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CONTROL OF DIARRHOEAL DISEASES

The Management of Bloody Diarrhoea in Young Children

World Health Organization

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1. INTRODUCTION

Bloody diarrhoea in young children is usually a sign of invasive enteric infection that carries a substantial risk of serious morbidity and death. This is especially true in the developing countries, where the problem occurs most frequently. Non-infectious causes account for a very small proportion of episodes of bloody diarrhoea.

About 10% of diarrhoeal episodes in children under 5 years of age have visible blood in the stool, and these account for about 15% of diarrhoea-associated deaths in this age group worldwide (1). Compared with watery diarrhoea, bloody diarrhoea generally lasts longer, is associated with more complications, is more likely to adversely affect a child's growth, and has a higher case fatality rate (2-4).

Studies in communities and health facilities have shown that the management of patients with bloody diarrhoea is frequently irrational. Many medications prescribed are ineffective or dangerous, and when an effective medication is advised the amount given is often too little, the duration of treatment too short, or both (5-7). Oral rehydration salts (ORS) solution is recommended in only a small proportion of cases and the amount taken is often insufficient to prevent dehydration (5). Food also may be withheld or given in reduced amounts.

The correct treatment of bloody diarrhoea requires that mothers recognize the problem and seek medical care promptly, and that health workers dispense an appropriate antibiotic, give ORS solution or other fluids to prevent or treat dehydration, advise on appropriate feeding, and provide follow-up, especially for children at increased risk of serious morbidity or death. When correct treatment is given promptly, most episodes of bloody diarrhoea resolve rapidly and many serious consequences are avoided.

This document describes simple and effective guidelines, and their rationale, for the management of bloody diarrhoea in children below age 5 years, especially among outpatients. These are based on case management guidelines outlined in the WHO chart, *Management of the patient with diarrhoea* (1992 version), and in other WHO documents and publications.

2. DEFINITIONS

The following definitions apply to terms used in this document.

2.1 Bloody diarrhoea

This is a clinical diagnosis that refers to any diarrhoeal episode in which the loose or watery stools contain visible red blood. This does not include episodes in which blood is present in streaks on the surface of formed stool, is detected only by microscopic examination or biochemical tests, or in which stools are black owing to the presence of digested blood (melena).

2.2 Dysentery

This has the same meaning as bloody diarrhoea, i.e. diarrhoea with visible red blood in the stool. This simple definition has been used in most community-based studies. Although clinical texts often use this term to describe the syndrome of bloody diarrhoea with fever, abdominal cramps, rectal pain and mucoid stools, these features do not always accompany bloody diarrhoea, nor do they necessarily define its etiology or determine appropriate treatment.

2.3 Invasive diarrhoea

This refers to diarrhoea caused by bacterial pathogens that invade the bowel mucosa, causing inflammation and tissue damage. This causes numerous polymorphonuclear leucocytes (PMNs), and sometimes red blood cells, to appear in the stool. These can be detected by microscopic examination. The stool may also contain visible blood, but this is not necessary to diagnose invasive diarrhoea. When visible blood is present, the episode could also be termed bloody diarrhoea or dysentery.

3. CAUSES OF BLOODY DIARRHOEA

Among young children in developing countries, most episodes of bloody diarrhoea result from intestinal infection, and nearly all of these are caused by invasive enteric bacteria. *Entamoeba histolytica*, the only important non-bacterial pathogen, usually account for less than 3% of episodes (3,8).

3.1 Invasive bacteria

3.1.1 *Shigella*

Shigella is the pathogen most frequently isolated from the stools of young children with bloody diarrhoea in developing countries (3,8), and the terms "shigellosis" and "bacillary dysentery" are used interchangeably. *Shigella* cause 50% or more of all episodes of bloody diarrhoea in young children, and a much higher proportion of episodes that are clinically severe (8,9). In a review of cases treated over 14 years at the International Centre for Diarrhoeal Disease Research, Bangladesh, 65% of all episodes of shigellosis and 80% of all deaths from shigellosis occurred in children under 5 years old (10). Shigellosis causes most of the estimated 370 000 deaths from dysentery that occur worldwide each year in children under the age of five years (11). Among children, the risk of death from shigellosis is greatest in infants and those who are severely malnourished (12).

Four species of *Shigella* are pathogenic for man. *S. sonnei* and *S. boydii* usually cause relatively mild illness in which diarrhoea may be watery or bloody (13). *S. flexneri* is the chief cause of endemic shigellosis in developing countries, and *S. dysenteriae* type 1 causes both epidemic and endemic shigellosis. Although *S. dysenteriae* type 1 is the *Shigella* species associated with the most severe disease and the highest case fatality rates, the majority of deaths from shigellosis worldwide result from endemic disease, especially that caused by *S. flexneri* (14).

Most endemic shigellosis occurs in children between 6 months and 3 years of age. Incidence is greatest at the time of weaning (10,15), which is also when children are learning to crawl and walk; the introduction of solid foods and increased mobility of the child both enhance the risk of exposure to faecal pathogens. In endemic areas shigellosis is a year-round disease, usually peaking in the hot season. The incidence of shigellosis is highest in densely populated areas with an unsafe or insufficient water supply and inadequate sanitation. Infection is spread by contaminated food and, less frequently, by water. Because an inoculum of fewer than 100 organisms can cause illness, shigellosis is also transmitted from person to person through faecal contamination of hands. Spread within families is common, young children usually contracting the disease from their mothers or older siblings. During the past 30 years large portions of Central America, South Asia and Central Africa have experienced epidemics of dysentery caused by *S. dysenteriae* type 1. These have affected both adults and children. In most areas the organism is becoming resistant to commonly used antibiotics, which has made effective treatment increasingly difficult (16,17).

Table 1

Bacteria, other than *Shigella*, that cause bloody diarrhoea in infants and young children

	General comments	Diagnosis	Treatment
Campylobacter jejuni	Causes 5-15% of diarrhoea in infants worldwide. In developing countries most children acquire immunity during first year of life; pathogen frequently found in stools of healthy older children. Spread by poultry and dogs.	Requires stool culture with special media and growth conditions.	Generally causes mild self-limited illness. Erythromycin and fluoroquinolones possibly effective if begun during first 3 days of illness.
Enteroinvasive *Escherichia coli*	Uncommon in developing countries. Causes sporadic food-borne outbreaks that affect children and adults. Symptoms of illness are similar to those of shigellosis.	Diagnosis requires specialized techniques, including: serotyping, tissue culture, immunochemical tests and DNA hybridization.	Antimicrobials for *Shigella* probably effective, but efficacy has not been established in controlled studies.
Enterohaemorrhagic *Escherichia coli*	Found in Europe and in parts of North and South America, where outbreaks may be caused by undercooked meat. Recent outbreaks in southern Africa traced to river water contaminated by cattle carcasses. Type O157:H7 causes haemolytic-uraemic syndrome.	Diagnosis requires specialized techniques, including: serotyping, tissue culture, immunochemical tests and DNA hybridization.	Ampicillin or TMP-SMX probably effective if agent is sensitive *in vitro*, but no controlled trials have been done.
Non-typhoid *Salmonella*	Causes 1-5% of gastroenteritis in most developing countries. Infection usually results from ingestion of contaminated animal products.	Conventional culture techniques. Serotyping to identify individual serotypes.	Antimicrobial therapy may prolong shedding of the pathogen in the stool.

3.1.2 Other invasive bacteria

Episodes of bloody diarrhoea caused by other bacterial pathogens occur less frequently than shigellosis, are usually less serious, and their cause is frequently difficult to determine, except in highly specialized laboratories. Table 1 lists these pathogens. Most of these agents require a larger inoculum to cause infection than do *Shigella*. They are usually spread through contaminated drinking water or food.

3.2 *Entamoeba histolytica*

Entamoeba histolytica is spread by the faecal-oral transmission of amoebic cysts. Ingestion of cysts may result in invasive or non-invasive infection of the colon.

3.2.1 Invasive amoebiasis

This is characterized by dysentery, the presence in stool specimens of trophozoites of *E. histolytica* containing red blood cells, characteristic pathologic lesions in the colonic mucosa, and serologic evidence of infection (18). Infection may also spread to other organs, especially the liver.

Invasive amoebiasis occurs globally and is an important public health problem in areas such as Mexico, Guatemala, portions of South America and sub-Saharan Africa, and South Asia (18). Unlike endemic shigellosis, however, *invasive amoebiasis is uncommon in children below 3 years of age*, most cases occurring among adults (3,8,19,20). A study conducted in China, India, Mexico, Myanmar and Pakistan involving 3640 children aged under 3 years of age with acute diarrhoea yielded only 10 cases of probable invasive amoebiasis (0.3% of all diarrhoea episodes and about 1.5% of episodes of bloody diarrhoea), but 400 cases of shigellosis (which caused 45-67% of episodes of bloody diarrhoea) (8). In Bangladesh, a study of 101 children with bloody diarrhoea (mean age 21 months) revealed none with *E. histolytica* trophozoites in their stool (3). When amoebiasis does occur in children, those with severe malnutrition are at greatest risk of fatal outcome (19).

3.2.2 Luminal amoebiasis

This refers to asymptomatic, non-invasive infection with *E. histolytica*, during which only amoebic cysts are found in the stool. Most episodes are associated with non-pathogenic strains of *E. histolytica* that are probably incapable of causing invasive disease (20-22). It is likely that most children infected with *E. histolytica*, but without symptoms, have non-invasive luminal amoebiasis (23).

3.3 Non-infectious causes of bloody diarrhoea

Blood in the stool can sometimes result from non-infectious causes, which may include: anatomic disorders (especially intussusception), haematological problems (such as vitamin K deficiency in newborns), immunological causes (for example, Henoch-Schönlein purpura), and ulcerative colitis or Crohn's disease. These should be considered when bloody diarrhoea occurs in a newborn, when signs or symptoms suggesting one of these diagnoses are present, or when treatment of bloody diarrhoea for the usual infectious causes is ineffective.

4. NATURAL HISTORY OF BLOODY DIARRHOEA AND ITS RESPONSE TO TREATMENT

4.1 Shigellosis

Shigellosis in children ranges in severity from a mild, self-limited episode of watery diarrhoea without visible faecal blood to fulminant dysentery that causes death in a few days (10,24,25). The onset is usually rapid. In some patients the illness begins with watery stool that becomes bloody after one or two days. Shigellosis is often accompanied by fever and constitutional symptoms. Bowel movements may occur very frequently, 30 times or more a day, and stools usually contain visible mucus. A substantial proportion, perhaps 50%, of patients with diarrhoea caused by *Shigella* do not develop bloody stools and their illness is usually milder, resembling acute diarrhoea caused by non-invasive enteric pathogens (9,26). Infants below 4 months of age are an exception: shigellosis is more severe in them than in older children and has a higher case fatality rate; only about 20%, however, develop bloody diarrhoea (27).

When infection with *Shigella* causes dysentery it has a greater adverse effect on nutritional status than does diarrhoea caused by other agents. This is because episodes last longer (28,29), cause anorexia that can persist for days or weeks after recovery (30), and may cause substantial loss of serum protein through damaged bowel mucosa (16,31). Shigellosis is also more severe in children with pre-existing malnutrition, causing their nutritional status to worsen rapidly (11, 32-34).

Complications of shigellosis, including rectal prolapse, toxic megacolon, bacteraemia, hyponatraemia, hypoglycaemia and hypoproteinaemia, occur most frequently in children whose illness is clinically severe (31,35,36). The risk of severe disease is greatest in infants, children with severe malnutrition, children who become dehydrated, and children recovering from a recent episode of measles (12,27,32,37). The haemolytic-uraemic syndrome (HUS), consisting of anaemia, thrombocytopenia and renal failure, is caused by Shiga toxin and usually occurs in children infected with *S. dysenteriae* type 1 (16). In general, complications are more frequent when effective antimicrobial treatment is started more than 2 days after onset of symptoms.

When a child with shigellosis is given an effective oral antimicrobial, marked symptomatic improvement will occur within 2 days: there will be less fever, fewer stools, less faecal blood, less pain and improved appetite, and the child will resume normal activity (38,39). Without antimicrobial treatment, or if an ineffective antimicrobial is given, an episode of shigellosis lasts from two to 10 days, or longer, and the risk of serious complications or death is greatly increased, especially for infection caused by *S. flexneri* or *S. dysenteriae*, type 1 (40). Inadequately treated shigellosis is an important cause of persistent diarrhoea (2,25,29).

4.2 Bloody diarrhoea caused by other invasive bacteria

Some features of illness caused by other important bacterial causes of bloody diarrhoea are summarized in Table 1. These agents may occasionally cause severe disease, especially *E. coli* O157:H7, but this occurs less frequently than with *Shigella*. Most complications associated with severe shigellosis are also unusual with these infections, most episodes improving spontaneously within two to five days. An exception is the haemolytic-uraemic syndrome, which is an important complication of bloody diarrhoea caused by *E. coli* O157:H7.

4.3 Intestinal amoebiasis

Although symptoms of amoebiasis overlap significantly those of dysentery caused by *Shigella* and other invasive bacteria, amoebic dysentery is often gradual in onset, and patients may be ill for two or three weeks before coming to a health centre for treatment (19). Constitutional symptoms are generally not marked, and fewer than half of patients are febrile. The response of intestinal amoebiasis to appropriate treatment is usually rapid, distinct improvement being apparent within two to three days.

5. DETERMINING THE ETIOLOGY OF BLOODY DIARRHOEA

5.1 Based on clinical features

It is not possible precisely to determine the etiology of bloody diarrhoea in children based only on clinical features of the illness. Nevertheless, it is known that *Shigella* cause at least 50% of episodes of bloody diarrhoea in children, and nearly all that are clinically severe (8,9). It is reasonable, therefore, initially to consider *Shigella* the most likely (and most important) cause whenever bloody diarrhoea develops in a young child.

5.2 Based on microscopic examination of stool

Microscopic examination of the stool may be done to detect polymorphonuclear leucocytes (PMNs), and trophozoites or cysts of *E. histolytica*.

The presence of numerous PMNs on stool microscopy indicates an inflammatory process in the colon, usually caused by invasive bacteria, but does not identify the specific causative agent. Faecal PMNs are also found in patients with amoebic dysentery, but are usually less numerous (9,30). In general, microscopic examination for PMNs provides little information concerning etiology that cannot be determined clinically. For example, a community-based study of bloody diarrhoea in Bangladesh found that a mother's history of bloody stools was as predictive of shigellosis as was any combination of signs, symptoms and findings on microscopic examination of the stool (3).

A firm diagnosis of invasive amoebiasis requires the finding in fresh stool specimens of amoebic trophozoites with typical morphology and containing ingested red cells (haematophagous trophozoites). However, even experienced technicians frequently mistake non-pathogenic protozoa, white blood cells, macrophages containing red blood cells or partially digested vegetable matter for amoebic trophozoites (41). *Where the skill of technicians is not confirmed by regular quality control procedures, amoebiasis is routinely over-diagnosed and laboratory reports are of little value.*

5.3 Based on stool culture

Isolating an invasive bacterial pathogen from stool is the only way to determine with certainty that an episode of bloody diarrhoea is caused by a specific bacterial agent. However, many invasive bacteria require special culture media, unusual growth conditions, or diagnostic antisera that are often unavailable in laboratories in developing countries. Even attempts to isolate *Shigella* may fail unless the specimen is inoculated immediately and properly transported to the laboratory. Moreover, the results of culture are available only after two or three days, whereas treatment must be decided upon when the patient is first seen.

6. PRINCIPAL STEPS IN THE MANAGEMENT OF CHILDREN WITH BLOODY DIARRHOEA

Treatment guidelines for bloody diarrhoea in children reflect the points discussed above and consist of the following elements (also summarized in Figure 1):

(i) Refer immediately to hospital children with bloody diarrhoea who are severely malnourished.
(ii) Treat and prevent dehydration with oral rehydration therapy.
(iii) Treat all cases promptly with an oral antimicrobial effective against most local *Shigella* strains. Give enough of the antimicrobial to last 5 days.
(iv) Re-evaluate all high-risk children after 2 days. If there is not definite improvement, refer them to hospital.
(v) Also re-evaluate after 2 days all children who do not show definite improvement. Stop the first antimicrobial and start a second one that is effective against most local *Shigella*, if one is available.
(vi) Give therapy for amoebiasis *only* when typical trophozoites are seen in the stool or there is no response to antimicrobial therapy for shigellosis.
(vii) Give frequent small meals of the child's usual food; continue breastfeeding.

During the clinic visit health staff should explain to mothers the importance of antimicrobial and fluid therapy, continued feeding and breastfeeding, and advise them when to return to the health centre for help.

7. DETAILED ASPECTS OF CASE MANAGEMENT

7.1 Detection of bloody diarrhoea

The diagnosis of bloody diarrhoea in a child is made by asking the mother whether the child's stool contains red blood or by looking at the stool. These methods are equally sensitive and precise (3). However, asking the mother is usually more efficient than waiting for the child to pass a stool.

7.2 Antimicrobial therapy

7.2.1 Rationale

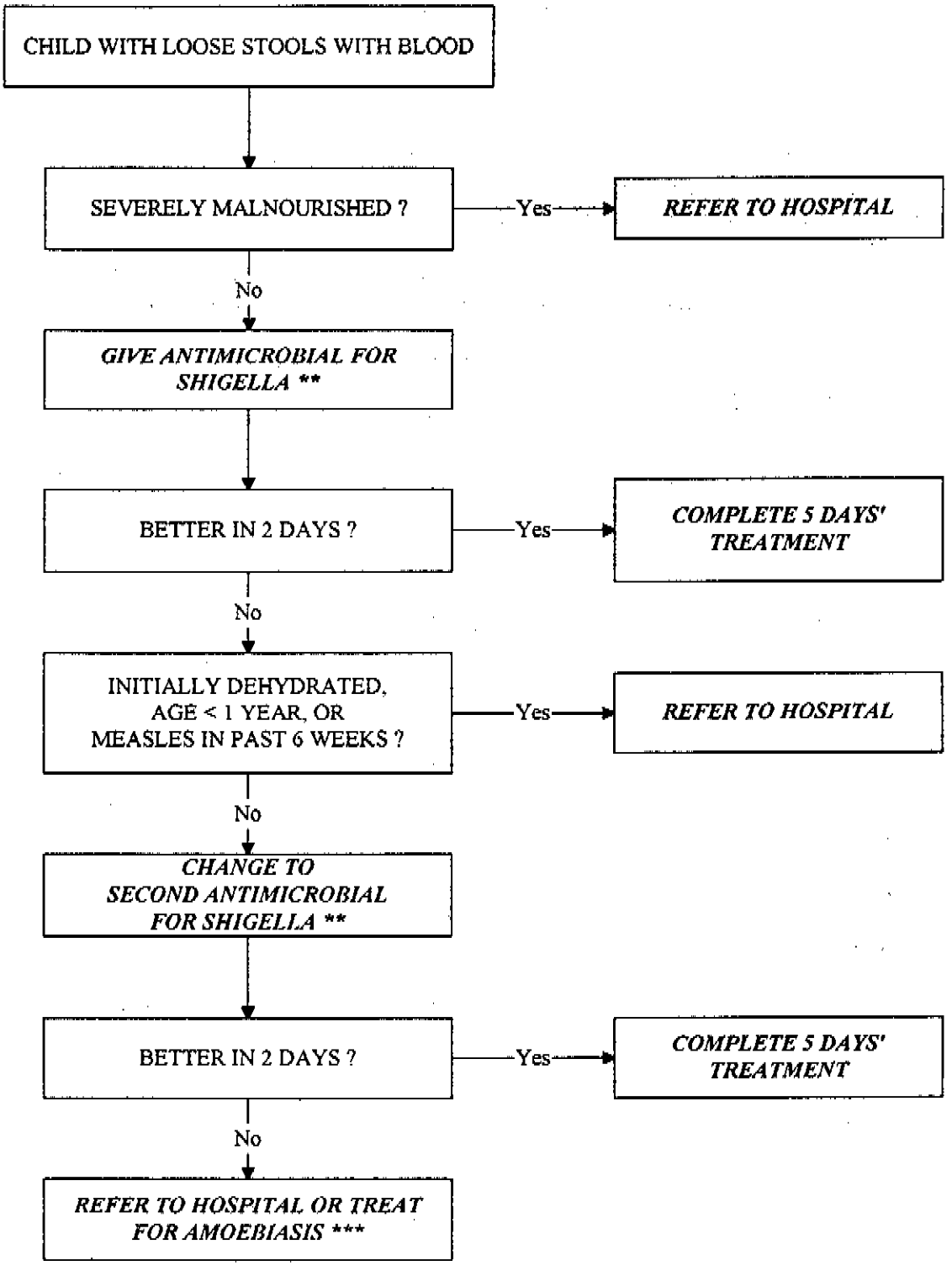
All infants and children with bloody diarrhoea should be treated promptly with an antimicrobial effective against *Shigella* because:

(i) bloody diarrhoea in this age group is caused much more frequently by *Shigella* than by any other pathogen;

(ii) shigellosis is more likely than other causes of diarrhoea to result in complications and death if effective antimicrobial therapy is not begun promptly; and

(iii) early treatment of shigellosis with an effective antibiotic substantially reduces the risk of severe morbidity or death.

Figure 1: Outpatient management of bloody diarrhoea in children below 5 years of age *



* Treatment should also include (i) oral rehydration therapy to treat or prevent dehydration, and (ii) continued frequent feeding, including breastfeeding.

** Give enough of the antimicrobial to last 5 days.

*** If trophozoites of *E. histolytica* are seen in stool at any time by a reliable technician, treatment for amoebiasis should be given.

7.2.2 Antibiotics for *Shigella*

Unfortunately, options for antimicrobial therapy of shigellosis have narrowed considerably in recent years as bacterial resistance has increased (Table 2). Resistance to ampicillin and cotrimoxazole, formerly the drugs of choice, is now widespread, particularly among *S. dysenteriae*, type 1, but also in many areas among *S. flexneri*. Nevertheless, cotrimoxazole, and in a few areas, ampicillin, may still be effective against a majority of endemic strains. Nalidixic acid, formerly used as a "backup" drug to treat resistant shigellosis, is now the drug of choice in many areas, but resistance to that drug is also appearing. Health facilities in areas where there is a high incidence of bloody diarrhoea should try to stock more than one antimicrobial known to be effective against most local strains of *Shigella*.

Sometimes there is an insufficient supply of effective antimicrobials to treat all persons with bloody diarrhoea. This is most likely to occur during epidemics caused by *S. dysenteriae* type 1 that are resistant to all commonly available antimicrobials. In such instances steps should be taken urgently to obtain a sufficient supply of effective antimicrobials. Until this is achieved, the available supply of effective drugs should be used for patients at greatest risk of death, who are: children under 5 years of age, especially infants and those with severe malnutrition, adults aged 50 years or more, and patients presenting with signs of dehydration[1].

Newer drugs offering promise in the treatment of shigellosis include pivmecillinam and the new fluoroquinolones, including norfloxacin, ciprofloxacin and enoxacin (40). The new fluoroquinolones, which are related to nalidixic acid, are highly effective in shigellosis, and may prove useful for short-course therapy (43). These drugs are relatively expensive, however, and concerns about their safety in children have not yet been resolved (44). Short-course therapy may also prove effective for other agents, but further research is needed to determine this.

Antimicrobials that are *not effective* for shigellosis are listed in Table 3. These include agents to which *Shigella* are usually resistant. Also listed are agents that are ineffective because they penetrate poorly the intestinal mucosa where invasive *Shigella* must be killed. Treatment of shigellosis with any of these agents, or an antimicrobial to which resistance has developed, is ineffective. Such treatment may also have serious side effects.

7.2.3 Antimicrobials for bloody diarrhoea caused by other invasive bacteria

Although illness caused by each of these agents responds to early treatment with an effective antimicrobial, this information has little practical value because appropriate antimicrobial therapy can be decided only after the pathogen is isolated by culture and its antimicrobial sensitivity determined. For this reason, "blind" therapy with commonly available antimicrobials is unlikely to be effective and should not be given.

7.2.4 Antimicrobials for invasive amoebiasis

Therapy for amoebic dysentery is outlined in Table 4. Metronidazole is the drug of choice. It should be given *only* when trophozoites of *E. histolytica* containing red blood cells are detected in the stool by a reliable laboratory, or when two different antimicrobials usually effective for *Shigella* have proved ineffective.

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[1] For additional information see: *Guidelines for the control of epidemics due to Shigella dysenteriae type 1*, WHO document WHO/CDD/93.45 (Rev. 1).

Table 2
Current options for antimicrobial therapy of shigellosis in developing countries[a]

Drug	Cost[b]	Availability	Resistant organisms	Dose in children	Dose in adults
Ampicillin	Inexpensive	Wide	Most *S. dysenteriae* type 1; many other *Shigella* species	25 mg/kg 4 times a day for 5 days	1g 4 times a day for 5 days[c]
Trimethoprim-Sulfamethoxazole (TMP-SMX; also called cotrimoxazole)	Inexpensive	Wide	Many *S. dysenteriae* type 1; variable among other *Shigella* species	TMP 5 mg/kg and SMX 25 mg/kg twice a day for 5 days	TMP 160 mg and SMX 800 mg twice a day for 5 days
Nalidixic acid	Inexpensive	Variable	Increasing among *S. dysenteriae* type 1; uncommon among other *Shigella* species	15 mg/kg 4 times a day for 5 days	1g 4 times a day for 5 days
Pivvmecillinam	Expensive	Limited	Rare among all *Shigella* species	20 mg/kg 4 times a day for 5 days	400mg 4 times a day for 5 days
Newer quinolones[d]	Expensive	Variable	Rare among all *Shigella* species	Not approved	Dosage depends on the drug[e]
Ceftriaxone	Expensive	Limited	Rare among all *Shigella* species	20 mg/kg IV twice a day for 5 days	1g IV once a day for 5 days

[a] Adapted from Salam & Bennish, ref. 40.

[b] In Bangladesh, for example, the retail cost of a 5-day course of therapy for a 10-kg child is as follows: Ampicillin suspension, US$1.00; TMP-SMX suspension, $0.56; nalidixic acid tablets, $0.75, and pivmecillinam capsules, $5.63.

[c] Single dose therapy of 100 mg/kg, up to 4g, is also effective for children above 4 years and adults (42).

[d] The newer quinolones are not yet approved for use in children because they cause arthropathy when given to certain species of immature mammals.

[e] Controlled trials conducted in adults have found that ciprofloxacin (500 mg b.i.d. x 5 days), enoxacin (200 mg b.i.d. x 5 days) and norfloxacin (400 mg b.i.d. x 5 days) are effective for treatment of shigellosis. Ciprofloxacin has also been shown to be effective in a single dose, although less so for *S. dysenteriae* type 1 than other *Shigella* (43).

Table 3

Antimicrobials that are *not effective* against *Shigella*

1. Antimicrobials to which *Shigella* are usually resistant *in vitro*:

   - Metronidazole
   - Streptomycin
   - Tetracyclines
   - Chloramphenicol
   - Sulfonamides

2. Antimicrobials to which *Shigella* may be sensitive *in vitro*:

   - Nitrofurans (e.g. nitrofurantoin, furazolidone)
   - Aminoglycosides (e.g. gentamicin, kanamycin)
   - First and second-generation cephalosporins (e.g. cephalexin, cefamandole)
   - Amoxycillin

Table 4

Antimicrobial therapy of amoebic dysentery

Antimicrobial	Dose in children	Dose in adults
Metronidazole	10 mg/kg 3 times a day for 5 days (10 days for severe disease)	750 mg 3 times a day for 5 days (10 days for severe disease)

7.2.5 Misuse of metronidazole

Metronidazole is often prescribed as initial therapy for children with bloody diarrhoea, but this is inappropriate. While it remains the drug of choice for *proven* amoebic dysentery, metronidazole has no efficacy against *Shigella* or other invasive bacteria[2]. Metronidazole is ineffective when given as initial therapy of bloody diarrhoea, it may have side-effects and its use makes treatment unnecessarily expensive. Metronidazole is *never* indicated for children with acute watery diarrhoea without blood.

7.3 Fluids

Although bloody diarrhoea is not usually associated with marked loss of fluid and electrolytes, the child's state of hydration should be accurately assessed. If dehydration is detected, it should be treated at the health facility. Children with bloody diarrhoea and signs of dehydration are at increased risk for complications and should be re-evaluated after 2 days of treatment. For all children, the caretaker should be encouraged to offer increased amounts of suitable fluids at home. WHO guidelines for rehydration therapy have been published elsewhere (45).

7.4 Feeding

Continued provision of nutritious food is important for all children with dysentery. However, owing to anorexia, children may have to be coaxed to eat. Initially, children may refuse all food, but appetite usually improves after 1-2 days of effective antibiotic therapy. Frequent small meals with familiar foods are usually better tolerated than a few large meals. Mothers should be advised to breastfeed as often and as long as their children want. Children convalescing from dysentery should be given an extra meal each day for at least 2 weeks to help them recover weight that may have been lost during the illness. The caretakers of those with pre-existing malnutrition should be advised on appropriate feeding practices and the child monitored until substantial weight gain has been documented.

7.5 Follow-up and referral to hospital

Severely malnourished children with bloody diarrhoea are at very high risk of complications and should be referred immediately to hospital after starting treatment for shigellosis. These include children whose weight-for-age is less than 60%, or weight-for-length is less than 70%, of the National Center for Health Statistics (NCHS) medians.

All children at increased risk of complications from shigellosis should be re-evaluated after 2 days. These include those below 12 months of age, children who present with signs of dehydration, and children who have had measles during the past six weeks. If a high risk child does not show definite improvement within 2 days, the health worker should refer the child to the nearest hospital.

Other children who have not improved after 2 days should also be re-evaluated. The antimicrobial being given should be stopped and a second one to which most *Shigella* in the area are sensitive should be started, if one is available. If there is still no improvement after 2 days of treatment with the second antimicrobial, the drug should be stopped and the child should be

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[2] Metronidazole is also effective for pseudomembraneous enterocolitis caused by *C. difficile*.

referred to hospital or started empirically on therapy for amoebiasis. Children who are improving, however, should continue the treatment for 5 days.

Appropriate treatment of children referred to hospital should be determined by the resources available and by the findings on further evaluation of the child. At a minimum, children should be evaluated for: other infections (such as pneumonia or urinary tract infection), dehydration, mainutrition, and possible non-infectious causes of bloody diarrhoea. Where possible, laboratory studies should include: microscopic examination of stool for PMNs, for trophozoites of *E. histolytica* and for other enteric parasites, and stool culture for *Shigella* and other invasive enteric bacteria, with determination of the antimicrobial sensitivity of any isolated pathogens. Other important studies are: complete blood count (or haematocrit), serum creatinine and urine output (to detect haemolytic uraemic syndrome), and serum sodium concentration (to detect serious hyponatraemia).

Management of hospitalized children should follow the guidelines described above, with the addition of treatment for any other infections identified and appropriate dietary management of malnutrition. Treatment for enteric infection should be based on laboratory findings (e.g. isolation of a specific bacterial pathogen, identification of trophozoites of *E. histolytica*), but should not repeat antimicrobial therapy already given. When no specific etiologic diagnosis is made, the guidelines given above for antimicrobial therapy of presumed shigellosis should be followed. Patients not responding to this treatment may be empirically treated for amoebiasis. A more intensive search for non-infectious causes of bloody diarrhoea should also be made.

8. OTHER MEASURES

(i) All health workers should be trained in the management of bloody diarrhoea as part of their training on the correct management of patients with diarrhoea.

(ii) Health facilities should be monitored to ensure that they are properly stocked with antimicrobials effective against *Shigella* and ORS packets, and that cases of bloody diarrhoea are recorded in clinic records.

(iii) Periodic surveys should be conducted to determine the antimicrobial resistance patterns of local *Shigella* strains and the results used to revise treatment guidelines, if necessary.

(iv) Outbreaks of dysentery should be promptly reported and investigated by health authorities to determine their cause and the most appropriate treatment.

(v) In countries where epidemics of bloody diarrhoea contribute significantly to morbidity and mortality in young children, managers of national diarrhoeal diseases control programmes should take effective steps to reduce the spread of infection, and prevent complications and deaths. These are described in detail elsewhere (46).

9. ACKNOWLEDGEMENTS

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