

Sensitivity pattern of *Salmonella* serotypes from a tertiary care hospital of Punjab

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ABSTRACT

Enteric fever is classically caused by *S. Typhi* & *S. Paratyphi* A, B & C and it is known to be endemic in India. For optimal patient care, precise information on antibiotic susceptibility pattern is required. Hence, this study was undertaken to know the antimicrobial sensitivity profile of *Salmonella* serotypes isolated from blood in a tertiary care hospital of Punjab. All the blood samples received from January 2010 – December 2011 were processed by automated blood culture systems (BACTEC 9240/BacT-Alert 3D). Identification and antimicrobial susceptibility pattern of *Salmonella* strains was studied by automated identification system (MicroScan Walk-Away/ VITEK 2). Out of a total of 35854 blood samples, 5234 (14.6%) samples were found to be positive for bacterial growth, of which 363 (6.93%) were *Salmonella* spp. Of these, 281 (77.4%) were *S. Typhi* and 82 (22.6%) were *S. Paratyphi* A. Only 2 (0.7%) isolates of *S. Typhi* were found resistant to ampicillin and trimethoprim-sulfamethoxazole, and 5 (1.8%) were resistant to ciprofloxacin & levofloxacin. All the *S. Typhi* isolates were sensitive to 3rd generation cephalosporins. *S. Paratyphi* A isolates were sensitive (100%) to all the drugs, except trimethoprim-sulphamethoxazole (97.6%) & ceftriaxone (98.8%). Though multi drug resistant *Salmonella* are being reported from various parts of India, in our region the *Salmonella* isolates are still susceptible to the commonly used drugs.

Keywords : Antimicrobial sensitivity, Enteric fever, *Salmonella* Paratyphi A, *Salmonella* Typhi

INTRODUCTION

Enteric fever is one of the most common causes of pyrexia of unknown origin (PUO) in most parts of the world. It includes typhoid fever caused by *Salmonella* Typhi and paratyphoid fever caused by *S. Paratyphi* A, B and C. An estimated 600,000 deaths occur annually throughout the world due to enteric fever. It continues to be a major public health problem in developing countries and the mortality is as high as 30%. Isolation of *Salmonella* species occurs throughout the year. *S. Typhi* and *S. Paratyphi* A are the predominant types of *Salmonella* responsible for enteric fever in India.¹

Chloramphenicol was considered the gold standard anti-microbial for the treatment of typhoid fever after its

introduction in 1948.² Amoxicillin and co-trimoxazole were the effective alternatives till the development of “multidrug resistant (MDR) strains” (resistant to ampicillin, chloramphenicol and co-trimoxazole – ACCo) towards the end of 1980s and 1990s.³ Due to increasing frequency of antibiotic resistance, the use of chloramphenicol, amoxicillin and co-trimoxazole have become infrequent and quinolones have become the first line of treatment for typhoid fever. However, in recent years, there have been several reports indicating the re-emergence of susceptibility to drugs used in the past, such as ampicillin and trimethoprim. Therefore, the present study was done to determine the antimicrobial susceptibility pattern of *S. Typhi* & *S. Paratyphi* A in our region.

MATERIAL & METHODS

A total of 35,854 blood specimens obtained from patients suffering from PUO or septicemia during the study period (January 2010 - December 2011) were processed using the automated blood culture systems (BACTEC 9240/ Bac T Alert 3D). The samples were inoculated in blood culture bottles and incubated in the system. When the bottle was flagged positive by the system, subculture was done on 5% sheep blood agar & MacConkey's agar and

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Table I
The antibiotic sensitivity pattern of *S. Typhi* and *S. Paratyphi A*

Antibiotics	MIC (Sensitive) µg/ml	<i>Salmonella Typhi</i> n= 281	<i>Salmonella Paratyphi</i> n= 82
Ampicillin	≤8	279 (99.3)	82 (100)
Trimethoprim-sulphamethoxazole	≤2/38	279 (99.3)	80 (97.6)
Ciprofloxacin	≤1	276 (98.2)	82 (100)
Levofloxacin	≤2	276 (98.2)	82 (100)
Ceftazidime	≤8	281(100)	82 (100)
Ceftriaxone	≤8	281(100)	81 (98.8)

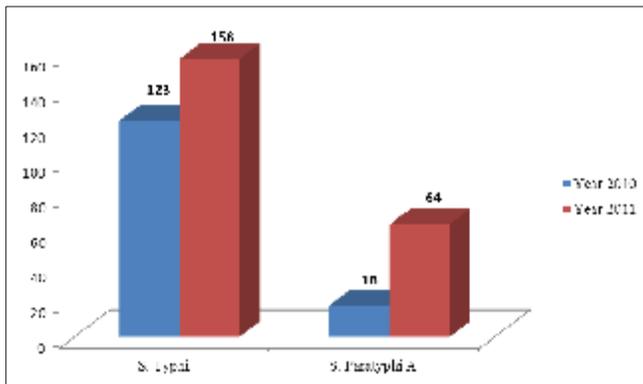


Figure 1: Year wise distribution of *Salmonella* isolates.

a smear was prepared. Initial identification of the organism was carried out on the basis of colony morphology and Gram's stain. The final identification and antimicrobial susceptibility testing was done by using fully automated systems (Microscan Walkaway/Vitek 2). In addition the confirmation of *Salmonella* spp. was carried out using specific antisera procured from CRI, Kasauli.

RESULTS

Out of a total of 35,854 blood samples processed, 5,234 (14.6%) were positive for various organisms. Out of these, *Salmonella* spp. was isolated from 363 (6.93%) blood samples. Of these, 281 (77.4%) were identified as *S. Typhi* and 82 (22.6%) as *S. Paratyphi A*. Year wise distribution of *Salmonella* isolates is depicted in Figure I.

Table I shows the antibiotic sensitivity pattern of *S.*

Typhi and *S. Paratyphi A*. *S. Typhi* showed 100% sensitivity to 3rd generation cephalosporins (ceftazidime & ceftriaxone), 99.3% sensitivity to ampicillin & cotrimoxazole and 98.2% sensitivity to fluoroquinolones (ciprofloxacin, levofloxacin). *S. Paratyphi A* showed 100% sensitivity to ampicillin, ciprofloxacin, levofloxacin and ceftazidime. Whereas, sensitivity to ceftriaxone and cotrimoxazole was 98.8% and 97.6% respectively.

DISCUSSION

Enteric fever is an important public health problem in many underdeveloped and developing countries. *S. Typhi* continues to be the predominant pathogen in enteric fever but infections with *S. Paratyphi A* are also on rise. In the present study, a 28.5% increase in *S. Typhi* isolates was observed whereas an increase of 39% was observed in *S. Paratyphi A* in the year 2011 in comparison to 2010. Similar trend has been observed by Gupta *et al*⁴ in Chandigarh and Tankhiwale *et al*⁵ in Nagpur.

Resistance to commonly used antibiotics has been reported from different parts of India. Yashawanth *et al*⁶ reported a sensitivity of 98.7% and 92.7% to ampicillin for *S. Typhi* and *S. Paratyphi A* in Mangalore. Similarly, in the present study 99.3% of *S. Typhi* and 100% of *S. Paratyphi A* isolates were susceptible to ampicillin (MIC ≤ 8µg/ml). However, as per Gupta *et al*⁴ *S. Paratyphi A* isolates were less susceptible to ampicillin (69.2%) in Chandigarh. In a separate study by Verma *et al*,⁷ sensitivity of *S. Typhi* & *S. Paratyphi A* was 67% and 71.5% respectively for ampicillin.

There has been increase in cases of clinical failure

after the administration of ciprofloxacin to patients with enteric fever. Prajapati *et al*⁸ reported a decreased susceptibility to ciprofloxacin, 86.6% for *S. Typhi* and 51.3% for *S. Paratyphi A*. Similarly, Lakshmi *et al*⁹ reported a sensitivity of 83% and 70% to *S. Typhi* and *S. Paratyphi A* respectively. In contrast, Tankhiwale *et al*,⁵ Nagpur, India, reported that 100% of the *S. Paratyphi A* isolates were sensitive to ciprofloxacin and Verma *et al* reported a sensitivity of 90.6% and 91.2% to *S. Typhi* and *S. Paratyphi A* respectively.⁷ In the present study, 100% of *S. Paratyphi A* isolates & 98.2 % of *S. Typhi* isolates were found to be sensitive to ciprofloxacin & levofloxacin (MIC $\leq 1\mu\text{g/ml}$ & $\leq 2\mu\text{g/ml}$ respectively).

Ceftriaxone, cefotaxime, and (oral) cefixime are effective for treatment of MDR enteric fever, including nalidixic acid resistant and fluoroquinolone-resistant strains. In the present study, all the *Salmonella* isolates were susceptible to ceftazidime, however one of the *S. Paratyphi A* isolates was found resistant to ceftriaxone. Various studies from other parts of India have also reported 100% sensitivity to 3rd generation cephalosporins,^{4-6,10,11} whereas resistance to these have been reported by Verma *et al*.⁷

Prompt administration of appropriate antibiotic therapy prevents severe complications of enteric fever and results in decreased case-fatality rate. Though multi drug resistant are being reported from various parts of India, but in our region the *Salmonella* isolates are still susceptible to the commonly used drugs. It is advisable to do continuous surveillance of antimicrobial susceptibility pattern of isolates as to make rational use of antibiotics

in the management of enteric fever cases.

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