Changing trend of antimicrobial susceptibility pattern of Salmonella species isolated at Kathmandu Medical College Teaching Hospital.

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ABSTRACT

Introduction: The present study was designed to analyze the antibiotic susceptibility pattern of Salmonella species and to determine the changing trend of antimicrobial susceptibility pattern of Salmonella species

Method: A total of 100 isolates of Salmonella species among all the blood culture samples in KMCTH lab from March 5th 2011 onward were taken into a study group and antibiotic sensitivity test was performed by Kirby Bauer's method.

Result: Out of 100 positive samples, 93 were found to be Salmonella typhi and 7 were Salmonella paratyphi. Salmonella typhi was found to be 100% sensitive to Ciprofloxacin, Amikacin & Erythromycin. Nalidixic acid was found to be the least sensitive (86.02%). Other frequent resistant antimicrobial were Ceftriaxone (7.52%), Cotrimoxazole (4.3%), Chloramphenicol (3.22%) and Ampicillin (1.07%).

Similarly, Salmonella paratyphi was found to be 100% sensitive to Ciprofloxacin & Amikacin. In addition to this Chloramphenicol, Erythromycin and Nalidixic acid were also 100% sensitive but were resistant to Ceftriaxone (28.57%), Ampicillin (28.57%) and Cotrimoxazole (14.28%).

Conclusion: The emergence of Salmonella typhi and paratyphi resistant to Ceftriaxone is of very great concern.

Keyword: salmonella paratyphi , salmonella typhi, sensitivity.

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Introduction

Typhoid fever occurs in all parts of the world where there is substandard water supply and sanitation.[1] It is still an important public health problem in developing countries including Nepal. WHO estimates the annual global incidence of typhoid fever at 0.3%. [1]

Salmonella typhi is a major cause of enteric fever. Salmonella paratyphi A & B are relatively infrequent. The primary sources of infection are contaminated water and food with faeces and urine of cases and carrier.

Chloromphenicol is used to be the drug of choice for the enteric fever since its introduction.[2] But, with the emergence of Chloromphenicol resistant strains of Salmonella, Ampicillin and Cotrimoxazole were then used for a long time as a suitable alternate. Since 1998, due to emergence of Multi drug resistance, Salmonella typhi (MDRST), 3rd generation Cephalosporin (eg. Ceftriaxone) and Fluroquinolene (eg. Ofloxacin, Ciprofloxacin) are being used. Thereafter, with some emergence of resistance to CRO, Azithromycin is used as an alternative.[3,4]

Multi drug resistance Salmonella typhi (MDRST) is epidemiologically defined as strains resistant to any two antimicrobials in vitro even if the antimicrobials tested are known to be clinically ineffective.[5]

Typhoid fever caused by MDRST has become a significant cause of morbidity and mortality over recent years.[2] A considerable variation has been noted in the various studies about antimicrobial sensitivity pattern among isolates of Salmonella species. [6 - 13] Antimicrobial sensitivity pattern is of very important for the appropriate antimicrobial therapy.

The present study is therefore, undertaken to determine the changing trend of antimicrobial sensitivity pattern of salmonella species isolated.

Method

This study was carried out from 5th March, 2011 onwards among the blood samples received in KMCTH lab for blood culture. The samples were inoculated/ processed in Brain Heart infusion broth (45ml +1% Bile salt + 5 ml blood) and incubated at 37°C for 24 hours. Sub culture were done two times after 24 hours and 48 hours incubation on blood agar and Mac konkey agar and incubated at 370C for another 24 hours. Identification of bacteria from positive culture plates were done with the standard microbiological techniques like colony morphology, staining reaction, biochemical properties and serotyping (Antisera , Denka- Seiken, Tokyo)). Only the confirmed isolated 100 salmonella species were taken into study group and antibiotic sensitivity test was performed by Kirby Bauer's method on Muller Hinton agar using antibiotic disc of Himedia laboratories Pvt. Ltd.

The disc used were Ciprofloxacin (CF, 5 µg), Amikacin (Ak), Erythromycin (E, 15 µg), Ampicillin (AM, 10 µg), Chloramphenicol (C, 30 µg), Cotrimoxazole (CO, 1.25 +23.75 µg), Ceftriaxone (Ci, 30 µg), Nalidixic acid (NA, 30 µg),

Result

Table 1. Antibiotic sensitivity pattern of Salmonella typhi

Organism isolate	Antibiotic disc	Sensitive	Resistant
Salmonella typhi	CF	93 (100%)	-
	Ak	93(100%)	-
	E	93(100%)	-
	AM	92 (98.93%)	1(1.07%)
	C	90 (96.77%)	3 (3.22%)
	CO	89 (95.69%)	4 (4.3%)
	Ci	86 (92.47%)	7 (7.52%)
	NA	80 (86.02%)	13 (13.98%)

Table 2. Antibiotic sensitivity pattern of Salmonella paratyphi

Organism isolate	Antibiotic disc	Sensitive	Resistant
Salmonella paratyphi	CF	7(100%)	-
	AK	7(100%)	-
	E	7(100%)	-
	C	7(100%)	-
	NA	7(100%)	-
	CO	6 (85.71%)	1 (14.28%)
	AM	5 (71.43%)	2 (28.57%)
	Ci	5 (71.43%)	2 (28.57%)

Out of 100 positive samples, 93 were found to be Salmonella typhi and 7 were Salmonella paratyphi. Salmonella typhi was found to be 100% sensitive to CF , AK & E. NA was found to be the least sensitive (86.02%). Other frequent resistant antimicrobial were Ci (7.52%), CO (4.3%), C (3.22%) and AM (1.07%).

Similarly, S. paratyphi was found to be 100% sensitive to CF & AK. In addition to this, C, E and NA were also 100% sensitive but were resistant to Ci (28.57%), AM (28.57%) and CO (14.28%).

Discussion

Enteric fever caused by Salmonella typhi and paratyphi is still an important public health problem mainly in developing countries. [2] Typhoid fever caused by MDRST has become a significant cause of morbidity and mortality over recent years.[2] Chloramphenicol is used to be the drug of choice for the enteric fever since its introduction. But, with the emergence of Chloromphenicol resistant strains of Salmonella, Ampicillin and Cotrimoxazole were then being used for a long time as a suitable alternate. Since 1998, due to emergence of Multi drug resistance, Salmonella typhi (MDRST), 3rd generation Cephalosporin (eg. Ceftriaxone) and Fluroquinolene (eg. Ofloxacin, Ciprofloxacin) are being used. Thereafter, with some emergence of resistance to Ci, Azithromycin (Erythromycin) is used as an alternative. [3,4]

A considerable variation has been noted in the various studies about antimicrobial sensitivity pattern among isolates of Salmonella species. CF & Ak were found to be 100 % sensitive to Salmonella S. typhi which were similar to the findings in a study done in Nepal & India. [14-17] Salmonella typhi was found to be resistant to Chloromphenicol and CO at 3.22% and 4.3% respectively which were very low to the findings of a study done at Kathmandu Medical College by KC Mathura et al in the year 2005 where they were found to be resistant at 63% and 84.8% respectively. [18] NA was found to be resistant at 13.98%. Frequent occurrence of resistant to Chloramphenicol and Nalidixic acid is an important indication that S. typhi will soon be emerged as resistant to Chloramphenicol and quinolone group of drugs as Nalidixic acid susceptibility test is in fact the test for Ist step mutation for quinolone (Ciprofloxacin) resistance. [2]

In the year 2002, Department of health services, a team of medical researchers from the Armed forces Research Institute of medical Sciences (AFRIMS) in Bangkok, CIWEC Travel Medicine Clinic and National Public Health Laboratory (NPHL- Nepal) jointly have investigated the large number of patients with high fever in the Bharatpur district of Nepal. A total of 33 were confirmed as Salmonella typhi and one as Salmonella paratyphi. At AFRIMS, complete antimicrobial susceptibility testing was performed using NCCLS standard disk diffusion method. The majority of the isolates were resistant to Nalidixic acid, Ampicillin, Tetracycline, Cotrimoxazole, Chloramphenicol and Streptomycin. The isolates were appeared to be sensitive to Ciprofloxacin and Ceftriaxone in vitro even though there were reports of clinical failure and by using the "E test" strip method for Minimal Inhibitory Concentration (MIC) to Ciprofloxacin and Ceftriaxone, they have mentioned that there is decreased in susceptibility as compared to what is reported in literature. [19]

Ceftriaxone were found to be 100 % sensitive in a study done by KC Mathura et al in the year 2005.[18] Sporadic resistant S. typhi was reported in a study done by Shah SK et al.[20] but in this study, 7.52% S. typhi were found to be resistant to Ceftriaxone.

Regarding Salmonella paratyphi, CF, AK, C, E & NA were found to be 100% sensitive and the findings were very similar to the study done by P Pokharel et al[14] and Bhatta CP et al.[21] CO, Am and Ci were found to be resistant at 14.28%, 28.57%7 and 28.57% respectively. The matter of resistant to Ci is of very great concern.

Conclusion

Ceftriaxone is also found to resistant in few cases which is a matter of resistant of very great concern. So, antimicrobial susceptibility pattern of Salmonella species must be evaluated frequently which is very important for the appropriate antimicrobial therapy.

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