

Laboratory and Epidemiology Communications

Multiresistant *Shigella* Species Isolated from Childhood Diarrhea Cases in Kolkata, India

Swapan Kumar Niyogi* and Gururaja Perumal Pazhani

*Division of Microbiology, National Institute of Cholera and Enteric Diseases,
Kolkata 700 010, India*

Communicated by Haruo Watanabe

(Accepted February 26, 2003)

Antimicrobial therapy for shigellosis reduces the duration and severity of the disease and can also prevent potentially lethal complications (1). However, over the past few decades *Shigella* spp. have become progressively resistant to most of the first-line drugs used, and the prevalence of multidrug-resistant strains is an important concern of treatment (2,3). In this report we analyze the occurrence rate and multidrug-resistance pattern of *Shigella* isolates obtained from childhood diarrhea cases.

From January 2001 to June 2002, a total of 1,295 stool samples was collected from children suffering from acute diarrhea who attended the Diarrhoea Treatment Unit at Dr. B.C. Roy Memorial Hospital for Children, Kolkata, and were cultured for *Shigella* spp. All isolates were confirmed serologically by slide agglutination using commercially purchased antisera (Denka Seiken, Tokyo). Antimicrobial susceptibility tests were performed using an agar diffusion technique method in accord with the National Committee for

Clinical Laboratory Standards guidelines (4). The sixty-eight strains of *Shigella* spp. isolated were distributed as follows: 37 (54.4%) were *S. flexneri*, 19 (28%) were *S. sonnei*, 9 (13.2%) were *S. boydii*, and 3 (4.4%) were *S. dysenteriae*. Antimicrobial susceptibility testing of *Shigella* spp. showed a high degree of resistance to the commonly used antimicrobials, including ampicillin (41%), co-trimoxazole (95%), tetracycline (87%), and nalidixic acid (59%), and low level resistance against norfloxacin (9%) and ciprofloxacin (6%). We observed a different antimicrobial resistance pattern among four *Shigella* spp., necessitating the identification of serogroups along with resistance patterns for purposes of treatment of shigellosis. Overall, 90% of *Shigella* isolates were found resistant to two or more antimicrobial agents. Multidrug resistance also varied significantly among species (Table 1).

Antimicrobial resistance has been occurring among *Shigella* spp. since the 1940s, when sulfonamide resistance among *Shigella* organisms was first recognized in Japan (5). By 1970, widespread resistance of this disease to sulfonamides limited their therapeutic usefulness (6). In 1984, an epidemic of shigellosis, caused primarily by multidrug-resistant *S. dysenteriae* 1, broke out in the eastern part of India and caused many deaths in and around Kolkata (7). During this period, the

*Corresponding author: Mailing address: National Institute of Cholera and Enteric Diseases, P-33, C.I.T. Road, Scheme XM, Beliaghata, Kolkata 700 010, India. Tel: +91-33-350 0448, Fax: +91-33-350 5066, E-mail: niyogisk@hotmail.com

Table 1. Multidrug-resistance pattern of 68 *Shigellae* isolates

<i>Shigella</i> spp.	Resistance pattern*	Total	
<i>S. dysenteriae</i> (n = 3)	A, CO, T, Na, Nx, Cf	3	
	<i>S. flexneri</i> (n = 37)	None	3
		CO, T	6
		CO, Na	2
		A, CO	1
		A, CO, T	7
		A, CO, Na	1
		CO, T, Na	4
		A, CO, T, Nx	1
		A, CO, T, Na	11
		A, CO, T, Na, Nx	1
<i>S. boydii</i> (n = 9)		None	1
	CO, T	2	
	A, T	1	
	A, CO, T	2	
	CO, T, Na	1	
	A, CO, T, Na	1	
	A, CO, T, Na, Nx, Cf	1	
<i>S. sonnei</i> (n = 19)	None	1	
	CO, T, Na	15	
	CO, T	3	

*: A, ampicillin; CO, co-trimoxazole; Na, nalidixic acid; Nx, norfloxacin; Cf, ciprofloxacin; T, tetracycline.

efficacy of nalidixic acid in the treatment of multi-resistant *S. dysenteriae* 1 infection was reported from Kolkata (8). However, within a short period, the widespread use of this drug resulted in the emergence of nalidixic acid-resistant *S. dysenteriae* type 1 (9). The development of resistance of *Shigella* spp. to common drugs in Kolkata had been reported earlier (10). *Shigella* isolates resistant to multiple drugs have been reported from several parts of the world (11,12). Our results revealed that multi-resistant strains of *Shigella* are present in Kolkata, and emphasize the importance of maintaining surveillance of these strains in order to assess local susceptibility patterns and empiric therapy. Multidrug resistance is an emerging problem in the clinical management of shigellosis, particularly in children in third world countries where diarrheal diseases are a major cause of childhood morbidity and mortality.

The authors thank Mr. S. K. Das for typing this manuscript.

REFERENCES

1. Salam, M. A. and Bennish, M. L. (1991): Antimicrobial therapy for shigellosis. Rev. Infect. Dis., 13 (Suppl. 4), S332-S341.
2. Sack, R. B., Rahaman, M., Yunus, M. and Khan, E. (1997): Antimicrobial resistance in organisms causing diarrhoeal disease. Clin. Infect. Dis., 24 (Suppl. 1), S102-S105.
3. Bennish, M., Eusof, A., Kay, B. and Wierzbza, T. (1985): Multiresistant *Shigella* infections in Bangladesh. Lancet, ii, 441.
4. National Committee for Clinical Laboratory Standards (1997): Performance standard for antimicrobial disk susceptibility tests: approved standards. M2-A6. 6th ed. National Committee for Clinical Laboratory Standards, Wayne, Pa.
5. Watanabe, T. (1963): Infective heredity of multiple drug resistance in bacteria. Bacteriol. Rev., 27, 87-115.
6. Weissman, J. B., Gangarosa, E. J. and DuPont, H. L. (1973): Changing needs in the antimicrobial therapy of shigellosis. J. Infect. Dis., 127, 611-613.
7. Pal, S. C. (1984): Epidemic bacillary dysentery in West Bengal (Letter). Lancet, ii, 1462.
8. Bose, R., Nashipuri, J. N., Sen, P. K., Dutta, P., Bhattacharya, S. K., Dutta, D., Sen, D. and Bhattacharya, M. K. (1984): Epidemic dysentery in West Bengal: clinicians enigma. Lancet, ii, 1160.
9. Sen, D., Dutta, P., Deb, B. C. and Pal, S. C. (1988): Nalidixic acid resistant *Shigella dysenteriae* type 1 in Eastern India. Lancet, ii, 911.
10. Niyogi, S. K., Mitra, U. and Dutta, P. (2001): Changing patterns of serotype and antimicrobial susceptibilities of *Shigella* species isolated from children in Kolkata, India. Jpn. J. Infect. Dis., 54, 103-107.
11. Centers for Disease Control (1986): Multiply resistant shigellosis in a day-care center -Texas. Morbid. Mortal. Wkly. Rep, 35, 753-755.
12. Lima, A. A. M., Lima, N. L., Pinho, M. C. H., Barros, E. A. Jr., Teixeira, M. J., Martins, M. C. V. and Guerrant, R. L. (1995): High frequency of strains multiple resistant to ampicillin, trimethoprim-sulfamethoxazole, streptomycin, chloramphenicol and tetracycline isolated from patients with Shigellosis in northern Brazil during the period 1988 to 1993. Antimicrob. Agents Chemother., 39, 256-259.