

ABOUT TYPHOID

Typhoid fever is a life-threatening infection and highly contagious caused by *Salmonella* Typhi. It spreads through contaminated food or water. Food and Water contaminated by human feces are the major sources from where the bacteria is transferred to humans. Once *Salmonella* Typhi bacteria enters the body, they multiply and travels into the bloodstream.

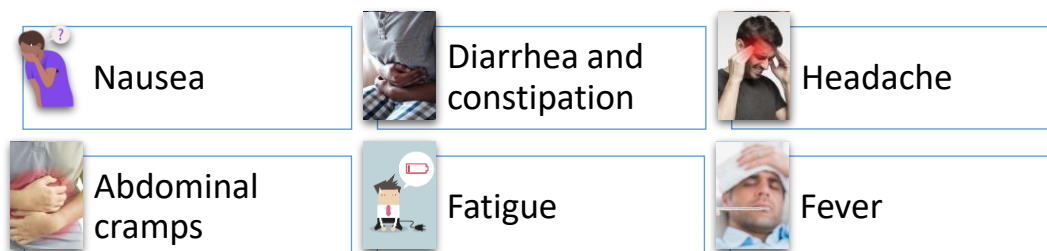
Fast facts on typhoid

- Typhoid is a bacterial infection in nations with low incomes, due to contaminated food or water.
- If untreated, it is fatal in around 25 % cases.
- Symptoms include nausea, fatigue, headache, abdominal cramps, fever and gastrointestinal problems.
- Some people carry the bacteria but develops no symptoms.
- Approximately 11–20 million people get sick from typhoid and between 128 000 and 161 000 people die from it every year.
- It can be treated with antibiotics although increasing resistance to different types of antibiotics is making treatment more complicated.



Clinical features

Acute symptoms of Typhoid fever are fever, nausea, headache, and abdominal cramps, although other nonspecific symptoms may occur. Neuropsychiatric symptoms like psychosis, abnormal behavior, hallucinations and confusion, are also reported in literature. Other signs include relative bradycardia, rose spots, hepatomegaly, and splenomegaly may be present in some cases.¹

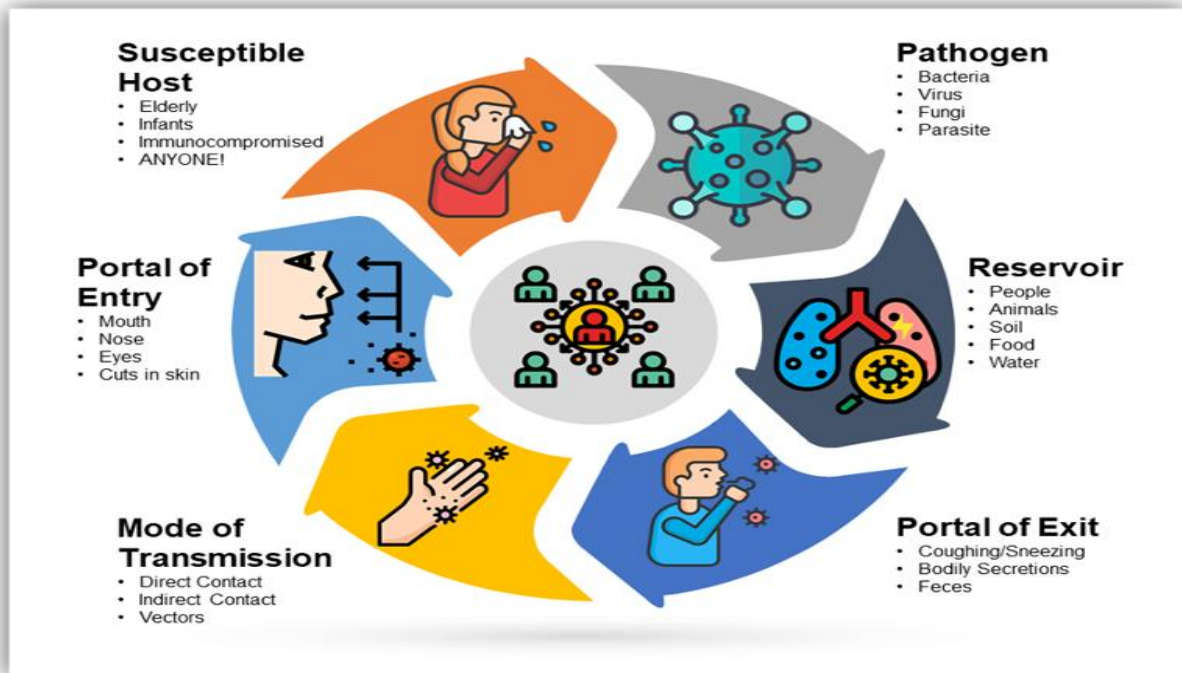


If typhoid fever remains untreated it leads to complications in 10-15%, usually in 3rd and 4th weeks of infection. Fatality rates in typhoid fever range from 1% to 4%; fatality rates in children younger than 4 years of age are 10 times higher than in older children. In untreated cases, the fatality rates may rise to 10% to 20%.^{2,3}

PATTERN OF INFECTION

Human as Reservoir

Humans are considered as the reservoir of *Salmonella* Typhi. This bacteria has very limited capability to multiply when it is outside of the human host, but it has tendency to survive for long duration in the environment. Acute *Salmonella* Typhi infection presents as typhoid fever. It is complex to differentiate typhoid fever clinically from other febrile illnesses. If it remains untreated, it leads to neuropsychiatric, intestinal, and other complications in patients.



Portal of Exit and Root of infection

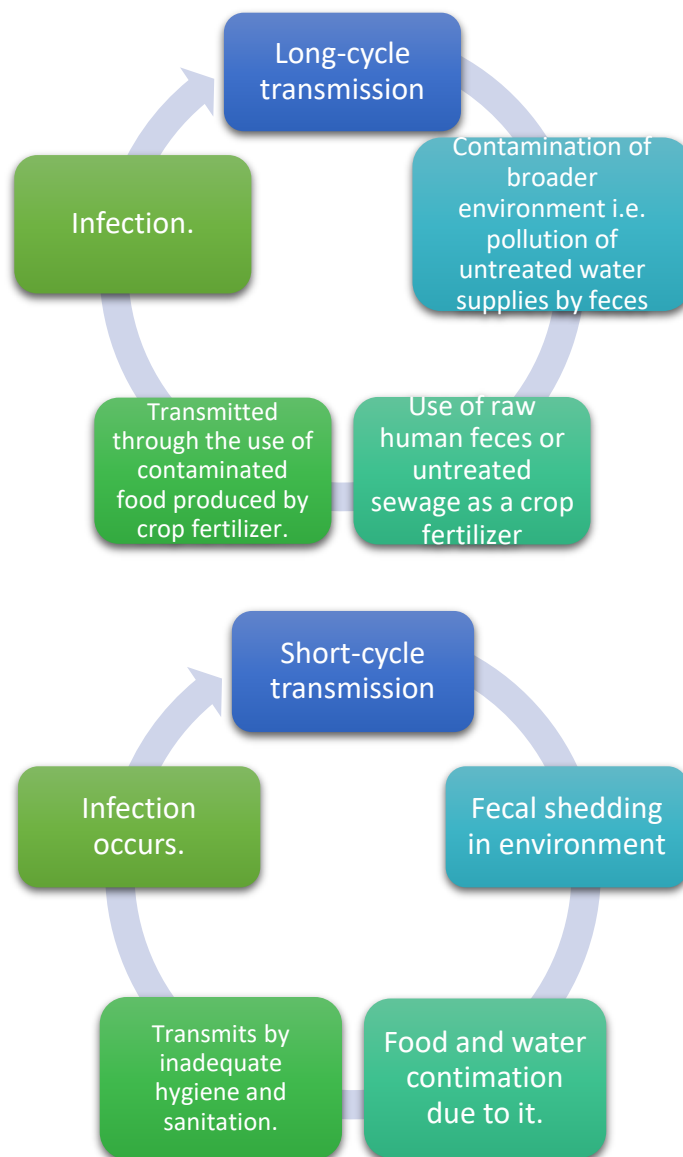
Feces is considered as the major portal of exit of *Salmonella* Typhi, although shedding in urine has also been documented.⁴ This Bacteria may be shed in stool or in urine throughout both clinical and subclinical acute infection. Practically speaking, a chronic carrier is someone with no history of typhoid fever or someone who had the disease >1 year previously, who has fecal or urine

cultures positive for this bacteria separated for at least 48 hours. Chronic carriers are major root for domestically acquired *Salmonella* Typhi infections.

Mode and Patterns of Transmission

The infection is frequently passed on through contaminated water and food, and it is more prevalent in areas where handwashing is very less. It can also be transmitted by carriers who carry the bacteria but are unaware of it.

Salmonella Typhi transmission is divided into 2 broad patterns. Short-cycle transmission and long-cycle transmission. The means by which contamination spread and type of vehicles involved differ considerably from area to area.



Portal of Entry and Host

The portal of entry for *Salmonella* Typhi infection is through the mouth, usually by engulfing of fecally contaminated food or water. Ingestion of human feces during oral–anal sex has been indicated in literature. Infection occurs in a susceptible human host. Incubation period shortens and the chances for infection compresses with the ingested dose. After engulfing, the bacteria spread from intestine via the blood, where they multiply to the intestinal lymph nodes, liver, and spleen.

Diagnosis and treatment

For diagnosing and assessing typhoid fever medical and travel history of a person should be asked. Body Fluid and Tissue culture should be done. Analyzing samples of blood, urine and faeces should be done, but the reliability and sensitivity of some of the tests are very low, which leads to misdiagnosing.

- Isolation of bacteria from blood, stool, or bone marrow by culture.
- Widal test, which determines antibodies in blood against *S. Typhi* antigens, this test has poor sensitivity and poor specificity.
- Dot enzyme-linked immunosorbent assay test detects IgG and IgM antibodies against an outer membrane protein of *Salmonella* Typhi. A systematic review was done which concluded low sensitivity and specificity of this test as well.
- Early and effective treatment with antibiotics shortens disease duration and decreases the risk of complications.
- Third generation cephalosporin are commonly used in patients admitted to hospital.
- Azithromycin is being used increasingly as a first-line oral treatment regime.

Typhoid as an Indicator of Water Quality

Primary indicator of water quality is typhoid fever. Before the advent of formal water testing, public health experts took typhoid fever as an indicator of water quality.⁵

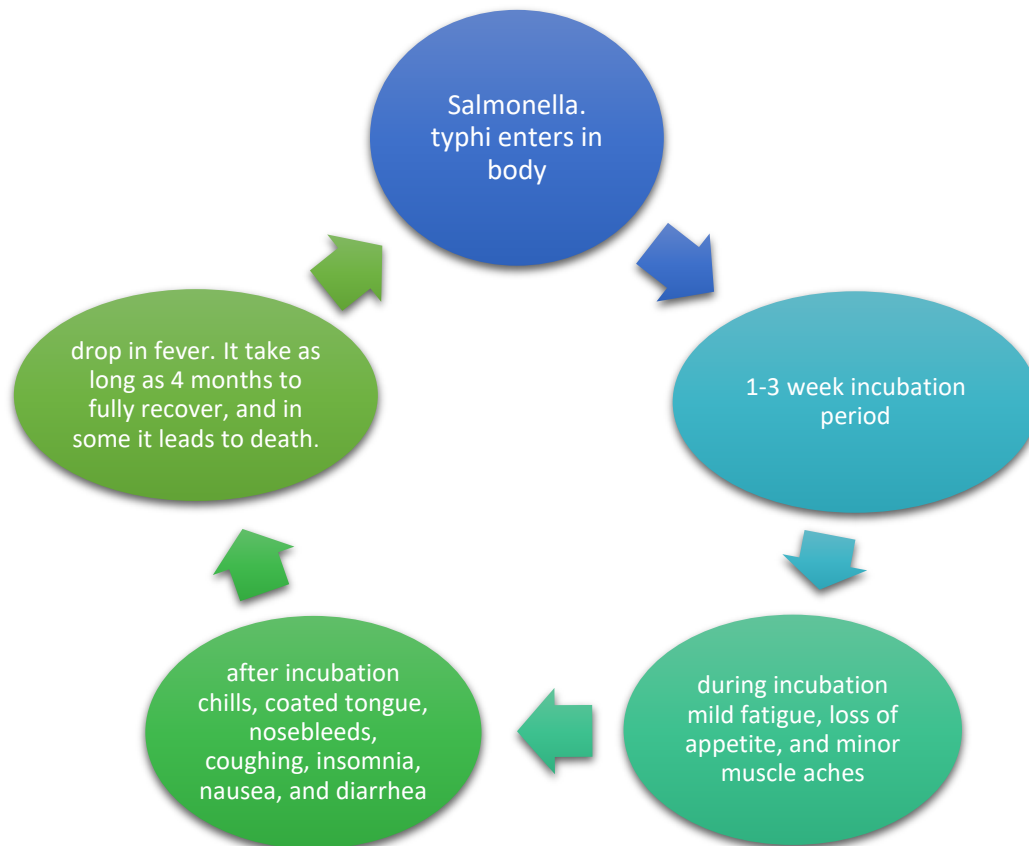
Living and Dying with Typhoid

I suffered from typhoid few years back, I was misdiagnosed and doctor gave me treatment for dengue instead of typhoid. But when my health was getting worse, my parents inquired and took me to another doctor, he then assessed my symptoms and performed another test other than the widal test which was done first time when I visited the doctor who misdiagnosed me because of the inaccuracy of the test results.

I faced mild fatigue, loss of appetite, and minor muscle aches which I think was bacteria's incubation period and after incubation, I experienced more severe symptoms: chills, coated tongue,

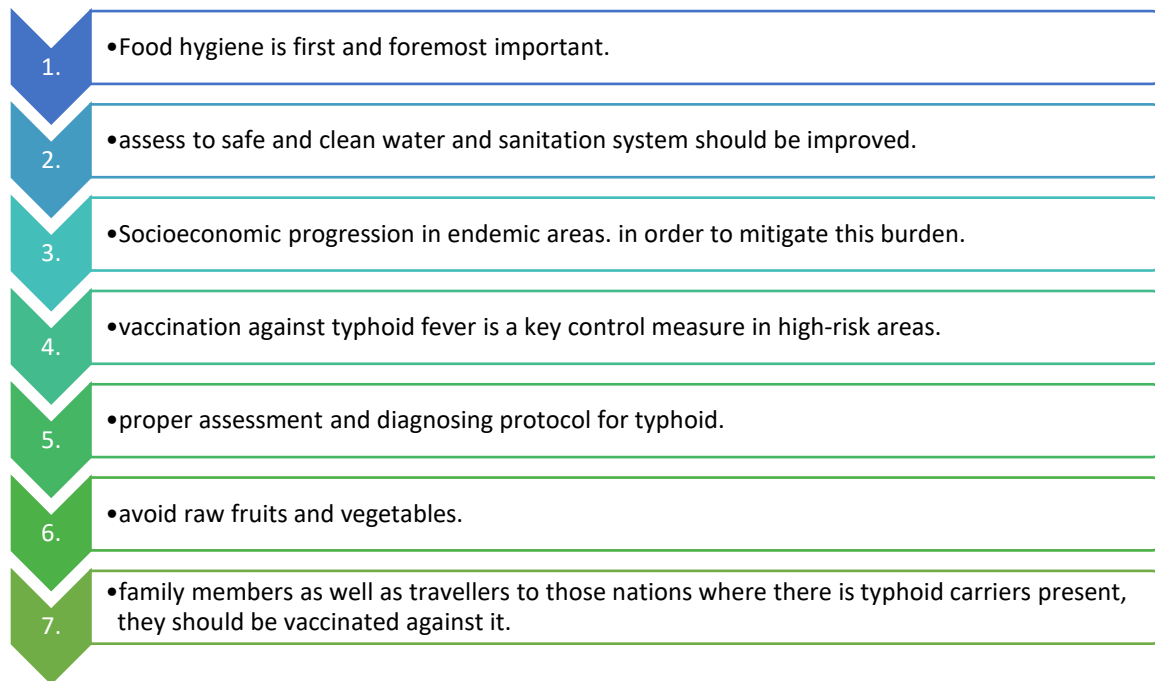
nosebleeds, coughing, insomnia, nausea, and diarrhea. During acute stage, typhoid's symptoms often resembles with symptoms of respiratory diseases. 3 weeks after incubation, the disease was at its worst. I was feverish, and often had blood-tinged stools. And I felt like I am between life and death. And then with medications it took 2 months for me to recover from the symptoms.

In nearly all cases, typhoid victims experience severe fever. Body temperatures rise as high as 105° Fahrenheit. Amazingly, the severity of typhoid's symptoms, 90-95% of its sufferers survives.



Potential control measures

Given the route of transmission and the fact that humans are the only source of infection, improved sanitation. Food hygiene are important control measures.



Artificial Intelligence- Future of Medicine

With the arrival of advancing technologies, many conventional techniques are being swapped with new techniques such as stem cell therapy, limb saving techniques, joint preservation and, medical robotics. In nations where first-world medicine is available, with time there will appear new challenges in re-educating for professionals and uncertainty for patients as to choosing the best treatment regime. It is a challenge for medical professionals to stay up to date with emerging evidence-based literature. Some features of their practice quickly become outdated. As patients become more conscious of symptoms of their pathologies, and they become so-called Dr. Google, self-diagnosis will be at the peak, and it will lead to misdiagnoses or conditions such as cyber phobia from misinformation and information overload. Patients usually visit google, WebMD, etc. to seek information about their pathology, literature reveals around 70% of patients seek google for self-diagnosis. Innovations such as Artificial Intelligence will come to light, to sum up, the ample information that is being issued every day on medical databases. Artificial Intelligence that will interchange with the practitioners, aiding in making diagnoses and therapy protocol is already available. Embracing change will become the standard.

Artificial Intelligence in Medicine means computer systems executing tasks that need human intelligence. A subgroup of Machine learning is AI focusing on computers investigating from data and then forming predictions without being programmed to. By using feedback loops, the software can re-code itself permitting the computer to learn from its errors and upgrade its performance. It is an advantage for Medical researchers to use these systems to address difficult tasks that appears very tough to a human brain. These tasks include assessing or diagnosing complex pathologies that can't be distinguished via surface symptoms and the identification of correct treatment plans.

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