Clinical Profile and Sensitivity Pattern of Salmonella Serotypes in Children: A Hospital Based Study

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Abstract

Introduction: Enteric fever is a systemic infection caused by the bacteria, Salmonella enterica serovar Typhi (*S.typhi*) and Salmonella enterica serovara Paratyphi (*S. paratyphi* A, B and C). Most of the burden of the disease is limited to the developing world and the disease still has the issues like wide spectrum of clinical presentation and multidrug resistance. **Objectives:** This study was done to analyze the clinical profile and antibiotic sensitivity pattern in the cases of culture positive enteric fever. **Methods:** A prospective cross-sectional study was conducted in Civil Service Hospital from February 2010 to January 2011 in the paediatric population in the age group of 2 to 14 years. Children with Salmonella species isolated in blood culture were included in the study**. Results:** Out of the 40 children with culture positive enteric fever, male to female ratio was 1.3:1 with common age group between 11-14 years. *S typhi* was isolated in 25 cases while S. *paratyphi* in 15 cases. Clinical features of *S. typhi* and *S. paratyphi* were indistinguishable. Both *S.typhi* and *S. paratyphi* were found to be 100% sensitive to drugs like Ceftriaxone, Cefotaxime, Cefixime and Chloramphenicol. Sensitivity to Ofloxacin was 100% in *S. paratyphi* and 92% in *S.typhi*. Similarly sensitivity of Azithromycin was 92% and 93% for *S.typhi* and *S. paratyphi* respectively. **Conclusion:** Salmonella serotype is still 100 % sensitive to third generation cephalosporin. Some percentage of resistance is seen with Ofloxacin in *S. typhi* and with Azithromycin in both *S.typhi* and *S. paratyphi*.

Key words: Enteric fever, S.typhi, S.paratyphi, Sensitivity

Introduction

Enteric fever is a systemic infection caused by the bacteria Salmonella enterica serovar Typhi (*S.typhi*) and Salmonella enterica serovara Paratyphi (*S. paratyphi* A, B and C). Because of the provision of clean water and good sewage system, it is a sporadic disease in developed countries and occurs mainly in travellers returning from endemic regions. Today, most of the burden of the disease is limited to the developing countries where standards of hygiene and sanitation remain poor[1].

The global estimate of incidence of enteric fever caused by *S. typhi* is over 21 million causing 700,000 deaths each year and more than 5 million new infections are caused by *S. paratyphi A*[2,3]. It is one of the major public health problems in Nepal, particularly in Kathmandu and other urban areas[4]. Chloramphenicol became the standard antibiotic since its introduction in 1948. Its resistance occurred within two years after its introduction, but Chloramphenicol – resistant typhoid fever became a major problem in 1972 when outbreaks occurred in Asia and Latin America[1,5,6]. Later in late 1980s, *S. typhi* developed multi drug resistance to Chloramphenicol, Trimethoprim, Ampicillin and Sulfamethoxazole which were then used as first-line drugs, leading to outbreaks in Asia and Africa[7,8,9,10]. Fluoroquinolones were very effective in early 1990s, but emergence of resistance to these drugs have occurred[11]. Also sporadic reports of high level of resistance to Ceftriaxone in *S.typhi* and *S.paratyphi* have been seen and the relapse rate is 3-6% with this drug[1,12]. Cefixime though, effective and cheaper oral option for the treatment of multidrug-

resistant cases, experience with this drug is less[13]. A short course of 5-7 days of treatment with Azithromycin is enough in uncomplicated typhoid fever, which has a relapse rate of less than 3% as compared to Ofloxacin where 7-10 days of treatment is required. Short course of treatment with Ofloxacin (less than 7 days) has higher incidence of treatment failure[14, 15].

Enteric fever still has issues like wide spectrum of clinical presentation and complex mode of treatment[12]. Hence this paper describes clinical profile and antibiogram of *S.typhi* and *S. paratyphi*.

Materials and methods

A prospective cross-sectional study was conducted in Civil service Hospital from February 2010 to January 2011. All the patients between the ages of 2 years to 14 years presenting to outpatient department who were suspected to have enteric fever had complete blood count and blood culture and sensitivity done. Those cases with Salmonella species isolated in culture were included while clinically diagnosed enteric fever was excluded from the study.

All blood samples were grown in Mac Conkey's agar for at least 96 hours and Mueller-Hinton agar with Kirky Bauer disc diffusion was used for sensitivity of culture.

Results

The study revealed total of 40 cases of culture positive enteric fever. Out of 40 children, 23(57.5%) were male and 17(42.5%) were female. According to age wise distribution, 2-5 years were 20%, 6-10 years were 32.5% and 11-14 years were 47.5%. Of the 8 patients (20%) in the age group of 2-5 years, male to female distribution was equal.Thirteen patients were in the age group of 6-10 years with male: female ratio being 0.8:1. Of 19 patients in the age group of 11-14 years; male: female ratio was 2.1:1. (Table 1).

Table 1: Age and sex distribution

Age Group (year)	Male		Female		Total	
	n	%	n	%	n	%
2-5	4	50	4	50	8	20
6-10	6	46.1	7	53.8	13	32.5
11-14	13	68.5	6	31.5	19	47.5
Total	**23**	**57.5**	**17**	**42.5**	**40**	**100**

The occurrence of the disease was higher during summer and rainy season (Fig. 1). Out of 40 cases, 25(62.5%) were *S. typhi* and 15 (37.5%) were *S. paratyphi* A.

All patients had fever. Headache, abdominal pain and vomiting were the most common associated symptoms seen in 52.5%, 22.5% and 20% respectively. Six patients had constipation and four patients had diarrhea (Table 2). On examination, hepatosplenomegaly was seen in three patients while splenomegaly was seen in five patients. 92.5% had the WBC count within the normal range (4000-11000) while 7.5% patients had leucopenia. No patient had leukocytosis

Table 2: Symptoms in culture positive patients.

Symptoms	No. of patients	Percentage
Fever	40	100
Headache	21	52.5
Abdominal pain	9	22.5
Vomiting	8	20
Constipation	6	15
Diarrhoea	4	10

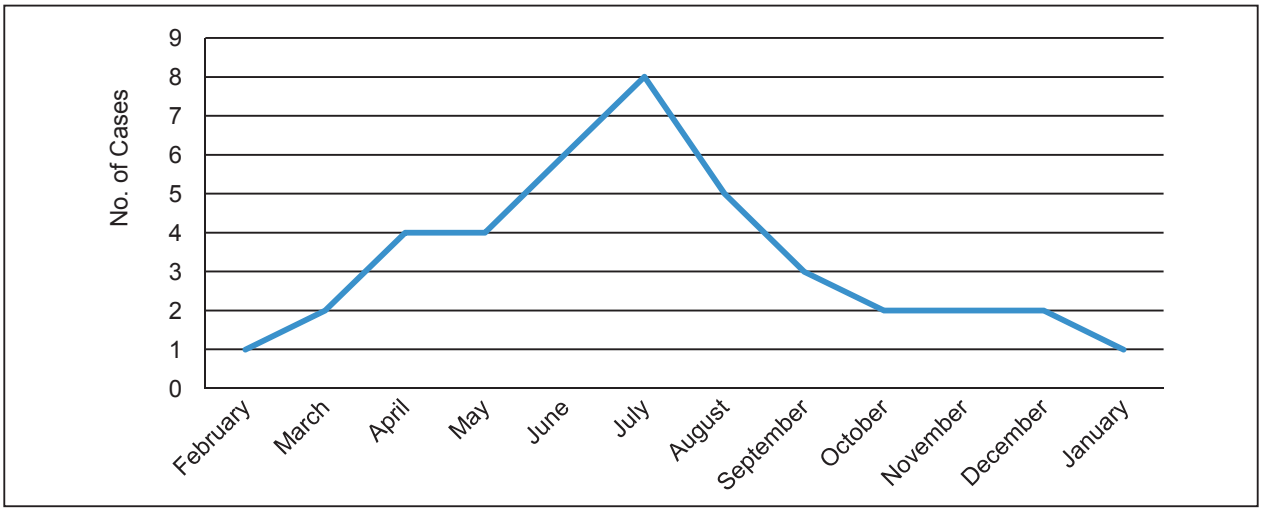

Fig 1: Seasonal Incidence

S.typhi was found to be most sensitive to Ceftriaxone, Cefotaxime, Cefixime, Chloramphenicol and Cotrimoxazole (100%) followed by Ofloxacin and Azithromycin (92%) and Ciprofloxacin (88%). It was least sensitive to Ampicillin (76%) and Nalidixic acid (44%) Table 3. *S. paratyphi* A was found to be most sensitive to Ceftriaxone, Cefotaxime, Cefixime, Ciprofloxacin, Ofloxacin, Chloramphenicol and Cotrimoxazole (100%) followed by Azithromycin (93.3%), Ciprofloxacin (86.6%) and Ampicillin (73.3%). It was also least sensitive to Nalidixic acid (40%) (Table 4).

Table 3: Antibiotic Sensitivity pattern of *S.typhi (n=25)*

Drugs	Number	Percentage of Sensitivity
Chloramphenicol	25	100
Cotrimoxazole	25	100
Ceftriaxone	25	100
Cefotaxime	25	100
Cefixime	25	100
Ofloxacin	23	92
Azithromycin	23	92
Ciprofloxacin	22	88
Ampicillin	19	76
Nalidixic acid	11	44

Table 4: Antibiotic Sensitivity pattern of *S.paratyphi (n=15)*

Drugs	Number	Percentage of Sensitivity
Cefixime	15	100
Ceftriaxone	15	100
Cotrimoxazole	15	100
Chloramphenicol	15	100
Cefotaxime	15	100
Ofloxacin	15	100
Azithromycin	14	93.3
Ciprofloxacin	13	86.6
Ampicillin	11	73.3
Nalidixic acid	6	40

Discussion

Enteric fever is one of the common causes of febrile illness and is the major reason for seeking health service by general population[16].

In this study, the most common age group affected was 11-14 years (47.5%). This result is much different from the study of Prajapati et al where result showed that common age group was 1-5 years[17]. Out of 40 children, males had higher incidence of disease (male to female ratio of 1.3:1). The study done by Ansari et al[18] and Bhattarai et al[19] showed similar results. There was clustering of cases of both S.*typhi* and S. *paratyphi* during summer and rainy seasons which is similar to the study done by Karkey A[3]. This study also showed that fever was present in all the patients followed by headache, abdominal pain and vomiting which is similar to other studies[16, 20, 21].

Clinical symptoms of *S. typhi* and *S. paratyphi A* were indistinguishable in this study, which is similar to the study done by Karkey A[4]. The incidence of *S.typhi* and *S. paratyphi A* in this study was similar to findings reported by Karkey et al[3] and Jog et al[12]. The antibiotic sensitivity pattern was also not much different from other studies[16, 19]. In our study 100% sensitivity was seen with Ceftriaxone, Cefotaxime, Cefixime, Chloramphenicol and Cotrimoxazole. Sensitivity to Ofloxacin was 100% in *S. paratyphi* and 92% in *S.typhi.* Azithromycin resistance is documented in some percentage of Salmonella serotypes in our study which is different from the study done by Mishra et al where result shared 100% sensitivity to Azithromycin[22]. This could be due to larger sample size and mostly adult population. Most of the patients had normal leucocyte count which was similar to other literatures[12,19,21].

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Conclusion

Salmonella serotype is still 100 % sensitive to third generation cephalosporin. Some percentage of resistance is seen with Ofloxacin in *S. typhi* and with Azithromycin in both *S.typhi* and *S. paratyphi*. In the endemic region like ours, appropriate antibiotic should be chosen as indicated by sensitivity pattern to prevent the emergence of resistance to common drugs.

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