Original Research Article

Study on ultrasound observations in children with typhoid fever in a tertiary care hospital

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ABSTRACT

Background: Enteric fever continues to be endemic in poor countries globally, although it has been eradicated from the developed nations due to their well-organized sanitation and protected water supply. The five Fs most concerned with spread of typhoid disease are fingers, food, fomites, flies, and feces. Enteric fever is predominantly caused by *Salmonella typhi* and next in frequency is *Salmonella paratyphi*. Very less literature is available on radiological manifestations of typhoid fever in children on the basis of age difference in India. Hence, a study was conducted to observe the radiological findings and to correlate with laboratory manifestations in typhoid fever. Objectives of the study was to observe the ultrasound abdomen changes in Typhoid fever at rural area.

Methods: The current study was conducted at Department of pediatrics of Narayana Medical College Hospital, Nellore, Andhra Pradesh state in a period of one year. All patients presenting with fever having positive for Widal test were included. In total 50 patients were included and divided into 2 age groups, <5 years and >5years. The laboratory results and abdominal ultrasound were conducted in the two groups and compared.

Results: Total 20 patients in <5 years age and 30 patients in >5 years were enrolled. Male to female ratio was 2:1 in both groups. Common laboratory findings showed 32 patients (64%) with Anemia, elevated liver enzymes in 40 patients (80%), and elevated ESR in 42 patients (84%). 45 patients have Splenomegaly and hepatomegaly with normal parenchymal echotexture. Gallbladder sludge and biliary sludge was seen in 6 patients. Thickened gall bladder in 34 patients (68%) was observed. Bowel wall thickening seen in 32 patients (64%). mesenteric lymphadenopathy in 36 patients (68%) observed. All were recovered by treatment.

Conclusions: On ultrasound, splenomegaly, hepatomegaly, and thick-walled gallbladder were observed in most of the children with typhoid fever. Therefore, ultrasound can also be used as supportive diagnose along with laboratory parameters due to it is a non-invasive and economical tool of diagnosing typhoid.

Keywords: Anemia, Splenomegaly, Typhoid fever, Ultrasound

INTRODUCTION

Typhoid fever is an acute systemic febrile infection caused by *Salmonella enterica* Serovar *typhi* (*S. typhi*). Typhoid fever is an acute febrile illness that constitutes a major public health problem in many developing countries of the world.¹ This disease has also been increasingly reported from the developed countries.² According to Center for Disease Control and Prevention

report, there are 21.6 million typhoid cases annually, with the annual incidence varying from 100 to 1000 cases per 100000 population and 600000 deaths occurring per year.^{3,4} The clinical picture of typhoid fever has changed considerably during recent years with the emergence of multidrug resistant strains of *S. typhi* (MDRST).^{5,6} *S. typhi* evades triggering an innate immune response in the gut of its human host using a stealth approach to allow colonization of deeper tissues in the body.^{7,8} This

property may contribute to the unique findings associated with typhoid fever, such as the absence of local inflammation characterized by the lack of overt thickening of the bowel. Typhoid fever is commonly associated with systemic manifestations, such as progressive fever, leukopenia, bradycardia, rose spots and splenomegaly, rather than regional intestinal inflammation. In the course of enteric fever, various organs can be involved leading to a wide range of presentation from uncomplicated typhoid fever to a complicated one involving multiple organs. Several studies have reported ultrasonographic (US) findings in typhoid fever. Puylaert et al, reported US findings in three patients from the United States with typhoid fever, revealing enlarged mesenteric lymph nodes (MLNs) and mural thickening of the terminal ileum.⁹ Mateen et al, demonstrated finding splenomegaly, hepatomegaly and a thick-walled gallbladder are also useful for diagnosing typhoid fever; in all cases of typhoid fever examined they found bowel wall thickening and enlarged MLNs and noticed the five-layered intestinal wall structure was preserved, suggesting minimal destruction.¹⁰ A recent study by Voedisch et al, reported the use of a mouse model to study *S. Typhimurium* infection; they found MLNs comprised a vital barrier against systemic *S. Typhimurium* dissemination.¹¹ Since humans are exclusively susceptible to *S. Typhi*, it is important to determine whether morphological changes in MLNs and the degree of enterocolitis seen in mouse models are also seen in patients with typhoid fever. Ultrasound of the abdomen was used to study widal test confirmed typhoid fever cases.

METHODS

This was a hospital-based study conducted from June 2012 to July 2013 at the department of paediatrics, Narayana Medical College Hospital, Nellore, Andhra Pradesh. This hospital is one of the biggest tertiary teaching hospitals in Andhra Pradesh situated at Rural Nellore. The study was designed to include demographic, clinical information and radiological changes observed in the patients. The patients were specifically questioned regarding past medical history of jaundice and medications etc.

Inclusion criteria

Children of age 2-13 years presented with fever of 5 days or more with signs and symptoms suggestive of typhoid fever and positive Widal test or Typhidot tests were included in the study. Patients with positive blood culture for *S. typhi* were registered for the study.

Exclusion criteria

Whereas patients with history of chronic liver disease and positive viral hepatitis were excluded from the study.

On admission, blood samples were obtained from all the patients for bacteriology malaria parasite. Ultrasound abdomen done for the patients with clinical and bacteriological evidence. Management was done as per standard guidelines for the management of Typhoid fever and it included antibiotics (mainly Ceftriaxone and Ciprofloxacin) and supportive therapy. The antibiotic therapy was started empirically considering the clinical diagnosis of typhoid fever and likely sensitivity to drugs, and therapy has continued accordingly after receiving the culture and sensitivity report. Data was analyzed and expressed as mean age $\pm$ SD.

RESULTS

A total of 50 patients fulfilled the inclusion criteria. Overall, the mean age of the patients in the study was 7.8 $\pm$ 5.8 years (2-13 years). 20 patients in <5 years age and 30 patients in >5 years were enrolled, 33 Males (66%) and 17 females (34%), there was no significant age difference between males and females. Majority of the patients came from rural area. Most of the patient's parents involved in the study were laborers and agriculture fields. The duration of illness was 4-10 days before the patients attended department of pediatrics at the hospital. Fever, headache, vomiting, abdominal pain, generalized body pain, loss of appetite were the main symptoms observed overall. Very few patients fever, headache, abdominal pain, yellowish discoloration of eyes and urine were the presenting symptoms. Sick appearance, fever, anemia, abdominal tenderness, hepatomegaly and splenomegaly were the main clinical signs (Table 1). Common laboratory findings showed 26 patients (52%) with Anemia, low platelet count observed in 15(30%) patients respectively.

Table 1: Clinical data of 50 patients with Typhoid fever.

Parameter	Number	Percentage
Males	33	66
Females	17	34
Symptoms		
Fever	50	100
Headache	44	88
Anorexia	40	80
Myalgia	39	78
Abdomen pain	36	72
Vomiting/Nausea	22	44
Diarrhea	8	16
Jaundice	4	8
Abdomen Tenderness	32	64
Anemia	26	52
Low platelet count	15	30
Ultrasound findings		
Hepatomegaly	28	56
Splenomegaly	22	44
Gall bladder thickening	29	58

Ultrasound abdomen revealed hepatomegaly in 28 (56%), splenomegaly in 22 (44%) were observed. There was normal parenchymal echotexture of liver observed. Thickened gall bladder in 29 patients (58%) was observed (Figure 1). The mean hospital stay was 12 ± 4 days (8-17 days). The outcome was favorable in all the cases and were discharged after completion of antibiotic therapy. In the follow up, jaundice disappeared within 10 days while in the hospital; and all the abnormal clinical conditions returned to normal 3 weeks after successful antibiotic therapy. US abdomen performed during the follow up was normal in all the cases.

Figure 1: Ultrasound of abdomen of children's with typhoid fever. Observations showing gall bladder wall thickening, hepatomegaly and splenomegaly.

DISCUSSION

Enteric fever is an acute systemic disease consisting of malaise, fever, abdominal discomfort, transient rash, hepatosplenomegaly, and leukopenia. Most commonly enteric fever is due to *S. typhi* and is referred to as typhoid fever. Less commonly enteric fever can be caused by other *Salmonella* serotypes and is referred to as paratyphoid fever. The incidence of complication in typhoid fever is reported variably.

Hepatomegaly is usually observed in enteric fever after the first week of illness, most often persists throughout the period of marked elevation of temperature, becomes less evident as defervescence progresses and usually lasts for 3-4 weeks. A higher incidence of hepatomegaly has been reported in children suffering from multidrug resistant typhoid fever.¹²⁻¹⁵ Incidence of hepatomegaly is believed to be 2-3 times more common in typhoid fever than para typhoid fever and has been reported between 23-90% in children with typhoid fever. Hepatomegaly was observed in 56% of the cases. The enlargement of liver in typhoid fever is caused by hypertrophy and hyperplasia of Kupffer's cells. Jaundice in typhoid fever tends to occur at the peak of fever which differentiates it

from viral hepatitis in which case fever usually comes down after the appearance of jaundice.¹⁶ When jaundice is present in typhoid fever hepatitis, cholangitis, cholecystitis and hemolysis will be the most likely cause. Morgestrn et al, has reported incidence of jaundice in 9% of cases of typhoid fever.¹⁷ where as Giltin has reported jaundice in 33% cases.¹⁸ The presenting symptoms of 8% patients were jaundice. Hepatomegaly is usually present in enteric fever after the first week of illness, presumably caused by hypertrophy and hyperplasia of Kuffer cells. In this case series, hepatomegaly was observed in 56% patients, which is higher than previous reports by Ahmet et al, (42%) and Rasoolinejad et al, (52.3%).^{19,20} We noted splenomegaly in 34% patients which is higher than previous reports i.e. 26% and 20% by Mirsadraee et al, and Bhutta ZA respectively.^{21,22}

Hematological changes are common in typhoid fever. Significant changes include anemia, leucopenia and thrombocytopenia. Bone marrow suppression and hemophagocytosis are considered to be an important mechanism in producing hematological changes. In the case series, hemoglobin was low in 52%, higher than reported by Alam (31%).²³ Thrombocytopenia was present in 30% cases, which is reported only in 10% of typhoid fever in Khosla et al, study.

CONCLUSION

In conclusion, recognition of typhoid fever with liver changes is important since it has to be differentiated from other conditions such as viral, malarial and amoebic infections. In the presence of high-grade fever, jaundice and tender hepatomegaly in patients from rural areas with unhygienic conditions should arouse suspicion of typhoid fever. Hepatic dysfunction in these cases, despite its high incidence and serious nature, is transient and responds favourably to appropriate antibiotic therapy.

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