Dear Editor,

Typhoid fever, caused by Salmonella enterica subsp. enterica serovar Typhi (S. Typhi), is one of the serious bloodstream infections that belongs to the class 2 of the legal infectious diseases in Korea. It has variable incubation period ranging from one to six weeks depending on the infectious dose [1, 2] and requires urgent treatment with antimicrobial agents. However, recently, the prevalence of S. Typhi strains resistant to antimicrobial agents has been gradually increasing [3, 4]. This fact poses the failure of empirical treatment or a threat to the control of infectious typhoid fever [3].

In Korea, about 100-200 cases of typhoid are reported annually. To our knowledge, we report the first case of extensively drug-resistant (XDR) S. Typhi in Korea. Patient demographic and clinical information was collected from Sangju Red Cross Hospital (Sangju, Korea) by formally applying for access to the medical records of the outsiders and the informed consent from the patient. This study was exempted by the Institution Review Board of Kyungpook National University Chilgok Hospital (Reference number: KNUCH 2019-04-015).

A 28-year-old male patient having fever and cough for a day visited the emergency department on the next day. He was found negative for the influenza antigen test and was discharged with a three-day prescription of ceftriaxone. After three days, he visited the emergency department again with the same symptoms and worsening diarrhea. Therefore, the treatment was switched to amoxicillin and a β-lactamase inhibitor. However, due to uncontrolled fever and significantly worsened diarrhea, he was hospitalized. Chest X-ray and abdomen CT scan were unremarkable except an evidence of probable mesenteric lymphadenitis. Therefore, he was treated with ceftriaxone for five days, however, his symptoms did not improve. Although his history was unremarkable, the symptoms began in 26 days after his arrival in Korea from a visit to Pakistan. AST, ALT, and ALP were moderately increased, but all the viral hepatitis markers were negative. Stool culture for Salmonella spp., Shigella spp., Vibrio spp., and Clostridium difficile showed negative until discharge. The toxin A and B assay for C. difficile was negative. However, blood culture revealed positive and Salmonella ser. Typhi was identified by using the Vitek2 Gram-negative identification system (bioMérieux, Durham, NC, USA). Serotyping for Salmonella spp. by serum agglutination test using Salmonella antisera (Joongkyeom, Goyang, Republic of Korea) revealed group D. However, anti-microbial susceptibility tests showed MICS for ampicillin, trimethoprim/sulfamethoxazole, and cefotaxime at \( \geq 32 \mu g/mL \), \( \geq 320 \mu g/mL \), and \( \geq 64 \mu g/mL \), respectively, using the Vitek2 AST-N224 system (bioMérieux) and for ciprofloxacin at \( \geq 2 \mu g/mL \) by the manual microdilution, according to the

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The emergence of S. Typhi strains resistant to antimicrobial agents leads to treatment failure and treatment change in antimicrobial policy. Ciprofloxacin was the drug of choice for typhoid fever in 1997 as S. Typhi strains were resistant to chloramphenicol, ampicillin, and trimethoprim-sulfamethoxazole as well as fluoroquinolones and third-generation cephalosporins. The isolate confirmed as Salmonella enterica subsp. enterica Ty2 through the 16S rRNA sequencing (Identities = 1,384/1,385, 99.93%). The blaCTX-M-15 extended-spectrum β-lactamase (ESBL) gene and a single mutation in gyrA (S83F) were detected. His symptoms improved upon changing the treatment with intravenous administration of carbapenem for 14 days according to the United States CDC report [6] once the XDR S. Typhi was identified. He was discharged on day 23 after admission.

In conclusion, we should pay attention to the emergence of XDR Salmonella Typhi in Korea.

Conflicts of Interest

None declared.

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