

**ORIGINAL ARTICLE****ROLE OF ULTRASONOGRAPHY IN DIAGNOSIS OF ENTERIC FEVER- A CLINICAL STUDY**Vijay Hanchate<sup>1</sup>, Avinash Patil<sup>2</sup><sup>1</sup>Consultant Radiologist, Thane, Maharashtra, <sup>2</sup>Consultant Physician, Dhanwantri Hospital Ovala, Thane- 400607**ABSTRACT:**

**Background:** Enteric fever is caused by Salmonella typhi and paratyphi bacilli and is endemic in many parts of the world. It has remarkable predominance in India. It is the fifth most common infectious disease in India. The present study was conducted to evaluate the efficacy of Ultrasonography (USG) in detection of enteric fever. **Materials & Methods:** This study was conducted in in among 55 patients. All patients underwent USG procedures, along with blood samples of patients were used for culture in xylose deoxycholate agar. Widal test was performed after 7 days of fever. **Results:** Out of 55 patients, 30 were males and 25 were females. The difference was non- significant (P-0.2). At day 5 on USG, out of 55 patients, 55 patients had splenomegaly, 50 had mesenteric lymph nodes enlargement, 45 had bowel thickening, 23 had acalculus cholecystitis and 18 had hepatomegaly. At day 10, 50 patients had splenomegaly, 45 had MLNs, 10 had bowel thickening, 14 had acalculus cholecystitis and 18 had hepatomegaly. At day 10, 25 patients had splenomegaly, 20 had MLNs, 0 had bowel thickening, 5 had acalculus cholecystitis and 18 had hepatomegaly. **Conclusion:** Ultrasound is quick, economical, non invasive and effective for diagnosing enteric fever when serological results are time consuming and in presence of negative cultures.

**Key words:** Enteric fever, splenomegaly, ultrasound

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**INTRODUCTION**

Enteric fever is caused by Salmonella typhi and paratyphi bacilli and is endemic in many parts of the world. It has remarkable predominance in India. It is the fifth most common infectious disease in India. Atypical clinical findings make an early diagnosis difficult. An early diagnosis is difficult because of several spectra of clinical features of the disease. Definitive diagnosis of typhoid fever is made by hemoculture and serological tests, namely Widal test, which requires 4 days and 7 days to show positive results. Improper and inadequate use of antibiotics leads to sterile cultures adding to the difficulty in diagnosis. Imaging techniques have not generally been used in the diagnostic approach to typhoid fever.<sup>1</sup>

Ultrasonography (USG) is another useful diagnostic tool in detection of enteric fever. Systemic manifestations such as enlarged mesenteric lymph nodes (MLNs) and mural thickening of the terminal ileum are seen in typhoid patients along with other findings such as splenomegaly,

acute acalculus cholecystitis, and hepatomegaly, which are confirmed using the ultrasonography (USG) test.<sup>2</sup>

USG is quick, noninvasive, and non ionizing technique. Emphasis on the usefulness of detecting MLNs with ultrasound as a diagnostic method during the early stage of typhoid was given. MLNs are vital barriers against the systemic dissemination of S. typhi in a mouse model.<sup>3</sup> Typhoid cases are difficult to diagnose early, which remains an important goal in this field. USG examination of the abdomen is helpful in the diagnosis of typhoid fever during the 1st week of onset of fever. The bowel wall thickening of the ileocecal region with MLNs is not specific for any one causative organism for bacterial enteritis, but a proper diagnosis of typhoid fever could be possible along with the typical USG features described above.<sup>4</sup>

The present study was conducted to evaluate the efficacy of Ultrasonography (USG) in detection of enteric fever.

**MATERIALS & METHODS**

This study was conducted among 55 patients. The following inclusion criteria were used.

**Inclusion-** Patient’s who were clinically suspected of having enteric fever in the past 2-5 days with consistent abdominal pain were included in study.

All patients underwent USG procedures, along with blood samples of patients were used for culture in xylose deoxycholate agar. Widal test was performed after 7 days of fever.

USG - A convex transducer with a frequency of 4 MHz and a linear transducer with a frequency of 12 MHz on the ultrasound machine were used for a thorough evaluation of the abdomen with emphasis on liver, spleen, and gall bladder (GB), as well as the small and large intestines.

There were enlarged mesenteric paracecal lymph nodes in right iliac fossa with thickening of terminal ileum, caecum (Fig-1, fig-2).

USG Murphy’s sign along with pericholecystic edema and fluid collection were evaluated according to the graded compression method in suspected cases of acalculus cholecystitis. A GB wall thickness of 3 mm was considered normal. After the initial USG procedure on Day 1, repeated scans were done with selected patients on 5-day intervals up to 15 days of presentation.

The average duration of the USG examination was 20 minutes, and no patient required analgesia to achieve the adequate bowel compression.

To determine the presence of the causative bacterium, a 1- mL blood sample taken from each patient was serially diluted to 1:10 in 0.1% peptone water, and an aliquot of 0.5 mL was plated on xylose deoxycholate agar; one or two drops of Tween 80 were added to the first of each dilution with each blood sample. Plates were incubated at 37°C for 24 hours. In each trial, a few presumptive colonies were picked and were confirmed as *S. typhi*. At the end of 4 days, the growth of *S. typhi* was confirmed. Patients were put on tab ciprofloxacin 15 mg/kg body weight, tab azithromycin 5- mg/kg body weight for 14 days. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

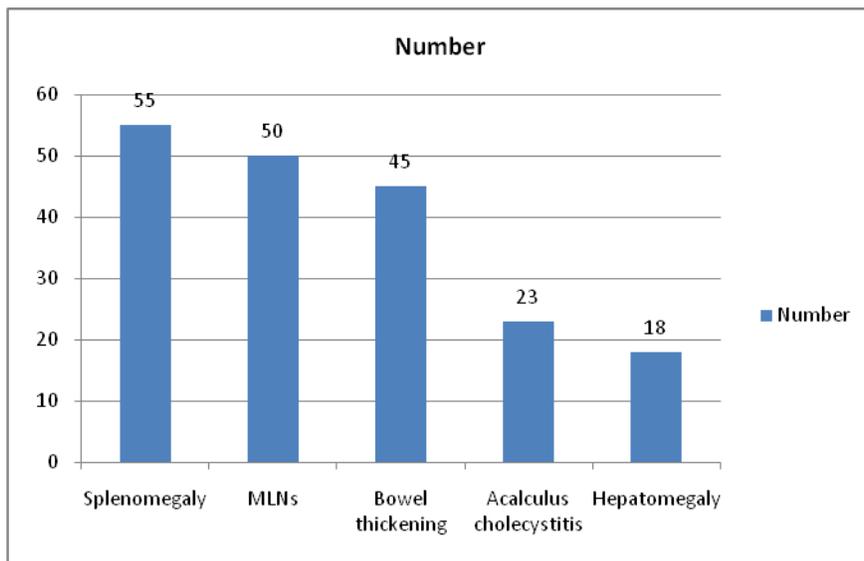
**RESULTS**

Table I shows that out of 55 patients, 30 were males and 25 were females. The difference was non- significant (P=0.2). Graph I shows that at day 5 on USG, out of 55 patients, 55 patients had splenomegaly, 50 had mesenteric lymph nodes enlargement, 45 had bowel thickening, 23 had acalculus cholecystitis and 18 had hepatomegaly. Graph II shows that at day 10, 50 patients had splenomegaly, 45 had MLNs, 10 had bowel thickening, 14 had acalculus cholecystitis and 18 had hepatomegaly. Graph III shows that at day 10, 25 patients had splenomegaly, 20 had MLNs, 0 had bowel thickening, 5 had acalculus cholecystitis and 18 had hepatomegaly.

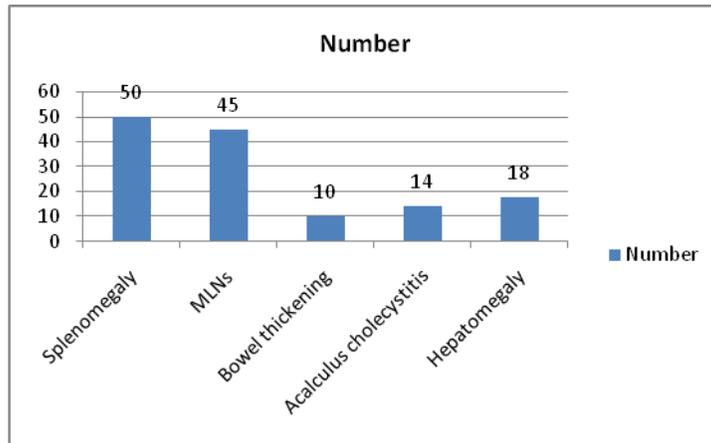
**Table I** Distribution of patients

Total – 55		
Male	Female	P Value
30	25	0.2

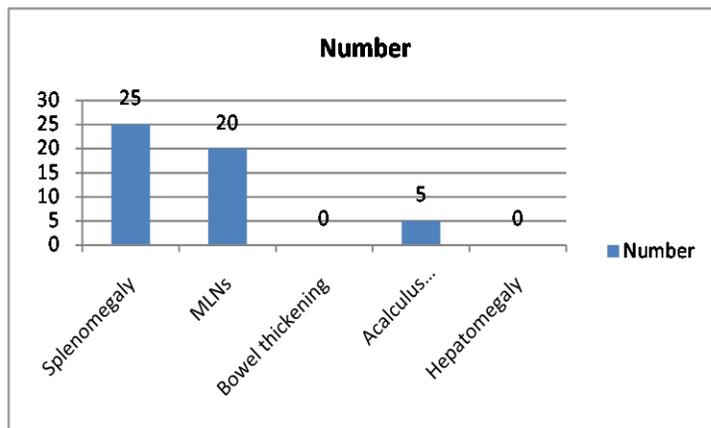
**Graph I** USG finding of 55 patients on day 5



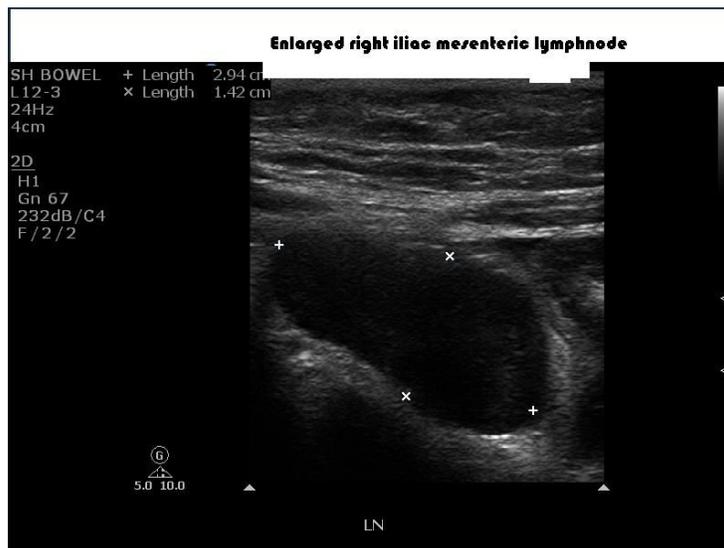
**Graph II** USG finding of 55 patients on day 10



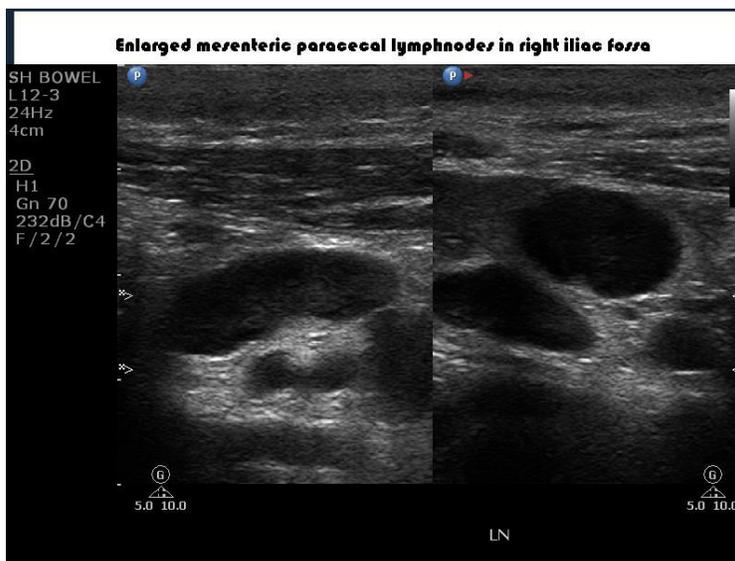
**Graph II** USG finding of 55 patients on day 15



**Figure- 1** Enlarged right iliac lymph nodes



**Figure 2-** Enlarged mesenteric lymph nodes



## DISCUSSION

The clinical presentation of typhoid fever varies from a mild illness with low-grade fever, malaise, and slight dry cough to a severe clinical picture with abdominal discomfort and multiple complications. Many factors influence the severity and overall clinical outcome of the infection. They include the duration of illness before the initiation of appropriate therapy, the choice of antimicrobial treatment, age, the previous exposure or vaccination history, the virulence of the bacterial strain, the quantity of inoculums ingested.<sup>5</sup>

Biliary infections are asymptomatic, but GB and bile ducts are commonly infected during typhoid fever. Initially, infecting bacilli multiply in the small intestine and further invade the intestinal lymphatic system and MLNs, causing enlargements. Consequently, bacilli occupying the liver and biliary ducts cause bacteremia and get excreted into the bile, and remain concentrated in the GB in high titers during the progress of the infection. Thus, enlarged MLNs, bowel wall thickening, acalculus cholecystitis, and hepatosplenomegaly are the typical pathophysiological changes seen with the infection during USG procedures.<sup>6</sup>

The present study was conducted to evaluate the efficacy of Ultrasonography (USG) in detection of enteric fever.

We found that out of 55 patients, 30 were males and 25 were females. We found that at day 5 on USG, out of 55 patients, 55 patients had splenomegaly, 50 had mesenteric lymph nodes enlargement, 45 had bowel thickening, 23 had acalculus cholecystitis and 18 had hepatomegaly. This is in accordance to Johnson AO.<sup>7</sup>

Mural thickening of the bowel may be an inflammatory response triggered by systemic infection from bacilli, which was observed after the onset of typhoid fever. Enlarged MLNs should have given rise to the described

systemic manifestations in patients with typhoid fever.<sup>8</sup> Splenomegaly and a moderately large liver are the main USG features for the diagnosis of malaria.

In tuberculosis enteritis, the 5 layered structure of the bowel wall is lost and narrowing of the bowel lumen and strictures are common. This distinguishes it from Typhoid enteritis where the 5 layered bowel wall structure is maintained.<sup>9</sup> Ultrasound findings are diagnostic in areas endemic for Typhoid fever. In cases with atypical clinical findings, abdominal ultrasound provides a rapid and effective tool in differentiating from conditions like appendicitis, abscesses and diverticulitis. In endemic areas of typhoid fever where yersinia and campylobacter enteritis is almost unknown, the clinical picture and ultrasound findings are almost diagnostic even when widal test is inconclusive and blood cultures are sterile or not available.<sup>10</sup>

## CONCLUSION

Ultrasound is quick, economical, non invasive and effective for diagnosing enteric fever when serological results are time consuming and in presence of negative cultures.

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