

Original Article

Phage Types of multidrug resistant Salmonella species in a rural area of Maharashtra, India

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Abstract

Objective: The aim of the present study is to know Phage typing and antimicrobial susceptibility pattern of Salmonella species. **Methods:** A total of 32 Salmonella species isolated from stool and blood specimen were included in the study. They were sent for phage typing to Lady Hardinge Medical College, New Delhi. Antimicrobial susceptibility was done by using Kirby Bauer disc diffusion method. **Results:** Majority of Salmonella typhi belongs to phage type E1 and biotype I. Decreased susceptibility of the isolate was observed to Ampicillin, Cotrimoxazole, Cephalexin and Gentamicin. Majority of the isolates were sensitive to Ciprofloxacin. **Conclusion:** Predominant phage type was E1. The antibiotic sensitivity pattern is changing and resistant cases are emerging due to inappropriate use of antibiotics.

Keywords: Serotype, Phage type, Salmonella typhi, Antibiotic resistance.

Introduction

Prolonged pyrexial illness is still a major cause of anxiety to the medical community.¹ Salmonella infections are frequent throughout the world and are a major health concern particularly to India. In India, enteric fever is endemic in many parts.² Infection is caused by substandard water supply and sanitation. Increasing reports of multiple drug resistant (MDR) Salmonella strains from different parts of the country demands constant surveillance.^{3,4} Bacteriophage typing is the standard method for subdividing S. typhi into epidemiologically significant subtypes.

The present study was undertaken at a rural medical college to determine the prevalent phage types and biotypes of Salmonella serotypes isolated during one year period and antibiotic sensitivity pattern of it.

Material & Methods

A total of 32 Salmonella were isolated from blood and stool samples during one year period. Samples were cultured and processed as per the standard

methods and Salmonella species were identified by the biochemical reactions and confirmed by specific serotyping procedures.⁵

Antibiotic sensitivity pattern of isolated Salmonella was studied by Kirby Bauer disc diffusion method.⁶ Phage typing and biotyping was carried out by the National Phage typing Center, Lady Hardinge Medical College, New Delhi.

Results

Thirty two Salmonella were isolated over two year's period. Out of 32 patients, 20 were Salmonella typhi and 12 were Salmonella paratyphi A. Phage types of Salmonella species is given in table1. The antibiogram of it is shown in table 2. Majority of the isolates were sensitive to Ciprofloxacin. There was an increase in resistance to Ampicillin, Cotrimoxazole and Cephalexin.

Discussion

The spectrum of Salmonella infection has widened over the last few years due to acquisition of mul-

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tidrug resistance to conventional drugs. Besides causing self limiting clinical manifestations of gastroenteritis, Salmonellae are also responsible for invasive disease including enteric fever (typhoid and paratyphoid fever) bacteremia, septicemia and extraintestinal focal sepsis.

In the present study a total of 32 salmonella strains were isolated. *Salmonella typhi* was the commonest followed by *Salmonella paratyphi A*. The commonest phage type of *S.typhi* was E1 and the biotype was I followed by phage type A (table I). Many similar studies have also reported E1 as the predominant phage type.VII-X Whereas other studies have reported phage type A as the commonest from the different parts of the country, particularly Central India.¹¹⁻¹³ The phage O which has also been commonly reported was absent in our study.^{14,15} The difference is probably due to introduction of the new phage types in the area.

Of the ¹² *S. paratyphi A* strains, all were untypable. Multidrug resistance showed an alarming rise in our study. Various reports from time to time have shown increase in the drug resistance.¹⁶⁻¹⁹

In our study majority of the isolates were sensitive to ciprofloxacin (87.5%) followed by chloramphenicol (75%). In the present study it has been found that the large numbers of isolates were resistant to cotrimoxazole (90.62%), erythromycin (71%), ampicillin (65.62%), penicillin (65.62%), norfloxacin (56.25%), gentamicin (53.15%), amikacin (43.75%) and cephalexin (40.62%) in the decreasing order of frequency. Ampicillin and chloramphenicol have long been the first line of treatment for invasive *Salmonella* infections but these drugs can no longer

be recommended in developing countries. Indiscriminate use of the drug and acquisition of plasmid mediated R factor has led to the development of resistance to *Salmonella*.²⁰

Alternative therapy includes Fluoroquinolones and cephalosporin. Quinolones are preferred for most *Salmonella* infections but cephalosporin may be better in neonatal meningitis. Empiric therapy with ciprofloxacin had led to decrease in the frequency of chloramphenicol resistance, but resistance to ciprofloxacin is now recognized.^{21,22}

In our study ciprofloxacin shows 12.5% resistance to *Salmonella*. This may be due to indiscriminate use of drugs. Moderate costs, advantage of oral route, tolerability, convenient dosage schedule has contributed towards its indiscriminate use.

To conclude, emergence of resistance to antibiotics is clearly accelerated. Multidrug resistance increases burden on economy and health costs, the patient is more likely to require prolonged hospitalization and treatment with more expensive and more toxic drugs with consequent risk of treatment failure and death. *Salmonellae* are no longer to be considered as to have predictable antibiotic sensitivity. Appropriate antibiotic indicated by sensitivity tests should be employed to prevent the development of resistant strains of *Salmonella*.

Conflict of interest- None to declare

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Table I: Phage types and biotypes of various *Salmonella* serotypes isolated

Serotypes	Total	Phage types				Biotypes	
		E1	A	Uvs1	Untypable	I	II
<i>Salmonella typhi</i>	20	16	4	0	0	20	0
<i>Salmonella paratyphi A</i>	12	0	0	0	12	0	0
Total	32	16	4	0	12	20	0

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Table II: Antibiotic sensitivity/resistance patterns in culture proven cases

Serotypes/ Antibiotics	<i>Salmonella</i> <i>Typhi</i> (20)	<i>Salmonella</i> <i>Paratyphi</i> <i>A</i> (12)	Total sensitivity (32)	Total Resistance
Ampicillin	7 (35%)	4 (33.33%)	11 (34.37%)	21 (65.62%)
Gentamicin	10 (50%)	5 (41.66%)	15 (46.87%)	17 (53.15%)
Cotrimoxazole	2 (10%)	1 (8.33%)	3 (9.37%)	29 (90.62%)
Ciprofloxacin	18 (90%)	10 (83.33%)	28 (87.5%)	4 (12.5%)
Cephalexin	12 (60%)	7 (58.33%)	19 (59.37%)	13 (40.62%)
Norfloxacin	9 (45%)	5 (41.66%)	14 (43.75%)	18 (56.25%)
Amikacin	11 (55%)	7 (58.33%)	18 (56.25%)	14 (43.75%)
Penicillin	8 (40%)	3 (25%)	11 (34.37%)	21 (65.62%)
Erythromycin	6 (30%)	3 (25%)	9 (28.12%)	23 (71.87%)
Chloramphenicol	15 (75%)	9 (75%)	24 (75%)	8 (25%)

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