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TYPHOID FEVER: CLINICAL FEATURES, DIAGNOSIS, TREATMENT AND PREVENTION

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Abstract

Typhoid fever is a systemic bacterial infection caused by Salmonella enterica serovar Typhi. It remains an important public-health concern where drinking water, sanitation and food safety systems are unreliable. Transmission usually occurs when people ingest food or water contaminated with faeces from an infected person or a chronic carrier. The illness can begin gradually with persistent fever, headache, weakness, abdominal discomfort and altered bowel habits; severe disease may lead to intestinal bleeding, perforation or other complications. Because symptoms overlap with many febrile illnesses, clinical suspicion should be supported by appropriate microbiological testing, preferably blood culture. Antibiotic selection must reflect local resistance patterns and susceptibility results, as drug-resistant Salmonella Typhi increasingly complicates care. Prevention requires safe water, effective sanitation, hand hygiene, food-safety practices and vaccination where recommended. This narrative review summarises the organism, transmission, clinical presentation, diagnosis, management and prevention of typhoid fever, drawing on guidance from the World Health Organization (WHO) and the US Centers for Disease Control and Prevention (CDC).

Keywords: Typhoid fever; Salmonella Typhi; enteric fever; blood culture; antimicrobial resistance; vaccination; sanitation; food safety.

1. Introduction

Typhoid fever, also called enteric fever, is a potentially serious infection that affects the whole body rather than only the intestine. It is caused by Salmonella enterica serovar Typhi, a bacterium adapted to humans. Paratyphoid fever is a related illness caused by Salmonella Paratyphi and may look clinically similar, although the organisms are different. Typhoid continues to occur in parts of the world where access to safe drinking water and adequate sanitation is limited. WHO cited estimates for 2019 of approximately nine million illnesses and 110,000 deaths globally, illustrating the

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continuing scale of the problem [1]. These are modelled estimates for that year, not a count of cases occurring in the current year.

The disease is preventable and treatable, but outcomes depend on early recognition, access to effective antibiotics and measures that interrupt faecal–oral transmission. A key challenge is that early symptoms are not specific: malaria, dengue, other bloodstream infections and gastrointestinal illnesses can present with fever and malaise. For this reason, typhoid should be considered in the appropriate epidemiological context, but not diagnosed from symptoms or a single serological test alone [2,3].

2. Causative organism and transmission

Salmonella Typhi enters the body through the mouth, most often through contaminated water or food. After ingestion, bacteria cross the intestinal lining and can spread through the bloodstream to other organs. An infected person may shed bacteria in stool; some people continue to carry and release the organism after symptoms resolve. These carriers can unknowingly contaminate food or water if hand hygiene and sanitation are inadequate [1,2]. Transmission is therefore closely linked to water treatment, sewage disposal, food handling and access to handwashing facilities.

Risk is higher for people living in or travelling to areas where typhoid is endemic, particularly where water supplies are unsafe or food is handled without adequate hygiene. Crowded living conditions and disrupted water and sanitation services can also increase opportunities for spread. A history of recent travel, unsafe food or water exposure, or contact with a known case can help guide clinical assessment.

3. Clinical features and natural history

The incubation period is commonly about 6–30 days, although it can vary with the dose of bacteria and individual factors [2]. Illness often develops progressively. Early symptoms may include headache, fatigue, loss of appetite, abdominal discomfort and fever that rises over several days. Constipation or diarrhoea may occur, and some patients develop a dry cough or faint, rose-coloured spots on the trunk. None of these findings is present in every patient, and no single symptom reliably confirms typhoid [2,3].

Untreated infection can persist and become severe. Important complications include gastrointestinal bleeding, intestinal perforation, confusion or encephalopathy, and circulatory complications. These are medical emergencies. Prompt evaluation is especially important when a persistent fever is accompanied by severe abdominal pain, blood in stool, confusion, fainting or marked weakness. A person with suspected

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typhoid should seek medical care rather than relying on home treatment or leftover antibiotics.

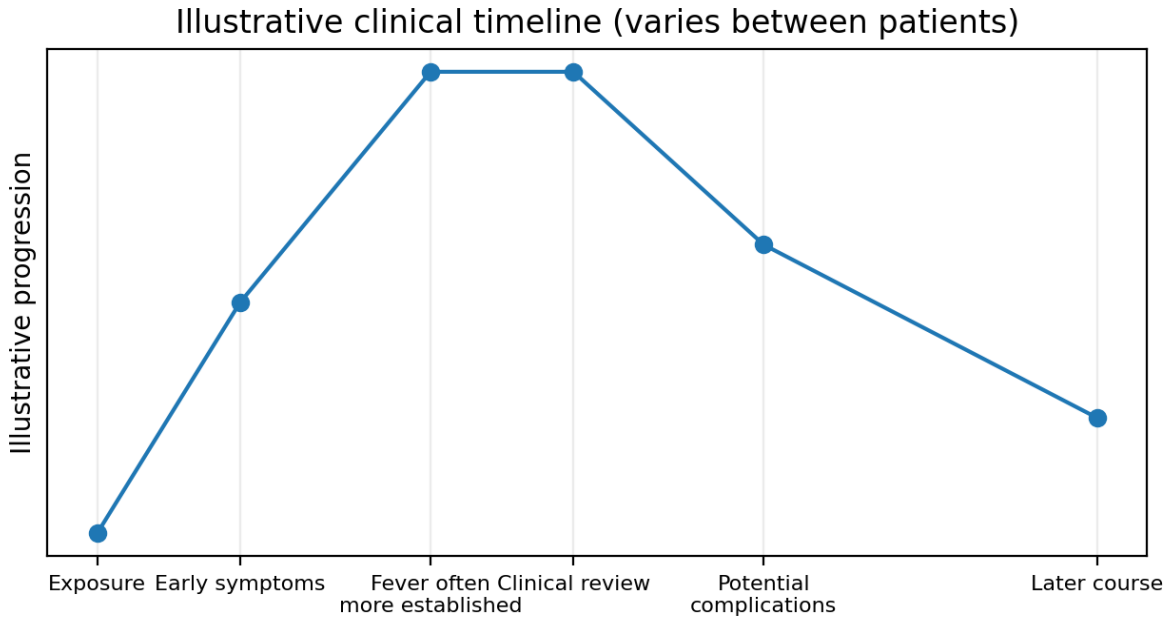


Figure 1. Illustrative timeline only; symptoms and progression differ between individuals. The figure is not a diagnostic tool.

4. Diagnosis

Laboratory confirmation is important because the clinical picture overlaps with other infections and treatment depends on identifying the likely organism and its antibiotic susceptibility. Blood culture is the preferred diagnostic method. A single culture may be negative, so clinicians may request additional cultures when suspicion remains high. Bone-marrow culture is more invasive but can be more sensitive in selected cases; stool culture is less useful early in the illness [2,3]. Where feasible, cultures should be collected before antibiotics are started, without delaying urgent treatment in a seriously ill patient.

The Widal test and other antibody-based rapid tests have limitations. They may produce false-positive results and may not reliably distinguish current infection from previous exposure or other causes of antibodies. Consequently, a Widal result should not be treated as definitive proof of typhoid. Test choice should follow local clinical guidance and laboratory capacity [2,3].

Test	Role	Main limitation

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Blood culture	Preferred test to confirm infection and obtain an isolate for susceptibility testing.	Sensitivity is imperfect; more than one sample may be needed.
Bone-marrow culture	Can be more sensitive in selected cases, including after antibiotics.	Invasive and not routinely used.
Stool culture	May help identify shedding or infection later in the course.	Often less sensitive early in illness.
Widal/serology	Sometimes used where culture access is limited.	False positives and poor ability to distinguish current from past infection.

Table 1. Common diagnostic approaches and their practical limitations. Summary based on CDC clinical guidance [2,3].

5. Treatment and antimicrobial resistance

Typhoid fever requires clinician-directed antibiotic treatment. The choice of medicine should be informed by the patient's severity, travel and exposure history, local resistance data and, whenever available, laboratory susceptibility results. Resistance to several commonly used antibiotics has increased, and extensively drug-resistant strains have been reported. A medicine that was effective in one region or year may not be appropriate elsewhere [2,4]. For this reason, this article does not recommend a single antibiotic regimen for all patients.

Patients should take antibiotics exactly as prescribed and complete the course unless their treating clinician changes the plan. Self-medicating, sharing antibiotics or stopping treatment as soon as fever improves can contribute to treatment failure and resistance. Hydration, appropriate nutrition and monitoring for complications are important supportive measures. People who are severely unwell, unable to drink, confused or showing signs of intestinal complications may need hospital care. If symptoms persist or return, medical reassessment is necessary.

Clinical improvement does not always mean that transmission risk has ended. Some patients may continue to shed the organism, and a small proportion become chronic carriers. Food handlers, healthcare workers and people caring for young children may need specific clearance or follow-up testing under local public-health rules before returning to certain duties [1,4].

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6. Prevention and public-health control

Typhoid prevention works best when household actions are supported by reliable public infrastructure. Safe water, sewage treatment, food-safety regulation and accessible handwashing facilities reduce exposure at community level. At household level, people should wash hands with soap after using the toilet and before preparing or eating food; use treated, boiled or sealed safe drinking water when water quality is uncertain; eat food that is thoroughly cooked and served hot; and wash or peel produce with safe water. Food prepared in unsafe conditions and ice made from unverified water can be sources of exposure [1,5].

Vaccination is an important additional layer of protection, especially in endemic settings and for travellers at risk. WHO recommends typhoid conjugate vaccines for use in relevant public-health programmes, with decisions based on national policy and epidemiology [6]. Vaccines reduce risk but do not provide complete protection, and they do not replace safe water, sanitation or food hygiene. Vaccine product, age eligibility and schedule differ by country; individuals should follow local immunisation guidance and seek advice before travel.

Prevention measure	Practical action
Safe water	Use a reliably treated supply; if safety is uncertain, boil or otherwise treat water according to public-health advice.
Hand hygiene	Wash with soap after toilet use and before handling food or eating.
Food safety	Cook food thoroughly; eat it hot; avoid unsafe raw produce, unpasteurised products and ice from uncertain sources.
Vaccination	Ask a healthcare professional or travel clinic whether typhoid vaccination is indicated and which schedule applies.
Carrier and case management	Follow medical advice, finish prescribed treatment and observe local rules for food-handling or childcare duties.

Table 2. Practical actions to reduce transmission, adapted from WHO and CDC prevention guidance [1,5,6].

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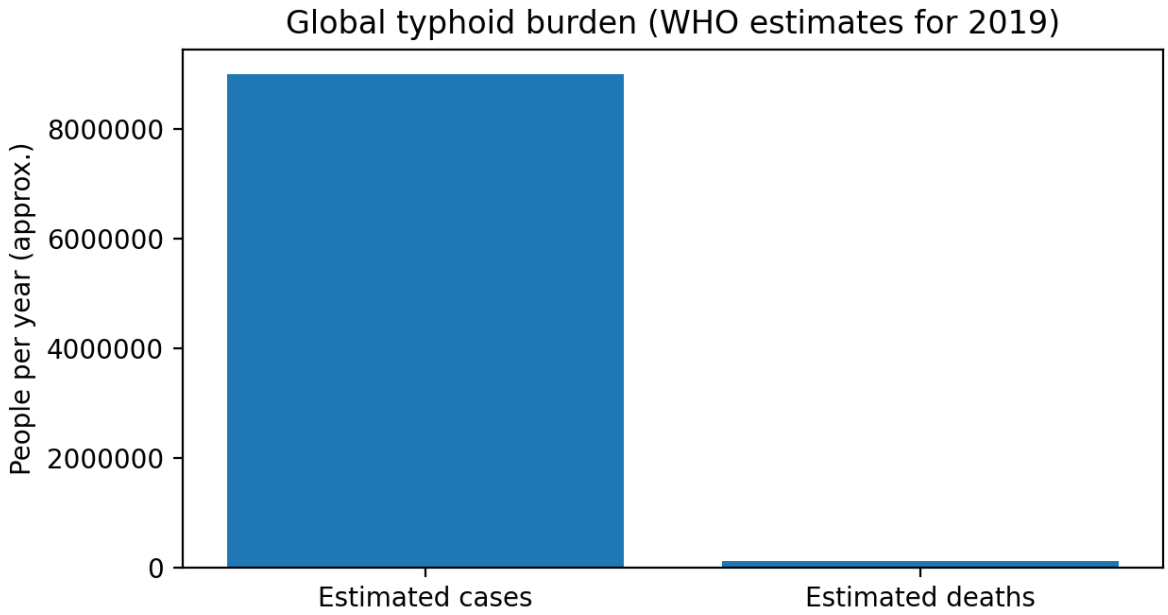


Figure 2. Approximate global burden cited by WHO for 2019. The values are estimates and the large difference in scale means deaths are visually compressed.

7. Discussion

Typhoid fever illustrates how clinical medicine and environmental health are connected. Effective treatment can save an individual patient, but it cannot by itself prevent new infections when contaminated water and unsafe food practices remain common. Likewise, vaccination can reduce disease burden but works best as part of a wider strategy that includes surveillance, laboratory capacity, sanitation and public education. Antimicrobial resistance makes this combined approach increasingly important: preventing infection reduces the need for antibiotics and therefore reduces opportunities for resistant organisms to spread.

Health education should be practical and locally relevant. Messages about handwashing, safe water storage, thorough cooking and early assessment of persistent fever are more useful when people have the resources to act on them. Public-health authorities also need timely reporting, reliable culture and susceptibility testing, and communication between clinicians, laboratories and environmental-health services. Future progress depends not on one intervention alone but on sustained improvements across the prevention and care pathway.

Conclusion

Typhoid fever is a preventable, potentially life-threatening systemic infection transmitted mainly through food and water contaminated by Salmonella Typhi. Persistent fever with constitutional or abdominal symptoms should prompt timely

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clinical assessment, particularly in settings where the disease is common. Blood culture remains the preferred method for confirmation, while serological tests have important limitations. Effective treatment requires appropriate antibiotics guided by resistance patterns and clinical judgement. Long-term control depends on safe water, sanitation, hand and food hygiene, vaccination where recommended, and responsible antibiotic use. Combining these measures offers the strongest route to reducing illness, complications and onward transmission.

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