

Typhoid and Enteric Fevers in Intensive Care Unit

Banambar Ray¹ , Abhijeet Raha² 

ABSTRACT

Enteric fever (typhoid and paratyphoid) is caused by *Salmonella typhi* and *Salmonella paratyphi*. It is spread by fecal-oral route, largely through contamination of water and foodstuff. Developing countries are the worst affected. It takes 7 – 21 days from ingestion of the organism to manifestation of symptoms which are generally Fever, relative bradycardia, and pain abdomen. Hepatosplenomegaly, intestinal bleeding, and perforation are the features at various stages of the disease. The bacteria invade the submucous layer and proliferate in the Peyer's patches. Blood culture is the gold standard for diagnosis but it is only rarely positive. Fluoroquinolones, cephalosporins, and azithromycin are antibiotics of choice. There is increasing evidence of the development of resistance to all antibiotics. *Salmonella* sepsis, though uncommon, can occur. Intestinal perforation, peritonitis, and secondary sepsis are complications that may require intensive care unit management.

Keywords: Ceftriaxone, Enteric fever, Fever, Fluoroquinolones, Gram-negative bacilli, ICU.

Indian Journal of Critical Care Medicine (2021): 10.5005/jp-journals-10071-23842

INTRODUCTION

Typhoid fever remains an enigma even 137 years after the isolation of its bacterium by German Scientist Gaffky. Typhoid and paratyphoid (or simply enteric fever) are caused by *Salmonella typhi* and *Salmonella paratyphi* (serotypes A, B, and C). Type A is the most common. Type B is seen in Europe. Type C is rare and only seen in Eastern Asia. Typhoid is endemic in many developing countries where there is a lack of safe drinking water and proper hygienic infrastructure. Approximately, 12 million people are affected with *S. typhi* and 4 million with *S. paratyphi*. More than 15,000 annual deaths occur worldwide due to typhoid fever.^{1,2} In India, the annual incidence of enteric fever was seen to be 377 (178–801) and 105 (74–148) cases, respectively/100,000 persons, with children between 2 years and 4 years old having the highest incidence.³ In India, the actual disease burden is difficult to estimate as different geographical areas have a difference in disease distribution along with deficiency of blood culture facilities in semiurban and rural areas. Even occasional outbreaks pose problems for the healthcare authorities to take stock of the disease prevalence. With mortality risk of about 0.2%, timely and appropriate antibiotic treatment yields good results.⁴ When untreated or inappropriately treated, typhoid fever can be a prolonged life-threatening illness with a lot of morbidities. Patients developing one or more complications need intensive care unit (ICU) admission. With a failure to diagnose and treat early, complications are often seen in the second week onward.⁵ Emergence of ciprofloxacin resistance and increasing trend of minimum inhibitory concentration (MIC) of ceftriaxone (present drug of choice) have made management difficult in India.

Pathophysiology

Pathophysiology begins with the transmission of the gram-negative bacilli via fecal–oral route. *Salmonella* is acid-sensitive and is destroyed in the stomach by gastric acid. Infection can only be acquired if a large dose of bacteria is consumed or patients are on long-term proton pump inhibitors or antacids. Following ingestion, *S. typhi* enters into the small bowel epithelium aided by the cystic fibrosis transmembrane conductance regulator (CFTR). Resistance to typhoid infection is seen in individuals with abnormal CFTR protein. There is a submucosal intracellular proliferation of the

^{1,2}Department of Critical Care Medicine, Sum Ultimate Medicare, Bhubaneswar, Odisha, India

Corresponding Author: Banambar Ray, Department of Critical Care Medicine, Sum Ultimate Medicare, Bhubaneswar, Odisha, India, Phone: +91 9238310648, e-mail: banambar.ray@gmail.com

How to cite this article: Ray B, Raha A. Typhoid and Enteric Fevers in Intensive Care Unit. *Indian J Crit Care Med* 2021;25(Suppl 2):S144–S149.

Source of support: Nil

Conflict of interest: None

bacteria and recruitment of mononuclear cells and lymphocytes in the second part of the Peyer's patches, leading to hypertrophy of the Peyer's patches. Over the next 1 – 3 weeks, the bacteria are released in the bile and spreads to the reticulo-endothelial system through the lymphatic system and bloodstream. Bacterial proliferation in the reticuloendothelial system is characteristic of enteric fever and that contributes to most of its symptomatology.⁶

Figure 1 depicts the pathogenesis of enteric fever.

Clinical Features

In the first week of illness, there may be rising (step-ladder) fever associated with chills. Also, pulse-temperature dissociation (or relative bradycardia) may be seen. Abdominal pain is common in the second week and “rose spots” may be seen. Subsequently, hepatosplenomegaly may be detected. Later in the third week, intestinal perforation due to ileocecal lymphatic hyperplasia may occur and this may lead to peritonitis and secondary sepsis.⁷ Perforation is more common in males.⁸ Such patients are admitted to ICU.

If a patient, after an acute infection, continues to excrete the bacteria in the stool or in urine for more than 12 months, a *chronic carrier state* should be diagnosed and then accordingly treated.⁹

Diagnosis

Blood culture remains the gold standard of diagnosis. Polymerase chain reaction (PCR), more so nested PCR, has high sensitivity

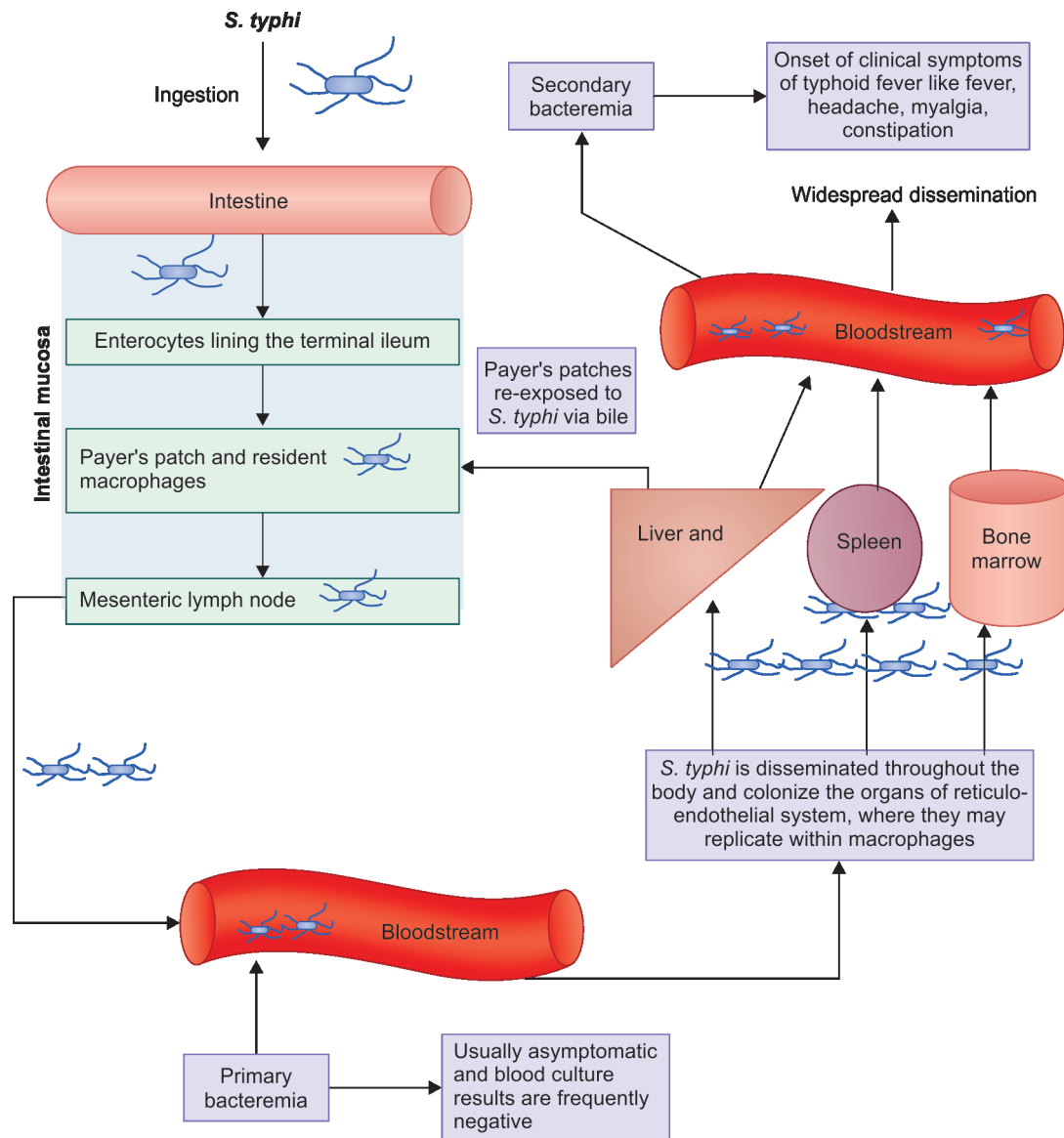


Fig. 1: Pathophysiology of typhoid fever

and specificity and can be used to detect “clinically suspected but culture negative cases.”¹⁰

Serological test, like Widal (sensitivity, 47–77% and specificity, 50–92%), has better negative than positive predictive value.¹¹ Other tests, like Typhidot, Typhidot-M, IDL Tubex test, and IgM Dipstick, have varying sensitivity and specificity patterns in detecting active disease.

Metabolomics is a relatively new area of scientific research. These can be used to detect and measure minute quantities of chemicals in biological material. Metabolomics uses mass spectrometry technology to detect these chemical substances and may offer an alternative approach for accurate diagnosis of fever of unknown origin.¹²

Antimicrobial Susceptibility in Typhoid Fever

A retrospective analysis at AIIMS, New Delhi, showed that *S. typhi* infections was susceptible to chloramphenicol (87.9%),

amoxicillin (75.5%) and cotrimoxazole (87.3%) while *S. paratyphi* A infections were susceptible 94.2, 90.1, and 94.2%, respectively.¹³ Ciprofloxacin, ofloxacin, and levofloxacin insusceptibilities were 71.3, 70.8, and 0.9% for *S. typhi* and 58.1, 57.4, and 57.1% for *S. paratyphi* A, respectively. MIC₅₀ and MIC₉₀ were 8 and 12 µg/mL for *S. typhi* with azithromycin, with susceptibility of 98.9%. The study also showed that susceptibility to ceftriaxone and cefixime was 100% but it also demonstrated that there was a steady increase in ceftriaxone MIC₅₀ and MIC₉₀ values over time. MIC₅₀ and MIC₉₀ values for ceftriaxone, in 12 years (2005–2016) showed a creepy rise (MIC₅₀ increased from 0.023 to 0.064 µg/mL) and MIC₉₀ values also showed a rise from 0.038 to 0.19 µg/mL). This was an indication of evolving resistance ($p < 0.05$).¹³ A retrospective study has shown cephalosporin resistance (1%) and macrolide resistance (9%).¹⁴

The AIIMS study showed a nonlinear change in the rate of culture-positive enteric fever with a maximum of 0.0087 in 1999 and a minimum of 0.0006 in 2014.¹³

Figure 2, adopted from the same article, depicts the trend.

The changing empiric antibiotic therapy over the years might be the reason attributed to the decrease and then further increase in the culture-positive cases and also an indicator of the development of multidrug resistance.

Figure 3 depicts the change in antibiotic usage for enteric fever in India from the year 2000 to 2015.

Drug-resistant enteric fever is more in developing countries, and the scenario is worsening over time. Improvement of public health, proper sanitation, clean drinking water, and programmed vaccination can decrease the disease spread and in turn prevent the development and spread of drug-resistant *Salmonella* infections.

Treatment Trends

Individual patient data were collected from four RCTs and analyzed.¹⁵ Among 2090 patients with clinical suspicion of enteric

fever, 855 (41%) were culture positive; of these, *S. typhi* was cultured in 28% ($n = 581$) and *S. paratyphi A* in 13% ($n = 274$). The study showed 139 (6.6%) treatment failures which included one death. Among the culture-positive patients, those with *S. typhi* infection had higher temperatures (median, 39.0°C) compared to *S. paratyphi A* (38.0°C). Liver function tests showed a significant elevation of liver enzymes in culture-positive than in culture-negative patients. Treatment failure rates between various antimicrobial treatments were similar. The review also showed the change in antimicrobial susceptibility and MIC values of different antibiotics. The study also depicted that MICs for *S. paratyphi A* were significantly higher than those for *S. typhi* with all antibiotics except cefixime.

An expert advisory panel recommended fluoro quinolones (especially, ciprofloxacin and ofloxacin) and cephalosporins (specifically those of the third and fourth generations) as the first-line therapeutic agents.⁹ The recommendations were based on the treatment recommendations by the World Health Organization,

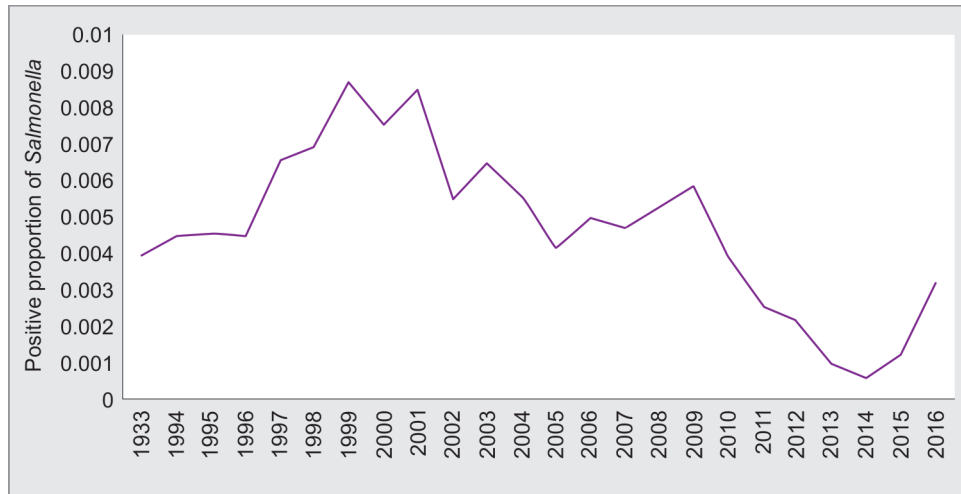


Fig. 2: Change in culture-positive cases over time

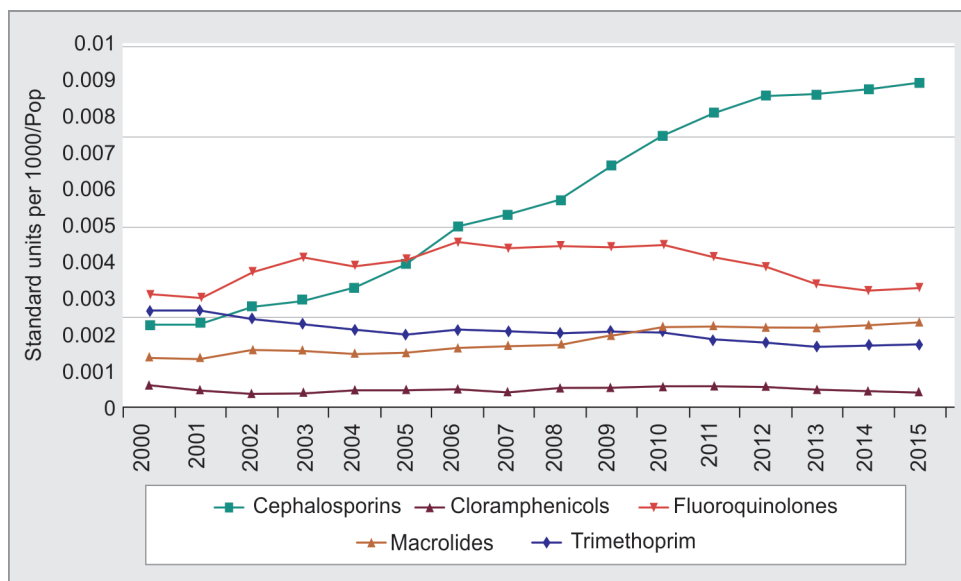


Fig. 3: Antibiotics used for the treatment of typhoid in India

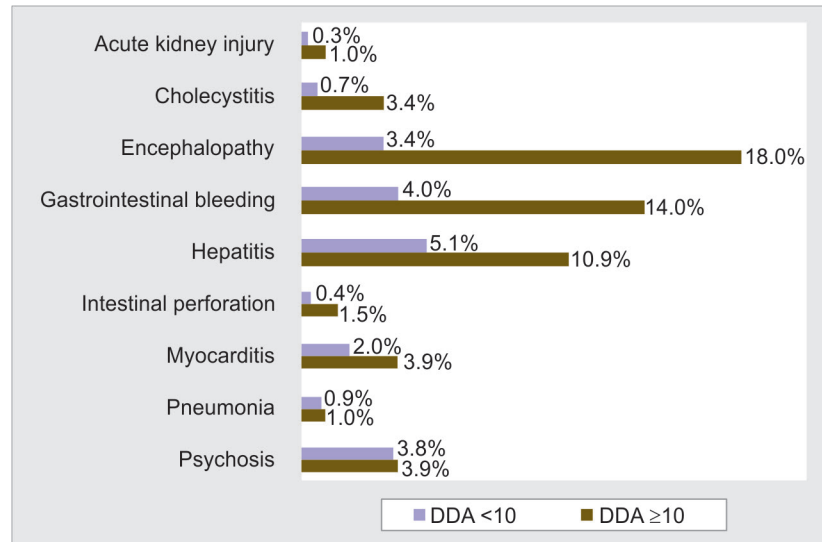


Fig. 4: Complication rates depending on disease onset to hospitalization

the Association of Physicians of India, and the Indian Association of Pediatrics.^{9,16}

Table 1 elucidates the likely antibiotics to be chosen to initiate therapy.

It is recommended to initiate parenteral treatment in presence of comorbid conditions or extremes of age, dehydration, or intolerance to a particular drug. The idea is that when the patient stabilizes, therapy should be de-escalated to oral antibiotics. In case, there is evidence to believe that there is inappropriate response to treatment (e.g., fever persisting beyond 5 days), therapy can be escalated by choosing a different antibiotic or a second antibiotic may be added. However, at any point during the course of the treatment, the likelihood of possible complications should be closely watched.¹⁷

Complications, Morbidity, and Mortality

The average days from disease onset to hospitalization (DDA) in a meta-analysis were used as a surrogate to assess the effect of delay in treatment on the prevalence and risk of complications. This meta-analysis showed that the prevalence of complications in enteric fever in studies reporting DDA ≥10 was higher (36%) than studies reporting DDA <10 (16%). Chances of complications were three times higher in patients who had obtained delayed medical help.⁵ Figure 4 depicts the complication rates in patients with “timely” compared to “delayed” admission.

A review and meta-analysis published in October 2020, has analyzed in detail, the complications and morbidity associated with typhoid fever.¹⁷ Among 10,355 confirmed typhoid patients, 2,719 (26.3%) had complications with an overall case fatality ratio (CFR) of 2.0%. Among the complications most frequently encountered, intestinal perforation, GI bleeding, bronchitis, encephalopathy, and toxic myocarditis are most relevant. Among all the cases of typhoid intestinal perforation, the median CFR was 15.5% (6.7–24.1%). On the other hand, CFR among nonsurgical patients was 0.9 to 5.4% across different regions of the world.

Table 2 lists out the complication rates seen in various geographical locations as revealed in the meta-analysis.¹⁷

Table 1: Treatment of enteric fever

Susceptibility	Patient	Antibiotic
Uncomplicated enteric fever	Adult	Responders: Ciprofloxacin or ofloxacin or third generation cephalosporin, like cefixime Nonresponders: Chloramphenicol or amoxicillin
	Child	Responders: Third generation cephalosporin like cefixime Nonresponders: Chloramphenicol or amoxicillin
Quinolone sensitive areas	Adult	Responders: Cefixime Nonresponders: Azithromycin
	Child	Responders: Azithromycin Nonresponders: Cefixime
Quinolone resistance areas	Adult	Responders: Third or fourth generation cephalosporins, like ceftriaxone or cefotaxime Nonresponders: Chloramphenicol or ampicillin
	Child	Responders: Cefotaxime or ceftriaxone Nonresponders: Chloramphenicol or ampicillin
Complicated enteric fever	Adult	Responders: Cefotaxime or ceftriaxone Nonresponders: Fluoroquinolones Cefotaxime or ceftriaxone
	Child	

Typhoid and Intensive Care

Intestinal perforation could be a frequent complication if enteric fever is not treated well and if the patient reports to a hospital quite

Table 2: Complications of typhoid fever, United Nations region wise, 1965 – 2018 (Source: <https://www.journalofinfection.com/action/showFullTableHTML?isHtml=true&tableId=tbl0002&pii=S0163-4453%2820%2930690-3>)

Complications ^a	Africa			Americas			Asia			Oceania			Total ^b		
	n/	N	(%)	n/	N	(%)	n/	N	(%)	n/	N	(%)	n/	N	(%)
Abdominal															
Intestinal perforation	37 /	486	(7.6)	4 /	217	(1.8)	34 /	4,622	(0.7)	5 /	739	(0.7)	80 /	6,064	(1.3)
Gastrointestinal hemorrhage	11 /	320	(3.4)	0 /	0	—	87 /	2,809	(3.1)	21 /	739	(2.8)	119 /	3,868	(3.1)
Hepatitis	10 /	157	(6.4)	1 /	9	(11.1)	104 /	2,389	(4.4)	17 /	739	(2.3)	132 /	3,294	(4.0)
Cholecystitis	1 /	55	(1.8)	0 /	0	—	10 /	913	(1.1)	0 /	365	(0.0)	11 /	1,333	(0.8)
Cardiovascular															
Asymptomatic electrocardiographic changes	ND			ND			ND			ND			ND		
Myocarditis	2 /	191	(1.0)	0 /	0	—	30 /	1,979	(1.5)	1 /	365	(0.3)	33 /	2,535	(1.3)
Shock	0 /	14	(0.0)	0 /	0	—	59 /	3,580	(1.6)	17 /	365	(4.7)	76 /	3,959	(1.9)
Neuropsychiatric															
Encephalopathy	0 /	0	—	0 /	0	—	98 /	2,460	(4.0)	4 /	365	(1.1)	102 /	2,825	(3.6)
Delirium	34 /	277	(12.3)	0 /	0	—	650 /	2,027	(32.1)	21 /	344	(5.8)	705 /	2,648	(26.6)
Psychotic states	2 /	50	(4.0)	2 /	217	(0.9)	28 /	1,438	(1.9)	0 /	0	—	32 /	1,705	(1.9)
Meningitis	6 /	347	(1.7)	1 /	9	(11.1)	13 /	1,625	(0.8)	0 /	0	—	20 /	1,981	(1.0)
Impairment of coordination	ND			ND			ND			ND			ND		
Respiratory															
Bronchitis	0 /	0	—	0 /	0	—	32 /	407	(7.9)	0 /	0	—	32 /	407	(7.9)
Pneumonia	4 /	191	(2.1)	7 /	226	(3.1)	43 /	1,416	(3.0)	18 /	374	(4.8)	72 /	2,207	(3.3)
Hematologic															
Anemia	132 /	311	(42.4)	52 /	226	(23.0)	683 /	3,516	(19.4)	150 /	703	(21.3)	1,017 /	4,756	(21.4)
Disseminated intravascular coagulation	0 /	0	—	0 /	0	—	98 /	660	(14.8)	1 /	374	(0.3)	99 /	1,034	(9.6)
Other															
Focal abscess	1 /	47	(2.1)	0 /	0	—	0 /	0	—	0 /	0	—	1 /	47	(2.1)
Pharyngitis	ND			ND			ND			ND			ND		
Miscarriage	0 /	0	—	0 /	0	—	1 /	6	(16.7)	0 /	0	—	1 /	6	(16.7)
Relapse	6 /	171	(3.5)	2 /	129	(1.6)	71 /	2,166	(3.2)	0 /	0	—	79 /	2,466	(3.2)
Chronic carriage	ND			ND			ND			ND			ND		
Seizure or convulsions ^c	14 /	125	(11.2)	0 /	0	—	94 /	4,224	(2.2)	0 /	0	—	108 /	4,349	(2.5)
Total complications	260 /	689	(37.7)	69 /	226	(30.5)	2,135 /	8,681	(24.6)	255 /	739	(34.5)	2,719 /	10,335	(26.3)
Total complications as described by study	116 /	348	(33.3)	24 /	327	(7.3)	401 /	3,028	(13.2)	128 /	739	(17.3)	669 /	4,442	(15.1)

^aComplications from Parry et al., Table 1; ND, no data. Data could not be abstracted as these complications were not described in any of the included articles;

^bEurope not shown due to the single study from Europe including participants diagnosed with stool and urine cultures, therefore it was not possible to distinguish complications among those diagnosed by culture of a normally sterile site;

^cComplication not listed by Parry et al.

late. Diagnosis is clinical and confirmed by point-of-care-ultrasound with the presence of pneumo peritoneum and pneumoretro peritoneum along with bubbles in peritoneal fluid and oedematous bowel loops.^{18,19}

In a prospective observational study, 67 consecutive patients who had exploratory laparotomy for typhoid perforation between

August 2009 and October 2012 in the main operating theatre of the University College Hospital, Ibadan, were studied.²⁰ Twenty-five patients (37.3%) out of 67 required critical care. Indications for ICU admission were poor respiratory effort, delayed recovery from anesthesia, sepsis, and septic shock. Twenty-one patients (84%) required mechanical ventilation. The mean ventilator days were

2.14 days (range 1–5 days). The length of ICU stay ranged from 1 to 15 days (mean 4.32 days) and 14 patients required inotropic support. Six patients (24%) expired. Hence, it can be observed that there is a high rate of ICU admission in patients who develop typhoid perforation and require active critical care involving mechanical ventilation, inotropic and ancillary supportive care.

Due to low yield from blood cultures (median of 1 CFU/mL of blood), *Salmonella* septicemia is uncommon. Adu-Gyamfi et al., reported a case of *Salmonella* sepsis in November 2019.²¹ The patient was operated on for a ruptured appendix after a 6 days history of fever and pain abdomen. Preoperatively, he was delirious and in the postop period, he developed septic shock with acute kidney injury with dyselectrolytemia, leucocytosis, and thrombocytopenia. His C-reactive protein was raised and he had an admission APACHE II of 31 and SOFA score of 10. The blood and intra-abdominal specimens isolated *S.typhi* which was sensitive to ciprofloxacin and the patient improved with it.

Additionally, patients who develop other systemic complications and/or secondary sepsis often require management in the critical care unit with appropriate antibiotic therapy along with cardiovascular, respiratory, renal, and other organ system support. It is imperative to check, identify and implement the quint essential care needed in all critically ill patients and this can be done by routine check of “FAST HUG BID” and ensuring its implementation adequately.

Supplemental image 1 depicts the subtle differences in the FAST HUG BID in medical and surgical ICUs.²²

Prognostic markers like APACHE II and SOFA scores would aid in identifying the criticality of illness in patients with complications of enteric fever who require ICU care.

ORCID

Banambar Ray  <https://orcid.org/0000-0002-8711-1867>

Abhijeet Raha  <https://orcid.org/0000-0002-1220-0048>

REFERENCES

- GBD 2016 Disease and Injury Incidence and Prevalence Collaborators. Global, regional and national incidence, prevalence, and years lived with disability for 328 diseases and injuries for 195 countries, 1990–2016: a systematic analysis for the global burden of disease study 2016. *Lancet* 2017;390(10100): P1211–P1259. DOI: 10.1016/S0140-6736(17)32154-2.
- GBD 2016 Causes of Death Collaborators. Global, regional, and national age-sex specific mortality for 264 causes of death, 1980–2016: a systematic analysis for the Global Burden of Disease Study 2016. *Lancet* 2017;390(10100):P1151–P1210. DOI: 10.1016/S0140-6736(17)32152-9.
- John J, Van Aart CJ, Grassly NC. The burden of typhoid and paratyphoid in India: Systematic review and meta-analysis. *PLoS Negl Trop Dis* 2016;10(4):e0004616. DOI: 10.1371/journal.pntd.0004616.
- Lynch MF, Blanton EM, Bulens S, Polyak C, Vojdani J, Stevenson J. Typhoid fever in the United States, 1999–2006. *JAMA* 2009;302(8): 859–865. DOI: 10.1001/jama.2009.1229.
- Cruz Espinoza LM, Mc Creedy E, Holm M, Im J, Mogeni OD, Parajulee P, et al. Occurrence of typhoid fever complications and their relation to duration of illness preceding hospitalization: a systematic literature review and meta-analysis. *Clin Infect Dis* 2019;69 (Suppl. 6):S435–S448. DOI:10.1093/cid/ciz477.
- Bhandari J, Thada PK, DeVos E. Typhoid fever [Updated 2020 Nov 23]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021.
- Connor BA, Schwartz E. Typhoid and paratyphoid fever in travellers. *Lancet Infect Dis* 2005;5(10):623–628. DOI: 10.1016/S1473-3099(05)70239-5. PMID: 16183516.
- Khan M. A plausible explanation for male dominance in typhoid ileal perforation. *Clin Exp Gastroenterol* 2012;5:213–217. DOI: 10.2147/CEG.S36569. PMID: 23180972; PMCID: PMC3501370.
- Upadhyay R, Nadkar MY, Muruganathan A, Tiwaskar M, Amarapurkar D, Banka NH, et al. API recommendations for the management of typhoid fever. *J Assoc Physicians India* 2015;63 (11):77–96. PMID: 29900721
- Khan S, Harish BN, Menezes GA, Acharya NS, Parija SC. Early diagnosis of typhoid fever by nested PCR for flagellin gene of *Salmonella enterica* serotype Typhi. *Indian J Med Res* 2012;136(5):850–854. PMID: 23287134
- Darton TC, Baker S, Randall A, Dongol S, Karkey A, Voysey M, et al. Identification of novel serodiagnostic signatures of typhoid fever using a *Salmonella* proteome array. *Front Microbiol* 2017;8:1794. DOI: 10.3389/fmicb.2017.01794.
- Zurfluh S, Baumgartner T, Meier MA, Ottiger M, Voegeli A, Bernasconi L, et al. The role of metabolomic markers for patients with infectious diseases: implications for risk stratification and therapeutic modulation. *Expert Rev Anti Infect Ther* 2018;16(2):133–142. DOI: 10.1080/14787210.2018.1426460.
- Sharma P, Dahiya S, Manral N, Kumari B, Kumar S, Pandey S, et al. Changing trends of culture-positive typhoid fever and antimicrobial susceptibility in a tertiary care North Indian Hospital over the last decade. *Indian J Med Microbiol* 2018;36(1):70–76. DOI: 10.4103/ijmm. IJMM_17_412.
- Sur D, Barkume C, Mukhopadhyay B, Date K, Ganguly NK, Garrett D. A retrospective review of hospital-based data on enteric fever in India, 2014–2015. *J Infect Dis* 2018;218(S4): S206–S213. DOI: 10.1093/infdis/ jiy502.
- Thompson CN, Karkey A, Dongol S, Arjyal A, Wolbers M, Darton T, et al. Treatment response in enteric fever in an era of increasing antimicrobial resistance: an individual patient data analysis of 2092 participants enrolled into 4 randomized, controlled trials in Nepal. *Clin Infect Dis* 2017;64(11):1522–1531. DOI: 10.1093/cid/cix185 [Erratum in: *Clin Infect Dis* 2017;65(8):1431–1433]. PMID: 28329181; PMCID: PMC5434338.
- WHO Guidelines for the Management of Enteric fever 2011. Available at <http://apps.who.int/medicinedocs/documents/s20994en/s20994en.pdf>.
- Marchello CS, Birkhold M, Crump JA. Complications and mortality of typhoid fever: a global systematic review and meta-analysis. *J Infect* 2020;81(6):902–910. DOI: 10.1016/j.jinf.2020.10.030.
- Coppolino F, Gatta G, Di Grezia G, Reginelli A, Iacobellis F, Vallone G, et al. Gastrointestinal perforation: ultrasonographic diagnosis. *Crit Ultrasound J* 2013;5(Suppl. 1):S4. DOI:10.1186/2036-7902-5-S1-S4.
- Adu-Gyamfi R, Hoosain F, Chetty S. *Salmonella typhi* – a quiet bacteria with a loud message: an ICU case report. *Bali J Anaesthesiol* 2019;3(2):129–132. DOI:10.15562/bjoa.v3i2.161.
- Chanler-Berat J, Birungi A, Dreifuss B, Mbiene R. Typhoid intestinal perforation: Point-of-care ultrasound as a diagnostic tool in a rural Ugandan Hospital. *Afr J Emerg Med* 2016;6(1):44–46. DOI: 10.1016/j.afjem.2015.09.004. PMID: 30456063; PMCID: PMC6233237.
- Adu-Gyamfi R, Hoosain F, Chetty S. *Salmonella typhi* – a quiet bacteria with a loud message: an ICU case report. *Bali J Anaesthesiol* 2019; 3(2):129–132. DOI: 10.15562/bjoa.v3i2.161.
- Nair A, Naik V, Rayani B. FAST HUGS BID: Modified mnemonic for surgical patient. *Indian J Crit Care Med* 2017; 21 (10):713–714.