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Perspective

Primary Care of Typhoid Fever Caused by *Salmonella Typhi*

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DESCRIPTION

Salmonella enterica, subspecies enterica and serovar typhi cause the bacterial infectious disease typhoid fever, which is now more aptly known as enteric fever. It is primarily spread orally by contaminated food and drink and by asymptomatic carriers. It is widely spread in low-resource environments and developing nations with inadequate hygienic and sanitation standards. It is less common in developed and high-income environments, but cases still happen in recent travellers due to endemic areas.

Depending on age, prevalence of enteric fever varies and is similar across all age groups in low-burden areas but greater among younger children in endemic areas. Children are generally more likely to experience problems such as ileitis and intestinal perforation. There have been reports of fatality rates as high as 62% when perforation begins. Therefore, it is crucial that primary care providers recognise early signs and symptoms to address enteric fever.

Intestinal bleeding and perforation, peritonitis, sepsis, meningitis, osteomyelitis, multiorgan failure, and death are just a few of the complications that can arise from untreated enteric fever that can be fatal. An efficient primary healthcare system, which is frequently the initial point of contact for most patients, is essential to the realisation of universal health coverage. It is therefore impossible to overstate the importance of the primary care clinician in the prevention, diagnosis, and therapy of enteric fever and its consequences. A primary care system that is effective should be the centre of this.

Salmonella, a member of Entero-bacteriaceae family is flagellated, non-capsulated, facultative anaerobic gram-negative bacillus that does not digest lactose and possesses flagellar, somatic, and outer coat antigens. The somatic O antigen makes up its outermost layer, whereas the flagellae are formed of H antigen. The identification of serotypes is based on a complex combination of the individual code numbers for each O and H antigen. The typhoidal infection is mainly caused by *S. typhi* and less frequently by *paratyphi*. *Salmonella typhi* and *paratyphi* A are believed to only affect humans.

The VI capsular antigen, which has immunomodulatory properties that are supposed to contribute the disease pathogenesis, is a key virulence factor in the majority of strains of *S. typhi*. These properties include restricting complement deposition; lowering immune activation; assisting with phagocytosis evasion; and inhibiting serum bactericidal activity. Its absence makes *S. typhi* more vulnerable to attack and annihilation by the host immune system. As a result, the VI antigen has been used as a key ingredient of typhoid vaccines, including the novel combination vaccines.

When consumed, *Salmonella typhi* avoids being broken down by digestive enzymes and stomach acid, and enters the host's system predominantly through the terminal ileum. Through specialised organs called fimbrae, they connect to the epithelial cells that cover Peyer patches which are collections of lymphoid tissues near the distal ileum. These act as a hub for macrophages moving from the gastrointestinal tract to the lymphatic system. At Peyer's patches, the activated macrophages generate cytokines that draw other macrophages to the area. *Typhii* is carried by these macrophages to the liver, spleen, and bone marrow, which are all components of the reticuloendothelial system where they reproduce up to a critical density, and enter the bloodstream to spread other regions of the body. The gall bladder is one of these infiltrated areas.

Through diseased bile or hemogenously, the gall bladder gets infected. Further, coming into contact with the Peyer patches at the distal ileum, infected bile subsequently release into the gut. This second sensitization of macrophages at this site results in inflammation and hypertrophy of lymphoid tissues (typhoid ileitis). The blood supply is intruded upon by this growth, causing ischemic coagulative necrosis, which in turn leads to perforation and peritonitis. *Salmonella* is excreted in small amounts in the stool, which can transmit infection.

Salmonella is expected to evade enzymatic and chemical destruction in the gall bladder for a considerable amount of time by establishing biofilms or accessing an intracellular "comfort zone" in the gall bladder epithelium. This is the source of transmission of *Salmonella* in chronic carriers. The signs and

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symptoms of enteric fever can vary greatly and are frequently vague. There are several of these, including pyrexia, headache, myalgia, arthralgia, nausea, rashes, stomach pain, constipation, and occasionally diarrhoea. Typically, symptoms start to show themselves after around 21 days. The symptoms of paratyphoid fever and typhoid fever are identical, but paratyphoid fever is more hazardous.

Implications of infection

Typhoid or paratyphoid fever that is left untreated might result in mortality, intestinal perforation, or gastrointestinal haemorrhage. If symptomatic patients receive early treatment, chance of death is less than 1%, but this percentage can rise to 12% and 30% in untreated persons. Relapse, reinfection, or chronic carriages are additional possibilities; 10% of people relapse 1-3 weeks after healing.

CONCLUSION

Travellers should seek immediate medical attention if they observe high persistent fever, stomach pain, or overall weakness when travelling to or after leaving endemic areas. Irrespective of vaccination status, prevention includes following food and beverage restrictions and regular hand washing. Typhoid fever is typically diagnosed through serology or the culture of S. *typhi* from the blood. Despite of negative blood, urine, and stool cultures, the diagnosis of TF was established by the isolation of S. *typhi* from gastric contents. A culture of the stomach's contents has not yet been approved for the use of this disease's diagnosis. The typhoid vaccine for injection needs only one dosage and four doses are required for the oral typhoid vaccination.