**Enteric fevers**

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## **Typhoid fever**

## **Paratyphoid fever A & B**

**Learning objectives:**

At the end of this lecture the students will be able:

1. To properly diagnosed typhoid fevers.
2. To differentiate between convalescent and chronic carrier state.
3. To dealing with chronic carrier (food handlers).
4. To delineate preventive measures of feco-oral diseases in general.
5. To know types and indications of typhoid vaccine.

**1. Identification:**

## A systemic bacterial disease with insidious onset of sustained fever, marked headache, anorexia, relative bradycardia**,** splenomegaly.

## Inapparent or mild illnesses occur, especially in endemic areas in 60-90% of typhoid patients. Severe cases with complications can occur (bleeding or perforation) in 1% of cases.

## In severe cases, the CFR → 10% - 20% in pre-antibiotic era, which drop below 1% with prompt antibiotic.

## 15%-20% of patients may experience relapses (generally milder than the initial clinical illness).

## Paratyphoid fever A and B presents a similar clinical picture, but tends to be milder, and the CFR is much lower. Relapses occur in approximately 3 – 4 %.

## **Diagnosis**

## Clinical picture → unexplained prolonged fever

## Isolation of M.O by culture:

## **Blood** first 7-10 days +ve

## 2nd – 3rd W 50% +ve

## **Bone marrow** +ve even with A.B

## **Stoo**l 1st W 50% +ve

## 2nd – 3rd W 100% +ve

## **Urine** 20-30 % +ve after 1st W

## **Serology:**

## **a) Widal test:**

## Infection S. typhi → O&H → the human body

## Vaccination S. paratyphi A-B Ag. will form

## In vitro we add Ag → **O&H** Agglutination **Ab**

## **Problems of Widal test:**

## Antigenic sharing between Salmonella genes, false positive (FP) result.

## Antigenic sharing with other M.O (FP in: malaria, typhus fevers, E. coli infections as UTI, other infections and cirrhosis).

## TAB vaccination (FP).

## It can be negative test in up to 30% of culture proved typhoid patients (FN).

## O -Ab → Appear in 6-8 days and remain for 6-12 months.

## H -Ab → Appear in 10-12 days and remain for years.

## **A single Widal test is generally of little diagnostic value.**

## A fourfold raised in paired sera (1st in the acute stage and the 2nd in the convalescent stage) is diagnostic, but this is difficult to apply practically.

## **b) Vi Ab** present in high titer in chronic carriers and can be used as a screening test for chronic carriers.

## **c) New serological test:**

1. **IDL Tubex® test:** Swedish company, rapid result (2 minutes). It detects IgM **09**. Sensitivity and specificity better than Widal test.
2. **Typhidot®** **test:** developed in Malaysia, 3 hours, EIA test, sensitivity 75%, specificity 95%, detect specific IgM & IgG.

Newer **Typhidot-M®** **test**: detect specific IgM.

1. **IgM dipstick test:** developed in Netherland**.**

## **2. Infectious agents:** Typhoid fever → *S. Typhi* Paratyphoid fever → *S. Paratyphi A and B.*

## **3. Occurrence:**

## Worldwide; occur in all areas where water supplies and sanitation are substandard. The annual I. of typhoid fever is about 21 million cases with approximately 200 000 deaths. Almost 80% of cases and deaths are in Asia and most of others occur in Africa and Latin America. In ***Nineveh*** 2005-2020: 45 000 cases (annual I. is about 3000 cases) and 70% of them affecting young age groups (15-45).

## **4. Reservoir:**

## Humans all ages - both sexes

## cases & carriers

## **Cases:** mild, missed or severe

## **Carriers:** temporary (convalescent) or chronic carrier.

## **Convalescent carrier’s** → excrete the bacilli for 6 -8 weeks, after 3 months only 4%.

## After 1 year only 3% → **chronic carrier** (either fecal or urinary carrier). In most chronic carriers, the microorganisms persist in the gallbladder and in the biliary tract. **“Typhoid Mary”:** an Irish cook in New York City in early 1900s.

## **5. Mode of transmission:**

## Feco-oral route by ingestion of water and foods contaminated by feces and urine of patients and carriers.

## -Raw fruits and vegetables especially when human excreta used as fertilizer.

## -Sea food (shell fish, oysters).

## -Contaminated milks and milk products,

## -Flies may infect foods in which the organism then multiplies to infective doses.

## **6. Incubation period:**

## 8 - 14 days but it may be as short as 3 days up to 60 days.

## **7. Period of communicability:**

## As long as the bacilli appear in the excreta. Usually from 1st week throughout the convalescence. (10% of untreated cases excrete bacilli for 3 months after onset of symptoms).

## **8. Susceptibility:** Is general, and increase in person with gastric achlorhydria, and possibly in those with HIV (+ve).

## Serum antibodies (O &H) are not the primary defenses against infection; *S. typhi* being an intracellular organism, cell-mediated immunity play a major role in combating the infection. The immunity is temporal, 2nd attacks infection may occur.

## **9. Method of control:**

## **A- Preventive measures:**

#### Educate the public …

#### Personal hygiene particularly food handlers.

#### Sanitary sewage disposal.

#### Provide, protect, purify and chlorinate public and private water supplies**.**

#### Control flies.

#### Use of sanitary practices for food preparation, handling and storage especially of salads.

#### Pasteurization or boiling of milk and diary products**.**

#### Exclusion of **typhoid carriers** from handling foods until 3 consecutive negative stool cultures (and urine in areas endemic for schistosomiasis) at least 1 month apart and at least 48 hours after antimicrobial therapy has stopped.

### **Rx** of chronic carriers → ciprofloxacin or norfloxacin twice daily for 28 days → 80% successful.

### Surgery → cholecystectomy + Ampicillin therapy.

The management of carriers continues to be an unsolved problem. This is the crux of the problem, in the elimination of typhoid fever.

## **Immunization**

## Vaccination of high-risk populations is considered the most promising strategy for the control of typhoid fever. Immunization is not routinely recommended in non-endemic areas.

## **1- TAB vaccine:**

## Killed, injectable, 2 doses at one month interval. Side effect → redness, fever, nausea and headache. Booster every 3 years.Age: adults and children ≥ 2 years.

## **WHO recommended → TAB vaccine should be discontinued.**

**2- Injectable Vi vaccine:**

Licensed in 1994, the vaccine is progressively introduced into school attending children vaccination programs in Asian countries. 75% protection. Age: adults and children ≥ 2 years.

## **3- *Oral vaccine Ty 21a (Vivotif or Typhoral)*** → oral, live attenuated, completely devoid of pathogenicity. It colonizes the gut. Enteric-coated capsule: one capsule/dose (+ antacid), 3 doses: day 1, 3 and 5.

## Protection commences 2 weeks after taking the last capsule and last for at least 3 years. Therefore, a booster every 3 years,

## - Age: adults and children > 6 years

## **-** Three years protection around 90%.

## - Now > 60 countries adopted.

## **Indications of vaccine:**

## Food handlers

## Workers in water, sewage plants obligatory in Iraq

## Swimming pools attendances

## Visitors to endemic areas

## School-age children living WHO

## in endemic areas.

## **B- Control of patients, contacts and immediate environment:**

## **Reporting:** Class II.

## **Isolation:** Enteric precaution while ill (hospital care in acute illness). Release from supervision until 3 consecutive negative cultures of stool (and urine in patients with schistosomiasis) on 3 separate days and at least 48 hours after antimicrobial therapy has stopped and not earlier than 1 month after onset. If any of these is positive, repeat cultures at monthly interval during 12 months.

## **Disinfection:** of feces and urine.

## **Quarantine:** not applicable.

## **Immunization of contacts:** is of limited value.

## **Specific treatment:** ciprofloxacin for 2 weeks or ceftriaxone or azithromycine.

## Chloramphenicol, amoxicillin, ampicillin and trimetheprine-sulfamethoxazole are equally effective.