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**Original research article**

# A Prospective Observational Evaluation of the Clinical and Laboratory Profiles of Typhoid Fever in Children in the Bihar Region of India

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## Abstract

**Background:** Typhoid fever is a major health problem in developing countries. It is caused by Salmonella typhi and S. paratyphi. The Clinical & Laboratory profile of these patients is affected by this infection.

**Aims:** This study was conducted to evaluate the Clinical & Laboratory Profile of Typhoid Fever in Children in Bihar Region.

**Methods:** A prospective observational study was conducted in the Department of Pediatric, Jawaharlal Nehru Medical College and Hospital, Bhagalpur, Bihar, India for 1 year. Total 200 Children aged below 18 years with history of fever of more than 7-10 days duration were included in this study. In each case, age, sex, presenting complaint, laboratory investigations and antibiotic sensitivity pattern are collected and analysed.

**Results:** Out of 200 cases, 140 (70%) were male and 60 (30%) were female. Most patients were between 6 and 12 years old. Most patients (70%) stayed in hospital for two weeks or more. Fever (100%) was the most prevalent symptom, followed by anorexia (65.5%), vomiting (45.5%), abdominal discomfort (20.5%), diarrhoea (12.5%), headache (9%) and cough (9%) (7.5 percent). Physical observations included toxic look (69.5%), coated tongue (49.5%), hepatomegaly (43.5%), splenomegaly (19.5%), hepatosplenomegaly (14%), and pallor (6.5%). Anemia was identified in 45 (22.5%) instances, while leucopenia and leucocytosis were found in 67 (33.5%) and 33 (16.5%) respectively. Neutropenia was detected in 83 (41.5%) instances and neutrophilia in 58 (29%). 89 (44.5%) had eosinopenia, 15 (7.5%) had eosinophilia, and 31 (15.5%) had thrombocytopenia. SGOT (>200IU/ml) was high in 23% of patients and SGPT (>200IU/ml) in 15%. Blood culture positive for Salmonella typhi in 49 instances (24.5%).

**Conclusion:** Public health interventions like supply of safe drinking water, appropriate sanitation, awareness of the disease and its transmission, and good personal hygiene practices may be employed.

**Keywords:** children, clinical profile, coated tongue, typhoid fever

## Introduction

The term enteric fever includes typhoid fever caused by S.typhi and paratyphoid fever caused by S.paratyphi A, B and C. Detailed study of enteric fever was presented by Bretonneau (1826) who identified intestinal lesions. The name typhoid fever was given by Louis (1829) to distinguish it from typhus fever. Eberth (1880) described typhoid bacillus.[1] According to WHO Confirmed case of typhoid fever is defined, as a patient with fever (> 38°C) that has lasted for at least three days, with a laboratory confirmed positive culture of S. typhi.[2] Probable case of typhoid fever is a patient with fever (> 38°C) that has lasted for > 3 days, with a positive serodiagnosis or antigen detection test but without S. typhi isolation.[2] The world sees approximately 22 million new typhoid cases occur each year. In India in disease-endemic areas, the annual incidence of enteric fever is about 1%.[3] Complete blood counts in enteric fever are

found to be unremarkable. The hemoglobin is normal in the initial stages but drops with progressing illness. Severe anemia is unusual and should make one suspect intestinal hemorrhage or hemolysis or an alternative diagnosis like malaria. The WBC count is normal in most cases and leucocytosis makes the diagnosis less probable. Leukopenia is perceived to be an important feature of typhoid fever and has been reported in only 20-25% cases.[4] The differential count is usually unremarkable except for eosinopenia. Eosinopenia often absolute may be present in 70-80% cases.[5] Presence of absolute eosinopenia offers a clue to diagnosis but does not differentiate enteric fever from other acute bacterial or viral infections. A normal eosinophil count does make typhoid fever a less likely possibility. Platelet counts are normal to begin with and fall in some cases by the second week of illness. Overall prevalence of thrombocytopenia is around 10-15%.[4] The emergence of strains of S*almonella typhi* resistant to multiple antibiotics poses a serious problem. Chloramphenicol was considered the antimicrobial gold standard for the treatment of typhoid fever till 1948.[6] But in the last two decades there has been increase in the resistance of strains of *S. typhi* to chloramphenicol. It was first reported in Britain, in 1950[7] and in India in 1972.[8] The classic Widal agglutination test is one of the most utilized diagnostic tests for typhoid fever, especially in developing countries. Treatment of typhoid includes proper hydration, correction of electrolyte imbalance, antipyretic therapy and appropriate antibiotics. Soft and easily digestible food should be continued.

## Materials and Methods

A prospective observational study was conducted in the Department of Pediatric, Jawaharlal Nehru Medical College and Hospital, Bhagalpur, Bihar, India for 1 year, after taking the approval of the protocol review committee and institutional ethics committee.

## Methodology

After taking informed consent detailed history was taken from the patient or the relatives if the patient was not in good condition. The technique, risks, benefits, results and associated complications of the procedure were discussed with all patients. Total 200 Children aged below 18 years who presented to the Pediatric department with history of fever of more than 7-10 days duration were included in this study. Previously antibiotic treated patients and patients with proven localised infection were excluded. These cases were either Widal positive (Widal test TO Titer >1:100 or TH titre >1:200) or blood culture positive for Salmonella species. The cases which were discharged against medical advice and cases for which consent was not obtained were excluded from the study. Antibiotics were started in each case after blood was drawn for Widal test and blood culture for Salmonella species. Each case was followed up clinically for improvement. For those cases which did not show improvement after 5 days of antibiotics, changes made according to the culture reports. Cases were followed till discharge.

Statistical analysis

The data collected was analyzed with respect to age, sex and presenting complaints using SPSS software version 20.

## Results

In this study, all the cases presented to OPD with a median of 7-10 days duration of fever. 140 cases (70%) had received antibiotics for a minimum period of 3-5 days prior to admission. Table 1 shows Out of 200 cases, 140 cases (70%) were males and 60 cases (30%) were females. Table 2 shows, most of the cases were aged between 6 and 12 years. 47 cases were below 6 years, representing 23.5%. 56 cases were aged above 12 years, representing
28%. 97 cases were aged between 6 and 12 years (48.5%). In all the above age groups male predominance was seen.

**Table 1: Gender Distribution of patients**

| Gender | N=200 | % |
|---|---|---|
| **Male** | 140 | 70 |
| **Female** | 60 | 30 |

**Table 2: Age wise distribution**

| Age( years) | N=200 | % |
|---|---|---|
| **0-6 years** | 47 | 23.5 |
| **6-12 years** | 97 | 48.5 |
| **12-18 years** | 56 | 28 |

Duration of hospital stay varied from up to two Week. As shown in Table-3, most of the cases (70%) stayed in hospital up to two Week after admission. 30% cases stayed up to one Week day in hospital. In these cases, fever persisted beyond one Week. No mortality was observed during our study period. Although mild elevated liver enzymes were observed in some cases, no complications were seen in any case.

**Table 3: Duration of hospital stay**

| Duration of hospital stay | No. Of cases | P-value |
|---|---|---|
| One Week | 60 (30%) | 0.17 |
| More than one Week | 140 (70%) | 0.00 |

Typhoid fever presents with a wide range of symptoms. Due to the use of antibiotics prior to diagnosis, children may not present with typical symptoms. However, in our study, the most common symptom was fever (100%), followed by anorexia (65.5%), vomiting (45.5%), pain abdomen (20.5%), diarrhea (12.5%), headache (9%), and cough (7.5%) table 4.

**Table 4: Common presenting symptoms**

| Presenting symptom | No. of Cases | P-value |
|---|---|---|
| Fever | 200 (100%) | 0.001 |
| Anorexia | 131 (65.5%) | 0.000 |
| Vomiting | 91 (45.5%) | 0.001 |
| Pain abdomen | 41 (20.5%) | 0.014 |
| Diarrhea | 25 (12.5%) | 0.079 |
| Headache | 18 (9%) | 0.99 |
| Cough | 15 (7.5%) | 0.169 |

**Table 5: Various physical findings**

| Signs | No. of Cases | P-value |
|---|---|---|
| Toxic look | 139 (69.5%) | 0.001 |

| | | |
|---|---|---|
| Coated tongue | 99(49.5%) | 0.001 |
| Hepatomegaly | 87 (43.5%) | 0.002 |
| Splenomegaly | 39 (19.5%) | 0.058 |
| Hepatosplenomegaly | 28 (14%) | 0.088 |
| Pallor | 13(6.5%) | 0.206 |

Coming to physical findings, the most common sign we observed was toxic look in 69.5% of the cases followed by coated tongue in 49.5%, hepatomegaly 43.5%, splenomegaly 19.5%, hepatosplenomegaly in 14% of cases and pallor in 6.5% of cases. (Table 5)

**Table 6: Laboratory parameters**

| **Laboratory parameters** | **Abnormal values** | **No. of cases** | **P-value** |
|---|---|---|---|
| **Hemoglobin** | Anemia (Hb <11g%) | 45 (22.5%) | 0.031 |
| **Total leukocyte count** | Leucocytosis (>11000cells/mm$^3$) | 33 (16.5%) | 0.029 |
| | Leucopenia (<4000cells/mm$^3$) | 67 (33.5%) | 0.00 |
| **Polymorphs** | Neutropenia | 83 (41.5%) | 0.00 |
| | Neutrophilia | 58 (29%) | 0.00 |
| **Eosinophils** | Eosinophilia | 15 (7.5%) | 0.18 |
| | Eosinopenia | 89 (44.5%) | 0.00 |
| **Platelets** | Thrombocytopenia | 31 (15.5%) | 0.01 |
| **SGOT** | Elevated SGOT | 23 (11.5%) | 0.31 |
| **SGPT** | Elevated SGPT | 30 (15%) | 0.24 |
| **Widal titres** | TO >1:100 | 189 (94.5%) | 0.00 |
| | TH >1: 200 | 155 (77.5%) | 0.00 |
| **Blood culture positive** | Salmonella | 49 (24.5%) | 0.01 |

Table 6 depicts the laboratory parameters. Anemia found in 45 (22.5%) cases, leucopenia and leucocytosis was observed in 67(33.5%) cases and 33(16.5%) cases respectively. Neutropenia found in 83(41.5%) cases and neutrophilia was found in 58(29%) cases. Eosinopenia was seen in 89(44.5%) cases, eosinophilia in 15(7.5%) cases and thrombocytopenia in 31(15.5%) cases. SGOT levels was elevated (>200IU/ml) in 23(11.5%) cases and SGPT (>200IU/ml) in 30(15%) cases. The elevated levels of liver enzymes lasted only few days. There were no complications observed during our study period. *Salmonella typhi* O titres >1:100 was seen in 189(94.5%) cases and TH titres >1:200 in 155(77.5%) cases. Blood culture positive for *Salmonella typhi* noted in 49(24.5%) cases. Out of 200 cases only 56 cases had been immunized

with typhoid vaccine. All of them had taken typhoid polysaccharide vaccine more than 3 years prior to illness.

**Discussion**

While typhoid is still prevalent, the number of confirmed cases has declined in recent years. A blood or bone marrow culture is required to confirm a typhoid fever diagnosis. However, low bacteremia and prior antibiotic use minimise the amount of blood required for blood culture.[9]
All cases presented to OPD with a 7-10 day fever. Prior to admission, 140 individuals (70%) had received antibiotics for 3-5 days. Out of 200 cases, 140 (70%) were male and 60 (30%) were female. Other research found similar findings.[10]
Most patients were between 6 and 12 years old. 23.5 percent of cases were under 6 years old. 56 instances (28%) were over 12 years old. 97 instances were 6-12 years old (48.5 percent). Male predominance was noted in all age groups. R Modi et al. found the highest incidence of typhoid in children aged 6 to 10 years.[11]
Another study found the highest number of instances in the 5+ age group.[12] The average hospital stay is 8-10 days. Three days of afebrile without antipyretics resulted in discharge.
These findings matched Hyder et al's research.[13] We found typhoid disease in the lower, middle, and upper classes. Different water sources and hygiene habits like hand washing and sanitary toilet facilities can explain this.
Another study found similar findings. Fever (100%) was the most common symptom in our study, followed by anorexia (65%) and vomiting (45.5%). Similar findings were seen in other investigations.[14-19] Contrary to this, Joshi et al identified headache as the second most prevalent symptom after fever.[20]

This was followed by coated tongue in 49.5%, hepatomegaly in 43.5%, splenomegaly in 19.5%, hepatosplenomegaly in 14%, and pallor in 6.5%. This is followed by hepatomegaly (76%) and splenomegaly (76%) according to Laishram et al (38 percent).[21]

In other studies, the most common signs were relative bradycardia and hepatomegaly.[22] During our study, all cases were positive for Widal. Blood culture was positive in 24.5% of cases. Other study also reported 16% culture positive cases.[13] A study done by Banu et al also reported 28% culture positive cases.[22] Due to prior use of antibiotics, the culture positive cases are decreasing. Thus, need for relay on other serological tests for diagnosis of typhoid exists. Study done by Modi et al reported 97% Widal positive cases.[11] Anemia was seen in 22.5% of cases. The other studies reported little higher percentage of anemias. A study done by Raj C et al reported anemia in 41.8% of patients and Lefebvre et al reported anemia in 78% of cases.[23,24] in our study Leucocytopenia and Eosinopenia found in 33.5% and 44.5% respectively. Similar results reported in Lefebvre et al.[24] Although leucocytosis and eosinophilia are rare in typhoid, our study reported leucocytosis in 16.5% of cases and eosinophilia in 7.5% cases respectively. Thrombocytopenia was found in 15.5% of cases. Elevated SGOT is seen 11.5 % of cases and SGPT was raised in 15% of the cases. The other study reported elevated liver enzymes in 70% of cases.[25]

**Conclusion**

The present study concluded that in younger children, stomach distension is more common than abdominal pain and headache. Public health interventions include safe drinking water, proper sanitation, illness awareness and prevention, and personal hygiene.

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