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Antibiotic resistance among *Shigella* serogroups isolated in Tehran, Iran (2002-2004)

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Key words: *Shigella*, antibiotic resistance, Iran

J Infect Dev Ctries 2009; 3(8):647-648.

Received 22 September 2008 - Accepted 12 August 2009

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Shigellosis, one of the most common bacterial diarrhoeal diseases, is endemic throughout the world. It is one of the major causes of morbidity in children with diarrhoea in Iran [1-4].

Antibiotic therapy is useful and effective for shigellosis. Treatment is critical for persons with severe disease, particularly children and immunosuppressed patients. Use of an appropriate antibiotic therapy can shorten the duration of symptoms, significantly reduce the risk of transmission, and also prevent potentially lethal complications [5-7]. However, high frequencies of resistance in *Shigella* spp. to commonly used antimicrobial agents have been reported in recent years worldwide [8, 9].

The aim of this study was to investigate the current antimicrobial resistance trends among the strains of *Shigella* recovered from children with acute diarrhoea in Tehran, Iran, during the years 2002-2004.

Of a total of 200 *Shigella* spp. isolates studied, 110, 84, 5, and one were identified as *S. sonnei*, *S. flexneri*, *S. boydii*, and *S. dysenteriae*, respectively. These strains were isolated from pediatric patients (younger than 12 years old) with acute diarrhoea admitted to five major hospitals in Tehran, Iran. Antimicrobial susceptibility testing was performed according to the standard guidelines of the Clinical and Laboratory Standards Institute [10].

Overall, more than 97.5% of tested isolates were resistant to streptomycin, 93.5% to sulfamethoxazole-trimethoprim, 93.5% to tetracycline, 8.0% to kanamycin, 1.5% to cefixime and 0.5% to amikacin. Most strains of *S. flexneri* (95.2%) were resistant to amoxicillin-clavulanic, while strains belonging to other serogroups were fully susceptible to this antibiotic. None of the strains of *S. flexneri* and *S. dysenteriae* and one strain only of *S. boydii* was resistant to nalidixic acid, but nine (8.2%) isolates of *S. sonnei* were resistant to this antibiotic. More than 72.6% of *S. flexneri* isolates, but 2.7% only of *S. sonnei* isolates, were resistant to ampicillin. More than 32.1% of *S. flexneri* strains were resistant to chloramphenicol, while only one isolate of *S. boydii* was resistant to this antibiotic.

None of the tested isolates was resistant to cephalothin, cefotaxime, ceftriaxone, ceftizoxime, ceftazidime, gentamicin or ciprofloxacin.

The results indicate that most *Shigella* isolates show high resistance rates to streptomycin, sulfamethoxazole-trimethoprim and tetracycline. When compared to previous reports from Iran, an increase in the prevalence of resistance to tetracycline and sulfamethoxazole-trimethoprim is evident. Previously, resistance to tetracycline was reported at 77%, 56%, and 74% by different authors in 1984, 1989 and 2001 [11-13]. Similarly, 94% of our isolates were found to be resistant to

sulfamethoxazole-trimethoprim in comparison with a previously reported 70% prevalence [13]. It can be concluded that these antimicrobial agents are no longer appropriate for empirical therapy of shigellosis in our country.

On the other hand, the resistance rate proves to be consistently low for ampicillin, cefixime, amikacin, kanamycin and chloramphenicol. Among the different serogroups, only *S. flexneri* isolates (32.1%) were resistant to chloramphenicol, a finding which is consistent with that of a previous study conducted in North America [14]. This is an interesting observation because *S. flexneri* is no longer the predominant species in Iran as it was in the past [1,2]. A cause of concern is the increasing frequency of resistance to nalidixic acid in *S. sonnei*, which has increased to 5% from a previous reported prevalence of approximately 1% in 2001 [13]. It is also noteworthy that none of our *Shigella* strains was resistant to gentamicin, ciprofloxacin, and third-generation cephalosporins.

In conclusion, we showed the prevalence of resistance to some commonly used antibiotics is high and differs within *Shigella* serogroups. While antibiotic resistance varies by *Shigella* serogroups, continuous monitoring of resistance patterns among individual serogroups is recommended. Our findings emphasize the need to reassess the use of antibiotic agents according to *Shigella* serogroup in the treatment of shigellosis in our country.

Acknowledgements

The authors are thankful for the cooperation of Dr. Mohammad Taghi Ashtiani and Mrs. Mina Abedini from the Microbiology laboratory of the Children's Medical Center. We would also like to thank Dr. Mohammad Rahbar from Millad Hospital.

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Conflict of interest: No conflict of interest is declared.