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***Original article***

# *An Epidemiological Study of Typhoid Patients from Rajgir, India*

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ABSTRACT

*The bacteria Salmonella Typhi is the source of typhoid fever, often known as enteric fever, a potentially fatal illness. It typically spreads by tainted food or drink. After being consumed, Salmonella Typhi bacteria proliferate and enter the bloodstream. The primary signs and symptoms of typhoid fever include: a fever that doesn't go down, headache, aches and pains all over the body, excessive exhaustion, coughing, constipation, poor appetite, lethargy, and diarrhoea. Usually, 1-3 weeks following bacterial exposure, symptoms start to appear. The faecal-oral route, which involves consuming tainted food or drink, is how typhoid disease is spread. The bacterium can be removed from the affected person's stool and contaminate fresh food or water. When treating typhoid fever, cephalosporins are the most often prescribed medications. The most successful cephalosporins nowadays for treating typhoid fever are third generation ones. The Rajgir, a popular tourist destination in the state of Bihar's Nalanda district, served as the study's site. This study comprised forty patients. This report presents the results of many parameters that were studied. There is a great deal of unfinished business in this area, which will allow for the development of a novel treatment plan for the efficient management of this research. It is imperative that chemists at the community level raise public awareness of this issue. The key to preventing this illness is to consume meals and drink only clean, safe water. The most efficient method of preventing the faecal oral route of transmission of this disease is to implement proper sanitation systems, including appropriate drainage systems, in both rural and urban settings.*

***Keywords:*** *Typhoid fever; Enteric fever; Salmonella typhi; Fecal-oral route; Cephalosporin.*

## *Abbreviations:*

S. typhi: Salmonella typhi, HLA: Human leukocyte antigens, AIDS: Acquired immunodeficiency syndrome, PBP: Penicillin Binding Protein, API: Active Pharmaceutical Ingredient, H. influenzae: Haemophilus influenza, IV: Intravenous, IM: Intramuscular, HAP-Hospital-acquired pneumonia, CAP- Cellulose acetate phthalate, CSF- Cerebrospinal fluid, MBC- Minimum Bactericidal Concentration, PPNG- Penicillinase producing Neisseria gonorrhoeae.

## *Introduction*

Typhoid fever is a life-threatening infection caused by the Salmonella Typhi bacterium. It is mainly transmitted via contaminated food or drink. When Salmonella Typhi bacteria are consumed, they grow and spread throughout the bloodstream [1].

Typhoid fever is uncommon in areas where few people carry the pathogen. It is also uncommon in areas where water is treated to eliminate germs and human waste is properly controlled. The United States is one example of a country with low typhoid fever rates. Africa and

South Asia have the most cases and frequent outbreaks. It poses a major health risk, particularly for youngsters, in areas where it is more prevalent [2].

Most typhoid fever patients feel better approximately a week after beginning antibiotic treatment. However, without treatment, there is a tiny risk of death from typhoid fever complications. Typhoid fever vaccines can help protect against the disease. However, they cannot prevent all cases of disease caused by other strains of salmonella. Vaccines can help reduce the chance of developing typhoid fever [3].

The bacterium dwells in human intestines and bloodstreams. It transmits between people by direct touch with the faeces of someone who has an illness [4].

Since no animals carry this disease, transmission is always from person to person. S. typhi enters the body through the mouth and remains in the intestine for 1-3 weeks. Then it passes through the intestinal wall and enters the bloodstream.5. It spreads from the bloodstream to other tissues and organs. Because S. typhi may dwell within the host's cells, the immune system has limited defence against it [6].

Doctors diagnose typhoid by identifying S. typhi in blood, stool, urine, or bone marrow samples [7].

**Symptoms**

Typhoid fever symptoms include prolonged high temperature, headache, stomach pain, and general aches and pains, extreme exhaustion (fatigue), cough, constipation, poor appetite, lethargy, and diarrhoea.

The incubation period is usually 1-2 weeks, with the disease lasting around 3-4 weeks [8].

**Modes of Transmission**

Typhoid fever is spread through the faecal-oral route, which involves ingestion of infected food or water. A person infected with the bacteria may eliminate it in their faeces, contaminating new food and drink.

***Methodology***

We conducted this questionnaire based study on the typhoid. Sample of Questionnaire is given below:

**An Epidemiological Study of Typhoid Patients from Rajgir, India**

**I. Demographic Details:**

*****Name: *Age:

*Gender: M/F…… *Temp.:

*Village/Town:

*Occupation: -

***Educational Level:**

1. Illiterate ☐
2. Up to Matric ☐
3. Intermediate ☐
4. Graduation ☐
5. Higher degrees ☐

**II. Illness (Summary):**

Date/day of Illness:…/……/…….

Date of specimen collection:…./……/……

Specimen collection type: -☐Blood /☐ Faeces /☐ Other.

Typhoid immunization history:

**III. Sign & Symptoms:** **Yes/No/Unknown**

| | |
|---|---|
| Malaise | ☐ Yes ☐ No ☐ Unknown |
| Anorexia | ☐ Yes ☐ No ☐ Unknown |
| Fever | ☐ Yes ☐ No ☐ Unknown |
| Headache | ☐ Yes ☐ No ☐ Unknown |
| Cough | ☐ Yes ☐ No ☐ Unknown |
| Rash/skin spot | ☐ Yes ☐ No ☐ Unknown |
| Body aches | ☐ Yes ☐ No ☐ Unknown |
| Diarrhoea | ☐ Yes ☐ No ☐ Unknown |
| Constipation | ☐ Yes ☐ No ☐ Unknown |
| Vomiting | ☐ Yes ☐ No ☐ Unknown |

Others:

**IV. Treatment (Antibiotics & Duration):**

**V. Risk Factors:**

| |
|---|
| **Travel:**<br>Domestic ☐Yes ☐No<br>International ☐Yes ☐No |

| |
|---|
| Household/close contact of person known to travelled overseas: ☐Yes ☐ No<br>Remarks …….. |
| Household/close contact of person known to have typhoid infection or similar illness: ☐Yes ☐ No<br>Remarks …….. |
| Had previous typhoid infection: ☐Yes ☐ No |

| |
|---|
| Household/close contact of person known to have previous typhoid infection: ☐Yes ☐ No<br><br>Remarks …….. |
| Drunk untreated water: ☐Yes ☐ No |
| Participated in swimming/ water sports: ☐Yes ☐ No |

**VI. Local Food Exposures:**

| |
|---|
| Cafes or Resturants: ☐ Yes ☐ No |
| Takeaway/Fast food outlets: ☐ Yes ☐ No |
| Family party or Functions with friends:<br><br>☐ Yes ☐ No |
| Festivals or Social gatherings:<br><br>☐ Yes ☐ No |

| |
|---|
| ***VII. FOLLOW UP :** |

| |
|---|
| **VIII. Patient counseling** (About personal hygiene and preventing disease transmission): |

## *Result*

**I. Demographic details:** Results of demographic details are given below:

**1. Age:**

| Age (in years) | n = 40 |
|---|---|
| Less than 1 years- | 1 |
| 1-20 | 15 |
| 21-40 | 17 |
| 41-60 | 6 |
| 61-80 | 1 |
| Above 80 | 0 |

**2. Gender:**

| Male | Female |
|---|---|
| 17 | 23 |

**3. Educational Qualifications:**

| | |
|---|---|
| Illiterate | 5 |
| Upto matriculation | 19 |
| Intermediate | 12 |
| Graduation | 4 |
| Higher degrees | 0 |

**II. Symptoms:** Symptoms of patients are shown in the table given below:

| **Feature** | **No. of patients (n = 40)** |
|---|---|
| Malaise | 0 |
| Anorexia | 0 |
| Fever | 40 |
| Headache | 36 |
| Cough | 0 |
| Rash/skin spot | 0 |
| Body aches | 22 |
| Diarrhoea | 0 |
| Constipation | 39 |
| Vomiting | 1 |

**III. Treatment given to Typhoid patients:** Treatment (antibiotics) given to typhoid patients are given in the table given below:

| Antibiotics | No. of patients |
|---|---|
| Cefixime | 22 |
| Ceftriaxone | 27 |
| Cefpodoxime | 7 |
| Cefixime plus Ofloxacin (combination drug) | 13 |
| Ceftriaxone plus sulbactum (combination drug) | 5 |

## *Discussion*

Based on the survey, we examined a cohort of forty individuals afflicted with typhoid. One patient was under the age of one, fifteen patients fell within the age range of 1-20 years, seventeen patients were between the ages of 21-40 years, six patients were between the ages of 41-60 years, and one patient was between the ages of 61-80 years. None of the patients were above the age of 80 years.

The study sample consisted of forty individuals, with seventeen being male and twenty-three being female.

Regarding educational credentials, it was found that five patients lacked literacy skills, nineteen patients had completed just matriculation education, twelve patients had completed intermediate education, and only four patients had completed graduate education.

According to the symptoms observed in the patients, it was found that forty patients exhibited symptoms of fever, thirty-six patients had headaches, twenty-two patients reported body aches, thirty-nine patients reported constipation, and one patient displayed the characteristic of vomiting.

Twenty-two patients received cefixime, twenty-seven patients received ceftriaxone, seven patients received cefpodoxime, thirteen patients received a combination of cefixime and ofloxacin, and five patients received a combination of ceftriaxone and sulbactam.

## *Conclusion*

Typhoid is a globally frequent disease that occurs in nearly all regions of the world. The occurrence is a result of the ingestion of food and water that has been polluted. Salmonella typhi is identified as the causative agent. Although it is less common in developed countries, it remains widespread in developing countries due to inadequate sanitation infrastructure. A range of therapy regimens are already accessible for the management of typhoid sickness; nonetheless, it is vital to prioritise the establishment of public awareness.

The findings of this study indicate that third generation cephalosporins have a high level of efficacy in the management of typhoid illness.

While this study paper has provided valuable insights into several aspects of typhoid, it is imperative to do additional research to enhance the efficacy of typhoid illness management and prevention strategies.

Pharmacists should promote public understanding regarding the use of uncontaminated and secure drinking water and food. Every urban and rural region should have a well-functioning sanitation infrastructure. The most effective method for preventing this disease is through the maintenance of hygienic conditions both indoors and outside.

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## *Conflict of Interest*

None declared.

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