

## SEROTYPES AND ANTIBIOGRAM OF SHIGELLA SPECIES ISOLATED IN ACCRA, GHANA

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### SUMMARY

**Objective:** To culture diarrhoea stool in order to determine *Shigella* serotypes and their antimicrobial susceptibility pattern.

**Main Findings:** In the 6 years period (January 1994 – December 1999), 4153 stool specimens from patients were cultured. *Shigella* species were isolated from 59 samples, 32 of these were from children. *Sh. Flexneri* was the commonest isolate (66%), followed by *Sh. Sonnei* (14%). Of the strains showing resistance, the highest level of resistance was to tetracycline (90%), followed by ampicillin (73%), cotrimoxazole (64%) and chloramphenicol (61%). Several resistance phenotypes were present; the commonest pattern was resistance to a combination of tetracycline, ampicillin, cotrimoxazole and chloramphenicol.

**Conclusion:** Continuous, local laboratory surveillance is justified, to monitor drug resistance and also guide empiric treatment of dysentery.

**Keywords:** Multiresistant shigella, resistant phenotypes, sensitivities.

### INTRODUCTION

Diarrhoea morbidity and mortality is a major global problem especially in developing countries<sup>1</sup>. In these countries, shigellosis occurs both endemically and as epidemics and the infection is of high public health significance. The genus *Shigella* has four subgroups namely; *Sh. dysenteriae*, *Sh. flexneri*, *Sh. boydii* and *Sh. sonnei*. All these had been isolated in developing countries. In many countries endemic disease is due to *Shigella flexneri*, this has been confirmed in earlier reports from Ghana<sup>2-3</sup>. It had also been observed that in an endemic focus, sometimes, the predominance of any one group might change<sup>4</sup>. In several countries a high proportion of *Shigella* species had been found to be resistant to different antimicrobial agents<sup>5-7</sup> and resistance is becoming increasingly important in the selection of drugs for treatment of enteric infections<sup>8</sup>.

This study analyses retrospectively, the results of diarrhoea stools cultured from 1994 to 1999 in Ac-

cra, to determine the common *Shigella* serotypes and also the antimicrobial susceptibility patterns of the isolates.

### METHODS

Stool samples from patients with diarrhoea sent to the Microbiology laboratory of Korle Bu Teaching Hospital in Accra for culture over a 6 year period 1994-1999 were examined. Samples were inoculated onto Salmonella-Shigella agar, MacConkey agar, Desoxycholate citrate agar and *Selenite F* broth for culture of Salmonella and *Shigella*. *Shigella* isolates were identified biochemically and serologically by standard techniques<sup>9</sup> using antisera from Difco Laboratories, Michigan, USA. Antimicrobial susceptibility tests were performed by disc diffusion using Stokes method. Drugs tested were ampicillin, tetracycline, chloramphenicol, cotrimoxazole, gentamicin, cefuroxime, cefotaxime and augmentin.

### RESULTS

Of a total of 4153 stool samples cultured over the period January 1994 to December 1999, 1619 were from children (under 12 years) and 2534 were from adults. Fifty-nine *Shigella* strains were isolated: *Sh. flexneri* 39, *Sh. sonnei* 8, *Sh. dysenteriae* 3, *Sh. boydii* 1, and also 8 *Shigella* species, as shown in Table 1. *Shigella flexneri* the most common species was cultured from 66% of the positive cultures. Thirty-two of the 59 strains were from children. No *Shigella* strains were cultured from specimens received in 1997.

**Table 1** *Shigella* subgroups isolated from 1994-1999

Year	Sh. flexneri	Sh. sonnei	Sh. dysenteriae	Sh. boydii	Sh. species
1994	6	2	1	1	-
1995	5	-	1	-	-
1996	9	5	1	-	8
1998	16	1	-	-	-
1999	3	-	-	-	-
<b>Total</b>	<b>39</b>	<b>8</b>	<b>3</b>	<b>1</b>	<b>8</b>

Table II shows the susceptibilities of the fifty-nine isolates. Of the 48 strains resistant to one or more of the drugs, 43(90%) were resistant to tetracycline, 35(73%) to ampicillin, 30(63%) to cotrimoxazole and 29(60%) to chloramphenicol respectively. Eleven of the 59 isolates (19%) were susceptible to all the antimicrobials tested. While 6 were resistant to only one drug, 42(88%) were resistant to two or more drugs. Twenty-seven strains were resistant to three or more antimicrobials, made up of 5 different resistant phenotypes. The most common resistant phenotype was a combination of ampicillin, chloramphenicol, cotrimoxazole and tetracycline found in the *Sh. flexneri* subtype, as shown in Table III.

**Table 2** Susceptibility of Shigella isolates 1994-1999 (n=59)

	No of strain	No (%) of fully susceptible strain	No (%) of mono-resistant strains	No(%) multiresistant strains
Sh flexneri	39	3(8)	3(8)	33(84)
Sh sonnei	8	2(25)	1(12)	5(63)
Sh dysenteriae	3	2(67)		1(33)
Sh boydii	1	1(100)		
Sh species	8	3(37)	2(25)	3(37)

places like Calabar, Nigeria<sup>6</sup> and in Thailand<sup>10</sup>. It also confirms what had originally been reported from Ghana in the 1970's<sup>2,3</sup>. Unfortunately susceptibility results of these earlier isolates from Ghana were not reported and therefore one cannot compare the percentage sensitivities seen in this study and that of the earlier isolates. Many of the strains were multi-resistant and the commonest resistant phenotype seen in Accra was to ampicillin, tetracycline, cotrimoxazole and chloramphenicol. This phenotype had also been observed in Thailand, and had been reported earlier in Accra from Salmonella strains<sup>11</sup>. With the development of resistance to the commonly used antimicrobials, newer drugs like azithromycin<sup>12</sup> and the quinolones<sup>10,13,14</sup> had been tested and found to be sensitive and also effective in the treatment of shigellosis. Unfortunately, (for those in the developing countries) these are relatively expensive when compared to drugs like ampicillin and tetracycline. The increasing resistance of Shigella to many of the more commonly available antimicrobial agents present a dilemma in the management of dysentery. Consequently, routine sensitivity testing of the quinolones and other newer drugs used in treating dysentery must be seriously considered. Local laboratory surveillance is therefore justified to monitor drug resistance and also guide empiric treatment.

**Table 3** Resistant patterns of Shigella strains which are resistant to at least 2 antimicrobial agents

	Number of resistant isolates										
	No of Isolates	T A	T S	T Ch	A Ch A	A S	A Ch S	A Ch S T	A Ch T Aug	A S T Aug G	Aug Ct
Sh flexneri	33	1	3	1	3	3	5	11	2	4	
Sh sonnei	5			2			2				1
Sh dysenteriae	1		1								
Sh species	3		1			2					

A Ampicillin  
S Cotrimoxazole  
T Tetracycline  
Ch Chloramphenicol  
Aug Augmentin  
G Gentamicin  
Ct Cefotaxime

## DISCUSSION

The extent of childhood shigellosis was indicated by the fact that 54% of isolates were from children as has been seen in other developing countries with poor sanitation. The commonest serotype seen in this study is *Sh flexneri*. This had been reported in

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