

## Antibiotic Sensitivity Pattern of Salmonella Species Isolated from Blood Culture

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### Abstract

<b>Introduction</b>	Typhoid fever occurs in all parts of the world where water supplies and sanitation are sub-standard. The disease is now uncommon in developed countries where most of the cases that occurs are either acquired aboard or imported by immigrants.
<b>Objectives</b>	The aim of this study is to determine the antibiotic sensitivity pattern of <i>Salmonella species</i> isolated from blood culture.
<b>Methods</b>	A retrospective study was conducted in the period Oct 2002 to Sept 2003 in Kathmandu Medical College Teaching Hospital, Sinamangal Kathmandu. Blood sample for culture were collected by vein puncture with disposable syringe and immediately inoculated into brain heart infusion broth and incubated at 37°C for 24 hours. After incubation sub-culture were done two times on blood agar and Salmonella- Shigella agar. Positive cultures were identified by standard microbiological technique. The entire isolates antibiotic sensitivity test was performed by disc diffusion method.
<b>Results</b>	A total 4350 patients blood were cultured, suspecting for fever, out of that 390 (8.9655%) patients blood were found to be positive for <i>Salmonella species</i> . Males outnumbered females and age group (21-40) had the maximum number 185 (47.43%) followed by age group (0-20) 160 (41.025%) and age group (41-60) 45 (11.538%). In vitro antibiotic sensitivity test shows that ciprofloxacin is highly sensitive (98.718%) followed by ofloxacin (98.208%), cephalexin (96.411%), chloramphenicol (95.898%), cotrimoxazole (94.103%) and ampicillin (87.18%).
<b>Conclusion</b>	The above study shows that prevalence of enteric fever was found to be high. Prevention of enteric fever is mainly by personal and domestic hygiene. The provision of safe drinking water and proper disposal of faeces will implement as soon as possible in Kathmandu valley.
<b>Keywords</b>	Blood culture, <i>Salmonella species</i> , Antibiotic.

### Introduction

Eberth (1880) first observed the typhoid bacillus in mesenteric lymph nodes and spleen in fatal cases of typhoid fever and Gaffky (1884) successfully isolated the organisms. It was then called Eberth-Gaffky bacillus or Eberthella typhi. Salmon and Smith in 1885 isolated the American hog-cholera bacillus (*S.choleraesuis*) and from the name of the first author the term *Salmonella* is derived<sup>1</sup>.

The enteric fever that includes typhoid fever caused by *Salmonella typhi* and paratyphoid fever caused by *Salmonella paratyphi A, B and C*. Typhoid fever occurs in all parts of the world where water supplies and sanitation are sub standard. The disease is now uncommon in the

developed countries where most of the cases that occur are either acquired aboard or imported by immigrants. In U.K typhoid fever has been brought very close to eradication with approximately one case per 1000,000 populations. Which is perhaps the lowest incidence of typhoid in the world<sup>2</sup>.

Typhoid fever continues to be unabated in the developing countries of Africa, Asia and Latin America<sup>3</sup>. In these countries incidence rates varying from 100- 1500 per 100,000 populations has been reported<sup>4</sup>.

Typhoid fever is endemic in India. Health surveys conducted by the Central Ministry of Health in the community

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development areas indicated a morbidity rate varying from 102 to 2219 per 100,000 populations in different parts of the country<sup>5</sup>. Patnaik reported an incidence of 110 among males and 75 among females per 100,000 populations in Delhi<sup>6</sup>. A limited study in an urban slum showed 1 percent of children up to 17 years of age suffer from typhoid fever every year<sup>7</sup>. *S.typhi* is a major cause of enteric fever. *S.paratyphi A* and *S.paratyphi B* are relatively infrequent<sup>8</sup>. The primary sources of infection are faeces and urine of cases or carriers; the secondary sources contaminated water, food, fingers and flies. There is no evidence that typhoid bacilli are excreted in sputum or milk, outside the human body the bacilli are found in water, ice, food, milk and soil for varying periods of time. Typhoid bacilli do not multiply in water; many of them perish within 48 hours, but some may survive for about 7 days. They may survive for over a month in ice and ice cream. They may survive for up to 70 days in soil irrigated with sewage under moist winter conditions, and for half that period under drier summer conditions<sup>9</sup>. Food being a bad conductor of heat provides shelter to the bacilli, which may multiply and survive for sometimes in food. Typhoid bacilli grow rapidly in milk without altering its taste or appearance in anyway. Vegetables grown in sewage farms or washed in contaminated water are a positive health hazard. These factors are compounded by such social factors as pollution of drinking water supplies, open-air defecation and urination, low standards of food and personal hygiene and health ignorance. Typhoid fever may therefore be regarded as an index of general sanitation in any country.

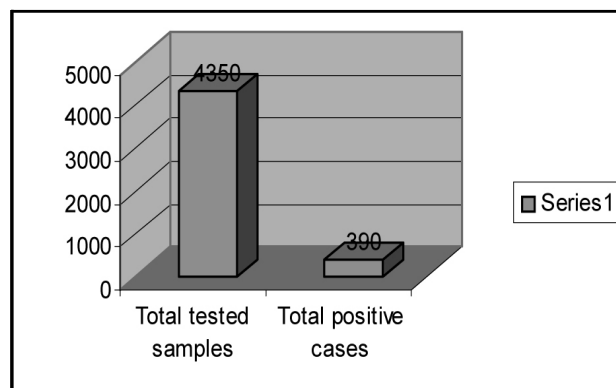
**Methods**

Total 4350 patients of both the sex 2840 males and 1520 females of all age groups, having fever were included in this study. Blood sample for culture were collected by vein puncture with disposable syringe from patients attending Kathmandu Medical College Teaching Hospital Sinamangal Kathmandu Nepal. During one year period from Oct 2002 to Sept 2003 is reported. Blood sample is immediately inoculated into brain heart infusion broth and incubated at 37°C for 24 hours. After incubation, sub culture were done two times after 24 hours and 48 hours on blood agar and Salmonella- Shigella (S-S) agar and incubated at 37°C for another 24 hours. Identification of bacteria from positive culture plates was done with the standard microbiological technique. Which included colony characters, staining reaction, biochemical properties and serotyping. For Serotyping of *Salmonella species* using polyvalent “O” (A-G) antibodies manufactured by Denka Seinek Co,Ltd, 3-4-2 Ni Honbashikayaba –cho, Chuo-KU, Tokyo, Japan. The entire isolates antibiotic sensitivity test

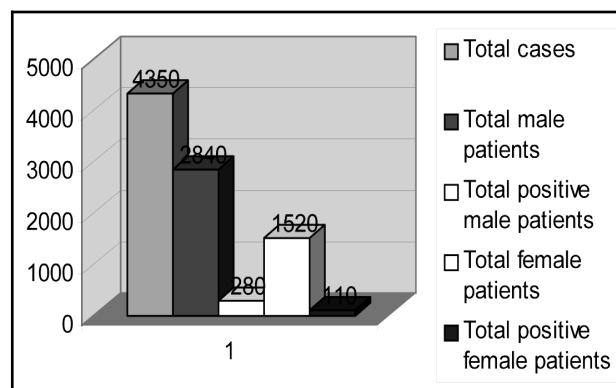
was performed by disc diffusion method on Muller Hinton agar using antibiotic disc of HiMedia Laboratories Pvt. Limited A-406, Bhaveshwar Plaza,LBS Marg, Mumbai-400086, India.

**Results**

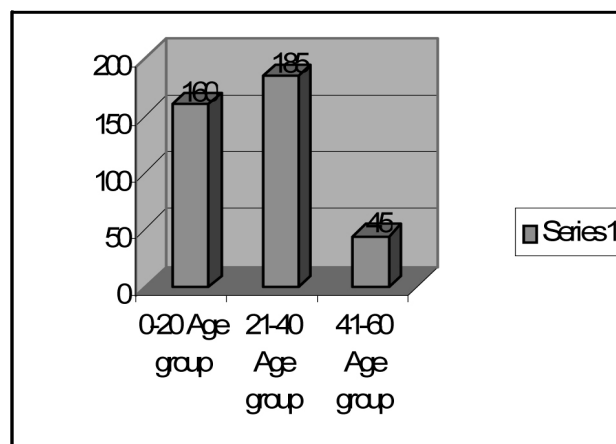
**Fig.1.** Total number of tested and positive cases

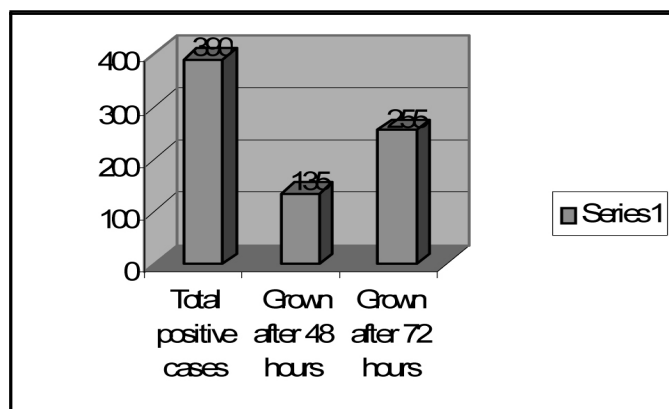


**Fig.2.** Gender wise distribution of patients and positive cases



**Fig. 3.** Age wise distribution of positive cases



**Fig.4.** Blood culture positive cases grown after 48 hours and 72 hours incubation at 37°C**Table 1.** Antibiotic sensitivity pattern of *Salmonella species*

Antibiotic	Total tested cases	Sensitive	Resistant
Ciprofloxacin	390	385 (98.718%)	5 (1.282%)
Ofloxacin	390	383 (98.208%)	7 (1.794%)
Cephalexin	390	376 (96.411%)	14 (3.589%)
Chloramphenicol	390	374 (95.898%)	16 (4.102%)
Cotrimoxazole	390	367 (94.103%)	23 (5.897%)
Ampicillin	390	340 (87.18%)	50 (12.820%)

## Discussion

Bacteraemia or septicaemia is most prevalent in the socio-economically deprived areas of the world. Spread of this disease is facilitated by poor environmental hygiene, which is endemic in many tropical countries. Bacteraemia is caused mainly by unhygienic food, contaminated water and polluted environment.

It is difficult to estimate the world wide impact about bacteraemia because the clinical picture resemblance may other febrile infection and because of the limited capacity for bacteriological diagnosis in most areas of the developing countries owing to lack of man power found and other facilities.

Bacteraemia may cause sever damage of internal organs of the body and sometimes may cause death of patients if an appropriate anti-microbial therapy could not be installed in a right time. So quick and prompt of appropriate anti-microbial therapy is requested for the prevention and control of disease and to minimize the mortality and morbidity rate.

In this study prevalence of *Salmonella infection* was found to be (8.9655%). In vitro antibiotic sensitivity test ciprofloxacin was highly sensitive (98.718%) followed by ofloxacin (98.206%), cephalexin (96.411%), chloramphenicol (95.898%), cotrimoxazole (94.103%) and ampicillin (87.18%). Similar study conducted in Tribhuvan University Teaching Hospital (TUTH) found that norfloxacin

and ciprofloxacin was found to be equally sensitive followed by chloramphenicol, gentamicin, ampicillin, cephalexin and co-trimoxazole against *Salmonella typhi*. One species of *Salmonella typhi* was intermediate sensitive to chloramphenicol. In *Salmonella paratyphi A* was found to be 100 percent sensitive to ciprofloxacin, norfloxacin, chloramphenicol and gentamicin followed by cephalexin two species was found to be intermediate sensitive<sup>10</sup>. Another similar study conducted in Kathmandu Valley and Chitawan district of Nepal during May –August 2002 showed that, total of 106 and 459 blood culture were found to be positive for *Salmonella species* respectively. Kathmandu isolates were sensitive towards chloramphenicol (100%), ciprofloxacin (61%), cotrimoxazole (41.4%), tetracycline (73%), ampicillin (51%) and ceftriazone (100%). Bharatpur isolates were found to be ciprofloxacin and ceftriazone (100%) sensitive and resistant to ampicillin (89.4%), chloramphenicol (91.5%), tetracycline (93.7%) and cotrimoxazole (89.4%). Out of 10 water samples collected from Bharatpur area 2 samples were positive (25%) for *S.typhi* and out of 87 samples from densely populated areas of Kathmandu 7 (9.06%) samples gave the positive result for *Salmonella typhi*.<sup>11</sup> Similar study conducted in children was found that out of 48,73 percent were males and 27.9 percent were females. The blood culture become positive by 48 hours in 83 percent another 17 percent become culture positive by 120 hours (fifth days). The commonest species of *Salmonella* isolates was *Salmonella typhi* i.e. 24 (56%), thirteen (30%) patients had multidrug resistant enteric fever

i.e. resistant to three standard enteric fever antibiotics (chloramphenicol, ampicillin and cotrimoxazole). Chloramphenicol was sensitive to 70 percent of isolates species, while ciprofloxacin was sensitive to 100 percent, the least sensitive antibiotic was cotrimoxazole, and only 16 percent of species were sensitive to it<sup>12</sup>.

The emergence of resistant is due to improper use of antibiotic, use in sub-lethal doses, use of antibiotics in animals as growth promoting factors, the organisms present in such factors and when pathogens infect the resistant gene may be transferred in them from commensals by conjugation, transformation etc.

### Conclusion

The above study shows that prevalence of enteric fever was found to be high and most commonly observed in young productive age group 21-40 males followed by 0-20 year age group. Enteric fever is commonest health problem in developing country like Nepal. Where water supplies and sanitation are sub-standard. Large numbers of bacterial organisms *Salmonella species* are excreted in urine and faecal specimens during the diseases. An infection is by ingestion of the *Salmonella species* in contaminated food or water or directly from faeces and contaminated fingers. Prevention of enteric fever is mainly by personal and domestic hygiene. The provision of clean piped water supplies and the safe disposal of faeces will be implement as soon as possible in Kathmandu valley.

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