Scholars Academic Journal of Biosciences (SAJB) **ISSN 2321-6883 (Online)**
Sch. Acad. J. Biosci., 2016; 4(8):634-636 **ISSN 2347-9515 (Print)**

(An International Publisher for Academic and Scientific Resources)
www.saspublishers.com DOI : 10.36347/sajb.2016.v04i08.006

Original Research Article

Current Trend of the Antibiogram of *Salmonella* Isolates at a Tertiary Care Hospital in North India

Dr. SaumyaAgarwal[1], Dr. NandiniDuggal[2], Dr. ArunWilson[1]
[1]3rd year post graduate resident, [2]Professor& head,
Department of Microbiology, Dr. RML hospital& PGIMER, New Delhi-110001, India

***Corresponding author**
Dr. SaumyaAgarwal
Email: drsaumya.agarwal@gmail.com

Abstract: Typhoid fever continues to remain a major public health problem, especially in developing due to poor sanitation and personal hygiene. *Salmonella enteric* serovars*typhi* and *Paratyphi A&B* are predominantly known to cause enteric fever. A changing antibiotic susceptibility pattern of *Salmonella typhi* and *Salmonella Paratyphi A& B* and emergence of multi drug resistance has increased to a great concern. This study was conducted at the department of microbiology in Dr. RML Hospital, New Delhi to investigate the antibiotic susceptibility pattern of *Salmonella typhi* and *Salmonella Para typhiA&B.* Blood culture samples were collected from suspected enteric fever patient and tested microbiologically by standard procedure. Antibiotic susceptibility test was performed by Kirby-Bauer disc diffusion method and results were interpreted according toCLSI guidelines. Out of the total 19,037 blood samples, 228 *Salmonella* isolates were isolated. Of these, 206 (90.3%) were *S.typhi*, 21 (9.21%) isolates were *S.paratyphi A* and 1 isolate (0.44%) was *S.paratyphi B.* Among the tested antibiotics *S. typhi* was susceptible towards amikacin (97.5%), Chloramphenicol (89.4%), Ceftriaxone (87.8%), cotrimoxazole (87.8%), gentamicin (72.4%) followed by ciprofloxacin (10.3%) and nalidixic acid (9.1%). 2.92% of *S. typhi isolates* showed multidrug resistance. A considerable variation was observed in the antimicrobial susceptibility pattern of *S.typhi*and *S.paratyphi A* & *B.* Hence antibiotic susceptibility test must be sought before instituting appropriate therapy to prevent fromfurther emergence of drug resistance.
Keywords: Typhoid fever, *Salmonella typhi*, Blood culture, Antimicrobial susceptibility, Chloramphenicol, Multidrug resistance.

INTRODUCTION

Enteric fever is an important public health problem in developing countries like India, accounting for high morbidity and mortality [1]. Enteric fever includes typhoid fever caused by *Salmonella enterica var Typhi* and paratyphoid fever caused mainly by *Salmonella enterica var Para typhiA* and *B* and is mainly transmitted by the feco-oral route in regions where poor standards of hygiene and sanitation are prevalent [2].

Antibiotic therapy remains the mainstay of management of enteric fever, reducing the mortality from 30% in untreated cases to <1% in patients with appropriate antibiotic therapy[3]. Failure to treat an infection properly can lead to prolonged illness and also increases the chances of developing a carrier state in which persons are able to spread the resistant strain to others [3].

In the last few decades, multidrug resistant (MDR) *Salmonella* i.e. resistant to ampicillin, chloramphenicol and cotrimoxazolehave emerged. This has led to widespread use of fluoroquinolones and third-generation cephalosporins as the first-line drugs [3].

The present study was undertaken to study the antibiotic resistance of *Salmonella enteric serovartyphi* and *S. Para typhi* isolates obtained from blood cultures during August 2013 to August 2015 in a tertiary care hospital in north India.

MATERIAL AND METHODS

The study was conducted in PGIMER &Dr. R.M.L hospital, New Delhi from August 2013 to August 2015. Blood samples received for routine bacterial culture was collected in BacT/ALERT blood culture bottles. Blood culture bottles showing positive signal were subcultered on blood and MacConkey agar and were incubated aerobically at 37°C for 18-24 hours. The bacterial isolates were identified based on morphology, biochemical reactions and serotyping with specific antisera by slide agglutination.

The antimicrobial susceptibility of isolates was determined with Kirby-Bauer disc diffusion and performed on Muller-Hinton agar plates. Antibiotics disc used in this study were ampicillin (10 µg), chloramphenicol (30 µg), cotrimoxazole (1.25/23.75µg), gentamicin (30 µg), amikacin (30 µg), ciprofloxacin (5 µg), nalidixic acid (30 µg), tetracycline (30 µg), and ceftriaxone (30 µg). The reference strain *Escherichia coli* ATCC 25922 was included as quality control in the susceptibility assays. The disk strength and zone-size interpretation was in accordance with the Clinical and Laboratory Standards Institute (CLSI) guidelines [4].

RESULTS

During the study period 19,037 blood samples were received at Microbiology department in BACT/ALERT bottles for blood culture. From these, 228 *Salmonella* isolates were isolated. Out of these, 206 (90.3%) were *S.typhi*, 21 (9.21%) isolates were *S. Paratyphi A* and 1 isolate (0.44%) was *S. paratyphi B*. The antibiotic susceptibility pattern of the *Salmonella* isolates observed is illustrated in table-1.

Table-1 Result of susceptibility patterns of the *Salmonella* isolates to the antibiotics

Antibiotic	*Salmonella* Typhi (206)		*Salmonella* Para typhi A (21)		*Salmonella* Paratyphi B (1)	
	S (%)	R (%)	S (%)	R (%)	S (%)	R (%)
Gentamicin	149 (72.4)	57(27.6)	20 (95.2)	1 (4.8)	1 (100)	0 (0)
Amikacin	201 (97.5)	5 (2.5)	21 (100)	0 (0)	1 (100)	0 (0)
Chloramphenicol	184 (89.4)	22 (10.6)	21 (100)	0 (0)	1 (100)	0 (0)
Ciprofloxacin	21 (10.3)	185 (89.7)	18 (85.7)	3 (14.3)	1 (100)	0 (0)
Ceftriaxone	181 (87.8)	25 (12.2)	20 (95.2)	1 (4.8)	1 (100)	0 (0)
Cotrimoxazole	181 (87.8)	25 (12.2)	21 (100)	0 (0)	1 (100)	0 (0)
Nalidixic acid	19 (9.1)	187 (90.9)	0 (0)	21 (100)	0 (0)	1 (100)
Ampicillin	158 (76.9)	48 (23.1)	18 (85.7)	3 (14.3)	1 (100)	0 (0)

S.typhi showed the highest resistance to nalidixic acid (90.9%) while highest susceptibility was seen to amikacin (97.5%) followed by chloramphenicol (89.4%). *S.Paratyphi A* showed highest resistance to nalidixic acid (100%) and highest susceptibility to chloramphenicol, cotrimoxazole and amikacin (100%). *S.Paratyphi B* isolate was sensitive to cotrimoxazole, chloramphenicol, ciprofloxacin, ceftriaxone, ampicillin, gentamicin, and amikacin and resistant only to nalidixic acid.

It was observed that six isolates of *S.typhi* (2.92%) were MDR strains i.e., resistant to ampicillin, cotrimoxazole and chloramphenicol. All MDR strains were resistant to nalidixic acid and sensitive to ceftriaxone. None of the *S.Paratyphi A* and *S.Paratyphi B* isolates was MDR.

DISCUSSION

Enteric fever is a major public health problem in most resource-poor countries such as India due to a combination of factors including poor sanitation and health care infrastructure [5].

Chloramphenicol has been the drug of choice for enteric fever since its introduction in 1948. But due to its indiscriminate use, resistance developed within a few years [6]. Chloramphenicol resistant *Salmonella* were initially susceptible to other first-line antibiotics like ampicillin and cotrimoxazole. But, in late 1980s and early 1990s, *Salmonella*, resistant to chloramphenicol, ampicillin and cotrimoxazole emerged which were named as MDR Salmonella [7].

Introduction of ceftriaxone or azithromycin as a treatment of choice led to decrease in the use of first-line antibiotics in treating enteric fever. This might be the reason for re-emergence of susceptibility to chloramphenicol and other first-line drugs in previously resistant areas [8, 9, 10]. Our study also demonstrated a very good susceptibility of *Salmonella* isolates to chloramphenicol, ampicillin and cotrimoxazole which is consistent with the re-emergence of susceptibility to first line antibiotics.

In the present study, we have found 2.92% MDR *S.typhi* and this finding is in accordance with some reports which also showed the decrease in incidence of MDR *S.typhi* isolates [11, 12-15]. The low incidence of MDR *S.typhi* isolates is remarkable, since these drugs could once again be used for the treatment of enteric fever.

Nalidixic acid resistance is used as a surrogate marker for predicting low-level resistance to ciprofloxacin among *S. Typhi* and also an indicator of treatment failure to ciprofloxacin [12-16]. Hence, it is recommended that all *S. Typhi* isolates should be screened for nalidixic acid resistance along with ciprofloxacin. In our study, nalidixic acid resistance (by disc diffusion method) was observed in 90.9% *S. Typhi* isolates along with 89.7% resistance to ciprofloxacin.

CONCLUSION

With the decreased incidence of susceptibility to fluoroquinolones (ciprofloxacin) and nalidixic acid and the re-emergence of sensitivity to chloramphenicol among *Salmonella*, the policy of empirical treatment of enteric fever needs to be rationalized. The changing trends in the antibiotic susceptibility of *Salmonella* demands reconsideration for the use of chloramphenicol in typhoid fever, instead of ciprofloxacin or third and fourth generation cephalosporins. It is imperative that these drugs should be used judiciously to limit the spread of resistance and new, reliable treatment options must be sought before untreatable typhoid fever becomes a major problem.

REFERENCES

1. Crump JA, Luby SP, Mintz ED; The global burden of typhoid fever. Bull World Health Organ. 2004; 82:346-53.
2. Teh CS, Chua KH, Thong KL; Paratyphoid fever: splicing the global analyses. International Journal of Medical Sciences 2014; 11(7):732–41.
3. Singhal L, Gupta PK, Kale P, Gautam V, Ray P; Trends in antimicrobial susceptibility of Salmonella Typhi from North India (2001–2012). Indian Journal of Medical Microbiology2014; 32:149–152.
4. Performance Standards for Antimicrobial. Susceptibility Testing: Twenty- Third Informational Supplement.M100-S23: Clinical and Laboratory Standards Institute (CLSI); January2013.
5. Nagshetty K, Channappa ST, Gaddad SM; Antimicrobial susceptibility of Salmonella Typhi in India. The Journal of Infectious diseases in Developing Countries 2010; 4:70–73.
6. Butler T; Treatment of typhoid fever in the 21st century: Promises and shortcomings. Clinical Microbiology and Infection 2011; 17:959-63.
7. Kumar Y, Sharma A, Mani KR; Re-emergence of susceptibility to conventionally used drugs among strains of Salmonella of Salmonella Typhi in central west India. The Journal of Infectious diseases in Developing Countries 2011; 5:227–30.
8. Harish BN, Menezes GA; Antimicrobial resistance in typhoidal salmonellae. Indian Journal of Medical Microbiology2011; 29:223–9.
9. Lakshmi V, Ashok R, Susmita J, Shailaja VV; Changing trends in the antibiogram of Salmonella isolates at a tertiary care hospital in Hyderabad. Indian Journal of Medical Microbiology, 2006; 24:45–8.
10. Walia M, Gaind R, Mehta R, Paul P, Aggarwal P, Kalaivani M; Current perspectives of enteric fever: a hospital-based study from India. Annals of Tropical Paediatrics 2005; 25:161-174.
11. Dutta S, Sur D, Manna B, Bhattacharya SK, Deen JL, Clemens JD; Rollback of Salmonellaenterica serotype Typhi resistance to chloramphenicol and other antimicrobials in Kolkata, India. Antimicrobial Agents Chemotherapy 2005; 49:1662-3.
12. Harish BN, Prashanth K; Multidrug resistant Salmonella Typhiwith special reference to in vitro activity of ciprofloxacin.Biomedicine 1998; 18: 62-6.
13. MadhulikaU, HarishBN, ParijaSC; Current pattern in antimicrobial susceptibility of Salmonella Typhiisolates in Pondicherry. Indian Journal of Medical Research 2004; 120 (2): 111-114.
14. Nath G, Tikoo A, Manocha H, Tripathi AK, Gulati AK; Drug resistance in Salmonella typhi in North India with special reference to ciprofloxacin. Journal of Antimicrobial Chemotherapy2003; 46: 145-53.
15. Choudhary A, Gopalakrishnan R, Nambi PS, Ramasubramanian V, Ghafur KA, Thirunarayan MA; Antimicrobial susceptibility of Salmonella entericaserovars in a tertiary care hospital in southern India. Indian Journal of Medical Research 2013; 137(4): 800-802.
16. Rodrigues C, Shennai S, Mehta A; Enteric fever in Mumbai, India: the good news and the bad news. Clinical infectious Diseases 2003; 36(4): 535.