Ministry of Health

Standard Operating Procedures for Cholera Outbreak

Detection, confirmation and management Salmonella Typhi outbreak

Contents

1. Introduction

Typhoid fever is a systemic infection, caused mainly by *Salmonella typhi* found only in humans. It is characterized by a persistent fever for 3-4 weeks, relative bradycardia, with involvement of lymphoid tissue.

2. Objectives

2.1. General Objective

The general objective of this “Standard Operative Procedure (SOP)” is to promptly detect, confirm, and appropriately respond to typhoid fever outbreaks caused by *Salmomella typhi*

2.2. Specific Objective

To systematically collect and analyze epidemiological data on suspected cases for early detection.,

- To conduct rapid laboratory confirmation of causative agent through systematic collection and investigation of stool and blood specimens;
- To appropriately respond to typhoid fever outbreak.

3. Epidemiology

3.1. Infectious agent

Typhoid fever is an acute systemic infection caused by the bacterium *Salmonella enterica* serovar Typhi. *Salmonella enterica* serovars Paratyphi A, B, and C cuse the clinically similar condition, paratyphoid fever. Typhoid and paratyphoid fevers are collectively referred to as enteric fevers. In most endemic areas, approximately 90% of enteric fever is typhoid.

Incubation period : Usually 10-14 days but it may be as short as 3 days or as long as 21 daysdepending upon the dose of the inoculum.

3.2. Reservoirs and mode of transmission

Typhoid is transmitted by the fecal-oral route via contaminated food and water and is therefore common where sanitary conditions are inadequate and access to clean water is limited. Typhoid is usually contracted by ingestion of food or water contaminated by fecal or urinary carriers excreting *S. enterica* serovar Typhi. In addition, these bacteria can survive for prolonged periods in water, ice, dust and dried sewage and these may become sources of infection. In endemic areas, peaks of transmission occur in dry weather or at the onset of rains. Risk factors for disease include eating food prepared outside the home, bananas,sugar cane ,from street vendors, drinking contaminated water and eating vegetables and salads that have been grown with human waste as fertilizer.

4. Risk factors for outbreak

4.1. Environment

Typhoid bacilli are commonly found in water, ice, food, milk, and soil. These organisms don't multiply in water. Many of them perish within 48 hours but some may survive for about 7 days. Typhoid bacilli grow in milk without altering its taste or appearance. Vegetables grown in sewage farms or washed in contaminated water are a health hazard. These factors are compounded by social factors such as pollution of drinking water supplies, open air defecation, and urination, low standards of food and personal hygiene, and health ignorance.

4.2. Host

Humans are the only known reservoir of infection cases or carriers. A case is infectious as long as the bacilli appear in stool or urine. Carriers may be temporary or chronic. Temporary (convalescent or incubatory) carriers usually excrete bacilli up to 6-8 weeks. By the end of one year, 3-4 per cent of cases continue to excrete typhoid bacilli. Persons who excrete the bacilli for more than a year after a clinical attack are called chronic carriers. A chronic carrier state can be expected to develop in about 3 percent of cases. Faecal carriers are more frequent than urinary

carriers. A chronic carrier may excrete bacilli for several years either continuously or intermittently.

5. Detection and confirmation of an outbreak

5.1. Early warning

A basic surveillance system based on simple reporting of case counts and deaths of an illiness characterized by gradual onset of steadily increasing and then persistently high fever, chills, malaise, headache, sore throat, cough, and, sometimes, abdominal pain and constipation or diarrhea. using a standardized case definition and collected on a weekly basis will represent the minimum amount of data needed for monitoring transmission and for issuing any early warning of an impending typhoid fever outbreak. *(The case reporting form: Ref to IDSR Technical guide)*

5.2. Case definition (Ref.IDSR Technical guide)

Two types of case definitions should be used for reporting and surveillance of cases in order to set up an early warning of a typhoid fever outbreak:

5.3. Suspected case:

Any person with gradual onset of steadily increasing and then persistently high fever, chills, malaise, headache, sore throat, cough, and, sometimes, abdominal pain and constipation or diarrhea.

5.4. Confirmed case:

Suspected case confirmed by isolation of Salmonella typhi from blood, bone marrow, bowel fluid or stool.

6. Detection of a suspected outbreak

An outbreak of typhoid fever should be suspected whenever:

There is a sudden increase, unusual over the same place or period of time, in the weekly number of patients with clinical manifestations as described in the case definition or

There is an unusual number of suspected typhoid fever cases and the patients have the following points in common:

- − They have similar clinical symptoms (high fever, chills, malaise, headache etc…)
- − They are living in the same area or location;
- − They are sharing the same water source;
- − There is an outbreak of typhoid fever in a neighboring community.

A sample line listing for:Ref.IDSR Technical guide)

Alert thresholds for an evolving outbreak

An outbreak alert should be raised whenever:

• The disease surveillance system reports higher number of cases or deaths of"

gradual onset of steadily increasing and then persistently high fever, chills, malaise, headache, sore throat, cough, and, sometimes, abdominal pain and constipation or diarrhea.

" than expected given the place and time; or

• There are clustering of at-least 2 to 5 or more linked suspected typhoid fever cases in the same settlement, or in the same village in a week; or

• There are doubling of cases of gradual onset of steadily increasing and then persistently high fever, chills, malaise, headache, sore throat, cough, and, sometimes, abdominal pain and constipation or diarrhea.

" in two consecutive weeks; or whenever

• A single strain of *Salmonella typhi* has been isolated even in non endemic regions.

6.1. Alert of an outbreak

Whenever an outbreak alert has been raised a rapid field investigation should be carried out in order to:

• Confirm or verify the existence of outbreak;

• Identify additional cases and ensure appropriate treatment

• Collect laboratory samples (stools, blood) for confirmation of the causative agent.

• Respond to outbreak

6.2. Confirmation of outbreak

At least 2 confirmed cases per week at health facility Outbreak investigation

Data collection

A rapid field investigation (preferably by a trained Rapid Response Team) should be carried out in the particular place/camp/settlement as well as in its immediate surroundings wherein an outbreak alert has been raised. The outbreak investigation team would focus on collecting the following information:

- **Active case finding and risk assessment**: A rapid case investigation would be carried out on all suspected cases using a standardized form seeking details on cases and deaths either from the hospital/health clinic registers or from the community. (*A case investigation form:Ref IDSR Technical guide)*
- **Collection of laboratory samples**: Stool and blood specimens would be systematically collected from at-least 10-20 suspected “untreated” cases specially from those cases which conform to the following criteria:
  - − onset of illness less than four days before sampling;
  - − currently having clinical signs of typhoid fever as defined by the case definition;
  - − have not received antibiotic treatment for this illness;
- **Needs assessment**: The local (from where the suspected cases have been detected) human and material resources (Availability of drugs, trained and skilled providers, etc) would be assessed for control and management;
- **Protocolized treatment:** Local compliance to standardized case management would be required to be assessed.

Data analysis

After completion of the field investigation, data should be analysed locally and rapidly to determine the extent of the outbreak and the population at risk. The analysis would include:

Distribution of cases in terms of time: Construction of an epidemic curve to show the distribution of cases over time since the first case was reported; number of cases and attack rates by weeks, by age group and by geographic area (administrative unit, sector/locality).

Distribution of cases in terms of place: where the first cases/cluster occurred; number of cases and attack rates by geographical areas; is the outbreak spreading to other areas; mapping the cases;

Distribution of cases in terms of person: what is the age distribution of cases (percentage of cases by age group), what are the most affected age groups (attack rates by age group), what age group presents the highest case fatality ratio.

Discounting for seasonal rise in incidence: Comparison of current week's/months attack rate with previous week's/months attack rates (or comparison by geographical area) by providing information on past seasonal and secular trends best presented as line graphs;

Fatalities: Number of deaths and case fatality rate;

Laboratory diagnosis: Number of stool specimens collected and percentage of laboratory confirmed cases (including circulating pathogens and antimicrobial sensitivity pattern);

Outcome: Aggregated data by class classification (suspected/confirmed, improved, dead, etc)

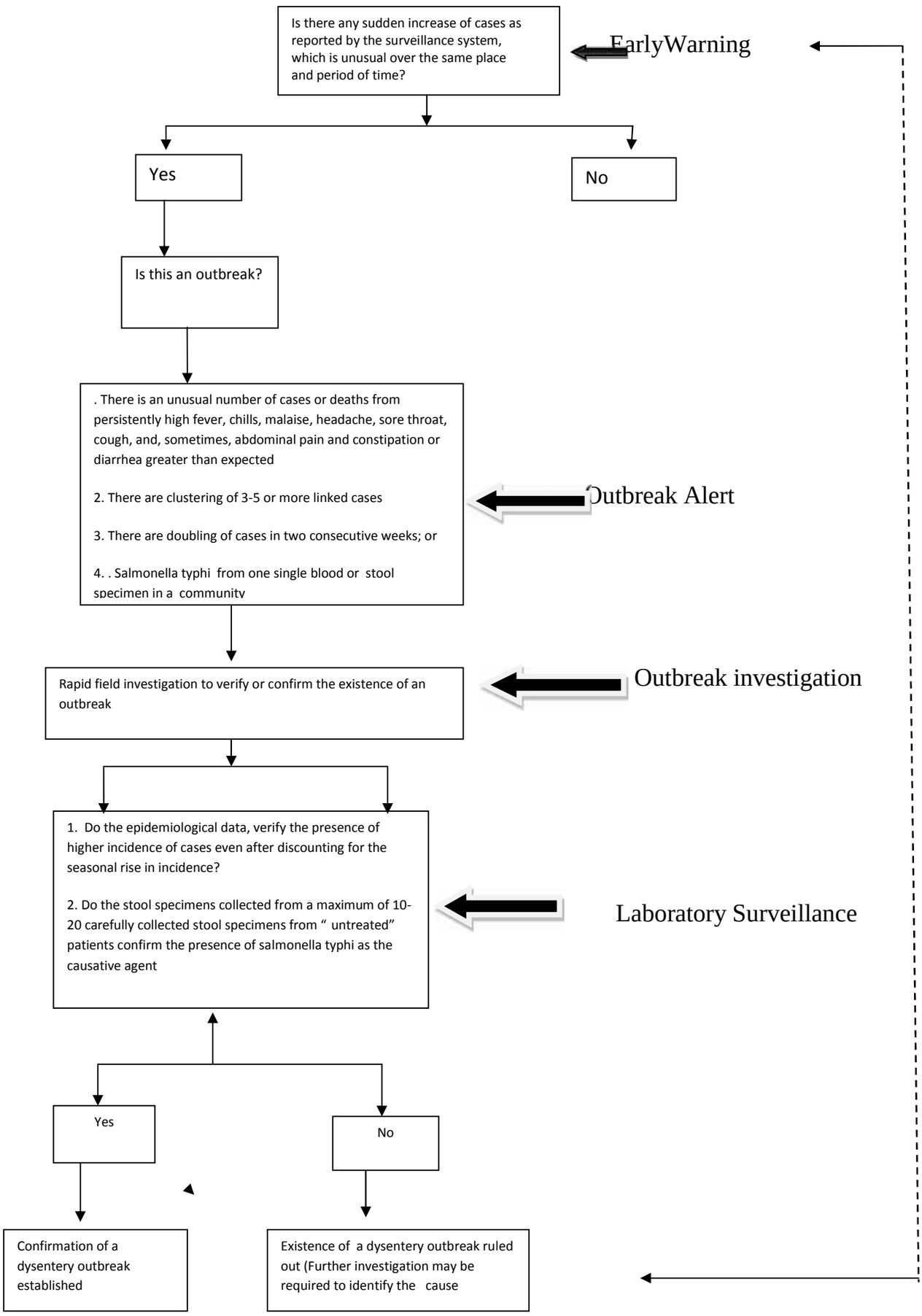
Source identification

If need be, further investigation/epidemiological studies should be carried out to clarify mode of transmission, better definition of risk factors for disease and at-risk groups.

Laboratory confirmation

An outbreak of typhoid fever would be laboratory confirmed when the causative pathogens (*Salmonella typhi*) are isolated from a maximum of 10 to 20 carefully collected blood and/or stool specimens. The blood is a choice of specimen to be collected during the first week of illness. The stool will be collected during second and third week of disease.

Steps in detection and confirmation of a Typhoid fever outbreak



7. Public health response and control strategies for management of typhoid fever outbreak

7.1. Management of patient with typhoid fever

Supportive measures are important in the management of typhoid fever, such as oral or intravenous hydration, the use of antipyretics, and appropriate nutrition and blood transfusions if indicated. More than 90% of patients can be managed at home with oral antibiotics, reliable care and close medical follow-up for complications or failure to respond to therapy. However, patients with persistent vomiting, severe diarrhea and abdominal distension may require hospitalization and parenteral antibiotic therapy.

7.2. Antimicrobial therapy

The fluoroquinolones are widely regarded as optimal for the treatment of typhoid fever. They are relatively inexpensive, well tolerated and more rapidly and reliably effective than the former first-line drugs, chloramphenicol, ampicillin, amoxicillin and trimethoprim-sulfamethoxazole (Table 1). In severe typhoid the fluoroquinolones are given for a minimum of 10 days (Table 2).

Table 1: Treatment of uncomplicated typhoid fever

	Optimal therapy			Alternative effective drugs		
Susceptibility	Antibiotic	Daily dose mg/kg	Days	Antibiotic	Daily dose mg/kg	Days
Fully sensitive	Fluoroquinolone e.g Ciprofloxacin or ofloxacin	15	5-7	Chloramphenicol Amoxicillin TMP-SMX	50-75 75-100 8-40	14-21 14 14
Multidrug resistance	Fluoroquinolone or cefixime	15 15-20	5-7 7-14	Cefixime	8-10 15-20	7 7-14
Quinolone resistance	ceftriaxone	8-10 75	7 10-14	Cefixime	20	7-14

Table 2 : Treatment of severe typhoid fever

	Optimal therapy			Alternative effective drugs		
Susceptibility	Antibiotic	Daily dose mg/kg	Days	Antibiotic	Daily dose mg/kg	Days
Fully sensitive	Fluoroquinolone e.g ofloxacin	15	10-14	Chloramphenicol Amoxicillin TMP-SMX	100 100 8-40	14-21 14 14
Multidrug resistance	Fluoroquinolone	15	10-14	Ceftriaxone or cefotaxime	60 80	10-14
Quinolone resistance	Ceftriaxone or cefotaxime	60 80	10-14	Fluoroquinolone	20	7-14

7.3. Prevention of Typhoid fever

The major routes of transmission of typhoid fever are through drinking water or eating food contaminated with *Salmonella typhi*. Prevention is based on ensuring access to safe water and by promoting safe food handling practices. Health education is paramount to raise public awareness and induce behaviour change.

7.4. Safe water

Typhoid fever is mainly a waterborne disease and the main preventive measure is to ensure access to safe water. The water needs to be of good quality and must be sufficient to supply all the community with enough drinking water as well as for all other domestic purposes such as cooking and washing.

During outbreaks the following control measures are of particular interest:

_ **In urban areas**, control and treatment of the water supply systems must be strengthened from catchment to consumer. Safe drinking water should be made available to the population trough a piped system or from tanker trucks.

_ **In rural areas**, wells must be checked for pathogens and treated if necessary.

_ **At home**, a particular attention must be paid to the disinfection and the storage of the water however safe its source. Drinking-water can be made safe by boiling it for one minute or by adding a chlorine-releasing chemical or water treatment tablets. Narrow-mouthed pots with covers for storing water are helpful in reducing secondary transmission of typhoid fever.

N.B: Chlorine is ineffective when water is stored in metallic containers.

8.5. Food safety

Contaminated food is another important vehicle for typhoid fever transmission. Appropriate food handling and processing is paramount and the following basic hygiene measures must be implemented or reinforced during epidemics:

_ washing hands with soap before preparing or eating food;

_ avoiding raw food, shellfish, ice;

_ eating only cooked and still hot food or re-heating it.

During outbreaks, food safety inspections must be reinforced in restaurants and for street food vendors activities.

Typhoid can be transmitted by chronic carriers who do not apply satisfactory food-related hygiene practices. These carriers should be excluded from any activities involving food preparation and serving. They should not resume their duties until they have had three negative stool cultures at least one month apart.
Recommend medical examination for all food handlers

8.6. Sanitation

Proper sanitation contributes to reducing the risk of transmission of all diarrhoeal pathogens including *Salmonella typhi*.
_ Appropriate facilities for human waste disposal must be available for all the community. In an emergency, pit latrines can be quickly built.
_ Collection and treatment of sewage, especially during the rainy season, must be implemented
_ In areas where typhoid fever is known to be present, the use of human excreta as fertilisers must be discouraged.

8.7. Health Education

Health education is paramount to raise public awareness on all the above mentioned prevention measures. Health education messages for the vulnerable communities need to be adapted to local conditions and translated into local languages. In order to reach communities, all possible means of communication (e.g. media, schools, women's groups, religious groups) must be applied.
Community involvement is the cornerstone of behaviour change with regard to hygiene and for setting up and maintenance of the needed infrastructures. In health facilities, all staff must be repeatedly educated about the need for:
_ excellent personal hygiene at work;
_ isolation measures for the patient;
_ disinfection measure.