



Case Report

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Importance of surveillance in infection prevention, and control (IPC): A case of *Salmonella typhi* infection among family members in Gombe, Nigeria

Umar Maigado Ishiyaku^{1,2*}, Mohammed Ibrahim^{1,2}, Umar Mohd Hassan^{1,2}, Fatima Baba-Ali^{1,2}, Aishatu Bello^{1,3}, Maryam Usman Oluwatosin⁴ and Mohammed Mohammed Manga^{1,2}

¹Department of Medical Microbiology and Immunology, College of Medical Sciences Gombe State University, Gombe, Nigeria. E-mail: uimaigado@gmail.com

²Department of Medical Microbiology and Immunology, Federal Teaching Hospital, Gombe, Nigeria.

³Department Microbiology, College of Nursing and Midwifery Gombe, Gombe, Nigeria.

⁴Department of Paediatrics, Federal Teaching Hospital, Gombe, Nigeria.

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Abstract

Background: Surveillance is one of the most important components of Infection Prevention, and Control (IPC) in healthcare facilities, it is an essential tool for breaking the chain of transmission of infection. *Salmonella enterica* serotype typhi can easily be transmitted from carrier(s) to the susceptible hosts through contaminated food, water, or both. Prompt identification and treatment of patients with enteric fever using appropriate antibiotics is important in achieving bacteriological cure, also epidemiological surveillance and follow-up to determine potential carriers can limit/halt further transmission and prevent further occurrences. **Case report:** A 17-year-old male patient was admitted to our hospital with complaints of high-grade fever and headache of 13 days duration, abdominal pain, and passage of loose stool of 3 days duration. The blood culture of the patient yielded the growth of *Salmonella enterica* serotype typhi, showed susceptibility to Ciprofloxacin and Ceftriaxone. He received oral ciprofloxacin 500 mg twice daily for 14 days, and the IPC surveillance team traced all members of his family and took stool samples from each member, the result showed *Salmonella enterica* serovar typhi; isolated from 3 asymptomatic carriers among the members of this family, the carriers were treated with Ciprofloxacin 500 mg twice daily for 7 days. The patient was discharged with full recovery after treatment. **Clinical discussion:** Typhoid fever is a common condition in poor resource countries like Nigeria, due to poor hygiene, shortage of potable water, and poor food handling. This case report's main aim is to draw the attention of hospitals to the importance of surveillance in IPC in breaking the chain of infection transmission, thereby preventing major public health challenge.

Keywords: Typhoid fever, Surveillance, Infection prevention, Control

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* Corresponding author: Umar Maigado Ishiyaku, Department of Medical Microbiology and Immunology, College of Medical Sciences Gombe State University, Gombe, Nigeria. E-mail: uimaigado@gmail.com

1. Introduction

Typhoid fever is a debilitating acute life-threatening systemic infection caused by a Gram-negative bacillus called *Salmonella enterica* serovar *Typhi* and *Salmonella enterica* serovar *Para typhi* (A, B, or C) (Ohanu et al., 2019). It is associated with high morbidity and mortality globally, and remains a serious public health problem in Nigeria and other low-resource countries because of inadequate supplies of clean and potable water, inadequate facilities for processing human wastes, overburden of healthcare delivery systems, and increased urbanization (Crump et al., 2004; Akinyemi et al., 2024). Incidences of typhoid fever in Nigeria varies from one region to another, with incidence of 7.0-18.6% in Lagos, 3.9-10.4% in Kano, and less than 1% in Abuja (Akinyemi et al., 2024). However; the exact incidence of typhoid fever in Nigeria is difficult to evaluate because a positive blood culture result is the Gold standard to estimate the true burden of the infection, but only a few hospitals perform blood cultures to diagnose the infection, and lack of coordinated surveillance systems (Akinyemi et al., 2024). Disease transmission is mainly through ingestion of water and food contaminated with feces, and humans are the only known reservoir (Ohanu et al., 2019). High-grade fever in step ladder fashion, chills, headache, tachycardia, abdominal pain, constipation alternating with diarrhea, and joint weakness are the main clinical manifestation of typhoid fever (BD IF Deol P Kevadiya et al., 2024). The laboratory diagnosis of enteric fever include but not limited to, collection of quality clinical specimens such as blood, stool, urine, and bone marrow for culture and susceptibility testing (Ohanu et al., 2019). The choice of antibiotics for the management of typhoid fever depends on the susceptibility of the *S. typhi* strain but commonly used drugs include fluoroquinolones (ciprofloxacin, and levofloxacin), a combination of cephalosporins and azithromycin, and chloramphenicol (Mahmoud et al., 2023). This case report underscores the importance of surveillance in IPC.

2. Case report

A 17-year-old male secondary school student who presented to Federal Teaching Hospital, Gombe (FTHG) through the Emergency Pediatrics Unit with complains of 13 days history of fever and headache, 3 days history of abdominal pain, and passage of loose stool. The fever was said to be high-grade, intermittent, and associated with chills and rigors. At the same time patient developed severe headache, global, dull in nature, not radiating, and severe enough to prevent the patient from sleeping, and often relieved by taking paracetamol but no known aggravating factor. There was no associated history of photophobia, convulsion, loss of consciousness, neck stiffness, or similar symptoms in the family. Three days before presentation patient developed abdominal pain that was generalized, colicky associated with passage of loose stool that was non-bloody, non-mucoid, and foul smelling, with about 5 episodes per day, with no abdominal distension or constipation. There was also a history of vomiting that was non-projectile, non-bloody, non-mucoid, and post-prandial, associated with generalized body weakness and loss of appetite. The patient occasionally patronizes food vendors; however, mother prepares family food of questionable hygienic condition. No history of ingestion of poorly cooked meal.

At the onset of the symptoms, he was initially taken to primary healthcare (PHC), however; his condition deteriorated necessitating presentation to FTHG.

He is the first child of his mother with other 4 siblings, living in a polygamous family setting, their source of water is a bore-hole but occasionally they patronize water vendors, they use a pit latrine and practice open dumping of their waste.

Examination findings on admission showed a young man, in painful distress, not pale, anicteric, acyanosed, mildly dehydrated, febrile with an axillary temperature of 40.1 °C, no peripheral lymphadenopathy, no pedal edema, pulse rate was 96 beats/minute, and blood pressure was 100/60 mmHg. The abdomen was flat and moves with respiration, generalized vague tenderness, more marked at the suprapubic region, no rebound tenderness, liver and spleen were not palpably enlarged, and kidneys were not ballotable. He was conscious and alert, pupils were bilaterally reactive to light, no sign of cranial nerve deficit, no sign of meningeal irritation, normal power in all the limbs.

Assessment of Enteric fever was made, and the patient was admitted at Pediatrics' Medical Ward (PMW) and the following investigations were done (Table 1).

Table 1: Showing the investigations carried out at FTHG and the results obtained		
S/No.	Investigation	Result
1	Blood culture	Yielded the growth of <i>Salmonella enterica</i> , serovar <i>typhi</i> susceptible to Ceftriaxone, Ciprofloxacin, Meropenem, and Cefepime and resistant to Co-trimoxazole
2	Typhidot for <i>Salmonella typhi</i> antibody	Reactive for IgM and IgG
3	Stool microscopy, culture, and sensitivity	Macroscopy: brownish semi-formed, non-bloody, non-mucoid Microscopy: no ova, cyst, or trophozoites seen Culture: No <i>Salmonella</i> or <i>Shigella</i> species isolated
4	Urine microscopy, culture, and sensitivity	Macroscopy: Amber and clear Microscopy: pus cells 1-2/hpf, no RBC, epithelial cells, bacterial cells, cast or crystals Culture: Yielded no growth after 48hours of incubation
5	Blood film for malaria parasite (2 days after treatment with antimalarial drugs)	No malaria parasite seen
6	Full blood count	WBC = 3.9×10^9 /L, PCV = 42%, N = 30% ↓, E = 05%, L = 45% ↑, PLT = 215×10^9 /L, MCHC = 33.1g/dl ↓, MCH = 29.7pg, MCV = 89.6fl, Mo = 20% ↑
7	Electrolyte, urea, and creatinine	Na = 123 mmol/l ↓, K = 4.3 mmol/l, Cl = 89 mmol/l ↓, HCO ₃ = 22 mmol/l, Urea = 4.8 mmol/l, Creatinine = 79 μmol/L
8	Abdominal pelvic ultrasound scan	Normal study

Treatment was then commenced immediately with Oral ciprofloxacin 500 mg twice daily. A clinical Microbiologists reviewing and verifying results using Electronic Medical Record (EMR) saw the results and immediately activated an immediate surveillance team that further reviewed the patient and advised the managing team to convert the I.V ciprofloxacin to oral ciprofloxacin. Family members of the patient were contacted, their stool specimens collected and processed, and was identified using the analytical profile index (API-20E Biomereux) the result showed that 3 members harbor *Salmonella typhi* (Figures 1, 2, 3 and Table 2), however; none of them had any symptoms. The 3 members identified as asymptomatic carriers were treated with 500 mg of Ciprofloxacin twice daily for 14 days.

The fever and other symptoms resolved gradually, the daily record of temperature showed stepwise decreasing pattern (40.1 °C, 40.0 °C, 39.8 °C, 39.7 °C, 37.7 °C, 38.9 °C, 37.1 °C, 37.0 °C, 36.7 °C, 36.6 °C, and 36.6 °C), and the patient was discharged home with no sequelae.



Figure 1: *Salmonella shigella* agar culture plate showing the colonies of *Salmonella typhi* and H₂S production

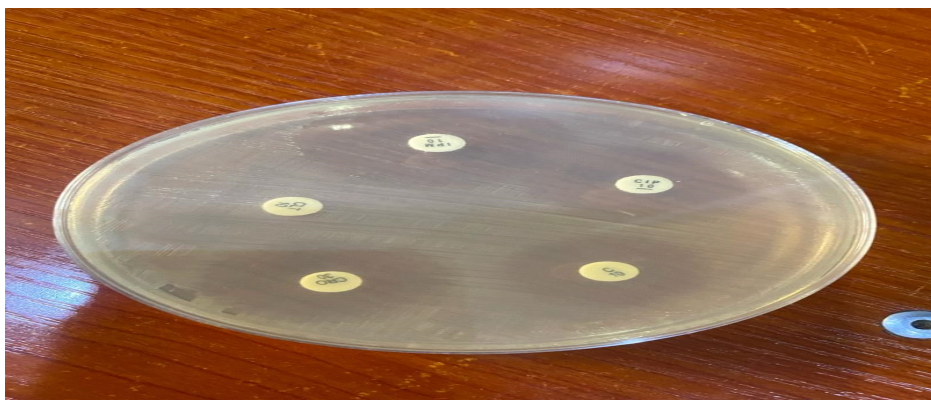


Figure 2: Muller-Hinton agar showing Antibiotics susceptibility testing of *Salmonella* specie isolated



Figure 3: API-20E showing the identification of *Salmonella typhi* of all the three isolates

Table 2: Antibiotic susceptibility profile of all the three isolates from family members

S/No.	Antibiotic susceptibility tests	Remark
1	Ceftriaxone Ciprofloxacin Co-trimoxazole Chloramphenicol Imipenem	Resistant Susceptible Resistant Resistant Susceptible
2	Ceftriaxone Ciprofloxacin Co-trimoxazole Chloramphenicol Imipenem	Susceptible Susceptible Resistant Resistant Susceptible
3	Ceftriaxone Ciprofloxacin Co-trimoxazole Chloramphenicol Imipenem	Resistant Susceptible Resistant Resistant Susceptible

3. Discussion

Blood culture or bone marrow biopsy are the requirements for a definitive diagnosis of typhoid fever. The sensitivity of the blood culture is between 60-80% in the first week of illness, positivity decreases after the first

week and becomes negative after the 4th week (Buzgan et al., 2007). Our patient presented at the end of the second week of his illness, and his blood culture was positive for *Salmonella enterica*, serovar *typhi*. Even though the yield of the organism at the time of presentation was expected to be low from the bloodstream, however, its isolation may not be unconnected with the fact that the patient had no antibiotics before admission to our hospital and also the use of a continuous automated blood culture system (Bact-alert). *S. typhi* could also be recovered from Urine and stool cultures in the later period of the illness, however, both urine and stool cultures did not yield the growth of the pathogen. This may be because the patient has already commenced antibiotics at the time the specimen was taken. The clinical picture of typhoid fever is not pathognomonic, however typical clinical manifestation of typhoid fever comprises high-grade fever, chills, abdominal pain, diarrhea, fatigue, and myalgia. Our patient presented with high-grade pyrexia, chills, abdominal pain, and diarrhea. The risk factors that predispose individual to typhoid fever include; consumption of food and water contaminated with feces and urine of the disease carriers, contaminated water bodies around the environment, poverty, and lack of hygiene (Mahmoud et al., 2023). The predisposing factor in our patient was likely ingestion of contaminated water and his asymptomatic siblings.

Antibiotic therapy for the management of typhoid fever depends on the susceptibility of *S. typhi* strain to antibiotics, in a low-resource setting fluoroquinolones are the most effective and affordable drug for the treatment of typhoid fever infection and have more advantages than cephalosporins (Mahmoud et al., 2023). Our patient was treated with oral ciprofloxacin, his symptoms resolved completely, and other members that are carriers of *S. typhi* were also treated with the same drug.

Targeted surveillance is seldom conducted in most healthcare facilities in low- and medium-income countries especially in cases relating to that of enteric fever. The presence of functional EMR in our facility provide an ample opportunity for Clinical Microbiologist in collaboration with the IPC team and other healthcare personnel in FTHG to proactively managed this patient and to also traced the epidemiological linkage of the disease aetiology to some family members and appropriate IPC measures were instituted and transmission halted thereby breaking the chain of transmission of this infection.

4. Conclusion

Typhoid fever is one of the most problematic diseases in LMIC and Nigeria, it is associated with high morbidity and mortality. This case report is to draw attention of hospital on the importance of targeted surveillance system in the management of infectious diseases.

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Conflict of Interest

No conflict of interest declared.

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