

## Antimicrobial Susceptibility Pattern for Salmonella Typhi in A Tertiary Care Hospital

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**Abstract:**

**Introduction:** Salmonella typhi caused enteric fever remains a significant concern in developing countries. Recent increases in antimicrobial-resistant strains have made management more difficult. This study was done to evaluate antimicrobial sensitivity pattern of Salmonella typhi isolated from blood in a tertiary care hospital

**Materials and Methods:** This retrospective study was conducted between June 2021 and December 2022 in the microbiology laboratory of Kamineni Medical College and Hospital. A total of 100 S.typhi isolated from stool and blood samples were included in the study. Using the Kirby-Bauer disc diffusion method, antimicrobial susceptibility was determined.

**Results:** All the isolates were 100% sensitive to Ceftriaxone, 99 % were sensitive to ampicillin, 99% were sensitive to chloramphenicol, 98% isolates were susceptible to Cefuroxime and 95% were sensitive to Cotrimoxazole. There was decreased susceptibility was observed in Nalidixic acid and Ciprofloxacin.

**Conclusion:** The results of this study contribute to the expanding concern regarding the presence and spread of quinolone and broad spectrum antibiotic resistant Salmonella typhi, thereby emphasizing the need for judicious use of quinolone and azithromycin and other interventions to control antibiotic resistance

**Keywords:** Salmonella typhi, Typhoid fever, Antimicrobial susceptibility, Resistance.

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**Introduction**

Typhoid fever is an invasive bacterial infection caused by Gram-negative bacteria. Salmonella enterica serovars Typhi (Salmonella Typhi) and Paratyphi A, B, and C [1]. The disease is spread primarily by contaminated food and water [2]. While blood cultures are the gold standard for diagnosing enteric fever, they are only positive in about 30-40% of cases. Because intestinal fever mimics numerous febrile diseases, clinical diagnosis might be difficult. As a result, clinicians frequently rely on antigen testing methods like the Widal test and the typhidot test to confirm the diagnosis of enteric fever. [3]

The Centres for Disease Control and Prevention (CDC) considers antibiotic-resistant Salmonella typhi to be a severe danger that necessitates ongoing monitoring and prevention to avoid its spread. [4] Historically, first-line antibiotics for typhoid treatment included chloramphenicol, ampicillin, and trimethoprim-sulfamethoxazole. However, in the late 1980s, multidrug resistant (MDR) Salmonella typhi, defined as bacteria resistant to these first-line antibiotics, appeared.[5]

Salmonella enterica serovar typhi has developed significant resistance to routinely given antibiotics.

[6] In various parts of the world, there have been reports of multi-drug resistance Salmnoella typhi with plasmid-mediated resistance to common antibiotics such as chloramphenicol, cotrimoxazole, and ampicillin.[7] Salmonella typhi multidrug resistance to antibiotics such as chloramphenicol, amoxicillin, co-trimoxazole, and fluoroquinolone has emerged as a new problem in the treatment of typhoid fever.[8]

The first major outbreak of multidrug-resistant Salmonella typhi was reported in Mexico in 1972. Since then, there has been an increase in antibiotic resistance reported from all around the world, but particularly from underdeveloped countries.[9] Typhoid fever is becoming increasingly difficult to diagnose and treat due to its varied patterns of presentation and the development of antibiotic resistance. Resistance to well-known and trusted antimicrobial medicines is widely acknowledged as one of the most difficult difficulties that physicians encounter when treating adult and paediatric diseases.[10]

Salmonella typhi, particularly the multidrug resistant (MDR) strain, is of concern not only for its resistance to existing treatments, which results

in a high death rate, but also for its potential for epidemic outbreaks, which may be difficult to manage. This study was done to evaluate antimicrobial sensitivity pattern of *Salmonella typhi* isolated from blood in a tertiary care hospital.

**Materials and Methods:** A retrospective analysis was carried out using records from the Microbiology laboratory at Kamineni Medical College & Hospital in Hyderabad, Telangana, from June 2021 to December 2022.

The study comprised 100 *Salmonella typhi* isolates from blood and stool specimens. All isolates were identified using API 20 E (BIOMERIEUX) and serologically verified using salmonella typhi "O" and "H" specific antisera. Ampicillin (10g),

Chloramphenicol (30g), Amoxicillin/Clavulanic acid (20g+10g), Cotrimoxazole (1.25g+23.75g), Tetracycline (30g), Nalidixic acid (30g), Ciprofloxacin (5g), Ceftriaxone (30g) susceptibility testing was performed on all isolates. The Kirby-Bauer disc diffusion method was used to examine antimicrobial susceptibility on Muller-Hinton agar media.

Microsoft Excel 2007 was used to record and analyse the data. The outcomes are explained in terms of frequency and percentage..

**Results:** The most prevalent age range was between 11 and 20 years, while males had a higher frequency. The age and sex distribution of *Salmonella typhi* is shown in the table 1.

**Table 1: Age and sex distribution of *Salmonella typhi***

Age group	Male	Female	Total
0-10	8	2	10
11-20	17	23	40
21-30	15	10	25
31-40	10	6	16
41-50	3	1	4
51-60	2	2	4
>60	1	0	1
Total	56	44	100

Antibiogram showed 100% isolates were susceptible to ceftriaxone, 99% isolates were susceptible to Ampicillin, 99% isolates were susceptible to Chloramphenicol, 98% isolates were susceptible to Cefuroxime, 95% isolates were susceptible to cotrimoxazole, 80 % isolates were susceptible to Azithromycin, 60% isolates were susceptible to Ciprofloxacin and 55% isolates were susceptible to Nalidixic acid as shown in Table 2

**Table 2: Antibiotic sensitivity pattern of *Salmonella typhi***

Antibiotics	(N=100)	
	Sensitivity (%)	Resistant (%)
Ampicillin	99	1
Azithromycin	80	20
Ciprofloxacin	60	40
Cotrimoxazole	95	5
Chloramphenicol	99	1
Ceftriaxone	100	0
Cefuroxime	98	2
Nalidixic acid	55	45

## Discussion

The purpose of this study was to determine the antibiotic sensitivity patterns of *Salmonella typhi*. The results indicate that men are more susceptible than women because men in this age group frequently work outside the home and frequently consume hawked foods that may be contaminated.

Over a period of time, there had been considerable changes to the *S. typhi* antibiogram. There have been numerous reports of NARST (nalidixic acid resistant *S. typhi*) throughout the world, which were to blame for decreasing sensitivity to ciprofloxacin leading in treatment failures and problems in enteric fever, even if multidrug

resistance appears to be tapering at one end. [11-14]

Nalidixic acid resistance is a marker for low-level ciprofloxacin resistance in *S. typhi* and also a sign of ciprofloxacin therapy failure.[15-17] As a result, CLSI now advises that all *S. typhi* isolates be tested for nalidixic acid resistance in addition to ciprofloxacin.[18] Currently, 3rd generation cephalosporins like ceftriaxone serve as a backup medication for treating *Salmonella typhi* and cases of ciprofloxacin resistance.[19] Third-generation cephalosporins are now the only viable treatment options for the majority of travel-related enteric fever patients.[20]

## Conclusion

This study confirms that Ceftriaxone, Cefuroxime, Chloramphenicol, Ampicillin are the most effective drugs in the treatment of typhoid fever. The findings of this study have highlighted the growing worry about the existence and spread of quinolone and broad spectrum antibiotics resistance *Salmonella typhi*, highlighting the necessity of prudent antibiotic use as well as other important measures that would aid in the management of antibiotic resistance.

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