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CONTROL OF DIARRHOEAL DISEASES

GUIDELINES FOR THE CONTROL OF EPIDEMICS DUE TO **SHIGELLA DYSENTERIAE 1**

World Health Organization

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CONTENTS

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1. INTRODUCTION

Since its discovery in the last decade of the 19th century, Shigella dysenteriae 1, the classical Shiga bacillus, has been recognized as an unusually virulent organism capable of causing widespread epidemics distinguished by high case fatality and extreme debility in survivors. After the 1920s, however, the infection virtually disappeared from the developed countries and, for unknown reasons, also became uncommon in the developing world. No major epidemic was recorded anywhere until December 1968, when epidemics due to drug-resistant strains of S. dysenteriae 1 appeared, causing endless human suffering in Central America and Mexico, and in later years in Asia and Africa.

These guidelines briefly describe the S. dysenteriae 1 epidemics that have occurred since 1968, review information about the clinical features and epidemiology of S. dysenteriae 1 infection that is of relevance for the control of such epidemics, and propose strategies for their prevention and control.

2. RECENT EPIDEMICS

Since December 1968, S. dysenteriae 1 epidemics have been recorded in 6 countries of Central America (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua) and Mexico (1969-1972), Bangladesh (1972-1977), southern India (1972-1978), Somalia (1976), Sri Lanka (1976-1982), Maldives (1982), Central Africa (Burundi, Rwanda, Zaire) (1979-1986), United Republic of Tanzania (1982-1983), eastern India (Assam, Tripura, West Bengal) (1984), Burma (1984-1985), Thailand (1985-1986), Nepal (1984-1985), Bhutan (1984-1985) and the Andaman and Nicobar Islands, India (1986).

These epidemics were not equally calamitous or rapid in spread; those in Central America, Central Africa and Bangladesh were of greater magnitude and had more serious consequences. In Central America, the epidemic lasted about 4 years and is reported to have caused around half a million cases and at least 20 000 deaths. During 1970-1972, about 140 cases imported from this area were detected in the United States of America, compared with only 10 cases between 1965 and 1968. The epidemic in Bangladesh appeared in 1972 following the 1971 War of Independence which involved mass population movements; it lasted for 6 years and caused many cases and deaths. A rapidly spreading epidemic began in West Bengal, India, in April 1984, causing some 350 000 cases and 3 500 deaths within 3 months. The 1982 epidemic in the Maldives caused about 13 000 cases (8% of the total population) and around 200 deaths. In Central Africa the epidemic began in November 1979 in northeastern Zaire, spread very quickly within the country, reached Rwanda in March 1981, and then Burundi in December 1981. It also is reported to have caused many cases and deaths. In Burundi alone there were 101 487 cases and more than 2 000 deaths between 1982 and 1985. The fury of the epidemics appears at present to have abated in most of these areas, but sporadic cases continue to occur and there is no reason to believe that epidemics will not break out again.

While the epidemics themselves were caused by S. dysenteriae 1, other Shigella serotypes were also isolated more frequently at the same time, perhaps because of a real increase in their occurrence, or as a result of the use of better laboratory techniques. In the earlier epidemics, S. dysenteriae 1 strains were found to be resistant to such common antimicrobials as sulfonamides, streptomycin, tetracyclines and chloramphenicol. In addition, resistance to ampicillin and/or trimethoprim-sulfamethoxazole was sometimes present, or appeared to varying degrees, sometimes quite rapidly, following wide use of these drugs. Resistance to nalidixic acid also appeared after it came into use. Resistance to a particular antibiotic sometimes disappeared when its use was diminished.

The reasons for the sudden appearance of the epidemics, first in Central America and then independently elsewhere, and for their abatement, remain speculative. Genetic studies of strains isolated in the different areas indicate that the epidemics were not all caused by the same clone. It has been postulated that the epidemic in Central America came to an end when it reached Costa Rica because sanitary conditions were better, surveillance was well-established, and treatment could be carried out with antibiotics to which the organism was susceptible. However, these conditions did not apply in other areas where epidemics subsided inexplicably.

In some countries the S. dysenteriae 1 epidemics were initially wrongly diagnosed as outbreaks of amoebiasis, probably because of the unexpected appearance of the organism, poor laboratory techniques and a lack of clinical response to commonly used antimicrobial drugs.

3. RELEVANT CLINICAL AND EPIDEMIOLOGICAL INFORMATION

As few as 10-100 shigella can cause disease in adult volunteers - in this sense they are unique among the enteropathogenic bacteria. This low infectious dose explains why epidemics are hard to stop and person-to-person transmission is common. Man is the only natural host and reservoir, although shigella may be isolated from the stools of primates living close to human habitations.

Disease caused by S. dysenteriae 1, like that caused by other shigella serotypes, has a wide spectrum, although this serotype causes more severe cases. Disease is more commonly severe in infants (especially those that are not breast-fed), the elderly and the malnourished. However, most cases remain uncomplicated and self-limited, lasting up to 7 days; occasionally diarrhoea may be prolonged and even become chronic. Excretion of the organism usually lasts for 7-12 days in untreated cases, but may be prolonged for more than a year in chronic cases.

Complications like bacteraemia, rectal prolapse, toxic megacolon, leukemoid reaction, disseminated intravascular coagulation and haemolytic uraemic syndrome (HUS) are more common with S. dysenteriae 1 disease; for reasons that are unknown, the last three complications were observed more frequently in some areas, e.g., Bangladesh and Sri Lanka, than in others, e.g., Central America and Calcutta, India.

Case fatality is also higher in infants, the elderly and the malnourished, and is associated with the presence of moderate to severe dehydration, fever, leukemoid reaction, HUS and bacteraemia. The case-fatality rate among hospitalized cases at the International Centre for Diarrhoeal Disease Research in Dhaka during the epidemic in Bangladesh was 7-10% in adults and 41% in young children. The overall rate was about 8% in Sri Lanka, 7% in Central America, 2-6% in some parts of Central Africa and 1-2% in Calcutta and Burma. In one area in Africa, where effective chemotherapy was not available and cases were treated with rehydration and supportive therapy only, the case fatality was about 9% in adult men, 4% in adult women and 12% in children.

The overall attack rate in the different epidemics ranged from 6-34% and was higher in overcrowded areas with poor water supply, sanitation and hygiene. During the epidemics, infection was usually introduced into families by adults or older children, while the brunt of the disease fell on young children aged 1-4 years in whom the attack rate was as high as 50%. In a family study in Bangladesh, 27% of family contacts of index cases under 5 years of age developed clinical shigellosis and 40% of them had blood in their stools. In Zaire and the United Republic of Tanzania, well-nourished adults were also frequently affected, but infants below 6 months of age, particularly when breast-fed, were generally spared.

In endemic areas, the incidence of shigellosis usually peaks during the hot humid and rainy seasons; this is also when epidemics have generally occurred, though the seasonality was less pronounced in Africa. Transmission most commonly occurs by direct person-to-person contact and through food, water and fomites. Flies are considered to play a greater role in the transmission of shigella than of other diarrhoea pathogens because of the low infective dose, but their actual importance is probably minimal. Cases of S. dysenteriae 1 disease are considered more important sources of spread than carriers. Information on carrier rates during epidemics is scarce; however, the rate is probably low because most infections are associated with disease.

Shigella are usually excreted in the stool in large numbers (10^6 - 10^8 per g), but they die off quickly as stool becomes acidic. There is little information on the survival of S. dysenteriae 1 in different environments. S. flexneri and S. sonnei survive in soiled linen for 9-46 days, in water for up to 6 months, and in various foods for 3 weeks to 6 months, usually in decreasing numbers (though some initial multiplication has been found to occur in milk). They survive for longer periods at temperatures of below 25°C.

4. STRATEGIES FOR PREVENTION AND CONTROL

The increasing number of epidemics due to multiple drug-resistant S. dysenteriae 1 in Asia, Africa and Latin America in recent years indicates that all developing countries are threatened. A national programme for the control of diarrhoeal diseases (CDD), if properly organized and managed, provides the best infrastructure and assures a state of preparedness for the early detection and control of such epidemics. In addition, an effective programme will decrease diarrhoea-associated mortality, morbidity and malnutrition and reduce the risk of epidemics.

Specific strategies for the control of S. dysenteriae 1 epidemics consist of their early detection, proper treatment of cases, and surveillance and education of contacts. A short synopsis of control measures is provided in Annex 1. There is as yet no suitable vaccine for the control of shigellosis or shigella epidemics despite many years of active interest and research. The WHO CDD Programme is supporting research to develop an effective live oral vaccine.

4.1 Specific measures

4.1.1 Early detection of epidemics

Outbreaks of dysentery, like those of other diarrhoeal diseases, can usually be detected early if treatment facilities are systematically recording information on diarrhoeal cases as part of the activities of a national CDD programme. A simple case-record maintained by the staff who provide treatment for diarrhoea showing the date, name and age of each patient, the clinical diagnosis and the service provided should be adequate to detect any unusual increase in the number of diarrhoea cases with blood in their stool (many of whom may have fever, abdominal pain or tenesmus). By examining this record, health workers should be able to recognize a change in the usual pattern of illness, particularly a clustering of such cases in a locality, signifying the beginning of an outbreak of shigellosis and draw the attention of their immediate supervisors to the need to arrange for stool examinations and appropriate control measures. In the absence of such systematic recording and reporting, shigella epidemics are often detected by hospitals, private practitioners, pharmacists, community leaders or the media, but this often happens after the disease has become widespread and caused many deaths.

4.1.2 Diagnosis and antimicrobial susceptibility testing

Once an epidemic is suspected, stool specimens should be collected from suspect cases to establish the cause of the epidemic and determine the antimicrobial susceptibility pattern (antibiogram) of the isolated organism. Procedures for collection of the specimen, bacteriological examination and drug-susceptibility testing can be found in the WHO Manual for Laboratory Investigations of Acute Enteric Infection[1] (see also Annexes 2 and 3). If laboratory support is not readily available, treatment of cases should be initiated on clinical grounds; however, stool specimens should be collected from some (5-10) patients and sent for laboratory investigation.

4.1.3 Treatment of cases

Priority should be given to assuring prompt treatment of dysentery cases. This will alleviate the symptoms and reduce deaths, which in turn will help to secure the cooperation of the community in controlling the epidemic.

To ensure that all cases receive proper treatment as early as possible, it will be important to tell the public to report for treatment whenever there is a case of dysentery in the family and to ensure that health workers are trained to treat cases. Health workers visiting homes to provide information and health education messages (see section 4.2) can also help to find and refer cases for proper treatment.

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[1] WHO document CDD/83.3 Rev. 1 (1987)

4.1.3.1 Antimicrobial therapy

Antimicrobials shorten the duration of illness, reduce the risk of serious complications and mortality, and shorten the period of shigella excretion in the stool. During an epidemic all cases of diarrhoea with visible blood, with or without mucus, in the stool should be assumed to be cases of shigellosis and treated with antimicrobials.

Selection of an antimicrobial agent should be based on the drug-susceptibility pattern either of strains isolated from local cases or of strains recently isolated in nearby areas. If laboratory support is not readily available and there is no information on the drug-resistance pattern of recent isolates, one of the following two antimicrobials should be given first consideration:

Ampicillin:

All ages: 100 mg/kg/day (maximum 4 g) in 4 divided doses x 5 days.

One study suggests that children over 4 years of age and adults may be treated with a single dose of 100 mg/kg (maximum 4 g); while the simplicity and economic advantages of this dosage are obvious, its efficacy needs to be confirmed in additional studies before it can be recommended.

Trimethoprim-Sulfamethoxazole (TMP-SMX):

Children (under 10 years): TMP 10 mg/kg/day and SMX 50 mg/kg/day in 2 divided doses x 5 days (not to exceed the adult dose described below).

Adults: TMP 160 mg and SMX 800 mg twice daily x 5 days.

If the clinical response is poor and/or resistance is demonstrated to both drugs, nalidixic acid should be used:

All ages: 55 mg/kg/day (maximum 4 g) in 4 separate doses x 5 days.

Although this drug has been used widely for the treatment of shigellosis caused by S. dysenteriae 1 strains that are resistant to ampicillin and TMP-SMX, some studies have shown that the clinical response and bacteriological cure are slower than in patients infected with ampicillin-sensitive strains and treated with that antibiotic.

As resistance to sulfonamides, streptomycin, tetracyclines and chloramphenicol is common, these drugs should never be used unless strains have been demonstrated to be susceptible to them. When strains are resistant to all available antimicrobials, cases should be managed with supportive therapy (see below). Mild cases in adults can also be treated with supportive therapy alone, especially if the supply of antimicrobials is limited.

Because resistance to any antimicrobial can develop during an epidemic (sometimes quite rapidly), it is important to develop a system for monitoring drug resistance; this involves examining a sample of isolates on a regular basis (e.g., every 2 or 3 weeks) or isolates from cases whose clinical response appears to be poor despite proper administration of the drug. When strains are sensitive to the agent used, clinical improvement (e.g., improvement in general appearance; decrease in number of stools, amount of blood in the stool, fever, abdominal pain) normally occurs within 48 hours after its administration. If laboratory support is not readily available, reliance has to be placed on careful monitoring of the clinical response of cases.

In view of the emergence of strains that are resistant to available antimicrobials, research aimed at developing new and safe antimicrobials for shigellosis is receiving high priority. Oral gentamicin, pivmecillinam and new quinolone derivatives such as norfloxacin and ciprofloxacin are currently being evaluated. Gentamicin is an aminoglycoside to which most shigella are sensitive, but its efficacy when given orally for the treatment of shigellosis is not established. Pivmecillinam (a derivative of penicillin) has been

shown to be effective in adults, but has not yet been evaluated in children. Norfloxacin is also effective in adults with shigellosis, but its use has not been approved for children since, like other quinolones, it has been associated with adverse effects on cartilage and bone growth in animals. A single dose (2.5 g) of tetracycline was found in one small study to be effective in the treatment of shigellosis in adults, even when the infecting strain was resistant when tested in vitro; use of this approach requires confirmation and is not recommended at present. Trimethoprim alone has also been found effective, but is likely to induce resistance more rapidly than when given in combination with sulfamethoxazole. Furazolidone, kanamycin, neomycin and amoxycillin have not been shown to be efficacious and are not recommended.

4.1.3.2 Supportive therapy

This includes appropriate feeding in all cases and the prevention or correction of dehydration.

Nutritional management

The feeding of shigellosis cases, though sometimes difficult, is important as the disease has a marked adverse effect on nutritional status. Breast-feeding should be continued during illness, more frequently than normal if possible, as the infant may not take the usual amount per feed. Children aged 4-6 months or more should receive their normal weaning foods containing easily digestible, high quality proteins enriched with a little fat or sugar to provide adequate calories. Dairy products, legumes, fish, eggs and chicken are suitable. Milk and cereal mixtures are generally better tolerated than milk alone. During illness frequent, smaller-than-normal feedings may be better tolerated. Adults should eat easily digestible, calorie-rich food and avoid fried, spicy and fibrous foods.

During convalescence one extra meal should be given daily for one week or at least until the pre-episode weight has been regained.

Prevention and treatment of dehydration

Clinically evident dehydration is not common with dysentery but when it occurs the illness is more likely to be severe with an increased risk of death. Adequate household fluids should be given to prevent it from occurring. Oral rehydration with Oral Rehydration Salts (ORS) containing sodium chloride 3.5 g, trisodium citrate, dihydrate 2.9 g (or sodium bicarbonate 2.5 g), potassium chloride 1.5 g and anhydrous glucose 20.0 g per litre of drinking water is usually adequate for the treatment of dehydration. Intravenous rehydration using Ringer's lactate (Hartmann's solution for injection) is required only for severe and extremely weak cases.

4.1.3.3 Other drugs

Drugs available for symptomatic relief of abdominal pain and tenesmus, including synthetic opiates (e.g., loperamide, diphenoxylate) and opium-containing preparations (e.g., paregoric) should not be used in the treatment of shigellosis as they can potentially increase the severity of dysentery by delaying clearance of the causative organism. In young children, these drugs have been associated with respiratory depression, altered consciousness and severe ileus with abdominal distension. Fever and toxic megacolon have been reported in adults receiving diphenoxylate hydrochloride with atropine.

Potassium depletion may be quite severe in shigellosis and may lead to ileus with abdominal distension; it should be prevented by giving adequate oral rehydration with ORS and potassium-rich foods.

High fever is associated with seizures in young children. It should be brought down by tepid sponging or paracetamol.

4.1.3.4 Follow-up and referral

Infants and individuals with dehydration or severe undernutrition have a higher risk of dying from shigellosis and should be assessed 48 hours after the initiation of treatment. Any of these or any other case that is not improving after 48 hours of treatment should be referred to a secondary or tertiary health facility.

4.1.4 Surveillance and education of contacts

Close contacts of patients (particularly children) often become ill; thus, they should be instructed to seek medical attention at the first appearance of symptoms. Chemoprophylaxis should not be used, mainly because it can hasten the emergence of resistant strains, making treatment of the disease more difficult. Instead, careful personal, food and domestic hygiene practices should be promoted and families provided with soap and ample water. Most importantly, persons caring for cases should not prepare or handle food and water.

4.2 General measures

The strategies applied by the national CDD programme to reduce morbidity and mortality from acute diarrhoeas are effective for the control of epidemics caused by S. dysenteriae 1 as well as endemic shigellosis (see below). In addition, immunization against measles should be actively promoted, as many cases of severe shigellosis occur during or shortly after measles.

It is particularly important to inform the public about the ways in which shigellosis can spread and methods for its prevention, using all available channels of communication: during home visits, when providing treatment, through schools, religious leaders and the mass media. Messages must be carefully prepared taking the local culture, traditions and beliefs into consideration; only practicable measures should be promoted. The launching of campaigns may be appropriate in order to reach large numbers of the population quickly.

During epidemics, increased attention should be given to promoting the following strategies:

4.2.1 Provision of plenty of clean water

As the infectious dose for shigellosis is low, its spread is facilitated under conditions of inadequate water supply and poor personal and domestic hygiene. Thus, the availability of large volumes of water is important for its prevention and control.

As sources of water vary widely in type and quality, it is difficult to make specific recommendations. The following are some general guidelines, which should be reviewed with and implemented by the national authority responsible for water supply (see also section 4.2.5):

- When piped water is available, its quantity should be increased and proper chlorination assured; leaking joints should be repaired to prevent contamination and loss of water.

- Where a single exposed water source, e.g., river, pond or well, is used for drinking water, it should be protected from contamination, if necessary by a fence with one entrance (preferably guarded), and alternative facilities provided for washing, bathing, etc. Drainage ditches should be dug to prevent storm and other surface water from flowing into it. Defaecation must not be allowed, nor latrines located, within 10 metres of this water source.

- When all locally available water is known to be contaminated, water can be supplied by tankers or transported in drums, provided that a regular supply can be assured.

- When an epidemic shows signs of continuing for a long time, consideration should be given to long-term solutions like digging or drilling wells or installing piped, treated water systems.

- Families should be properly instructed and motivated to collect and store water in clean, covered containers, to keep it out of the reach of children and animals, and to use a dipper, kept specially for this purpose, for taking water from the containers.

- Domestic chlorination should be encouraged whenever necessary (see Annex 4. When there is doubt about the potability of the water and chemical disinfection is not possible, it should be boiled, at least when it is to be used by young children; bringing water to the boil is adequate. Special care should be taken to prevent recontamination of the boiled water.

- The supply of suitable chemicals for water treatment at home and of narrow-mouthed earthen jars with covers for storage may help to reduce transmission within families.

4.2.2 Promotion of hand-washing with soap

Proper hand-washing with soap appears to be the single most effective measure to prevent shigellosis transmission and should be promoted in every family and enforced in residential institutions. Hand-washing is practised more frequently where water is plentiful and within easy reach. If soap is not available, ash or earth can be used, though they are a poor substitute. If possible, soap should be supplied through peripheral health workers to those without it. Hand-washing is particularly important after cleaning a child who has defecated or disposing of a child's stool, and before preparing or eating food. Washed hands should not be dried with dirty clothes. Health care workers also should wash their hands with soap and water after handling each patient.

4.2.3 Improvement of personal and domestic hygiene

Because shigellosis is commonly transmitted by the person-to-person route, hygienic practices are important for its prevention and control. The need for proper personal cleanliness through regular bathing, washing and changing of clothes is generally well known. Plenty of water should be made available to promote these practices.

4.2.4 Assuring food safety and promoting breast-feeding

As shigellosis is generally a more severe disease in infants and young children, special care must be taken to motivate mothers to adopt good weaning practices. These include the use of clean utensils, washing hands before preparing food, proper cooking or boiling of food, keeping food covered and stored in a cool place, and re-heating it to simmer for a few minutes if it has been kept for more than 2 hours (see also sections 4.2.2 and 4.2.3).

For the control of shigellosis, particularly important practices are: eating cooked foods while they are still hot, proper kitchen hygiene to prevent cross contamination between cooked and raw foods, keeping food covered, and preventing flies from settling on food. Those who prepare food should avoid contact with known cases, the utensils used by them and the persons caring for them.

Bottle-feeding is a recognized risk factor for death from shigellosis in infants. Therefore, special efforts should be made during shigella epidemics to promote breast-feeding. Mothers of children who are already weaned and receiving artificial milk formulae should be reminded of the appropriate techniques for their preparation and administration.

4.2.5 Provision of facilities for the disposal of human excreta

As the only source of shigella infection is human faeces, it is essential to arrange for proper disposal of the faeces of cases and of all family members, especially those of children, in whom shigella infection rates are highest. In areas without adequate facilities for human waste disposal, an appropriate sanitary system should be constructed by the national authority (see section 4.2.1), taking into account the following suggestions.

In rural areas, the digging of pit-latrines generally constitutes a practical solution. The latrine should be dug at least 10 metres away from the living quarters and from any surface or underground water source; it is not suitable for marshy areas. For one family, the pit should be at least 2 m deep with a 1-m^2 opening, while for a community a trench should be dug 1 m wide, 2 m deep and 6-10 m long. The edges of the pit or trench must be higher than ground level to prevent rain or other water from draining into it. The latrine should have a concrete or wooden floor supported by beams, leaving an appropriately shaped opening for defecation. If the pit latrine is of the ventilated type (VIP latrine), it is not necessary to have a cover for the hole. A tight-fitting cover will otherwise help to reduce the entry and exit of flies. As it is difficult to change defecation habits rapidly, the technology promoted must take into consideration the available facilities and local customs, practices and prejudices.

A bore-hole latrine (40 cm in diameter and 5-6 m in depth) may be constructed with earth-augers where there is no rock. One such latrine may be required for 20 persons.

Health education messages should stress the need for proper use of latrines by everyone (including children) and their maintenance; the dangers associated with defecating in the open and in or near water, and with bathing in rivers and ponds; and the importance of hand-washing with soap or ash after defecation (see section 4.2.2). It should be emphasized that the stools of infants and young children must also be picked up, using a scooping instrument like a shovel, and deposited in the latrine or buried.

Where there is no latrine, defecation should be performed only in a demarcated area, at least 10 m away from any water source, and a shovel made available to bury the excreta.

4.2.6 Prevention of fly breeding

The breeding of flies is best controlled by building proper latrines (see section 4.2.5) and by burying or burning refuse, if it cannot be removed by the municipal authorities. The use of insecticides is not practical.

4.2.7 Disinfection and disposal of dead bodies

As the surroundings of a shigellosis case living in unhygienic quarters are inevitably contaminated, disinfection of the patient's clothing, used articles, home and surroundings is important. Several effective disinfectants are available for this purpose: chlorinated lime, 2% chlorine solution or 1-2% phenolic preparations like lysol are cheap and practical. Disinfectants are not a substitute for cleaning: clothes should be washed thoroughly using soap and sufficient water and then boiled or disinfected. Proper sun drying of clothes is also helpful. Utensils may be washed with boiling water or disinfected. The washing of contaminated articles, particularly clothes, in rivers and ponds or near wells must be prohibited.

Funerals of persons who die from shigellosis should be held quickly and close to the place of death; more importantly, the washing of dead bodies and the preparation and distribution of food during funerals should be forbidden.

5. POST-EPIDEMIC FOLLOW-UP

Careful clinical surveillance should be continued to ensure that sporadic cases of shigellosis are promptly detected and treated, as should efforts to improve personal and domestic hygiene, water supplies and sanitation to prevent a recurrence of the epidemic.

Routine laboratory examinations of food and water are not likely to be helpful. The experience gained during the epidemic should be used to strengthen the capacity of the national CDD programme to control all endemic acute diarrhoeas, including shigellosis, which will also prevent further epidemics.

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ANNEX 1

SYNOPSIS - PREVENTION AND CONTROL OF SHIGELLOSIS

A. Detect the epidemic early by strengthening surveillance through health facilities providing treatment for diarrhoeas; this can be done through a properly implemented CDD programme.

B. Establish S. dysenteriae 1 as the cause of the epidemic and determine the antibiogram of the responsible strain in a reliable laboratory.

C. If laboratory support is not readily available, initiate action for control on clinical and epidemiological grounds. Collect some stool samples and send them for laboratory investigation.

D. Provide an antimicrobial agent (selected on the basis of available information) for the treatment of cases.

E. Assure proper nutritional management and prevent/treat dehydration in cases.

F. Inform the public and health workers with respect to case finding, treatment and referral of cases.

G. Establish a system for monitoring the drug-resistance patterns of the prevalent strains based on laboratory and/or clinical grounds and change the recommended antimicrobial agent accordingly, as required.

H. Assure surveillance and treatment of ill contacts; do not use chemoprophylaxis.

I. General measures:

- Make plenty of clean water available
- Promote hand-washing with soap
- Improve domestic and personal hygiene
- Assure the safety of weaning and other foods and promote breast-feeding
- Provide facilities for excreta disposal
- Prevent fly breeding
- Disinfect patients' surroundings and dispose rapidly of dead bodies

J. Encourage post-epidemic surveillance, treatment of sporadic cases and activities to improve environmental, domestic and personal hygiene to control endemic shigellosis.

ANNEX 2

LABORATORY DIAGNOSTIC SUPPLIES

(for 500 cases)

1.	Rectal swabs	500
2.	XLD medium	3 x 500 g
3.	MacConkey agar	3 x 500 g
4.	Kligler agar	2 x 500 g
5.	Mueller Hinton agar	2 x 500 g
6.	Diagnostic antisera:	Polyvalent:
		S. dysenteriae (group A)
		S. flexneri (group B)
		S. boydii (group C)
		S. sonnei (group D)
		Monovalent:
		S. dysenteriae type 1
7.	Disposable Petri dishes (9 cm)	1000
8.	Test tubes (13 x 100 mm)	1000
9.	Disposable Bijou bottles	1000
10.	Antibiotic discs for susceptibility tests (50 of each):	Ampicillin
		TMP - SMX
		Tetracycline
		Chloramphenicol
		Nalidixic acid
11.	Control strains (susceptible and resistant)	

ANNEX 3

WHO COLLABORATING CENTRES FOR ENTERIC INFECTIONS

The following two centres may be approached for technical assistance in bacteriological aspects of shigella:

1. WHO Collaborating Centre for Shigella,
   Enteric Bacteriology Section, Enteric Diseases Branch,
   Bacterial Diseases Division,
   Center for Infectious Diseases,
   Centers for Disease Control,
   Atlanta, GA 30333,
   USA
   (Chief: Dr K. Wachsmuth)

2. WHO Collaborating Centre for Phage-typing and Resistance of Enterobacteria,
   Division of Enteric Pathogens,
   Central Public Health Laboratory,
   Colindale Avenue,
   London NW9 5HT,
   United Kingdom
   (Director: Dr B. Rowe)

ANNEX 4

PROCEDURES FOR DOMESTIC DISINFECTION OF WATER

Prepare a 1% stock chlorine solution by adding enough water to 4 teaspoons (16 g) of sodium hypochlorite (70% available chlorine), or 10 teaspoons (40 g) of bleaching powder (30% available chlorine) to make up 1 litre of solution. Mix thoroughly and keep tightly stoppered. Fresh solution should be prepared daily.

Use 3 drops of the stock solution for 1 litre, or 1 teaspoon (4-5 ml) for 30 litres, or 1 litre for 4550 litres of water - always adding water to the stock solution for proper mixing. The chlorinated water should be allowed to stand for 20-30 minutes before use.

This procedure provides a chlorine concentration of about 2 mg per litre.

Commercial antiseptic solutions such as "Zonite" or "Milton" contain about 1% chlorine. Laundry bleaches, available as liquids under a variety of trade names, usually contain 3-15% available chlorine; they should be diluted to 1% before use.

Water purification tablets and liquids containing chlorine are also commercially available under different trade names. Attention has to be given to their stability and cost. Tablets containing chlorine and thiosulfate to neutralize excess chlorine and remove its taste are sometimes used, but they are costly and all the tablets required to treat a given volume of water must be added at the same time.

Iodine is also an excellent disinfectant for water - 2 drops of 2% tincture of iodine are sufficient for 1 litre of water. Cloudy or turbid water should be filtered and the filtrate treated with iodine. Commercial preparations such as "Globaline" and "Potable aqua" are available.

If chemical disinfection is not possible, it is advisable to boil water, at least when it is to be used for children; it is sufficient to bring the water to the boil.

NOTE: If only cloudy or turbid water is available, it should be filtered or allowed to settle; the separated clean water should then be treated.