Increasing Antimicrobial Resistance among *Shigella* Isolates in the Bushehr, Iran

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**Abstract:** Antibiotics are drugs used for treatment of infections caused by bacteria. Misuse and overuse of these drugs have contributed to phenomena known as antibiotic resistance. In this research, the antimicrobial resistance of the *Shigella* has been determined. This descriptive research analyzed registered laboratory data of patients referred to Fatemeh Zahrab Hospital of the Bushehr, Iran. *Shigella* was isolated from their cultured sample from the year 2002-2008. In this study, the total of 121 registered *Shigella* collected from 2002-2008 were analyzed. There were 62 cases of *S. sonnei, 46 cases of S. flexneri, eight cases of S. boydii and five cases of S. dysenteriae* among them. Furthermore, two cases of *Shigella sonnei* were collected from the blood and the rest from the watery stools of the infected patients. The following is the resistance pattern of these organisms: to ciprofloxacin, 4.25%, ceftazidime, 8.52%, nalidixic acid, 12.12%, co-trimoxazole, 86.13% and to tetracycline, 93.02%. Results of antibiogram showed that highest rate of drug resistance belongs to tetracycline and Co-trimoxazole and the lowest belongs to ciprofloxacin and ceftazidime. One of the important issue for clinicians, now a day is drug resistance of microorganisms. This phenomenon is increasing due to some factors such as improper use of antibiotics and irrational prescribing. These factors lead to development of new drug resistant species.

**Key words:** Antimicrobial resistance, *Shigella*, tetracycline, co-trimoxazole, ciprofloxacin

**INTRODUCTION**

*Shigella* is one of the most important causes of bloody diarrhea in the developing and under developing countries. *Shigella* can cause gastrointestinal tract infections in all age groups, especially child and newborns (Erqou et al., 2007). All serotypes of *Shigella* can cause infection out of the intestinal tract but it is rare. These infections such as bacteremia (Hawkins et al., 2007; Dronda et al., 1998), sepsisemia (Spiers, 1974), keratitis (Mustjens et al., 2006), osteomyelitis (Kliger and Hoeprich, 1984), and urinary tract infection (Anatoliotaki et al., 2003) and perinephric abscess (Al-Soub et al., 2005), were reported in literatures. Tetracycline was broadly used against *Shigella* for the treatment of related infections in human and animals. The first observed resistance to tetracycline was belonging to *S. dysenteriae* in 1953 (Chopra and Robert, 2001) and first resistance to sulfonamides was observed in Japan. Also resistance to ampicillin which was internationally used as drug of choice in the first decade of early 1980s was worldly increased and covered the Asia and Africa continents. Co-trimoxazole was used for treatment of shigellosis but resistance to this antibiotic occurred middle of the 1980s (Niyogi, 2007). At present nalidixic acid is used in endemic cases in developing countries as a first drug of choice in the treatment of infant shigellosis, but newly there is some report about the resistance to this medicine from different parts of the world and all species of *Shigella* are no longer sensitive to this drug. Results of the researchers from all over the world shows resistant to antibiotics are widely increased. Therefore, conducting research about this matter is seen to be important. This study aimed to determine the resistance pattern of *Shigella* sp. isolates collected from Fatemeh Zahrab Hospital of Bushehr, Iran from 2002-2008.

**MATERIALS AND METHODS**

This research was conducted in the Fatemeh Zahrab Hospital of Bushehr, Iran in the period of 2002-2008. All the cases of isolates of *Shigella* was studied without considering the age of patients whom the sample was collected. Stool samples of the patients were collected in the closed plastic container and was sent to microbiological laboratory for examination. Stool samples were cultured in the xylose-lysine-deoxycholate agar (XLD) and were incubated during 24 h in 37°C. The colorless (non-fermentation) colonies were chosen for identifying of enteropathogenic bacteria such as *Shigella*.
sp. Some special tests for distinguishing Shigella sp. from other enteric pathogens was conducted as follows: gram negative rods, non motile, non lactose ferment, oxidase, lysine decarboxylase, Simmons’s citrate, Voges Proskauer, urease were negative, mannitol and sucrose fermentation, ONPG test, ornithine decarboxylase test and indole were variable positive and Triple Sugar Iron Agar were alkaline/acid with no production of Hydrogen Sulfur and finally the identified Shigella sp. using special Shigella antiserum was confirmed and their types was identified (Gharibi et al., 2010). It was anti-biogramed by Kirby-Bauer disk diffusion method and using Mueller-Hinton medium. For sensitivity test, the following disc was used 5 μg ciprofloxacin, 30 μg nalidixic acid, 30 μg ceftizoxime, 23.75 μg co-trimoxazole and 30 μg tetracycline.

RESULTS

In this research, the number of 121 samples of Shigella collected from the year 2002-2008 was studied. The total number of 62 cases was Shigella sonnei, 46 were S. flexneri, 8 were S. boydii and 5 were S. dysenteriae. Furthermore, two cases of Shigella sonnei were from blood and the rest from stool.

The resistance pattern of the organisms was determined using five antibiotics such as ciprofloxacin, nalidixic acid, ceftizoxime, co-trimoxazole and tetracycline (Table 1). Results of the antibiogram isolates of Shigella showed most resistance rate is belong to Tetracycline with 93.2% and co-trimoxazole 86.1% and the lowest is belong to Ciprofloxacin with 4.25% and Ceftizoxime, 8.62% and Nalidixic acid, 12.12% (Table 1-3).

**DISCUSSION**

High rate of resistance of Shigella sp to tetracycline and co-trimoxazole in the period of 2002-2008 shows low efficacy of these drugs against these organisms and improper use of these drugs by patients and irrational prescribing of clinicians for treatment of different infectious diseases such as diarrhea (Table 1). Resistance of Shigella sp to ciprofloxacin and ceftizoxime was not observed in year 2003 while during the period of three-year resistance to ciprofloxacin and ceftizoxime reached to 11.5 and 13.5%, respectively. Ciprofloxacin is the drug of choice in Western countries (Haukka and Siitonen, 2008) but resistance to it were increased worldwide (Wong et al., 2010; Folster et al., 2011; Wilson et al., 2006). Nalidixic acid is the drug of choice for the treatment of shigellosis in the developing countries. Nalidixic acid is the drug for the treatment of shigellosis in the children and its resistance is increasing. Resistance rate of 7.8% in 2003 and 30% in 2007 to this antibiotic is considerable. Among the isolated species of Shigella, S. sonnei and secondly S. flexneri have the highest rate of prevalence but antibacterial resistance of S. flexneri was more than S. sonnei (Table 1).

The results of research in different cities of Iran and other countries as well shows resistance of Shigella sp. to these antibiotics conform to the results of this study. For instance, the results of a study conducted in Tehran, Iran in 2003-2005 the resistance of these bacteria to co-trimoxazole was 98% and to nalidixic acid 11.5% (Rahbar et al., 2007). In other studies done in Shiraz, Iran in 2003, the rate of resistance of these organisms to co-trimoxazole was reported 90.2% and to nalidixic acid 9.8% but all species were sensitive to ciprofloxacin (Farshad et al., 2006). In addition, in a study conducted in Nepal in 2002-2004, rate of resistance of Shigella sp. reported as follows: to tetracycline, 74.4%; to co-trimoxazole, 80.7%; to nalidixic acid, 31.3% and to ciprofloxacin, 2.4% (Wilson et al., 2006). In another study has done in Ethiopia between 2001-2005, the rate of resistance to tetracycline, co-trimoxazole and
Ciprofloxacin were reported 86, 73.4 and 8.9%, respectively (Yismaw et al., 2008). Also in Phnom Penh Hospital of Cambodia all the Shigella isolates were resistant to co-trimoxazole (Meng et al., 2011). In a study in Dares Salam, Tanzania between 2005-2006, the rate of resistance of Shigella sp. to tetracycline and co-trimoxazole was 100 and 93.3%, respectively (Moyo et al., 2011).

Furthermore most important matter is propagation of new strains of the Shigella sp. which are resistant to several antibiotics which make the treatment for bacteremia and sepsisemia more difficult.

Recently, many of the isolated Shigella are resistant to several drugs such as sulfamoxides, tetracycline and co-trimoxazole (Rahman et al., 2007; Vrints et al., 2009; Hosseini et al., 2007) and there is low resistance to the new drugs of choice such as nalidixic acid and ciprofloxacin. Stopping self medication and irrational uses of antibiotics prevents propagation of recent resistant species; also multiple antibiotic therapy to eradicate the organism is recommended.

CONCLUSION

Antibiotic resistance is one of the most important issues which are increasing very fast. High resistance rate of Shigella sp. to antibiotics such as co-trimoxazole and tetracycline makes the treatments so hard. Nalidixic acid is the drug of choice for the treatment of dysentery caused by bacilli in the underdeveloped countries that its rate of resistance is increasing too and for improper treatment it will be increased with higher rate in such a way that its treatment in near future will be more difficult.

REFERENCES


