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The Prevalence and Antibiotic Resistance of *Shigella* sp. Recovered from Patients Admitted to Bouali Hospital, Tehran, Iran During 1999-2001

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Abstract: The present study was conducted to determine the prevalence of serotypes and antibiotic resistance in *Shigella* spp. isolated from patients admitted to Bouali hospital, Tehran, Iran during 1999 to 2001. All cases of shigellosis that were diagnosed according to their clinical pictures and microbial cultures were included in current study. Patients' age ranged from 12 to 89 years. Overall, 52 patients (56%) and 41 (44%) were males and female, respectively. From a total of 90 *Shigella* isolates, 40 strains were identified as *S. sonnei* (45%), 26 as *S. flexneri* (27.9%), 3 as *S. boydii* (3%) and 21 as *S. dysenteriae* (24%). More than 95% of the isolates were susceptible to ciprofloxacin, ceftriaxone and ceftizoxim, 70% to nalidixic acid and less than 50% to co-trimoxazole, tetracycline, ampicillin and fourazolodon.

Key words: Antibiotic resistance, *Shigella* sp.

INTRODUCTION

Shigellosis is endemic throughout the world and it is among the most common causes of bacterial diarrhoeal diseases. It is responsible for approximately 165 million cases annually, of which 163 million are in developing countries and 1.5 million in industrialized ones. It is estimated that 1.1 million people die annually from *Shigella* infection and nearly 580,000 cases of shigellosis are reported among travelers from industrialized countries (Kotloff *et al.*, 1999). Although epidemic *Shigella* dysentery is the most serious manifestation of *Shigella* infection in developing countries, the majority of *Shigella* infections are due to endemic shigellosis. *S. flexneri* is the endemic species and is responsible for approximately 10% of all diarrhoeal episodes among children younger than five years. *S. dysenteriae* type 1 cause's epidemic and endemic disease, whereas, in developed countries, *S. sonnei* is predominantly involved in common source sporadic outbreaks. *S. boydii*, was first detected in India and up to now has been uncommonly found, excepting in the Indian subcontinent (Niyogi, 2005). Exceptions of *S. sonnei*, each species contains multiple serotypes based on the structure of the O antigen and at least 49 serotypes of *Shigella* have been recognized, representing subtypes from three of the four groups; of which 15 belong to *S. flexneri* (Simmons and Romanawsk, 1987; Bopp *et al.*, 2003).

Effective antimicrobial therapy reduces duration and severity of dysentery and can also prevent its potentially lethal complications (Bhattacharya and Sur, 2003). However, indiscriminate use of drugs and horizontal gene transfer has led to *Shigella* species becoming resistant to commonly used antibiotics. Resistance patterns are influenced by geographic location, year that isolates were obtained, classes of antimicrobial agents and pressure exerted by antimicrobial use. It was noticed that, over the past decades, *Shigella* strains have progressively become resistant to most of the widely use antimicrobials, such as ampicillin, chloramphenicol, tetracycline and trimethoprim-sulfamethoxazole (Lima *et al.*, 1995; Ashkenazi *et al.*, 2003). The antimicrobials that remain effective are ciprofloxacin and other fluoroquinolones, ceftriaxone and azithromycin (WHO, 2001).

There are also quite striking geographic differences in the corresponding resistance rates. This may be due to the occurrence and spread of antimicrobial-resistant clones. Surveillance programs on antimicrobial resistance not only identify pathogenic bacterial species, by reporting data like serotyping, microorganisms incidence rates and susceptibility to the antimicrobial agents currently used for treatment, but also contribute to monitoring the intervention strategies used to control their spread (WHO, 2001).

This study was conducted to evaluate the frequency of species, serovars and antimicrobial resistance profiles of *Shigella* isolated from patients admitted to a major hospital in Tehran Iran during 1999 to 2001.

MATERIALS AND METHODS

Bacterial isolation and identification: From 1999 to 2001, fecal specimens and rectal swabs were collected from patients with gastroenteritis and acute diarrhea, at the Bouali hospital in Tehran, Iran.

Specimens and rectal swabs were cultured on *Shigella-Salmonella* (SS), Xylose Lysine Deoxycholate (XLD) and MacConkey (MC) agars (Difco, Detroit, MI, USA). Suspected colonies were picked after incubation for 24 h at 35°C. *Shigella* sp. were preliminarily identified by gram stain, colony morphology, lactose fermentation, motility, as well as by results of general biochemical tests (Ewing, 1986). Strains were serogrouped by using commercially-available antisera.

Antimicrobial susceptibility testing: Antimicrobial susceptibility testing was performed according to the Kirby-Bauer methods (Bauer *et al.*, 1966) using following antimicrobial disks: ampicillin, amoxicillin, tetracycline, ceftriaxone, furazolidone, cefazolin, ceftizoxim, ciprofloxacin, gentamicin, nalidixic acid and trimethoprim-sulfamethoxazole. *Escherichia coli* ATCC 25922 was used as a quality control strain.

RESULTS

A total of 90 confirmed *Shigella* strains were isolated. Of these, 40 strains were identified as *S. sonnei* (45%), 26 as *S. flexneri* (27.95%), 3 as *S. boydii* (3%) and 21 as *S. dysenteriae* (24%) (Fig. 1).

Of all patients, 52 (56%) were male and 41 (44%) were female. The ratio of males to females was 1.26.

Ninety-seven percent of tested isolates were resistant to ampicillin, 81% to trimethoprim-sulfamethoxazole and

tetracycline, 9.7% to nalidixic acid and 3% to ceftizoxim. None of the tested isolates were resistant to ciprofloxacin and ceftriaxone.

DISCUSSION

Enteric infections comprise the second commonest medical problem after respiratory infectious diseases and, in some populations reach hyper endemic proportions (Ranjbar *et al.*, 2004, 2007). Bacillary dysentery caused by members of the genus *Shigella* is prevalent in many countries with temperate climates. It is a disease of children from 6 months to 10 years of age, although it can affect susceptible individuals of any age who are subject to poor sanitation (Surdeanu *et al.*, 2003).

In Europe and the USA *S. sonnei* is the most frequently isolated among the *Shigella* sp., however in developing countries *S. flexneri* is the most dominant (Lee *et al.*, 1991; Ranjbar *et al.*, 2004).

Serotyping of the isolates showed that *S. sonnei* was the most frequent species in the period of our study. The results obtained from our study is comparable with some of studies that have been undertaken in the United States, Canada and other developed countries. However, in Taiwan and Bangladesh the infections are mostly caused by *S. flexneri* (Chiou *et al.*, 2001; Tacket *et al.*, 1984). It has been suggested that factors involved in natural selection may have been the main reason for these discrepancies.

S. flexneri has been reported as the most prevalent species in Iran in 1984-1985 and 2001-2002 (MoezArdalan *et al.*, 2003; Nikkah and Mehr-Mrahead, 1988). Similar results have been reported in some neighboring countries. *S. flexneri*, accounted for 44.0, 58.0 and 65.0% of shigellosis cases in Saudi Arabia, Pakistan and Jordan, respectively (Kagalwalla *et al.*, 1992; Zafar *et al.*, 2005; Rawashdeh *et al.*, 1994).

Antimicrobial resistance patterns are valuable as a guide to empirical therapy, as a typing method and as an indicator of the dissemination of antimicrobial resistance determinants. Continuous monitoring of the susceptibility pattern of *Shigella* sp. is important to notice the emergence of antibiotic resistance as also for deciding periodically the appropriate antibiotic therapy for shigellosis.

In present study resistance to cephalexin, ampicillin, tetracycline and trimethoprim-sulfamethoxazole was greater than 50% thus these antibiotics may not be appropriate candidate for routine treatment of shigellosis. Antibiotic susceptibility testing showed low rate of resistance to nalidixic acid so in mild outpatients and child, we recommend use of because this antibiotic. In severe hospitalized patients ceftizoxim and ciprofloxacin are our preferences.

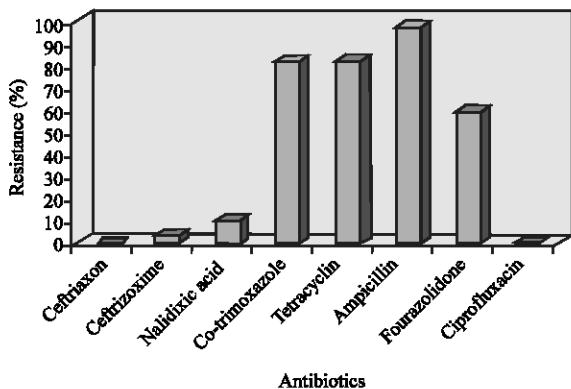


Fig. 1: Percentage of antibiotic resistance among the strains of *Shigella* sp. recovered from the patients admitted to Bouali hospital in Tehran, Iran

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