotril (acetorphan) is an enkephalinase inhibitor that decreases intestinal secretion and promotes absorption, but does not slow intestinal transit. A limited number of randomized controlled trials have shown that oral racecadotril decreased stool output and the duration of diarrhoea, while others have shown no difference (Salazar-Lindo et al., 2000, Mehta et al., 2012). The most recent European recommendations state that there is moderate evidence of benefit based on a systematic review of individual patient data (Lehert et al., 2011, Guarino et al., 2014). In the absence of conclusive evidence, use of racecadotril should be avoided in young children.

Dioctahedral smectite (Diosmectite) is a natural hydrated aluminomagnesium silicate that absorbs endo- and exotoxins, bacteria, and viruses. It increases water and electrolyte absorption and is believed to aid intestinal recovery. A recent metaanalysis showed that diosmectite was effective in all types of acute childhood diarrhoea except dysentery. However, the trials were mainly open-label and had major methodologic limitations, and therefore the evidence is considered to be of low quality (Das et al., 2015). Its routine use is not recommended.

Small studies in Egypt and Bolivia have evaluated nitazoxanide in rotavirus gastroenteritis and showed reduction in the duration of diarrhoea, but there is need for confirmatory studies (Teran et al., 2009, Rossignol et al., 2006).

Octreotide, an analog of somatostatin, has been used subcutaneously and intravenously to control diarrhoea in adults and children, but is recommended mainly in patients with other underlying conditions, such as HIV infections or malignancy (Peeters et al., 2010).

4.2.4 *Nonspecific Agents*

Bismuth subsalicylate and its degradation products are believed to bind enterotoxin. In trials in Peru and Chile (Figuroa-Quintanilla et al., 1993, Soriano-Brucher et al., 1991), benefits included a reduction in stool frequency

and weight and shorter disease duration, but a trial in Bangladesh in patients with acute diarrhoea reported nonsignificant decrease in severity and duration (Chowdhury et al., 2001). There are concerns regarding the toxicity from salicylate absorption, and routine use in children is not recommended (Lewis et al., 2006).

Kaolin-pectin, fibre, and activated charcoal should not be used in the treatment of diarrhoea and dehydration in infants and children. There is no conclusive evidence that they reduce stool losses, duration of diarrhoea or stool frequency. Although nontoxic, disadvantages of their use may include adsorption of nutrients and antibiotics in the intestine and masking the severity of fluid loss. As with other unproven therapies, use should be restricted.

4.2.5 Immune Active Agents

In the past few decades there has been interest in passive immune mechanisms to treat or prevent disease due to viral agents of gastroenteritis, particularly rotavirus. Several studies have shown that antirotavirus immunoglobulin, as pooled gamma globulin, bovine colostrum, or human milk, may decrease frequency and duration of diarrhea (eg, Guarino et al., 1994), but none are recommended for routine use.

A recent report of a randomized, double blind placebo controlled trial of a biological molecule consisting of the variable domain of llama heavy chain antibodies directed against rotavirus and expressed in yeast, for the treatment of rotavirus diarrhoea in Bangladesh, showed a decrease in stool output and frequency (Sarker et al., 2013). There appeared to be no effect on virus excretion or duration of illness. Although biological plausibility for the antirotavirus activity is supported by in vitro and animal model experiments, further evaluations of safety and efficacy are needed.

4.3 Special Clinical Scenarios

Special clinical scenarios may include children and adults with underlying disease such as HIV infection, cancers, or malnutrition. Malnutrition, malignancy, and immunodeficient states predispose to more severe episodes of illness or unremitting diarrhoea that can persist until the underlying condition is corrected. In all cases, the principles that underly the use of oral rehydration therapy in managing diarrhoeal disease apply although the specifics of the evaluation, and fluid, electrolyte, and nutritional management differ. Additional management strategies require a lower threshold for admission to the hospital for close observation.

5 CONCLUSIONS

The evidence-based management of viral gastroenteritis indicates that assessment of dehydration is critical to establish severity and monitor treatment. Oral rehydration with hypoosmolar solutions is the mainstay of treatment, and

continued or early refeeding feeding is essential in children. Interventions such as antiemetics, probiotics, and antisecretory agents are adjuncts to rehydration, which are recommended in some parts of the world, but their wider use requires further evaluation of effectiveness.

Unfortunately despite the recognition of the value of oral rehydration, ORS is still used in only a subset of cases in most settings around the world. Promotion of oral rehydration and the development of better formulations or adjunct therapies that decrease the volume of stool and shorten the duration of diarrhoea still require research and development of new approaches to improve outcomes in viral gastroenteritis.

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