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Original Article

Demographic, Clinical, Serological and Bacteriological Profile of Typhoid Fever Among Children Attending an Insurance Hospital

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ABSTRACT

INTRODUCTION: Typhoid fever is a multisystem infectious disease caused by the gram-negative bacterium Salmonella enterica serovar Typhi and, less commonly, Salmonella Paratyphi A. **AIM:** To get an insight of the demographic, clinical, serological and bacteriological profile of Typhoid Fever among the children attending an insurance hospital. **METHODOLOGY:** This study was designed as a hospital-based cross-sectional study conducted in the General Paediatrics Ward of ESIC Hospital, Rohini, Delhi. **RESULT:** Typhoid fever predominantly affected children aged 3–8 years, with fever as the universal symptom; blood culture was positive in 48% of cases, while Widal and Typhidot showed moderate positivity but low sensitivity and specificity without statistically significant correlation.Most Salmonella Typhi isolates were sensitive to third-generation cephalosporins and azithromycin, whereas fluoroquinolone resistance was higher, particularly in younger children, and the majority of patients responded to single-drug therapy. **CONCLUSION:** Typhoid fever commonly affects school-going children and presents predominantly with fever and gastrointestinal symptoms, with blood culture remaining the most reliable diagnostic modality compared to serological tests. Rational antibiotic use guided by local sensitivity patterns, along with early diagnosis, vaccination, and improved sanitation, is essential to reduce morbidity and prevent emerging drug resistance in pediatric typhoid fever.

Keywords: Typhoid fever, Salmonella Typhi, azithromycin.

INTRODUCTION

Typhoid fever is a multisystem infectious disease caused by the gram-negative bacterium Salmonella enterica serovar Typhi and, less commonly, Salmonella Paratyphi A.[1] It continues to be a major public health concern in many developing countries, including India, where inadequate access to safe drinking water and proper sanitation facilitates its transmission. Worldwide, typhoid fever affects approximately 26.9 million people annually, with an estimated mortality rate of around 1%, leading to nearly 270,000 deaths each year.[2] In India, the pooled incidence is estimated at 377 per 100,000 person-years, predominantly affecting children between 5 and 15 years of age. Certain regions, such as Kolkata, report particularly high incidence and prevalence rates. Clinically, typhoid fever presents with prolonged fever, malaise, abdominal pain, diarrhea or constipation, vomiting, and hepatosplenomegaly[3]. These nonspecific symptoms often mimic other tropical infections such as malaria, dengue, and viral fevers, making clinical diagnosis challenging. Although uncommon, severe complications such as intestinal hemorrhage, perforation, hepatitis, myocarditis, meningitis, and neuropsychiatric manifestations may occur, particularly in untreated or severe cases.[4] According to the World Health Organization, a confirmed case of typhoid fever requires fever persisting for at least three days along with laboratory confirmation through isolation of S. Typhi from blood or other sterile sites.[5] Blood culture remains the gold standard for diagnosis, although prior antibiotic use can reduce its sensitivity. Serological tests such as the Widal test and Typhidot are also used; however, they have limitations including false-positive and false-negative results and limited availability in resource-constrained settings.[3,4] These diagnostic challenges may delay treatment and contribute to increased morbidity and mortality.Management of typhoid fever includes adequate hydration, correction of electrolyte imbalances, antipyretics, and

appropriate antibiotic therapy. The Indian Academy of Pediatrics recommends third-generation cephalosporins and azithromycin as first-line treatment for uncomplicated cases, though therapy should ideally be guided by antibiotic susceptibility patterns.[6] Interestingly, recent years have shown a re-emergence of sensitivity to conventional first-line antibiotics in some regions. Preventive strategies such as improved sanitation, safe water supply, hygiene practices, and vaccination play a crucial role in reducing disease burden[7,8]. The newer conjugate typhoid vaccines are safe, effective, and suitable for young children and older adults.

AIM

To get an insight of the demographic, clinical, serological and bacteriological profile of Typhoid Fever among the children attending an insurance hospital.

METHODOLOGY

This study was designed as a hospital-based cross-sectional study conducted in the General Paediatrics Ward of ESIC Hospital, Rohini, Delhi. The study population comprised children aged 1 to 12 years who were admitted to the general paediatrics ward during the study period from December 2020 to June 2022. Fever was defined as an increase in body temperature of more than 38°C. Children were included in the study if they were between 1 and 12 years of age and had a history of fever for three or more days within seven consecutive days. Children were excluded if the fever was attributable to other identifiable causes such as urinary tract infection, pneumonia, dengue, malaria, or other confirmed infections. Additionally, immunodeficient children, those receiving immunosuppressive therapy, or those who had received immunoglobulins within three months prior to hospital admission were excluded from the study to avoid confounding factors that could influence clinical presentation or immune response.

RESULTS

Table-1:Distribution of study subject according to Age

Age in years	Number	Percentage
1-3	24	16%
4-8	84	56%
9-12	42	28%

Out of 150 cases enrolled, 24 (16%) cases were 1 to 3 year of age, 84 (56%) were between >3 to 8 years of age and 42 (28%) were between >8 to 12 year of age.

Table-2:Distribution of Study Subject According to Clinical Profile

Symptoms		Cases
	Fever	150 (100%)
	Vomiting	44 (29.33%)
	Pain abdomen	39 (26%)
	Diarrhoea	23(15.33%)
	Abnormal Behaviour	0
	Seizure	0
	Jaundice	0
Sign	Coated tongue	86 (57.33%)
	Hepatomegaly	68(45.33%)
	Splenomegaly	21(14%)
	Dehydration	24 (16%)
	Pallor	27 (18%)

	Relative Bradycardia	12 (8%)

Among the 150 cases, fever was present in all patients, with the most common associated symptoms being vomiting in 44 (29.33%), abdominal pain in 39 (26%), and diarrhea in 23 (15.33%) cases, while none exhibited abnormal behavior, seizures, or jaundice.On examination, coated tongue was the most frequent sign seen in 86 (57.33%) cases, followed by hepatomegaly in 68 (45.33%), pallor in 27 (18%), dehydration in 24 (16%), splenomegaly in 21 (14%), and relative bradycardia in 12 (8%) cases.

Table 3:LABORATORY PARAMETERS

Hemoglobin(gm/dl)	<7	6
	7-10	53
	>10	91
TLC	<4000	12
	4000-11000	118
	>11000	20
Platelet Count (per mm3)	<50,000	0
	50,000- 1 lakh	18
	>1 lakh	132
CRP	Positive	58 (38.67%)
	Negative	92 (61.33%)
LFT	Normal	129 (86%)
	Abnormal	21 (14%)

Among the 150 cases, anemia was observed with 6 (4%) having Hb <7 g/dL, 53 (35.33%) between 7–10 g/dL, and 91 (60.67%) >10 g/dL, possibly reflecting poor nutritional status; leukocyte counts were normal in 118 (78.67%) cases, low in 12 (8%), and elevated in 20 (13.33%).Thrombocytopenia (50,000–1 lakh/mm³) was seen in 18 (12%) cases while 132 (88%) had counts >1 lakh/mm³, CRP was positive in 58 (38.67%) cases, and deranged LFT was noted in 21 (14%) cases, with the majority showing normal parameters.

Table-4:Distribution of Study Subject According to Typhidot Positive , Widal Reactive and Serology Positive & Blood Culture Positive cases

		Blood culture		Total	P value
		Positive	Negative		0.146
Typhidot	Positive	33 (42.31%)	45 (57.69%)	78	
	Negative	39 (54.17%)	33 (45.83%)	72	
Widal	Reactive	40 (50 %)	40 (50%)	80	0.600
	Non reactive	32 (45.71%)	38 (54.29%)	70	
Serology (Widal &Typhidot)	Positive	44	58	102	0.0823
	Negative	28	20	48	

Among Typhidot-positive cases, 33 (42.31%) were blood culture positive and 45 (57.69%) were negative, while in Typhidot-negative cases, 39 (54.17%) were culture positive; similarly, among Widal-reactive cases, 40 (50%) were culture positive compared to 32 (45.71%) culture-positive cases in Widal non-reactive patients.Of the 72 blood culture–positive

cases, 44 (61.11%) were serologically positive and 28 (38.89%) were negative, whereas among culture-negative cases, 58 (74.36%) were serologically positive, with a p-value of 0.0823 indicating no statistically significant association.

Table-5: Diagnostic Parameters of Various test taking Blood Culture as Gold standard

	Sensitivity	Specificity	Positive predictive value	Negative predictive value
Typhidot	45.83%	42.31%	42.31%	45.83%
Widal	55.56%	48.72%	50%	54.29%

Following table and graph showing Sensitivity, Specificity, Positive Predictive Value and Negative Predictive Value of various tests in Blood culture positive cases. Widal has higher Sensitivity, Specificity and was found to be superior to Typhidot in terms of Diagnostic Predictive Value.

Table-6:Comparison of Diagnostic parameter in Two groups

		Antibiotics received before admission		
		Yes(50 cases)	No(100 cases)	P value
Blood culture	Positive	22(44%)	51(51%)	0.419
	Negative	28(56%)	49(49%)	
Typhidot	Positive	29(58%)	49(49%)	0.298
	Negative	21(42%)	51(51%)	
Widal	Reactive	23(46%)	57(57%)	0.131
	Non reactive	27(54%)	43(43%)	

Out of 150 cases, 50 (33.33%) had received empirical antibiotics prior to admission, among whom 29 (58%) were Typhidot positive, 23 (46%) were Widal reactive, and 22 (44%) had positive blood culture for Salmonella.Among the remaining 100 (66.67%) cases who had not received prior antibiotics, 49 (49%) were Typhidot positive, 57 (57%) were Widal reactive, and 51 (51%) showed blood culture positivity.

Table-7:Pattern of Antibiotics Susceptibility of S.Typhi among Culture Positive Cases

Sensitivity pattern	Ceftriaxone	Azithromycin	Meropenem	Cefixime	Amikacin	Fluoroquinolones
Sensitive	65	62	72	65	71	49
Resistant	7	10	0	7	1	23

Out of 72 blood culture positive cases, S.Typhi was sensitive to Meropenem in 72 (100%) cases, to Amikacin in 71 (98.61%) cases, to Ceftriaxone and Cefixime in 65 (90.28%) cases, to Azithromycin in 62 (86.11%) cases and to Fluoroquinolones in 49 (68.06%) cases. It showed resistance to Fluoroquinolones in 23 (31.94%) cases.

Table-8: Distribution of study Subject According to No.of Antibiotic required to Respond

No. of Antibiotic	Number	Percentage
1	115	76.67%
2	25	16.67%
3	10	6.67%

Out of 150 cases, 25 (16.67%) cases needed second antibiotic and 10 (6.67%) cases needed third antibiotic to respond as fever was not resolved even after 7 days of starting antibiotics. This was because of resistance to initial antibiotics shown in Blood culture reports or because of complications.

Table-9: Mean duration of being afebrile after starting of Antibiotic in Different Age Group

Age group	Mean duration
1-3 years	6.25 days
> 3 to 8 yrs	5.54 days
> 8 to 12 yrs	5.19 days

In younger age group of 1 to 3 years, mean duration of being afebrile after starting antibiotics was 6.25 days, mean duration of being afebrile was 5.54 days in age group of >3 to 8 years while in older age group of >8 to 12 years, mean duration of being afebrile after starting antibiotics was 5.19 days.

DISCUSSION

We found that out of 150 cases, 16% (24) were 1 to 3 years of age, 56% (84) were >3 to 8 years of age and 28% (42) were >8 to 12 years of age. In our study, school going children were mostly affected. Behera J et al (2021)[9] found 75% of children belonged to 6 to 14 years of age, little more compared to our study.

In our study, we found fever in 100% cases, vomiting in 29.33% , abdominal pain in 26% and diarrhoea in 15.33% cases. No cases of encephalopathy, seizures and clinical jaundice were found. Similar to our study, Ahmad MK (2021)[10] found gastrointestinal problems were the second most common after fever (100%), with vomiting in 45.5% cases, pain in the abdomen in 20.5% and diarrhea in 12.5% cases.

In our study, the most common sign was coated tongue in 57.33% (86) cases followed by hepatomegaly in 45.33% (68), anemia in 39.33% (59), splenomegaly in 14% (21), thrombocytopenia in 12% (18), leucopenia in 8% (12). We observed raised CRP in 38.67% (58) and deranged LFT in 14% (21) cases. Similar to our study Modi R et al (2016)[11] observed the most prevalent sign was coated tongue in 66.32% followed by hepatomegaly in 36.73%, splenomegaly in 20.40% cases.

We found Blood culture positive for Salmonella in 48% (72) cases, Typhidot positive in 52% (78) cases and Widal was reactive in 53.33% (80) cases. B L Sherwal et al (2004)[12] 57% cases reactive to Widal , comparable to our observation.

In our study, we found Blood culture for Salmonella Typhi was positive in 42.31% (33) among Typhidot positive (78) cases while culture was positive in 54.17% (39) among Typhidot negative (72) cases. This correlation was statistically not significant as p value is > 0.05.

Sensitivity and Specificity of Typhidot was 45.83% and 42.31% respectively in our study taking Blood culture as the gold standard.

In our study, we found Blood culture for S. Typhi was positive in 50% (40) cases among Widal reactive (80) cases while Blood culture for S.Typhi was positive in 45.71% (32) cases among Widal non reactive (70) cases. This correlation was statistically not significant as p value is >0.05. Sensitivity of Widal was 55.56% , Specificity of Widal was 48.72% in our study. The Positive Predictive Value and Negative Predictive Value of the Widal test were 50% and 54.29% respectively in our study.

We found 68% (102) cases were serologically (Widal andTyphidot) positive amongst which 43.14% (44) cases were Blood culture positive & we also found 58.33% (28) were Blood culture positive among serologically negative cases (48). This correlation was statistically not significant as p value is >0.05.

In our study out of 150 cases, 31.33% (50) cases received antibiotics before admission. In this group we found 44% (22) cases were Blood culture positive, Widal was reactive in 46% (23) cases and Typhidot was positive in 58% (29) cases. 66.67% (100) cases did not receive antibiotics before admission. In this group we found 51% (51) cases were Blood culture positive, Widal was reactive in 57% (57) cases and Typhidot was positive in 49% (49) cases. On comparing these two groups, we observed Blood culture positivity, Typhidot & Widal reactivity showed minor variations which was statistically not significant as p value is > 0.05.

On comparing sensitivity patterns of S. Typhi among Blood culture positive cases in different age groups, we observed that all three age groups had good sensitivity to Meropenem, Amikacin, Ceftriaxone, Cefixime & Azithromycin. But sensitivity to Fluoroquinolones was significantly lower than other antibiotics. In the younger age group of 1 to 3 years, resistance to Fluoroquinolones was 37.50%, >3 to 8 years age group it was 32.50% and >8 to 12 years age group it was 25%. Fluoroquinolones resistance was more in younger age groups compared to older age groups although it was statistically not significant as p value is >0.05 and could be due to higher blood culture positivity in younger age groups.

We observed most of the patients responded to one antibiotic only. In 16.67% (25) cases required a second antibiotic and 6.67% (10) cases required a third antibiotic to respond. This was because of resistance of S. Typhi to initial antibiotics shown in susceptibility testing or because of development of complications.

The mean duration of becoming afebrile after starting antibiotics in the age groups of 1 to 3 years, >3 to 8 years and >8 to 12 years was 6.25 days, 5.54 days and 5.19 days respectively. The younger children took more time to respond to antibiotics. This may be due to higher bacterial load, immature immune system and more complications in this age group.

CONCLUSION

In conclusion, this hospital-based cross-sectional study highlights that typhoid fever predominantly affects school-going children, with the highest incidence observed in the 3–8 years age group. Fever was the universal presenting symptom, and gastrointestinal manifestations such as vomiting, abdominal pain, and diarrhea were common, while severe neurological or hepatic complications were not observed. Coated tongue and hepatomegaly were the most frequent clinical signs. Blood culture positivity was observed in nearly half of the cases, whereas serological tests (Widal and Typhidot) showed moderate positivity but demonstrated low sensitivity and specificity when compared with blood culture, and their correlation was statistically not significant. Prior antibiotic intake before admission showed minor variations in diagnostic positivity, but without statistical significance.Antibiotic susceptibility patterns revealed good sensitivity of Salmonella Typhi to third-generation cephalosporins, azithromycin, meropenem, and amikacin across all age groups, while resistance to fluoroquinolones was comparatively higher, especially in younger children. Most patients responded to a single antibiotic, although a subset required escalation due to resistance or complications. Younger children took slightly longer to become afebrile, possibly due to higher bacterial load and immature immunity.

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