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Original Research Article

In-vitro antibiotic sensitivity pattern of *Salmonella typhi*

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Abstract

Introduction: *Salmonella typhi* is widely prevalent in India and it causes endemic and epidemic typhoid fever. Early and proper antibiotic administration is necessary to reduce morbidity, complication and mortality of typhoid.

Material and methods: A total of 1006 febrile patients, receiving treatment at Guru Govindsingh Hospital, Jamnagar, were included in this study. 1006 blood culture samples for *S. typhi* were collected from these patients. Blood cultures were tested for clinical bacteriology, as per standard protocol.

Results: 30 blood cultures grew positive for *S. typhi* with the isolation rate of 2.98%. 60% *S. typhi* isolates were resistant to chloramphenical, ampicillin, and co-trimoxazole and hence, were multidrug resistant *S. typhi*. Ciprofloxacin was the most effective drug with 93.33 % sensitivity.

Conclusion: Ciprofloxacin remains the drug of choice for treatment of typhoid fever. Unchecked use of ciprofloxacin antibiotic should be rationalized, since selection pressure has now emerged as ciprofloxacin resistance in *S. typhi*.

Key words

Antibiotic sensitivity, Ciprofloxacin, Salmonella typhi.

Introduction

Salmonella typhi is widely prevalent in India and it causes endemic and epidemic typhoid fever [1]. Early and proper antibiotic administration is necessary to reduce morbidity, complication and mortality of typhoid [2]. Chloramphenicol, ampicillin and co-trimoxazole were quite effective against *S. typhi* in past. Since 1989, *S. typhi* resistant to several antimicrobials is reported from India and other countries [2]. Ciprofloxacin was introduced around 1990. It was 100% effective against *S. typhi*, however resistant strains are emerging now. The present study was carried out to detect *in-vitro* antibiotic sensitivity pattern of *S. typhi*.

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Material and methods

A total of 1006 febrile patients, receiving treatment at Guru Govindsingh Hospital, Jamnagar, were included in this study. 1006 blood culture samples for *S. typhi* were collected from these patients. Five ml blood was collected intravenously aseptically and inoculated in 50 ml taurocholate broth. Blood cultures were tested for clinical bacteriology, as per standard protocol at Microbiology Department, Shri M. P. Shah Medical College, Jamnagar. The taurocholate broth was incubated at 37^0C for 24 hours and, then subcultured on blood agar, nutrient agar and, MacConkey's agar and, incubated at 37^0C for 24 hours. The colony growths were identified by colony characteristics, bio-chemical reactions, and confirmed by agglutination with specific antisera like Poly O, O-9, and H-d. The clinical isolates were subjected to antibiotic sensitivity test on Mueller-Hinton agar, using standard Kirby-Bauer disc diffusion test. Antibiotic discs used were Chloramphenicol, Amplicillin, Co-trimoxazole, Ciprofloxacin, Ofloxacin, Pefloxacin, Amikacin, Gentamicin, Tetracycline, Cefotaxime, Ceftizoxime and Piperacillin. The sensitivity was determined by measuring zone of inhibition around antibiotic discs. The negative samples were incubated for next seven days and then subcultured, before finally declaring them as culture negative *S. typhi.*

Results

Total 1006 blood cultures were tested bacteriologically at Microbiology Department, Shri M. P. Shah Medical College, Jamnagar, out of which 30 blood cultures grew positive for *S. typhi* with the isolation rate of 2.98%. Antibiotic sensitivity of *S. typhi* isolates was as per **Table – 1**.

20 (67%) *S. typhi* isolates were from male patients and, 10 (33%) *S. typhi* were from female patients. 18 (60%) culture positive patients fell into age group of 1-15 years.

Ciprofloxacin was the most effective antibiotic, because 28 (93%) isolates were sensitive to it. Ampicillin was the least effective antibiotic, because 25 isolates (85%) expressed resistance to it.

18 (60%) *S. typhi* isolates were multi-drug resistant, since they shown resistance to amplicillin, chloramphenicol and co-trimoxazole.

Table - 1: Antibiotic sensitivity of *S. typhi* isolates.

Antibiotic	Sensitive n (%)	Resistant n (%)
Chloramphenicol	11 (37)	19 (63)
Co-trimoxazole	09 (30)	21 (70)
Amplicillin	05 (16)	25 (84)
Ciprofloxacin	28 (93)	02 (7)
Pefloxacin	25 (83)	05 (17)
Amikacin	24 (80)	06 (20)
Gentamicin	24 (80)	06 (20)
Ceftizoxime	20 (66)	10 (34)
Cefotaxime	16 (53)	14 (47)
Ofloxacin	15 (50)	15 (50)
Piperacillin	13 (43)	17 (57)
Tetracycline	10 (33)	20 (67)

Discussion

Total 1006 blood cultures were tested bacteriologically, out of which 30 blood cultures were confirmed as positive for *S. typhi* with the isolation rate of 2.98%. We collected blood culture samples for *S. typhi* from patients, receiving treatment at Guru Govindsingh Hospital, Jamnagar. This hospital is a tertiary medical hospital for the region and, many patients seek treatment here, after receiving some treatment at local level. This factor may interfere with organism isolation rate. Studies conducted in nineteen nineties from different

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parts of India show a wide range of *S. typhi* isolation rate from 1.3% - 34.4% [3-9]. The incidence of typhoid increases during warm months and rainy season [1, 10]. We isolated majority of *S. typhi* (20, 67%) in warm and moist months between April and August.

The highest incidence of typhoid occurs in 5-19 years age group. Males are affected more frequently than females [10]. In the present study, 18 (60%) cases occurred between 1-15 years of age. 20 (67%) isolates were from male patients and 10 (33%) isolates were from female patients.

Since its introduction in late nineteen forties and until the mid-1970s, chloramphenicol was the "gold standard" antimicrobial of choice for typhoid. Very soon, reports of chloramphenicol resistance became public, starting from western world to India [11-15]. Resistant *S. typhi*, carrying R-factor with a mobilizing transfer factor (plasmids of the H1 incompatibility) were detected at Vietnam during March and April 1973 [16]. In the present study, 19 (63%) *S. typhi* isolates were resistant to chloramphenicol and, this finding is in line with the prevalent resistance profile.

Since 1980, trimethoprim and ampicillin had been used extensively for the treatment of patients infected with chloramphenicol-resistant *S. typhi* strains [17]. In the late 1980s, the prevalence of chloramphenicol – resistant strains began to rise rapidly in India and Pakistan and, by 1992, 70-80% of strains in many areas were resistant to ampicillin and trimethoprim in addition to chloramphenicol. In our study, 18 (60%) *S. typhi* isolates were multi-drug resistant, since they shown resistance to chloramphenicol, amplicillin, and co-trimoxazole. Mary V. Jesudasan, et al. [14]. In 1991, reported excellent sensitivity of multi-drug resistant *S. typhi* to ciprofloxacin. Similar finding were reported by Sudarsana J, et al. [18] during 1992. Maheshwari VD, et al. [19] reported 100% sensitivity to ciprofloxacin, while Rathish KC, et al. [6] and Shobha N, et al. [8] reported 95% sensitivity to ciprofloxacin. We also reported Ciprofloxacin as the most effective antibiotic, because 28 (93%) isolates were sensitive to it. On the worrying side, ciprofloxacin resistance has been reported by many studies [8, 20-22]. Ampicillin was the least effective antibiotic, because 25 (85%) isolates were resistant to it.

Conclusion

In typhoid endemic nation like India, multi-drug resistant *S. typhi* is a serious treatment challenge. Ciprofloxacin remains the drug of choice for treatment of typhoid fever. Unchecked use of ciprofloxacin antibiotic should be rationalized, since selection pressure has now emerged as ciprofloxacin resistance in *S. typhi*.

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