Nontyphoidal Salmonella Diarrhea in Thai Children: A Study at Bamrasnaradura Hospital, Nonthaburi, Thailand

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Abstract

From July 1, 1994 to June 30, 1996, 394 children with Nontyphoidal Salmonella diarrhea were studied at Bamrasnaradura Infectious Disease Hospital in Thailand. The ages ranged from 1 month to 12 years (mean, 1.4 years). Eighty-seven per cent of patients were in the first 2 years of life. Diarrhea, mostly acute with watery stool and fever were the most common presenting symptoms. The duration of diarrhea ranged from 1 to 20 days (mean, 5.2 days). Salmonella group B was the most common serogroup (56.1%). Most isolates were multiresistant strains, however, they were all sensitive to norfloxacin. Four (1%) patients were HIV-infected. Pneumonia found in 2 patients (0.5%) and septicemia in 1 patient (0.3%). None of the patients died. We conclude that nontyphoidal Salmonella diarrhea in children is still endemic in Thailand, especially among infants and high multidrug resistance occurs.

Salmonella is a genus of the family of Enterobacteriaceae[1], being found in the gastrointestinal tracts of animals[2]. Food products are the main source of Salmonella for human infection[3-5]. The major mode of transmission is fecal-oral route. Nontyphoidal diarrhea is usually a self limited disease, and antibiotic therapy may not alter the clinical course[6]. Multiple antibiotic resistance in nontyphoidal Salmonella has been reported[7]. Salmonella infection is also a common problem in patients with AIDS and recurrent Salmonella bacteremia is an AIDS-defining illness[8]. However, no report is yet available about non-typhoidal Salmonella infection in Thai children since the epidemic of HIV infection. Thus, we performed a study to evaluate the epidemiology, clinical and laboratory findings, complications and concurrent diseases in patients with Salmonella diarrhea at Bamrasnaradura Infectious Disease Hospital, one of the referral centers for patients with diarrhea and HIV/AIDS in Thailand.

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PATIENTS AND METHOD

Epidemiologic and clinical data

The study was conducted among children with diarrhea in the Diarrhea Center at Bamrasnaradura Infectious Disease Hospital, Nonthaburi, Thailand, over a 2 year period from July 1, 1994 to June 30, 1996. All children with diarrhea had stool specimens sent for culture. All Salmonella confirmed cases were included in this study. We recorded detailed history, physical examination, laboratory findings, treatment, complications and concurrent diseases in these patients.

Laboratory data

Stool specimens were examined for leukocytes, red blood cells and cultured for Salmonella on McConkey agars. Salmonella strains were identified by standard biochemical test[9]. Serogroup of Salmonella was done by using standard procedures. Susceptibilities to antimicrobial agents were determined by the agar disc diffusion method[10].

RESULTS

Epidemiologic and clinical features.

Between July 1, 1994 and June 30, 1996, there were 394 patients whose stool cultures were positive for nontyphoidal Salmonella.

Two hundred and eight patients (52.8%) were males and 186 (47.2%) were females.

The age distribution is shown in Table 1. The age ranged from 1 month to 12 years (mean 1.4 years). Seventy-five per cent of patients were infants and 87 per cent were younger than 2 years old.

There were patients seen in every month of the year, however, two peak periods were observed in June-August and October-December.

Table 1. Age distribution in 394 children with nontyphoidal Salmonella diarrhea.

Age groups	No. positive	%	
0+ - 1 mo	11	2.8	
1+ mo - 1 yr	287	72.8	87
1+ - 2 yr	45	11.4	
2+ - 5 yr	31	7.9	
5+ - 10 yr	17	4.3	
10+ - 14 yr	3	0.8	

Table 2. Clinical features in 372 children in with nontyphoidal Salmonella diarrhea.

Clinical features	No. of patients	(%)
Fever	278	(74.7)
Vomiting	126	(33.9)
Abdominal pain	223	(59.9)
Dehydration		
- No	251	(67.5)
- Some	115	(30.9)
- Severe	6	(1.6)
Appearance of stools		
- Watery stool	310	(83.3)
- Mucus bloody stool	62	(16.7)
Convulsion	2	(0.5)
Cough	21	(5.6)

Table 3. Nontyphoidal Salmonella isolates in 394 children with diarrhea.

Serogroup	No. of isolates	%
Salmonella group B	221	56.1
Salmonella group C	76	19.3
Salmonella group E	67	17.0
Salmonella group D	27	6.8
Salmonella group G	2	0.5
Salmonella group H	1	0.3
Total	394	100

Clinical data were available in 372 (94.4%) patients. Common presenting symptoms and signs are shown in Table 2. Diarrhea, mostly acute with watery stool and fever were the most common presenting symptoms. Bloody stool was observed in 16.7 per cent. Other clinical symptoms were vomiting, abdominal pain, dehydration, convulsion and cough. Cough was the presenting symptom in the cases with upper respiratory tract infection and pneumonia.

Laboratory findings

Of the 394 isolates, Salmonella group B was the most common serogroup found, 221 (56.1%), followed by Salmonella group C, 76 (19.3%) and Salmonella group E, 67 (17%) (Table 3).

Fecal examination was done in 132 (33.5%) children with Salmonella diarrhea. Fecal leukocytes, mostly polymorphonuclear cells (PMN), were found in 88 (66.7%) and red blood cells in 65 (49.2.%).

Table 4. Resistance patterns of Nontyphoidal Salmonella.

Atibiotics	No.of resistant strain/tested patients (% of resistant strains)					
	S. gr B		S. gr C		S. gr E	
Ampicillin	39/97	(40.2%)	4/46	(8.7%)	9/40	(22.5%)
Colistin	0/97	(0%)	0/46	(0%)	0/40	(0%)
Cotrimoxazole	62/97	(63.9%)	13/46	(28.3%)	11/40	(27.5%)
Gentamicin	12/97	(12.4%)	0/46	(0%)	0/40	(0%)
Nalidixic acid	10/97	(10.3%)	11/46	(23.9%)	1/40	(2.5%)
Nitrofurantoin	37/97	(38.1%)	18/46	(39.1%)	3/40	(7.5%)
Norfloxacin	0/97	(0%)	0/46	(0%)	0/40	(0%)
Tetracycline	68/97	(70.1%)	27/46	(58.7%)	16/40	(40%)

The antibiotic resistance pattern is shown in Table 4. Salmonella group B, the most common group isolates were highly resistant to ampicillin (40.2%), cotrimoxazole (63.9%), nitrofurantoin (38.1%) and tetracycline (70.1%). All isolates were susceptible to norfloxacin and colistin.

Treatment

Of the 394 patients, two hundred and ninety-eight (75.6%) patients were managed as outpatients and 96 (24.4%) were hospitalized. Half of the patients received drugs before entering hospital and half of them purchased drugs from drug stores without prescription. Approximately three-fourths of the patients were treated with norfloxacin while the remaining patients were treated with cotrimoxazole or gentamicin or a third generation cephalosporin or a combination of a third generation cephalosporin and amikacin. Approximately one-fourth of them were treated only with oral rehydration fluid or intravenous fluid without antibiotic therapy.

Follow-up

Data were available in 85 (88.5%) of the 96 inpatients. The duration of diarrhea was 1 - 20 days (mean, 5.2 days) Approximately ten per cent of inpatients recovered without antibiotic therapy. There was no electrolyte imbalace in detection of 2 patients with severe dehydration. There was no death in this study.

Complications and concurrent diseases

Of the 394 patients, some patients had signs and symptoms other than diarrhea such as chronic malnutrition or failure to thrive. Examination for HIV antibody revealed 10 (2.5%) cases, fever and dyspnea for chest X-ray in 5 (1.3%) cases, toxic symptom with high fever for hemoculture in 4 (1%) cases and for 3 tests in 1 (0.3%) case. The cerebrospinal fluid was not examined. There were 4 (1%) cases with HIV infection, 2 (0.5%) cases with pneumonia and 1 (0.3%) case with Salmonella group B septicemia. One of the 4 HIV-infected children in this study was the 11-month-old female who had Salmonella group B septicemia, pneumonia, failure to thrive, and reverse ratio of CD4/CD8 (1,250/7,740). Thus, this infant met the clinical definition of AIDS. There were no other underlying problems in our patients.

DISCUSSION

Salmonella infection is common in Thailand as well as in other countries[4,8,11]. The infection was more prevalent in small children, especially those less than 2 years old. This fact is also accepted by other authorities[12]. The most common presenting symptoms in our series were acute diarrhea with watery stool and fever.

Grossly bloody stools were found in the minority of patients, similar to previous studies[11]. Although both Salmonella and Shigella invade intestinal mucosa, the pathology is different[13]. Comparing the historical data in Thailand[14], our series showed that children with Salmonella diarrhea presented with bloody stools less frequently than those with Shigella diarrhea (42%). The fecal leukocyte found in 66.7 per cent was comparable to previous reports (range, 36% to 82%)[15].

Salmonella typhimurium, a member of the Salmonella group B, was the most common serotype isolated in previous studies[7,12,16,17]. It might have been the important cause of diarrhea in our patients. Antibiotic therapy is not indicated for simple Salmonella diarrhea because treatment does not significantly decrease the duration or severity of diarrhea or excretion of the organism. In contrast, antibiotics should be given in infants less than 3 months of age and metastatic infections. There was overuse of antibiotics (75%) in our study, it might be because the majority of patients were infants and managed as outpatients. Some clinicians were afraid of the infants developing serious complications if not given antibiotics. This problem must be made clear to clinicians.

There was a high prevalence of multiresistant strains isolated in our series. Salmonella group B, the most common isolated, showed a high resistant rate to the commonly used antibiotics in our series. All Salmonella isolates in our study, however, were susceptible to norfloxacin, a new fluoroquinolone.

Fluoroquinolones (e.g., norfloxacin and ciprofloxacin) are rapid bactericidal antibiotics and highly effective for the treatment and prevention of a variety of bacterial infections in adults including Salmonella infections[18,19]. Use of fluoroquinolones in children has been limited because of their side effects on arthropathy in juvenile animals[20]. The majority of our patients were treated with norfloxacin because of the multiple drug resistant problem. However, fluoroquinolones should be used with caution in children. Another oral antibiotic such as ceftibuten, was studied as an alternative[21].

Nontyphoidal Salmonellosis in children is mostly limited to acute gastroenteritis, characterized by a brief, self-limited diarrhea without complications[22]. This is supported by our series that some cases had rapid clinical resolution without antibiotic therapy. Although most Salmonella infections are limited to the gastrointestinal tract, invasion into the blood stream and focal infection can occur[5,23]. Neonates may develop bacteremia and meningitis[24]. Complications or extraintestinal Salmonellosis were uncommon in our series. Only one case with septicemia was found to be an AIDS patient. A previous studie reported a few infants with Salmonella gastroenteritis who later developed necrotizing enterocolitis[25]. Abdominal distension was observed in a few infants in our study. Several retrospective studies suggest that infants in the first month of life may have a risk of bacteremia as high as 30 to 50 per cent[26].

Salmonella sp. is an intracellular pathogen and patients with impaired cell-mediated immunity are at risk for nontyphoidal bacteremia and invasive disease[27]. Infections with nontyphoidal Salmonella occur more frequently in HIV-positive individuals than in the general population and more likely to be bacteremic and recurrent[28].

However, the prevalence of complications and concurrent diseases in children with Salmonella diarrhea in this study were underestimated because not all of these patients were studied for complications or concurrent diseases. Thus, our study may have missed many complications such as bacteremia. HIV-exposed infants <3 months of age and all HIV-infected children with severe immunosuppression should receive treatment for salmonella gastroenteritis to prevent extraintestinal spread[29].

Multi-drug resistance occurs in Thailand because drugs including antibiotics are available without prescription. An effective and ideal drug for the treatment of nontyphoidal Salmonella diarrhea in young infants and HIV-infected children should be carefully studied.

SUMMARY

Our study suggests that nontyphoidal Salmonella diarrhea in children is still endemic in Thailand, especially among infants. Salmonella group B was the most common serogroup isolated and septicemia was found in an AIDS patients in this study. Most isolates were multiresistant strains but all isolates were sensitive to norfloxacin. Antimicrobial Therapy is indicated only in young infants or immunocompromise patients.

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โรคอุจจาระร่วงจากซัลโมเน็ลลาที่มิใช่ทัยฟอยด์ในเด็กไทย : การศึกษาในโรงพยาบาลบำราศนราดูร นนทบุรี

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ได้ศึกษาผู้ป่วยเด็กโรคอุจจาระร่วงที่เกิดจากเชื้อ nontyphoidal Salmonella ที่โรงพยาบาลบำราศนราดูร ตั้งแต่วันที่ 1 กรกฎาคม 2537 ถึงวันที่ 30 มิถุนายน 2539 เป็นระยะเวลา 2 ปี พบว่าเกิดในผู้ป่วยเด็กอายุตั้งแต่ 1 เดือน ถึง 12 ปี (อายุเฉลี่ย 1.4 ปี) ร้อยละ 87 เกิดในเด็กอายุ 2 ขวบแรก ผู้ป่วยเด็กส่วนใหญ่มีอาการถ่ายเหลวเป็นน้ำและมีไข้ ช่วงระยะการถ่ายเหลว 1–20 วัน (เฉลี่ย 5.2 วัน) เชื้อที่แยกได้จากอุจจาระมากสุดคือ Salmonella group B (56.1%) พบว่าเชื้อที่แยกได้มีการดื้อยาต้านจุลชีพหลายชนิด ยกเว้น norfloxacin มีความไวต่อเชื้อที่แยกได้ทุกตัว ในการศึกษานี้พบว่ามีผู้ป่วยที่ติดเชื้อโรคเอดส์ด้วย 4 ราย (1%) ปอดบวม 2 ราย (0.5%) และเกิด Salmonella group B septicemia 1 ราย (0.3%) ไม่มีผู้ป่วยเด็กเสียชีวิต โดยสรุปเชื้อ nontyphoidal Salmonella ยังเป็นสาเหตุของการเกิดโรคอุจจาระร่วงที่พบบ่อยในเด็กโดยเฉพาะทารก และอัตราการดื้อยาหลายชนิดค่อนข้างสูงในประเทศไทย

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