

Original research article

**STUDY OF ENTERIC FEVER IN CHILDREN BY CLINICAL,  
LABORATORY PROFILE AND SONOGRAPHIC  
EVALUATION OF GALL BLADDER IN A TERTIARY CARE  
CENTRE IN HARYANA**

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**Abstract**

**Background:** Enteric fever caused by *Salmonella* Typhi is endemic in third world countries, with a remarkable predominance in India.<sup>1</sup> The enteric fever had been studied extensively in children in reference to the clinical setting and their correlation with laboratory parameters in reference to antibiotic sensitivity.

**Objective:** The objective of the present study is to correlate clinical presentations with laboratory findings, antibiotic sensitivity and ultrasonographic finding of gall bladder in paediatric cases of typhoid fever for better management.

**Material and Methods:** It was a cross sectional, observational study conducted in Adesh Medical College, Shahbad, Haryana, for a duration of 12 months from November 2022 to October 2023. All enteric fever cases from 1 to 15 years of age were included. Children who had already received typhoid vaccine, diagnosed with paratyphoid fever, with other causes of fever and who refused to be a part of study were excluded. Study protocol was approved by Institutional Ethics committee. Informed consent was taken from the patients' parents. All statistical calculations were done using (Statistical Package for the Social Science) SPSS 21version (SPSS Inc., Chicago, IL, USA) statistical program for Microsoft Windows.

**Results:** Majority of children 38 (38%) were from the age group of 5-10 years, of which 53% were males and 47% were females. There was correlation between history

of taking antibiotic intake during hospital stay and blood culture findings (*Salmonella* Typhi positive, p value=0.001). Correlation of clinical features with elevated liver enzyme SGOT (>55IU/L) was significant (p value =0.001). Also there was significant correlation between hepatomegaly and splenomegaly with rise in SGPT level (p value = 0.001). 12% children had gallbladder wall edema, 7% had pericholecystic edema, 4% were found to be have biliary sludge and 2% had cholecystitis.

**Conclusion:** Enteric fever is a major threat in the paediatric age group. For the diagnosis of typhoid fever, Typhidot is better than Widal test as it is more sensitive, easy to perform, detects the cases at early stage and results are available on the same day.

**Keywords:** Enteric fever, typhi dot, salmonella

### **Introduction**

Enteric fever caused by *Salmonella* Typhi is endemic in third world countries, with a remarkable predominance in India. Indeed, an early diagnosis is difficult because of several spectra of clinical features of the disease <sup>[1]</sup>. Enteric fever is one of the common causes of fever in children with varied presentations and significant difference in the signs and symptoms compared to adults. It presents as acute multisystemic febrile illness almost throughout the year with monsoon clustering patterns. The disease burden is compounded by explosive emergence of multidrug resistant salmonellae <sup>[2]</sup>. Gallbladder involvement is a well-recognized complication of enteric fever because the bacilli multiply in the bile in very high titers. However, only a few case reports and one small pediatric prospective study have described gallbladder sonographic findings associated with *Salmonella* enteric fever <sup>[3]</sup>. This study was a large prospective study with a purpose to analyze the varied clinical presentations, correlation with laboratory investigations with special reference to antibiotic sensitivity and ultrasound changes in gall bladder of patients diagnosed with enteric fever.

### **Material and Methods**

This study was a cross sectional, observational study, conducted in Adesh Medical college and hospital, Shahbad, Haryana over a period of 12 months from November 2022 to October 2023 by the approval of Institute Ethic committee. A total of 100 children from 1 to 15 years of age diagnosed as enteric fever (Typhidot IgM, sensitivity 84% and specificity 79%) <sup>[4]</sup> on the basis of clinical features, laboratory diagnosis and gall bladder changes on ultrasound were included after taking informed consent from parents. Children who have already received typhoid vaccine, diagnosed with paratyphoid fever, with other causes of fever and those who refused to be a part of study were excluded. Information on the socio-demographic profile, presenting complains, clinical profile, laboratory data, treatment given, and complication, were collected on a Microsoft Excel sheet. All statistical calculations were done using (Statistical Package for the Social Science) SPSS 21version (SPSS Inc., Chicago, IL, USA) statistical program for Microsoft Windows.

**Results**

Among 100 children, 38% (38/100) were from the age group of 5-10 years. 53% (53/100) children were males and 47% (47/100) were females. 50% (50/100) of children belonged to lower class family and 40% (40/100) to upper class family as per Modified Kuppuswamy’s scale. The water source was from tank water, ground water and filtered water for 52% (52/100), 36% (36/100) and 12% (12/100) children respectively. 73% (73/100) children had prior history of antibiotic intake.

All children (100/100) had history of fever. Anorexia, vomiting, pain abdomen and cough were the predominant symptoms in 96% (96/100), 53% (53/100), 41% (41/100) and 23% (23/100) children respectively with enteric fever at presentation. On examination 73% (73/100) children had coated tongue, 50% (50/100) had hepatomegaly, 30% (30/100) had splenomegaly and 29% (29/100) had hepatosplenomegaly. 68% (68/100) children had pallor while 9% (9/100) had jaundice. Taking 11.5gm% as Hb cut off value, 28% of the children were found to be anaemic and up to 27% of the children had leukopenia, 24% had eosinopenia and 9% had thrombocytopenia. SGOT, SGPT were found to be elevated in 36% and 30% cases respectively. Liver function test showed that 12% of children had abnormal serum bilirubin.

Blood culture results for *Salmonella* Typhi was positive in 12% of the patients while 88% blood cultures showed no growth. Only 25% children had gallbladder findings.

Table 1 shows significant correlation of gall bladder findings with blood culture (*Salmonella* Typhi, p=0.001).

**Table 1:** Correlation of sonographic gall bladder findings, antibiotics given during hospital stay and blood culture

		Blood Culture				Total	Chi-square value	p-value
		No Growth	Percentage	<i>Salmonella</i> Typhi	Percentage			
Gall bladder	Absent	72	82%	3	25%	75	18.181	0.001
	Present	16	18%	9	75%	25		
Prior intake of antibiotics	Absent	23	26%	4	33%	27	0.278	0.598
	Present	65	74%	8	67%	73		

Another significant correlation between prior history of antibiotic intake and blood culture finding (p value =0.01) was found. (Table 2)

**Table 2:** Correlation of antibiotics given during hospital stay and Blood culture

		Blood Culture				Total	Chi-square value	p-value
		No Growth	No Growth	Salmonella Typhi	Salmonella Typhi			
Treatment	Cefotaxime	22	25%	4	33%	26	11.198	0.011
	Cefotaxime plus AZithromycin	5	6%	2	17%	7		
	Ceftriaxone	57	65%	3	25%	60		
	Ceftriaxone plus Azithromycin	4	5%	3	25%	7		

During hospital stay, Ceftriaxone was given to 60% of children while Cefotaxime, Ceftriaxone plus Azithromycin and Cefotaxime plus Azithromycin was given to 26%, 7%, 7% children respectively.

Resistance pattern of isolated *S. Typhi* strains is depicted in figure 1. Approximately 50% of the strains of *S. Typhi* were resistant to Amikacin and Gentamycin, 42% resistant to Ciprofloxacin, 25% resistant to Amoxiclav and 8% to Azithromycin. However no resistant to Cefotaxime, Cefepime, Meropenem, Ceftriaxone, Ertapenem, Piptaz, Cefazolin and Aztreonam was seen.

Also a significant relationship between hepatomegaly and splenomegaly with rise in SGOT level (p= 0.001) was found.

**Table 3:** Gall bladder findings on ultrasonography

Ultrasound Abdomen	No. of cases	Percentage
Cholecystitis	2	2%
Biliary sludge	4	4%
Pericholecystic oedema	7	7%
Gallbladder wall oedema	12	12%

Table 3 showed the gall bladder findings on ultrasonography. 12% children had gallbladder wall edema, 7% had pericholecystic oedema, 4% were found to be have biliary sludge, 2% had cholecystitis.



Fig 1

Fig 2

**Gall bladder finding:** Gall bladder wall edema (Figure 1, Figure 2).

### Discussion

Typhoid fever is an endemic communicable disease with high incidence in developing countries, caused by *Salmonella enterica* serotype Typhi which spreads by eating food or drinking water contaminated with the faeces of an infected person. Risk factors include poor sanitation and poor hygiene<sup>[5,6]</sup>.

Our study was conducted to analyze the usefulness of USG in the diagnosis of typhoid fever.

38% of the children belonged to the age group of 5-10 years. Similar results have been reported in study by Dahiya S *et al.*<sup>[7]</sup> 53% children were males and 47% were females, in contrast to the study conducted by Ishaq U *et al.*<sup>[8]</sup> were 99 (49.5%) male and 101 (50.5%) female participants were enrolled. 50% children had hepatomegaly, 30% had splenomegaly and 29% had hepatosplenomegaly which is comparable to study conducted by Sirisanthana V *et al.*<sup>[9]</sup> were 73% hepatomegaly and 23% splenomegaly was found. In another study by Kumar R *et al.* hepatomegaly and splenomegaly were present in 88% and 46% cases respectively<sup>[10]</sup>.

Despite culture being the gold standard for diagnosis, complete blood count (CBC) is the preferred test in resource-limited countries where reactive changes in leukocyte counts are deemed clues for the diagnosis of typhoid. Although considered a key feature of typhoid, leukopenia is only present in 25% of the cases<sup>[11]</sup>, similar to our study where leukopenia were found in 27% of cases.

Differential leukocyte counts show consistent eosinopenia (80%) in several studies<sup>[12-13]</sup>. The relationship between acute infection and eosinopenia has been previously described. Sequestration of eosinophils during margination causes certain cytokines to be released which leads to decreased eosinophil counts<sup>[14]</sup>. In our study, eosinopenia was seen in 24% of the cases.

Liver function test showed that 12% of children had abnormal serum bilirubin value as compared to study by Jagadish K *et al.*<sup>[15]</sup> where jaundice was found in 16.1% of children. Our study showed that SGOT, SGPT were elevated in 36% and 30% of cases compared to study by Jagadish K *et al.* where raised levels of serum glutamic oxaloacetic transaminase (SGOT) (61.3%), serum glutamic pyruvic transaminase

(SGPT) (48.4%) was reported.

Gallbladder infections are a well-recognized complication of enteric fever as the bacilli multiply in the bile in very high titers<sup>[16]</sup>. However, only a few case reports<sup>[17]</sup> and one small pediatric prospective study<sup>[18]</sup> have described gallbladder sonographic findings associated with *Salmonella* enteric fever.

The gallbladder and bile ducts are commonly infected during typhoid fever, but most biliary infections are asymptomatic. The bacilli initially infect and multiply within the small intestine. After invading the intestinal lymphatic and mesenteric lymph nodes, bacteremia occurs, which allows the organism to seed the liver and biliary ducts. The organism is excreted into the bile and concentrated within the gallbladder in high titers. Our study showed gallbladder finding in 25% of cases and a significant correlation of gall bladder finding with blood culture (*Salmonella* Typhi)  $p=0.001$ . Similar results were found in study by Shetty PB *et al.*<sup>[19]</sup>.

### **Conclusion**

Majority of children were from the age group of 5-10 years. Approximately 50% of the strains of *S. Typhi* were resistant to Amikacin and Gentamycin, 42% resistant to Ciprofloxacin, 25% resistant to Amoxiclav and 8% to Azithromycin. However no resistant to Cefotaxime, Cefepime, Meropenem, Ceftriaxone, Ertapenem, Piptaz, Cefazolin and Aztreonam was seen.

There was a correlation between prior history of antibiotic intake and blood culture findings (*Salmonella typhi* positive). ( $p=0.01$ ). A significant relationship between hepatomegaly and splenomegaly with rise in SGOT level ( $p= 0.001$ ) was found. Abnormal gallbladder sonographic findings were seen in 25% of cases with gall bladder wall edema and pericholecystic oedema as the most common finding.

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