

Therapeutic methods for diarrhea in children

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DEFINITION

Acute diarrhoea is defined as passage of loose or watery stools at least three times in a 24 h period. When loose stools contain blood, it is called bloody diarrhoea (dysentery). It is the consistency of the stools which is most important rather than the frequency. Breast-fed babies often pass "pasty" stools frequently which is not diarrhoea. The mother can often tell accurately whether child has diarrhoea or not.

MAGNITUDE OF THE PROBLEM

Acute diarrhoea is an important cause of mortality and morbidity particularly in young children in the developing countries. Of the 11.6 million deaths among children less than five years old in all developing countries (1995) due to infectious diseases, 19% deaths are attributed to diarrhoea^[1]. In 1993, an estimated 3.2 million children below five years of age died from diarrhoea alone; 80% of these deaths occurred in the first two years of life^[2].

AETIOLOGY

Acute diarrhoea is usually caused by different infectious agents. The microbial agents causing diarrhoea may be classified as bacterial (*Vibrio cholerae* O1 and O139, *Vibrio parahaemolyticus*, enterotoxigenic *E.coli*, *Shigella*, *Salmonella*, *Campylobacter jejuni*, *Aeromonas* etc.), viral (Rotavirus, Norwalk virus etc.), parasites (*E. histolytica*, *Giardia lamblia*, *Cryptosporidium* etc.). The various agents produce diarrhoea either by production of toxin(s) or by invasion of the gut mucosa. Those organisms which produce diarrhoea by production of toxin(s) produce watery diarrhoea. *Vibrio cholerae* and enterotoxigenic *E.coli* are the prototype organisms producing watery (also called

secretory) diarrhoea. Those organisms which invade the gut mucosa usually produce bloody diarrhoea (dysentery). *Shigella* and *E.histolytica* are the prototype organisms producing bloody diarrhoea (also called invasive diarrhoea).

In watery diarrhoea usually there is loss of lots of fluid and electrolytes from the body which results in dehydration which is a conspicuous clinical feature in watery diarrhoea. In contrast, in invasive diarrhoea not much fluid and electrolytes are lost in the stool. Therefore, dehydration is not a major feature. It is most practical to base treatment of acute diarrhoea on the clinical type of illness (watery or bloody). Laboratory studies are usually not needed.

DEHYDRATION

Management of acute watery diarrhoea includes replacement of fluid and electrolytes losses, proper feeding and use of appropriate antibiotic in selected cases. It has been mentioned that dehydration occurs due to loss of fluid and electrolytes from the body. Dehydration is now clinically assessed as diarrhoea with "no signs of dehydration", diarrhoea with "some dehydration" and diarrhoea with "severe dehydration". Table 1 describes how to determine the degree of dehydration clinically. The signs typical of children with no signs of dehydration are shown in column A, signs of some dehydration in column B and those with severe dehydration in column C. The sign in bold print with asterisks (*) are the most valuable signs for assessing dehydration and are called "key signs". If two or more of the signs in column C are present including at least one key sign the child has severe dehydration. If this is not the case, but two or more signs from column B (and C) are present, including at least one key sign, the child has some dehydration. If this also is not the case, the child is classified as having no signs of dehydration.

PREVENTION OF DEHYDRATION (PLAN A)

Diarrhoea with no signs of dehydration may be managed safely and effectively at home with the administration of extra fluid, proper feeding and watching for danger signs. The mother may be educated to give her child extra fluid in the form of coconut water, salt and sugar solution, rice water with salt, mild tea (these fluids are called "home available fluid"-HAF) or oral dehydration salt solution (ORS). At any stage if the child becomes either very thirsty, passes many watery stools, vomits repeatedly, or has fever, or blood in stool, the mother should be alerted to take the child to a doctor for further management.

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Table 1 Assessment of diarrhoea patients for dehydration

1. Look at:	Condition ^a	Well, alert	Restless, irritable	'Lethargic or unconscious; floppy'
	Eyes ^b	Normal	Sunken	Very sunken and dry
	Tears	Present	Absent	Absent
	Mouth and tongue ^c	Moist	Dry	Very dry
	Thirst	Drinks normally, not thirsty	*Thirsty, drinks eagerly'	'Drinks poorly, or not able to drink'
2. Feel:	Skin pinch ^d	Goes back quickly	'Goes back slowly	'Goes back very slowly'
3. Decide:		The patient has no signs of dehydration	If the patient has two or more signs, including at least one 'sign', there is some dehydration	If the patient has two or more signs, including at least one 'sign', there is severe dehydration
4. Treat:		Use Treatment Plan A	Weigh the patient, if possible, and use Treatment Plan B	Weigh the patient and use Treatment Plan C urgently

^a Being lethargic and sleepy are not the same. A lethargic child is not simply asleep: the child's mental state is dull and the child cannot be fully awakened; the child may appear to be drifting into unconsciousness.

^b In some infants and children the eyes normally appear somewhat sunken. It is helpful to ask the mother if the child's eyes are normal or more sunken than usual.

^c It is necessary to look inside the child's mouth. The mouth may be dry in a child who habitually breathes through the mouth. The mouth may be wet in a dehydrated child owing to recent vomiting or drinking.

^d The skin pinch is less useful in infants or children with marasmus or kwashiorkor, or obese children.

TREATMENT OF DEHYDRATION (PLAN B & C)

Studies have shown that 90% of cases of watery diarrhoea with some dehydration can be safely and effectively managed with ORS solution alone^[3]. WHO/UNICEF recommended ORS contains sodium chloride 3.5 g, 85 mm potassium chloride 1.5 g, sodium bicarbonate 2.5 g, or trisodium citrate, dihydrate 2.9 g and glucose 20 g dissolved in 1 L of water. For the treatment of some dehydration ORS should be administered (50-100 mL per kg). Table 2 gives the guidelines for treating children and adults with some dehydration. The mother should be taught to prepare and give ORS solution. The solution should be given to infants and young children using a clean spoon or cup. Use of a feeding bottle is strongly discouraged. If vomiting occurs (usually during the first hour of treatment) the mother should wait for 5-10 minutes and then start giving ORS solution again but more slowly. The disadvantages of WHO/UNICEF ORS are that it does not reduce the stool volume or duration of diarrhoea and thus are sometimes not acceptable to the mothers. Several clinical trials have shown that an ORS solution containing cooked rice powder in place of glucose substantially reduces the rate of stool loss due to acute diarrhoea. Rice based ORS solution significantly reduces the rate of stool output during the first 24 hours of treatment by 36% in adults with cholera and by 32% in children with cholera. In contrast, the rate of stool loss in infants and children with acute non-cholera diarrhoea treated with rice ORS solution was only reduced by 18%^[4]. A small but significant proportion of dehydrated patients might benefit from using a low osmolarity solution in which glucose concentration has been slightly reduced^[5]. However, the real benefit of using such a solution as well as their exact composition remains to be determined.

The preferred treatment for children with severe dehydration is rapid intravenous rehydration. Such treatment should preferably be carried out by admitting the patient to the hospital. Guidelines for intravenous

rehydration are given in Table 3. The preferred solution is Ringer's Lactate.

FEEDING DURING DIARRHOEA

During diarrhoea the child should be fed properly. Previously it was thought that during diarrhoea, nutrients are not absorbed adequately and hence the bowel should be given a rest. Recent studies indicate that during and after diarrhoea most of the nutrients are sufficiently absorbed. In fact, proper feeding during diarrhoea has been shown to be beneficial and prevents malnutrition. Breast feeding should be continued throughout the duration of diarrhoea. Easily digestible, energy-rich, high potassium containing, non-fibrous food should be given to the child. During convalescence at least one extra feed daily for several weeks is recommended. Locally available and culturally acceptable foods are preferred.

ROLE OF DRUGS

All cases of bloody diarrhoea where dehydration is present should be managed with rehydration therapy as detailed for the acute watery diarrhoea. In addition, in all the cases of bloody diarrhoea in children below 5 years of age should be treated with an appropriate antibiotic assuming that the child is suffering from shigellosis. Studies have shown that antibiotic therapy definitely hastens recovery^[6]. The drug of choice for shigellosis is nalidixic acid^[7]. Other drugs (ampicillin^[8] or cotrimoxazole^[9]) may be used depending upon the drug resistance pattern of the circulating shigella strains in the area. It has been shown that norfloxacin^[10] or ciprofloxacin^[11] are also highly effective in the treatment of shigellosis. These drugs are contraindicated for young children because of the potential cartilage toxicity reported in experimental animals^[12]. However, more and more information is coming that these drugs may turn out to be safe even in children for such short term use^[13]. Amebiasis rarely occurs in children below 5 years of age and therefore random use of antiamebic drugs for childhood diarrhoea is

Table 2 Guidelines for treating children and adults with some dehydration

	Approximate amount of ORS solution to give in the first 4 hours					
Age ^a	Less than 4 months	4-11 months	12-23 months	2-4 years	5-14 years	15 years or older
Weight:	Less than 5 kg	5-7.9 kg	8-10.9 kg	11-15.9 kg	16-29.9 kg	30 kg or more
In mL	200-400	400-600	600-800	800-1200	1200-2200	2200-4000
In local measure						

^a Use the patient's age only when you do not know the weight. The approximate amount of ORS required (in mL) can also be calculated by multiplying the patient's weight in kg by 75.

- If the patient wants more ORS than shown, give more.
 - Encourage the mother to continue breastfeeding her child.
 - For infants under 6 months who are not breast fed, also give 100-200 mL clean water during this period.
- NOTE: During the initial stages of therapy, while still dehydrated, adults can consume up to 750 mL per hour, if necessary, and children up to 20 mL per kg body weight per hour.

Table 3 Guidelines for intravenous treatment of children and adults with severe dehydration

• Start IV fluids immediately. If the patient can drink, give ORS by mouth until the drip is set up. Give 100 mL/kg Ringer's Lactate Solution ^a divided as follows:			
	Age	Fist give 30 mL/kg in:	Then give 70 mL/kg in:
	Infants (under 12 months)	1 hour ^b	5 hours
	Older	30 minutes ^b	2.5 hours

- Reassess the patient every hour. If hydration is not improving, give the IV drip more rapidly.
- After six hours (infants) or three hours (older patients), evaluate the patient using the assessment chart. Then choose the appropriate Treatment Plan (A,B or C) to continue treatment.

^a If Ringer's Lactate Solution is not available, normal saline may be used.

^b Repeat once if radial pulse is still very weak or not detectable.

not recommended. However, if antibiotic therapy fails and *E.histolytica* trophozoites are seen by microscopic examination of stool, metronidazole or tinidazole may be used in the recommended doses.

Routine use of antibiotic(s) in acute watery diarrhoea is not recommended and is actually harmful. The only indication for use of antibiotics is for the treatment of suspected severe cholera cases as an adjunct to rehydration therapy. Cholera should be suspected when a child of more than two years of age suffers from acute watery diarrhoea with severe dehydration in an endemic area. The drugs of choice for the treatment of cholera are tetracycline and doxycycline. Norfloxacin^[14] and ciprofloxacin^[15] have been shown to be also highly effective. Antibiotic therapy shortens the volume and duration of diarrhoea thereby reducing the fluid requirement, and duration of hospitalisation and excretion of *Vibrio cholerae* in stool. Other drugs, as for example, antiemetics, anticholinergics, antidiarrhoeals like opium, charcoal, kaoline and pectin, steroid and cariotonics are not required for the treatment of diarrhoea. In fact some of them are not only useless but may also be harmful. Antiemetics produce sedation and therefore, interfere with oral rehydration therapy and may produce or aggravate hypotension thereby interfering with the renal circulation. Anti-cholinergics may produce paralytic ileals.

Recently, supplementation with micronutrients especially zinc as an adjunct to rehydration therapy for the treatment of acute diarrhoea has been suggested^[16].

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