

# Waterborne Diseases: Typhoid Fever

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## Key points:

- Introduction to Typhoid Fever
- Causes
- Diagnosis
- Treatment

## Introduction

Typhoid fever is a bacterial infection caused by *Salmonella Typhi* (S. Typhi), which is typically spread through contaminated water or food. It is considered a waterborne disease because the bacteria often enter the body through ingestion of water or food that has been contaminated by an infected person's feces or urine. Typhoid fever is a bacterial infection that largely spreads through contamination in food and water.

## Causes

Typhoid fever is a serious infection that is mainly caused by bacteria which is named as *Salmonella Typhi*. The causes can be:

**Contaminated water:** It can be caused by drinking contaminated water. As contaminated water contains different types of bacterias and other infectious agents.

**Fecal-oral route:** The bacteria are present in the feces of infected people, and can spread if someone doesn't wash their hands properly after using the bathroom, and then handles food or touches objects that others will handle.

## Diagnosis

Typhoid fever, a well-known enteric disease caused by bacteria from the *Salmonella* species, poses a significant threat to public health. The accuracy of diagnostic tests for typhoid fever can vary, with widely used methods such as the TUBEX-TF, Typhidot, and Widal tests producing inconsistent outcomes. These tests often show differences in sensitivity and specificity based on the region and population being tested. This review assessed the diagnostic reliability of various rapid diagnostic tests (RDTs) for typhoid fever in regions such as Zimbabwe, Bangladesh, India, Indonesia, Cameroon, and others. Studies assessed tests like TUBEX-TF, Typhidot, Widal, and newer systems such as the DPP Typhoid System. Results showed significant variability in sensitivity and specificity across regions, with TUBEX-TF showing sensitivities from 24% to 97.6% and specificity up to 99%, while the Widal test demonstrated high sensitivity but low specificity in some areas. Bayesian Latent Class Models were applied in several studies to refine accuracy assessments. The findings suggest that no single test is consistently reliable across all settings, and a combination of diagnostic approaches or the use of newer systems may

improve accuracy. Further research is needed to validate the performance of emerging tests in diverse populations.<sup>1</sup>

## Treatment

Antibiotics are the primary treatment for typhoid fever; however, *S. typhi* and *S. paratyphi* are now exhibiting resistance to these antimicrobials. Multidrug resistance (MDR) is an emerging health challenge for a growing nation worldwide. Between 1970 and 1980, multiresistant *S. typhi* (MDR *S. typhi*) emerged, and these bacterial strains were sensitive to quinolones but resistant to first-line treatments such as ampicillin, chloramphenicol, and co-trimoxazole. The incidence of MDR *S. typhi* increased from 34.2% to 48.5% between 2001 and 2006, and the percentage of patients resistant to ciprofloxacin increased from 1.6% to 64.1%.<sup>9</sup> Consequently, ceftriaxone, a third-generation cephalosporin, was prescribed. However, the first case of extensive drug-resistant *S. typhi* (XDR *S. typhi*) was documented in 2016 in Sindh Province, Pakistan. Azithromycin and carbapenems are the only available treatments for XDR typhoid. Azithromycin has replaced the third-generation cephalosporins because of its cost-effectiveness. The resistance of azithromycin has reportedly increased in Bangladesh; 32 of 2519 isolates of *S. typhi* identified between October 2016 and July 2018 were found to be resistant to the antibiotic. Drug-resistant *S. typhi* infections result in higher rates of morbidity and mortality, as well as an economic burden from longer hospital stays and higher costs of therapies. Typhoid vaccinations have been added to the World Health Organization (WHO) list of essential drugs for priority diseases due to increased drug-resistant strains in endemic areas. The increasing incidence of antibiotic-resistant typhoid in Pakistan has been attributed to various factors, including the limited availability of sanitary facilities and clean water, as well as poor public knowledge of the disease.<sup>2</sup>

## Practice of hygiene methods for prevention and control of *Salmonella typhi*

When asked about what fecal disposal facilities they frequently use, most respondents (98.2%) reported using pit latrines for feces disposal. Respectively 61.5% and 59.0% of respondents reported that they always washed their hands before eating and after using the latrine prior to the time that preventive and control measures were instated; during the same period, close to 25% reported that they sometimes or never washed their hands. At the time of data collection, the proportion of people who reported to always wash their hands before eating and after using the latrine had increased significantly to 71.3% and 71.7%, respectively. About 87.0% of respondents reported using soap when they wash their hands and 13% used water only.<sup>3</sup>

## Reference

1. Aziz MT, Rehan D, Omaimah Q, Ateeque R, Rasool R, Hassan R. Diagnosis of Typhoid Fever: A Review Article.
2. Ullah A, Shabil M, Abdulsamad SA, Jan A, Naeem AA, Ullah H, Khattak M, Ullah Z. Prevalence of the Antibiotic Resistance of *Salmonella typhi* and *Salmonella paratyphi* in Pakistan: A Systematic Review and Meta-Analysis. In Open Forum Infectious Diseases 2025 Mar 11 (p. ofaf131). Oxford University Press.
3. Gizaw JZ, Alemayehu A, Abraham J, Mohammed A. Knowledge Attitude and Practice of Food Handlers on Prevention and Transmission of Typhoid Fever in Adama Science and Technology University Students Café. American J Medi Re Heal Sci: AJMRHS-103. 2024.

