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Original Research Article

A Prospective Study to Examine the Clinical and Laboratory Characteristics of Typhoid Fever in Children Under 18 Years Age in Bihar Region

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Abstract

Background: Enteric fever, also known as typhoid, is a common worldwide bacterial disease caused by the ingestion of contaminated food or water which contains the bacterium Salmonella enterica, serovar Typhi. It disproportionately affects children with varied clinical presentations ranging from a mild illness with low grade fever to severe life-threatening complications.

Aim: To evaluate clinical and laboratory profile of typhoid fever in children of Bihar region.

Materials and Methods: Total 150 children aged below 18 years who presented in 2 years to the Department of Pediatrics, Patna Medical College and Hospital, Patna, Bihar, India with history of fever of more than 7-10 days duration were included in this study. In each case, age, sex, presenting complaint, past medical history, laboratory investigations including Widal test and antibiotic sensitivity pattern are collected and analyzed.

Results: Out of sample population of 150, 90 (60 %) were males and 60 (40 %) were females. Out of all these patients, maximum cases (58 %) were from age group of 7-12 years of age. The most common symptoms were fever (100 %), followed by anorexia (71.33 %). We observed high incidence of typhoid fever in lower class (28.67 %) and lower middle class (48 %), lesser in upper middle-class society (14 %) and least in upper class (9.33 %).]. The most common physical findings found in our study was toxic look (68.67 %) followed by coated tongue (62.67 %) and hepatomegaly (40 %).

Conclusion: Typhoid fever should be suspected and investigated in all children with short and long duration fever without localizing signs. Early diagnosis and institution of appropriate antibiotics therapy is of paramount importance in the management of typhoid fever.

Keywords: Typhoid Fever, Clinical, Laboratory, Profile.

Introduction

Enteric fever, also known as typhoid, is a common worldwide bacterial disease caused by the ingestion of contaminated food or water which contain the bacterium Salmonella enterica, serovar Typhi. It is very common in India [1]. The term enteric fever includes typhoid fever caused by Salmonella typhi and paratyphoid fever

caused by Salmonella paratyphi A, B and C. 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].

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].

The emergence of strains of Salmonella typhi resistant to multiple antibiotics poses a serious problem. Chloramphenicol was considered the antimicrobial gold standard for the treatment of typhoid fever till 1948[4]. 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 [5] and in India in 1972 [6]. Gradually, resistance to multiple antibiotics developed [7]. A major epidemic of drug resistant typhoid fever was first reported in 1972 and subsequently resistance to all the first line drugs (chloramphenicol, cotrimoxazole & ampicillin) was reported. These were called as Multi Drug Resistant typhoid fever (MDRTF) [8].

The classic Widal agglutination test is one of the most utilized diagnostic tests for typhoid fever, especially in developing countries. This study was conducted to evaluation of clinical and laboratory profile of typhoid fever in Bihar region children. Prompt recognition with time & appropriate antibiotics and other supportive measure can considerably reduce both morbidity and mortality and is important for favorable outcome.

Materials and Methods

A prospective observational study was conducted for 2 years in the Department of Pediatrics, Patna Medical College and Hospital, Patna, Bihar, India to evaluate clinical and laboratory profile of typhoid fever in children of Bihar region after taking the approval of institutional ethics committee. According to a previous research, the estimated prevalence of laboratory-confirmed typhoid with fever across all hospital studies was 9.7% [9] The sample size (n) required for this study was determined using a single population proportion formula [$n = (Z\alpha/2)^2 p(1-p)/d^2$)]; whereas n = the required sample size for this study, Zα/2: significance level at α =0.05 with 95% confidence interval, value received is 1.96, p: estimated prevalence of typhoid fever which is 9.7% [10], d: margin of error (5%). The required sample size is estimated 135 approximately. With a 10% nonresponsive rate, the final estimated sample size is 150 (~ 148).

Inclusion criteria:

- Includes children with age less than 18 years.
- Children with history of fever of more than 4-14 days duration.
- Cases with either Widal positive (Widal test TO titre > 1:100 or TH titre >1:200) or blood culture positive for Salmonella species.

Exclusion criteria:

- Previously antibiotic treated patients and patients with proven localized infection.
- Migrants from outside of Bihar region.

All patients included in this study underwent complete blood investigation to estimate the total and differential leukocyte count, hemoglobin level and serum transaminases (ALT, AST). Widal test was done by using semi-quantitative tube agglutination (titration) method in patient with history of fever of >7 days duration. The titre of the patient was taken as the highest dilution of the serum sample that gave a visible agglutination. Titre of 1:100 or more dilution for O and 1:200 or more dilution for H antigen was considered positive. Demographic details, past medical history of all the patients with all the variables regarding the clinical symptoms, signs and the results of laboratory investigations were recorded and analyzed.

Results:

According to the demographic details of all the patients i.e. out of 150 cases, 60 % were males and 40 % were females. So, the male to female ratio was 3:2. Most of the cases (58 %) belonged to age group of 7-12 years of age. The socio-economic status was graded as per Kuppuswamy's modified scale 2021. So out of all the recorded cases, 9.33 % were from upper class, 14 % were from upper middle, 28.67 % were from lower class while most of the cases (48 %) were from lower middle-class group. (Table 1&2)

Table 1: Distribution of patients according to age and gender

Age Group (In years)	Gender				Total (n=150)	
	Males (n=90)		Females (n= 60)			
	No.	%	No.	%	No.	%
0-6	10	11.11	07	11.67	17	11.33
7-12	56	62.22	31	51.67	87	58.00
13-18	24	26.67	22	36.66	46	30.67

Table 2: Socioeconomic status of all the patients according to Kuppuswamy modified scale

Socio-economic Status	No. cases of	%
Upper class	14	09.33
Upper middle class	21	14.00
Lower middle class	72	48.00
Lower class	43	28.67

Table 3: Peak temperature profile and total duration of fever

Temperature variables		No. of cases	%
Temperature in °F	99-101 °F	51	34.00
	101.1-103 °F	73	48.67
	103.1-105 °F	26	17.33
Duration (days)	4-7	61	40.67
	8-14	86	58.66
	>14	1	0.67

Table 4: Duration of hospital admission

Duration of hospital stay	No. of cases	%
1 Week	82	54.67
More than 1 week	68	45.33

100 % of the cases had fever before coming to the OPD with a median duration of 8-14 days. While reporting to the OPD, most of the patients had 101.1-103 °F fever. Approximately 58.66 % of patients had 8-14 days of fever. Duration of hospital stay of patients having enteric fever varied from one day to two weeks. Maximum patients were hospitalized from 1-7 days. 54.67 % stayed in hospital up to one week after admission. 45.33 % cases stayed up to two weeks in hospital. In these cases, fever persisted beyond one Week. No mortality was observed during our study period. (Table 3&4)

Table 5: Common presenting symptoms

Symptoms	No. of cases	%
Fever	150	100
Anorexia	107	71.33
Vomiting	58	38.67
Diarrhea	8	5.33
Headache	22	14.67
Cough	13	8.67
Rose spots	28	18.67
Loss of appetite	35	23.33

Table 6: Common physical findings

Signs	No. of cases	%
Pallor	8	05.33
Coated tongue	94	62.67
Weight loss	24	16.00
Abdomen swelling	9	06.00
Hepatomegaly	60	40.00
Hepatosplenomegaly	26	17.33
Toxic look	103	68.67
Rapid breathing	14	09.33

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 (71.33 %), vomiting (38.67 %), appetite loss (23.33 %), rose spots (18.67 %), headache (14.67 %), and cough (8.67 %), diarrhea (5.33 %).Coming to physical findings, the most common sign we observed was toxic look in 68.67 % of the cases followed by coated tongue in 62.67 %, hepatomegaly in 40 %, hepatosplenomegaly in 26.33%, weight loss in 16%, rapid breathing in 9.33%, of cases, abdomen swelling in 6% and pallor in 5.33% of cases. (Table 5&6)

Table 7: Laboratory parameters

Laboratory parameters	Abnormal values	No. of cases	%
Hemoglobin	Anemia (Hb<11g %)	48	32.00
Total leukocyte count	Leucocytosis (>11000 cells/mm^3)	34	22.67
	Leucopenia (<4000 cells/mm^3)	41	27.33
Polymorphs	Neutrophilia	63	42.00
	Neutropenia	41	27.33
Eosinophils	Eosinophilia	04	02.67
	Eosinopenia	79	52.67
Platelets	Thrombocytopenia	29	19.33
SGOT	Elevated SGOT	23	15.33
SGPT	Elevated SGPT	27	18.00
Widal titres	TO>1:100	138	92.00
	TH>1:200	127	84.67
Blood culture Positive	Salmonella	41	27.33

Anemia found in 48 (32%) cases, leucopenia and leucocytosis was observed in 41(27.33%) cases and 34(22.67%) cases respectively. Neutropenia found in 41(27.33%) cases and neutrophilia was found in 63(%) cases. Eosinopenia was seen in 79(52.67%) cases, eosinophilia in 4(2.67%) cases and thrombocytopenia in 29(19.33%) cases. SGOT levels was elevated (>200IU/ml) in 23(15.33%) cases and SGPT (>200IU/ml) in 27(18%) 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 138(92%) cases and TH titres >1:200 in 127(84.67%) cases.

Blood culture positive for Salmonella typhi noted in 41(27.33%) cases. (Table 7).

Discussion

The most common symptom in typhoid is the high-grade fever, which is the commonest manifestation in most of the diseases. So, assessment of a child presenting with complain of the fever in the initial days of infection is the most difficult challenge to most of us. The confirmed diagnosis of typhoid fever requires blood culture or bone marrow culture. Widal test is a type of blood test which is another supportive test for Salmonella typhi infection. In India, due to poor knowledge about enteric fever and anxiety of parents for their children, there is a tendency in most of the cases to start antibiotics directly without any confirmatory laboratory tests in the initial 2-5 days which might modify the treatment course and making the case more difficult for in interpretations of lab investigations.

Out of sample population of 150, 90 (60 %) were males and 60 (40 %) were females. Out of all these patients, maximum cases (58 %) were from age group of 7-12 years of age. Some outher studies like study done by R Modi et al [10], Devaranavadagi RA et al [11] also reported maximum incidence of typhoid cases in children in the age group of 6-10 years and above 5 years of age respectively. In our study, the most common symptom was fever (100 %), followed by anorexia (71.33 %), vomiting (38.67 %), appetite loss (23.33 %), rose spots (18.67 %), headache (14.67 %), and cough (8.67 %), diarrhea (5.33 %). Some other studies like Kapoor et al [12], Chowta et al [13] and Parry et al [14] also showed approximately same results. Contradictory to this, a study done by Joshi et al reported headache as the most common symptom next to fever [15]. The most common physical findings found in our study was toxic look (68.67 %) followed by coated tongue (62.67 %) and hepatomegaly (40 %). A similar study done by Laishram et al reported coated tongue (80%) as the most common sign followed by Hepatomegaly (76%) and splenomegaly (38%) [16].

We observed high incidence of typhoid fever in lower class (28.67 %) and lower middle class (48 %), lesser in upper middle-class society (14 %) and least in upper class (9.33 %). This can be explained by differences in drinking water sources and hygienic practices like hand washing and sanitary toilet facilities. Similar results were reported in other study [17].

Conclusion:

The burden of typhoid fever shows substantial variation within as well as between countries. Commonly identified risk-factors include a lack of clean drinking water, poor sanitation, inadequate hygiene practices and low socio-economic status. 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. Food handlers especially in hotels, hostels and government schools should be educated about proper hand washing techniques. Also, typhoid vaccination and rationale use of antibiotics based on the culture sensitivity pattern will help in reducing the burden of the disease.

Typhoid fever should be suspected and investigated in all children with short and long duration fever without localizing signs. Early diagnosis and institution of appropriate antibiotics therapy is of paramount importance in the management of typhoid fever. Fever, malaise, anorexia, vomiting, chills, headache, coated tongue, diarrhea and hepatomegaly are the common clinical manifestations of enteric fever. Normal to raised leukocyte count is more common; however, neutropenia and eosinopenia may be a prominent finding.

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