

Antimicrobial susceptibility pattern for *Salmonella Typhi* isolated from blood in Shaheed Suhrawardy Medical College, Dhaka

Tarana N¹, Shumu SJ², Khanam RA³, Jahan H⁴, Sarker S⁵, Bhowmic D⁶, Sarwar S⁷

Abstracts

Conflict of Interest: None

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Background: Typhoid fever remains a public health concern in developing countries. Antibiotic therapy constitutes the mainstay of management and multidrug resistant *Salmonella* spp has been emerged as a major public health concern.

Objective: This study was done to evaluate antimicrobial sensitivity pattern of *Salmonella typhi* isolated from blood in Shaheed Suhrawardy Medical College Hospital.

Methods: The retrospective study was done from January 2017 to December 2017 at microbiology laboratory, Shaheed Suhrawardy Medical College. A total of 367 samples, 30 isolates of *Salmonella typhi* obtained from blood culture. Both the indoor and outdoor patients were enrolled in this study.

Results: During one year study period, total 367 cases were enrolled and the prevalence of *Salmonella typhi* was 30 (8.2 %). Among them (56.1%) were male with a male to female ratio 1.27:1. The bulk (50.1%) cases were in the age group of 15-30 years, 14.4% cases were in less than 15 years and 6.5% cases were in more than 60 years of age. Regarding antibiotic sensitivity pattern, 70% strains were sensitive to amikacin, 73.33% to azithromycin, 63.33% to ceftazidime, 66.66% to ceftriaxone, 86.66% to ciprofloxacin and 70% were nalidixic acid resistant *Salmonella typhi*.

Conclusion: Ciprofloxacin may be used to treat typhoid fever cases and Ceftriaxone, azithromycin may be used as alternative drugs if they are found susceptible in culture and sensitivity testing.

Key Words: Antibiotic susceptibility, Dhaka, *Salmonella typhi*, Typhoid fever.

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Introduction

Typhoid fever poses a public health threat, recording high morbidity and mortality rates mainly in developing countries¹. According to recently revised global estimate,

1. Dr. Mst. Naznin Tarana, Department of Microbiology, Shaheed Suhrawardy Medical College, Dhaka, Bangladesh.
2. Dr. Samshad Jahan Shumu, Department of Microbiology, Shaheed Suhrawardy Medical College, Dhaka, Bangladesh.
3. Dr. Rashida Akter Khanam, Department of Microbiology, Shaheed Suhrawardy Medical College, Dhaka, Bangladesh.
4. Dr. Hosne Jahan, Department of Microbiology, Shaheed Suhrawardy Medical College, Dhaka, Bangladesh.
5. Dr. Soma Sarker, Department of Microbiology, Shaheed Suhrawardy Medical College, Dhaka, Bangladesh.
6. Dr. Devolina Bhowmic, Department of Microbiology, Shaheed Suhrawardy Medical College, Dhaka, Bangladesh.
7. Dr. Sharmin Sarwar, Department of Microbiology, Shaheed Suhrawardy Medical College, Dhaka, Bangladesh.

Correspondence to: Dr. Mst. Naznin Tarana, Lecturer, Department of Microbiology, Shaheed Suhrawardy Medical College, Dhaka, Bangladesh. Cell no.: +8801718077220. Email: naznintarana57@gmail.com

it causes 21.6 million illness every year, resulting in 216,500 death². Centers for Disease Control and Prevention (CDC) ranks antibiotic resistant *Salmonella typhi* as a serious threat that requires frequent monitoring and prevention to reduce the spread³. In the past, first line antibiotics for the treatment of typhoid included chloramphenicol, ampicillin, and trimethoprim-sulphamethoxazole. However, Multidrug resistant (MDR) *Salmonella typhi* defined as strains resistant to these first-line antibiotics emerged in the late 1980s⁴.

Salmonella enterica serovar *typhi* is now known to be markedly resistance to commonly prescribed antibiotics⁵. There have been several reports of multi-drug resistance *Salmonella typhi* with plasmid-mediated resistance to conventional antibiotics such as Chloramphenicol, Co-trimoxazole and Ampicillin in different parts of the world⁶. Multidrug resistance *Salmonella typhi* to antibiotic such as Chloramphenicol, Amoxicillin, Co-trimoxazole, and

Fluoroquinolone have emerged as new challenges to the treatment of typhoid fever⁷.

The first major epidemic of multidrug resistant *Salmonella typhi* was reported in 1972 in Mexico. Since then, an increasing frequency of antibiotic resistance has been reported from all parts of the world, but more so from the developing countries⁸. Today due to its changing modes of presentation, as well as the development of multidrug resistance, typhoid fever is becoming increasingly difficult to diagnose and treat. The resistance to well-known and trusted antimicrobial agents is widely recognized as one of the greatest challenges that physicians face in the management of adult and pediatric infections⁹.

Salmonella typhi, particularly the multidrug resistant (MDR) strain is of concern not only because of its resistance to available antibiotics resulting in high death rate but also because of its potential for epidemic outbreaks, which may be difficult to manage. This study was undertaken to have base line information regarding antibiogram of *Salmonella typhi* isolates, to develop cost effective treatment protocol.

Materials and methods

A retrospective study was conducted in microbiology laboratory at Shaheed Suhrawardy Medical College, Dhaka from January 2017 to December 2017. During 1 year study period, total 367 subjects were enrolled. After taking antiseptic measures 5-10 ml venous blood was collected from each patient and inoculated in tryptica soya broth. Subculture was done on blood agar and Mac Conkey's agar media. *Salmonella typhi* were identified by observing pale colonies on Mac Conkey's agar media and biochemical tests such as negative oxidase, urease and indole, alkaline slant and acid butt in TSI media with production of H₂S, negative citrate utilization test and positive motility test. Final species were identified by specific antisera. Antimicrobial susceptibility test was done by the disc diffusion method (Kirby-Bauer technique) using Mueller Hinton agar media following CLSI, 2013.

Results

A total of 367 clinical isolates were enrolled in this study, blood culture positive for *Salmonella typhi* were 30 (8.2%) and remaining 337 (91.8%) were culture negative (Table I). Majority of patients were male 206 (56.1%) and 161(43.9%) were female; male to female ratio 1.27: 1 (Table –II). The bulk 184 (50.1%) cases were in the age group of 15-30 years, 53(14.4%) cases were less than 15 years and 6.5% cases were more than 60 years of age. Regarding antibiotic sensitivity pattern, 70% strains were sensitive to amikacin, 73.33% to azithromycin, 63.33% to ceftazidime, 66.66% to ceftriaxone, 86.66% to ciprofloxacin and 70% were nalidixic acid resistant *Salmonella typhi*. (Table- IV).

Table I

Rate of isolation of Salmonella typhi in blood culture (n=367)

Rate of isolation	Frequency	Percentage (%)
No growth	337	91.8
<i>Salmonella typhi</i>	30	8.2
Total	367	100.0

Table II

Sex distribution of study subjects (n=367)

Sex	Frequency	Percentage (%)
Male	206	56.1
Female	161	43.9
Total	367	100.0

Table III

Age distribution of study subjects (n=367)

Age in years	Frequency	Percentage (%)
<15	53	14.4
15-30	184	50.1
31-45	64	17.4
46-60	42	11.4
>60	24	6.5
Total	367	100.0

Table IV

Antimicrobial sensitivity pattern of Salmonella typhi (N=30)

Antibiotics	Sensitive n (%)	Resistant n (%)
Amikacin	21(70)	9(30)
Azythromycin	22(73.33)	8(26.66)
Ceftazidime	19(63.33)	11(36.66)
Ceftriaxone	20(66.66)	10(33.33)
Ciprofloxacin	26(86.66)	4(13.33)
Chloramphenicol	12(40)	18(60)
Cotrimoxazole	14(46.66)	16(53.33)
Gentamycine	13(43.33)	17(56.66)
Levofloxacin	14(46.66)	16(53.33)
Nalidixic acid	9(30)	21(70)

Discussion

Enteric fever caused by *Salmonella enterica*, is a systemic infection with high rate of morbidity and mortality and have been a major public health problem in developing countries [10]. In this study, prevalence rate of *Salmonella typhi* isolated from blood cultures were 8.2%. Previous studies have reported rates from 2.3% to 23.1%¹¹ which is consistent with this study.

In this study, majority 184(50.1%) of the cases were in the age group of 15 to 30 yrs. This may be due to more frequent outdoor activities. These figures are consistent with other studies¹². Male to female ratio was nearly 1.27:1 which in concordance with other reports¹³.

The changing trend in the antibiogram of the enteric fever pathogens is a challenge to the clinicians. With the emerging resistance to the first line drugs (Ampicillin, Chloramphenicol, Cotimoxazole), quinolones were the main stay of treatment from 1990's. But within few years resistant strain of ciprofloxacin also emerged. In this study, *Salmonella typhi* were most sensitive to Ciprofloxacin, Azythromycin and Ceftriaxon (86.66%, 73.33% and 66.66%) respectively, which is consistent with other studies¹⁴. Moderate cost, advantage of oral intake, tolerability, convenient dosage schedule of fluoroquinolones led to rampant use and subsequent decrease in its sensitivity and clinical efficacy which prompted physician to use third generation cephalosporins¹⁵.

In our study, 70% *Salmonella typhi* were resistant to nalidixic acid, 60% resistant to Chloramphenicol. This study showed similar results with others^{16,17}. Nalidixic acid resistance is used as marker for predicting low level resistance to ciprofloxacin among *Salmonella typhi* and also an indicator of treatment failure to ciprofloxacin [18]. At present 3rd generation cephalosporins like ceftriaxone acts as a reserve drug for treating multi drug resistant *Salmonella typhi* and ciprofloxacin resistant cases¹⁹. Now 3rd generation cephalosporins and azythromycin are the only reasonable therapeutic options for most cases of travel related enteric fever²⁰.

Conclusion

Our antimicrobial susceptibility data suggests that Ciprofloxacin, Azythromycin and Ceftriaxone, Amikacin are the most effective drugs in the treatment of typhoid fever. The results of this study has further accentuated the growing concern about the presence of and the spread of multidrug resistant *Salmonella typhi* thereby underscoring the need for rational use of antibiotics and other necessary interventions that will help to control the antibiotic resistance.

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