Introduction

Every young child seems to suffer from an occasional attack of diarrhoea. This is most likely to strike while travelling or on holiday, after joining a crèche or pre-school, after a feed change and when other members of the family are also affected. Most often diarrhoea is a short-lived messy irritation, but when severe, it can result in frighteningly rapid progression into a severe, “washed-out” illness with an urgent need for hospitalisation, and some children die from dehydrated shock even before the parents have become aware of the diarrhoea.

This paper will place acute infective diarrhoea into an epidemiological perspective and provide an overview of prevention and management.

What causes diarrhoea?

In the vast majority of cases, acute diarrhoea is due to an acute intestinal infection. Faecal contamination of water, food, drink, toys or anything that can be placed in the mouth arises from a human or animal source. This explains why an inadequate and unsafe water supply, and poor application and practice of hygiene leads to faecal contamination.

A viral or bacterial pathogen can be identified in 70 – 80% of cases of acute diarrhoea. Differing seasonal and other local epidemiological factors determine the relative prevalence of responsible pathogens that include bacteria such as Escherichia coli, salmonellae, shigellae, vibrio cholerae, clostridia and yersinia, viruses such as rotavirus, astrovirus, caliciviruses and enteroviruses, and parasites and protozoa such as cryptosporidia. Viruses are responsible for the majority of cases, chiefly rotavirus. In temperate climates, a distinct winter peak can be observed for rotavirus incidence, while developing countries tend to have a high year-round prevalence of gastroenteritis.

Prevention of diarrhoea

Close attention to all those factors that predispose to faecal-oral transmission will reduce the incidence of infective diarrhoea. A sufficient
Table I: Progressive signs of dehydration

<table>
<thead>
<tr>
<th>Potential dehydration</th>
<th>Moderate dehydration</th>
<th>Severe dehydration with compensated circulatory failure and shock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Losing water in stools faster than intake</td>
<td>Dry mouth and mucosa Reduced urine and secretions Sunken eyes and fontanel Decreased skin turgor Irritability</td>
<td>Much reduced skin turgor Vasoconstricted (CFT &gt;3 sec) Tachycardia Metabolic acidosis Apathy</td>
</tr>
</tbody>
</table>

* CFT = Capillary filling time

supply of fresh water “dilutes” any contamination. Intrafamilial spread can be limited by very careful attention to hygiene including hand washing and having separate feeding utensils. Public health measures include notification of epidemic outbreaks. A rotavirus vaccine is becoming available and is likely to reduce the incidence of severe gastroenteritis.

Clinical features and differentiation
Some clinical features point to a particular pathogen, but in general, the clinical presentation does not allow a confident aetiological diagnosis to be made. After a variable incubation period, there is an abrupt onset of vomiting followed by the development of watery diarrhoea. There may be fever and some cramp-like abdominal pain. Patients with rotavirus infections often have respiratory symptoms at the onset. Where the large gut is also involved, mucus and blood are seen in the stool and pain is more prominent. This is the picture of dysentery, when stool culture for shigella or E.coli or the search for Clostridium difficile becomes mandatory.

The chief danger of acute gastroenteritis lies in the development of dehydration. Each watery stool represents fluid already lost to the body. The clinical signs of dehydration lag behind the actual amount of fluid lost, so the number and size of watery stools is a better guide to the requirement for extra fluids than clinical assessment.

Management
In holistic management of a child with gastroenteritis, the following principles apply, and will be discussed individually:
- Replace the fluids and electrolytes which are lost
- Remember nutritional management
- Investigations may be needed
- Drug therapy has limited value
- Follow-up to ensure recovery

Dehydration and Fluid Therapy (see Table II)
The best guide to dehydration is the history of observed water loss in stools. There is a poor correlation between the clinically observed features of dehydration and the degree of actual dehydration. A continuously progressive spectrum of features depends on the nutritional state, body sodium, and type and speed of fluid losses in the stool, but no single parameter accurately defines either the presence or severity of dehydration. Dehydration involves all body water compartments and will ultimately result in circulatory insufficiency and shock. In managing a patient with severe dehydration one must assess the state of the circulation for shock because that calls for resuscitation rather than just rehydration.

The management of the dehydrated patient depends on a careful assessment of the state of the circulation and the need for resuscitation. A number of criteria can be applied to decide on the need for an intravenous drip:

Indications for intravenous drip in dehydration
- Shock and peripheral circulatory failure
- Severe acidosis with vasoconstriction
- Encephalopathy
- Significant abdominal distension (ileus or intestinal obstruction)
- Deterioration or lack of improvement after adequate oral fluids for 2 – 4 hours
- Persistent severe vomiting after 2 – 4 hours of adequate oral fluids

In most instances, oral rehydration is appropriate and fully effective. Commercial rehydration solutions contain a sugar (eg glucose), sodium, potassium and a base eg citrate or bicarbonate to replace the losses. Infants may refuse to drink because of intestinal discomfort or because they do not like the taste, but if they are significantly dehydrated they may be so thirsty that they gulp down large quantities of solution too fast and then vomit. In the first instance, the taste...
may be hidden with the addition of sweetened juices, and in all cases the solution should be offered in small quantities at a time (eg 50 ml every 15 minutes rather than 200 ml every hour.)

Table 2 shows a practical approach to rehydration based on the initial assessment of circulation and dehydration. The aim is to resuscitate and then to proceed to oral rehydration as soon as is feasible.

### Nutritional management

Normally nourished infants with acute onset diarrhea do not require modification of their feeds. In particular, breastfeeding should be continued or even increased. In the

### Table II: Outline of practical fluid therapy of dehydrating watery diarrhoea

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Severe dehydration with shock</th>
<th>Moderate dehydration</th>
<th>Not obviously dehydrated</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Needs urgent fluids and resuscitation</td>
<td>Needs oral rehydration</td>
<td>Potential dehydration for home treatment</td>
</tr>
</tbody>
</table>

**General condition?**

- Lethargic or unconscious
- Deep breathing

**Capillary filling time? Peripheral pulse?**

- More than 3 seconds, weak fast pulse

**Skin pinch, eyes?**

- Much reduced, sunken

**Can the child drink?**

- Not able to drink

**Investigation**

- Do U&E, blood gases after resuscitation.
- Do finger prick blood glucose. Check urine by dipstick.

**Action**

- Start iv drip and give Ringers Lactate, 30 ml/kg in 1 hour
- After 1 hr: Reassess pulse, circulation, capillary filling time: Still in shock? Do blood tests as below
- **YES** : Repeat bolus of Ringer Lactate, 20 ml/Kg; Refer to ICU if not responding
- **IMPROVED, passing urine:**
  - Change drip to 1/2 Darrows/Dextrose 5%, 10 ml/kg/hr
- Reassess in 4 hours: General state better, able to take oral fluids?
  - **YES** : Reduce drip rate to 5 ml/kg/hr and start oral rehydration (next column)
  - **NO** : Evaluate blood test results, stool and urine output, increase drip rate to 10 – 15 ml/kg/hr if necessary

### Severe dehydration with shock

- Needs urgent fluids and resuscitation
- General condition?
  - Lethargic or unconscious
  - Deep breathing
- Capillary filling time? Peripheral pulse?
  - More than 3 seconds, weak fast pulse
- Skin pinch, eyes?
  - Much reduced, sunken
- Can the child drink?
  - Not able to drink

### Moderate dehydration

- Needs oral rehydration
- General condition?
  - Restless or irritable
- Capillary filling? Pulse and circulation?
  - Less than 4 seconds
  - Pulse and blood pressure maintained
- Skin pinch, eyes?
  - Reduced, sunken
- Can the child drink?
  - Thirsty, drinks eagerly

### Not obviously dehydrated

- Potential dehydration for home treatment
- General condition?
  - Still reasonable
- Capillary filling?
  - Normal, less than 2 seconds
- Skin pinch, eyes?
  - Not abnormal
- Can the child drink?
  - Yes, not overly thirsty

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Table 2 shows a practical approach to rehydration based on the initial assessment of circulation and dehydration. The aim is to resuscitate and then to proceed to oral rehydration as soon as is feasible.
acute phase, the feed quantity offered should be adapted as tolerated, but once vomiting has ceased, food should not be withheld. Malnourished and very young infants have a higher risk of intestinal mucosal damage with gastroenteritis and should be evaluated for digestive disturbance such as lactose intolerance if the diarrhoea persists beyond 5 – 7 days.

**Drug therapy**

*Antibiotics* need to be used only if the child is significantly malnourished, if fever persists after 24 hours, if the stools are bloodstained or a bacterial infection is suspected. The choice of antibiotic depends on the suspected organism. In patients with bloodstained stools choose ceftriaxone, a macrolide or quinolones for suspected shigella or E.coli. *Antidiarrhoea medication* is used in selected cases under specialist supervision only.

In malnourished children, potassium and zinc supplementation is indicated.

*Nosocomial or antibiotic-associated diarrhoea* is an indication for the consideration of probiotic use.

**Follow-up to ensure recovery**

Even though acute gastroenteritis is a self-limited condition in the majority of instances, each child should be followed up to ensure recovery with normal stools and resumption of normal weight gain. Persistent diarrhoea due to intestinal mucosal damage is an important cause of nutritional deterioration, morbidity and mortality. Therefore, it is usual to recommend additional meals daily for about 2 weeks after recovery from the diarrhoea episode to make up for the period of weight loss during the acute illness.

**See CPD Questionnaire, page 52**

*References*

1. McKenzie A, Barnes S, Shann F. Clinical signs of dehydration in children
3. Friedman JN, Goldman RD, Srivasta R, Parkin P. Development of a clinical dehydration scale for use in children between 1 and 36 months of age
6. Arch Dis Child 2001; 85: 132 - 142