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# Antibiotic Sensitivity Pattern of Blood Culture Enteric Fever

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## Abstract

Enteric fever is a systemic infection that evolved about 50,000 years ago. The organism classically responsible for the enteric fever syndrome is *S. Typhi* & *S. paratyphi*. Treatment of typhoid fever has been complicated by the development and rapid dissemination of typhoidal organisms resistant to ampicillin, cotrimoxazole, and chloramphenicol. In recent years, development of creeping resistance to fluoroquinolones has resulted in more challenges. Multidrug-resistant (MDR) strains have caused numerous outbreaks in the Indian subcontinent, Southeast Asia, Mexico, the Arabian Gulf, and Africa. Antimicrobial sensitivity of salmonella varies among different places & countries. So it is very important to know the local Antimicrobial sensitivity & resistance patterns for an appropriate treatment of enteric fever as like all other infectious disease. So the present study was designed to analyze the antibiotic sensitivity pattern in the cases of culture positive enteric fever in Bogra, Bangladesh. A total of 36 cases of blood culture proved enteric fever were studied for antibiotic sensitivity pattern. The study was conducted over a period of 6 months. Total of 36 culture positive cases of enteric fever were included in the study. The sensitivity pattern of isolates from blood culture was recorded. Out of 36 cases, 21 (58.3%) were males and 15 (41.7%) were females. Average age of presentation was 26.17 years. Out of 36 *Salmonella* strains isolated, *S. Typhi* was found in 25% cases & *S. Paratyphi A* was found in 75% cases. All *S. typhi* isolates were sensitive in vitro to ciprofloxacin, Levofloxacin, ceftriaxone, Ceftazidime & Meropenem (100%) while sensitivity to Amikacin, Nitrofurantoin & Cefepime was 67%. Cotrimoxazole, Cefixime, Chloramphenicol, Amoxicillin, Azithromycin is sensitive in only 33%. All *S. paratyphi* isolates were sensitive in vitro to ciprofloxacin, Levofloxacin, ceftriaxone, Cotrimoxazole, Azithromycin, Amikacin & Gentamicin.

## Introduction

Enteric fever is a systemic infection that evolved about 50,000 years ago<sup>1</sup>. The organism classically responsible for the enteric fever syndrome is *S. enterica* serotype *Typhi* (formerly *S. typhi*). Other *Salmonella* serotypes, particularly *S. enterica* serotype *paratyphi A*, *B*, or *C*, can cause a similar syndrome; however, it is usually not clinically useful or possible to reliably predict the causative organism based on clinical findings<sup>2</sup>. The term “enteric fever” is a collective term that refers to both typhoid and paratyphoid fever. It occurs in all parts of the world where there is substandard water supply and sanitation<sup>3</sup>. Typhoid fever is more

common in children and young adults than in older patients<sup>4</sup>. The disease remains a serious public-health problem in the developing countries<sup>5</sup>. The advent of chloramphenicol treatment changed the perception of typhoid fever from a severe to a readily manageable infection<sup>6</sup>. Outbreaks of chloramphenicol-resistant typhoid was reported in 1972. In the late 1980s and 1990s, outbreaks of typhoid caused by organisms resistant to chloramphenicol, cotrimoxazole, ampicillin and amoxicillin were reported<sup>6</sup>. Currently, decreased susceptibility has also been reported to fluoroquinolones and third-generation

cephalosporins<sup>7-10</sup>. With this background in mind, it becomes imperative to assess the extent of drug resistance before treatment is administered. Therefore, this study aimed to study the antibiotic sensitivity pattern among typhoid fever cases in a tertiary care setting, which most often caters to referred cases unsuccessfully treated elsewhere.

## Objectives

To see the antibiotic sensitivity of blood culture positive enteric fever cases in tertiary hospital in the northern area of Bangladesh.

## Materials and Methods

A retrospective record-based analysis was carried out for all the culture-proven enteric fever cases admitted to a tertiary care teaching hospital in Bogra. Due permission was sought from the hospital authorities to access the records. The medical records of all patients admitted from 1 January 2015 to 31 December 2015 with a diagnosis of enteric fever were analyzed. Only culture-positive (Bact/alert Biomerieux culture kits) enteric fever cases were included for the study. Of the 156 clinically suspected cases reporting to the hospital, 36 individuals who were culture positive for *Salmonella typhi* (9 case) & *Salmonella paratyphi* (27 case) during the study period were included in this study. Cases of enteric fever diagnosed on the basis of only clinical examination and Widal test were excluded from the study. Antibiotic susceptibility patterns were recorded. Data was entered and analyzed using SPSS version 20. Data has been summarized using percentages and proportions.

## Results

Among the 36 individuals who were culture positive for *Salmonella*, majority [21 (58.3%)] were males and 15 (41.7%) were females. Majority of the patients were (66.7%) in the age group of 16-30 years. The mean age of the patients was 22 years (SD 10.2). Widal was concomitantly positive in 28 (77.7%) cases. The antibiotic sensitivity pattern in the patients infected with *S. typhi* showed a high level of resistance to Cefixime (67%), Cefepime (33%), Moxifloxacin (100%), Chloramphenicol (67%), and Azithromycin (67%). Highest (100%) sensitivity for *S. typhi* found in Ceftriaxone, Ceftazidime, Ciprofloxacin, Levofloxacin, Netilmycin, Imipenem, Meropenem. The antibiotic sensitivity pattern in the patients infected with *S. paratyphi* showed a high level of resistance to Cefixime (45%), Moxifloxacin (88%), Chloramphenicol (88%), Imipenem (33%), Meropenem (33%). Highest (100%) sensitivity for *S. paratyphi* found in Ceftriaxone, Cotrimoxazole, Ciprofloxacin, Levofloxacin, Amikacin, Azithromycin. Overall Highest (100%) sensitivity for salmonella found in Ceftriaxone, Ciprofloxacin, Levofloxacin. Good sensitivity for salmonella found in Ceftazidime (92%), Amikacin (92%), Imipenem (92%), Meropenem (92%), Cotrimoxazole (83%), Azithromycin (83%). Multidrug resistant enteric fever (chloramphenicol, amoxicillin and cotrimoxazole) found in 8.3% cases.

## Antibiotic sensitivity pattern among culture positive enteric fever cases (n=36)

| Antibiotic (Group) | Antibiotic      | S. typhi (n=9) |               | S. paratyphi (n=27) |               | Total (n=36)  |               |
|--------------------|-----------------|----------------|---------------|---------------------|---------------|---------------|---------------|
|                    |                 | Sensitive (%)  | Resistant (%) | Sensitive (%)       | Resistant (%) | Sensitive (%) | Resistant (%) |
| Penicillin         | Amoxicillin     | 0 (0%)         | 9 (100%)      | 15(55%)             | 12(45%)       | 15(42%)       | 21(58%)       |
| Cephalosporin      | Cefradine       | 3(33%)         | 6(67%)        | 18(67%)             | 9(33%)        | 21(58%)       | 15(42%)       |
|                    | Cefixime        | 3(33%)         | 6(67%)        | 15(55%)             | 12(45%)       | 18(50%)       | 18(50%)       |
|                    | Cefuroxime      | 0 (0%)         | 9 (100%)      | 3(11%)              | 24(89%)       | 3(8%)         | 33(92%)       |
|                    | Ceftriaxone     | 9 (100%)       | 0 (0%)        | 27(100%)            | 0(0%)         | 36(100%)      | 0(0%)         |
|                    | Ceftazidime     | 9 (100%)       | 0 (0%)        | 24(89%)             | 3(11%)        | 33(92%)       | 3(8%)         |
|                    | Cefepime        | 6(67%)         | 3(33%)        | 15(55%)             | 12(45%)       | 21(58%)       | 15(42%)       |
| Sulphonamide       | Cotrim          | 3(33%)         | 6(67%)        | 27(100%)            | 0(0%)         | 30(83%)       | 6(17%)        |
| Quinolones         | Ciprofloxacin   | 9 (100%)       | 0 (0%)        | 27(100%)            | 0(0%)         | 36(100%)      | 0(0%)         |
|                    | Levofloxacin    | 9 (100%)       | 0 (0%)        | 27(100%)            | 0(0%)         | 36(100%)      | 0(0%)         |
|                    | Moxifloxacin    | 0 (0%)         | 9 (100%)      | 6(22%)              | 21(88%)       | 6(17%)        | 30(83%)       |
| Aminoglycosides    | Gentamicin      | 3(33%)         | 6(67%)        | 24(89%)             | 3(11%)        | 27(75%)       | 9(25%)        |
|                    | Amikacin        | 6(67%)         | 3(33%)        | 27(100%)            | 0(0%)         | 33(92%)       | 3(8%)         |
| Chloramphenicol    | Chloramphenicol | 3(33%)         | 6(67%)        | 6(22%)              | 21(88%)       | 9(25%)        | 27(75%)       |
| Macrolids          | Azithromycin    | 3(33%)         | 6(67%)        | 3(33%)              | 6(67%)        | 30(83%)       | 6(17%)        |
| Carbapenem         | Imipenem        | 9 (100%)       | 0 (0%)        | 24(89%)             | 3(11%)        | 33(92%)       | 3(8%)         |
|                    | Meropenem       | 9 (100%)       | 0 (0%)        | 24(89%)             | 3(11%)        | 33(92%)       | 3(8%)         |

## Discussion

Decreased susceptibility of *Salmonella typhi* to ciprofloxacin has been well documented in several studies<sup>3, 12-13</sup> but here we found good sensitivity to ciprofloxacin & Levofloxacin. Sensitivity to ceftriaxone in the current study was high, as reported in other studies<sup>11,12-13</sup>. The change in the resistance patterns of chloramphenicol, amoxicillin and is noteworthy, but cotrimoxazole has a good number of sensitivity. Our findings indicate a remarkable reversal in the resistance

pattern of serotype *Salmonella typhi*. Similar trends have been noted in several other studies<sup>13</sup>. The emergence of isolates resistant to oral cephalosporin suggests that if irrational and indiscriminate use persists, it is probably only a matter of time before the organisms develop widespread resistance to these. There is an urgent need to keep the possible emergence of untreatable strains to a minimum by the administration of appropriate antibiotics as indicated by the sensitivity tests.

## Conclusion

Enteric fever is one of the most common health problem in Bangladesh. Various drugs are being used in the treatment of enteric fever, in the meantime resistance to many of them are emerging, stressing the need for rational use of antibiotics after appropriate and timely antibiotic sensitivity and resistance testing. An appropriate antibiotic has to be initiated only after culture sensitivity in enteric fever.

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