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Original Research Article

Antibiotic resistance pattern of bacterial enteritis among hospitalized children in Ardabil: a single center experience

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ABSTRACT

Background: Gastroenteritis is one of the most important diseases in all parts of the world; and more dangerous among children, elderly, people who are undernourished and those who live in worse conditions. This study was set up to assess the antibiotic resistance pattern of bacterial enteritis among hospitalized children in Ardabil.
Methods: This prospective cross-sectional study was carried out on 52 children who were referred to Bu- Ali hospital with dysentery in 2014.
Results: Among all 52 collected Stool samples, 33 (63.4%) yielded *Shigella*. The most common *Shigella* isolate was *S. flexneri* (n = 17, 48.6%). Of 52 cases, 61.5% were boy, with the average age of 4.8 years. In the antibiogram, Ciprofloxacin and Gentamiycin were the most sensitive antibiotics to *Shigella* spp. and Co-trimoxazole and Azithromycin showed the highest resistance. Also, Imipenem, Ciprofloxacin and Gentamicin were the most sensitive antibiotics to *E. coli* and Co-trimoxazole showed the highest resistance. Finally, Azithromycin, Ceftazidime and Nalidixic acid were the most sensitive antibiotics for *Salmonella* group D.
Conclusions: The results showed that different bacterial species showed maximum sensitivity to different drugs whereas the majority of them were resistant to Co-trimoxazole.

Keywords: Antibiotic resistance, *E.coli*, Gastroenteritis, Hospitalized children, *Shigella* spp

INTRODUCTION

Gastroenteritis is one of the most important diseases among children, elderly, malnourished people and people who live in poor conditions in the world given the high morbidity and mortality in children and adults in developed and developing countries and considered as one of the world's six leading cause of death after heart disease and cancer. Dysentery causes suffering to one billion people in Asia, Africa and Latin America, of which about 4 to 6 million deaths have been occurred per year.[1-3]

In developed countries, diarrheal diseases cause more deaths, of which about 10 percent is from shigellosis, making it one of the major causes of childhood morbidity associated with diarrhea.[1]

Dysentery is an inflammatory bowel disease that is caused by microorganisms that invade the intestinal mucosa and called a chronic disaster for the people, especially those who live in poor sanitary conditions.[4]

Shigella is an important cause of acute diarrhoeal disease. Worldwide, there are 165 million cases yearly and 1.1 million people are estimated to die from *Shigella* infections. All species of *Shigella* (*S. dysentry*, *S. flexneri*, *S. sonnei* and *S. boydii*) can cause to Shigellosis.[5,6] The prevalence of *Shigella* infection can be increasing due to the low dose of bacterial virulence, easy

transmission from person to person, indirect contamination of people through consumption of contaminated food and water. The most important problem in the treatment of people with Shigellosis is antibiotic resistance which occurs by plasmids.[7]

In several studies, resistance to prescribed antibiotics such as Ampicillin, Co-trimoxazole, Nalidixic acid has been reported.[8]

Gastroenteritis is the most common Salmonella infections in humans that caused by Salmonella serotypes which its treatment we used antibiotics. The prevalence of antibiotic resistance among Salmonella infections is a major problem in treating them. The most causes of antibiotic resistant are indiscriminate and uncontrolled use of antibiotics in humans and non-completing treatment by patients which cause to remove sensitive bacteria and selecting resistant strains.[9-10]

This study was set up to assess the antibiotic resistance pattern of bacterial enteritis among hospitalized children in Ardabil.

METHODS

This prospective cross-sectional study was conducted in Bu-Ali hospital, Ardabil, Iran in 2014. Fifty two stool samples were collected in clean open-mouth disposable containers from children who were clinically diagnosed as suffering from dysentery. All the samples were sent to the laboratory for isolation and identification of *Shigella* organisms according to standard methods. Briefly, the stool specimens were directly cultured onto hektoen enteric and MacConkey sorbitol agar and incubated aerobically at 37°C for 24 hours. Bloody specimens primarily were enriched using selenit F broth for 6 hours at 37°C and then subcultured onto above-mentioned culture media.

The bacteria were identified using standard microbiological tests. Serological typing of *Shigella* spp were performed using *Shigella* group specific antisera (Sifin, Berlin Germany).

Antimicrobial susceptibility patterns of the isolates was determined using the disc diffusion method in accord with the guidelines of the Clinical Laboratory Standards Institute (CLSI). The used antibiotics represented in Table 1. The *E. coli* ATCC 25922 was used as quality control for susceptibility tests. In this study pathogenic and non-pathogenic strains were being isolated and all form of *E. coli* not isolated. Collected data analyzed by statistical methods in SPSS.16.

RESULTS

61.5% of children were boys, the mean age was 4.8±2.8 years, which from them 38.5% were in age group 3-6 years and 76.9% of them were from urban areas. 86.5% of infants were breast feed. 42.3% of cases occurred in the summer season. Age was the most prevalent symptom including 96.1% of children in the study. 55.7% of patients had leucocytosis as given in Figure 1.

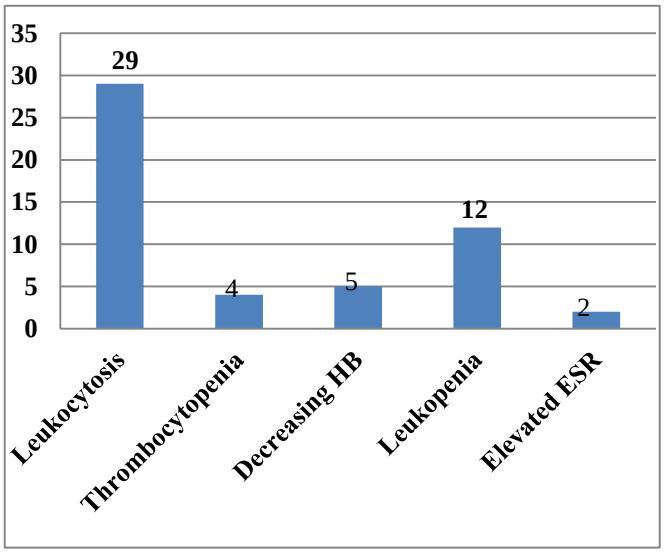

Figure 1: Frequency of laboratory findings in all study patients.

Shigella was the most commonly grown pathogen from stool samples with 33 cases (63%) as seen in Figure 2. *S. flexneri* with 17 cases (52%) accounted for the most *shigella* spp as in Figure 3.

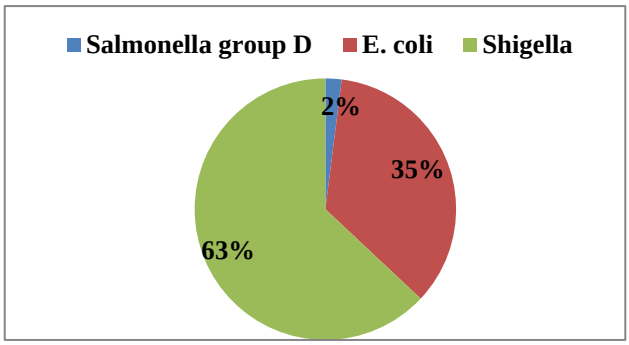

Figure 2: Type of isolated bacterial specimens.

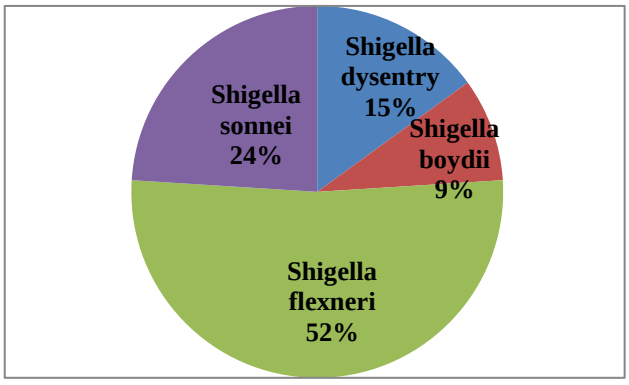

Figure 3: All type of *Shigella* isolated from specimens.

Table 1 showed that the *S. sonnei* have the most sensitivity to antibiotics Imipenem, Gentamicin, and Ceftazidime and the most resistant to Co-trimoxazole. Most of sensitivity of *Shigella* was to Ciprofloxacin and most resistance was to Co-trimoxazole. Most of sensitivity of *E. coli* was to Imipenem, Ciprofloxacin and Gentamicin and most resistance was to Co-trimoxazole as shown in Table 2. Also results showed that Azithromycin, Ceftazidime and Nalidixic-acid are effective drugs on Salmonella group D as in Table 3.

Table 1: Antimicrobial resistance pattern by *Shigella* spp.

***Shigella* type (n = 33) Antibiotics**	***S.dysentery* (n = 5)**		***S. flexneri* (n = 17)**		***S. sonnei* (n = 8)**		***S. boydii* (n = 3)**	
	S (n,%)	R (n,%)	S (n,%)	R (n,%)	S (n,%)	R (n,%)	S (n,%)	R (n,%)
Amikacin	3 (60)	2 (40)	8 (47)	9 (53)	5 (62.5)	3 (27.5)	2 (67)	1 (33)
nalidixic acid	2 (40)	3 (60)	10 (58.8)	7 (41.2)	7 (87.5)	1 (12.5)	2 (67)	1 (33)
Ciprofloxacin	5 (100)	-	9 (53)	8 (47)	7 (87.5)	1 (12.5)	3 (100)	-
Cefixime	2 (40)	3 (60)	3 (15.4)	14 (84.6)	3 (37.5)	5 (62.5)	2 (67)	1 (33)
Imipenem	4 (80)	1 (20)	13 (76.5)	4 (23.5)	8 (100)	-	2 (67)	1 (33)
Azithromycin	-	5 (100)	7 (42.9)	10 (57.1)	3 (37.5)	5 (62.5)	-	3 (100)
Ceftriaxone	2 (40)	3 (60)	2 (11.8)	15 (88.2)	5 (62.5)	3 (37.5)	2 (67)	1 (33)
Gentamicin	5 (100)	-	15 (88.2)	2 (11.8)	7 (100)	-	3 (100)	-
Co-trimoxazole	-	5 (100)	1 (5.9)	16 (94.1)	-	8 (100)	-	3 (100)
Ofloxacin	5 (100)	-	11 (68.8)	6 (31.2)	7 (87.5)	1 (12.5)	3 (100)	-
Ceftazidime	-	-	6 (33.3)	11 (66.7)	8 (100)	-	-	5 (100)

Table 2: Antimicrobial resistance pattern of *E. Coli* (n = 18).

Antimicrobial resistance pattern Antibiotics	**S; N(%)**	**I+R; N(%)**
Amikacin	9 (50)	9 (50)
nalidixic acid	11 (61)	7 (39)
Ciprofloxacin	13 (72.2)	5 (27.8)
Cefixime	6 (33)	12 (67)
Imipenem	16 (89)	2 (11)
Azithromycin	12 (67)	6 (33)
Ceftriaxone	9 (50)	9 (50)
Gentamicin	13 (72.2)	5 (27.8)
Co-trimoxazole	3 (17)	15 (83)
Ofloxacin	12 (67)	6 (33)
Ceftazidime	6 (33)	12 (67)

Table 3: Antimicrobial resistance pattern of Salmonella group D (n=1).

Antimicrobial resistance pattern Antibiotics	**S; N(%)**	**R; N(%)**
Amikacin	1 (100)	-
nalidixic acid	-	1 (100)
Ciprofloxacin	-	-
Cefixime	-	-
Imipenem	-	-
Azithromycin	1 (100)	-
Ceftriaxone	-	-
Gentamicin	-	-
Co-trimoxazole	-	-
Ofloxacin	-	-
Ceftazidime	1 (100)	-

DISCUSSION

In this study most of cases with dysentery were male (61.5%) which was consistent with other studies.[11-12] In our study similar to Jamshidi study, the most prevalent season for dysentery was summer.[12] In this study *E. coli* with 34.6% has the upper sensitivity to antibiotics Imipenem (89%), Ciprofloxacin (72.2%) and Gentamicin (72.2%) and has the most resistant to Co-trimoxazole. Jafari et al, reported that most of *E. coli* samples have resistant to Co-trimoxazole (54.3%), Ampicillin (45.7%), Amoxicillin (37.1%) and Tetracycline (37.1%) which approximately consistent with our study result.[13] Our study results have more consistent with some studies and non-consistent with other studies.[11,14-17]

According to recent studies, it seems that in *E. coli* cases most sensitivity was to Imipenem and Amikacin and most resistance to Co-trimoxazole which was similar to our study results. In this study from *Shigella* isolated cases, bacteria's type were *S. flexneri* (52%), *S. sonnei* (24%) , *S. dysentery* (15%) and *S. boydii* (9%) which was similar patterns to other studies.[5,12,18,19]

In our study similar to other studies, the most prevalent *Shigella* serotype isolated from *Shigella* species was *S. flexneri* (52%) which has the most sensitivity to Ciprofloxacin (94.1%) and Gentamicin (88.2%) and most resistance to Co-trimoxazole (94.1%) which was different from other studies which can be related to arbitrary use of antibiotic and geographic location.[13,19-21]

In *S. boydii* the most sensitivity was to Gentamicin and Ciprofloxacin (100%) and has resistance to Azithromycin and Co-trimoxazole (100%).

In *S. dysentery* type, the most sensitivity was to Ofloxacin (100%), Gentamicin and Ciprofloxacin (100%) and most resistance to Co-trimoxazole and Azithromycin (100%).

In *S. sonnei*, Imipenem, Getamicin and Ceftazidime (100%) has the most sensitivity and most resistance to Co-trimoxazole (100%) which was not similar to other studies.[14,21]

In our study, the low rate of isolated type was *Salmonella* group D with 1.9% which was similar to other studies. According to other studies, it seem that the rate of infants suffering to *Salmonella* is little and most of *Salmonella* group D has more sensitivity to antibiotics such as Azithromycin, Amikacin and Ceftazidime (100%) and more resistant to Naldixic acid (100%) which was not similar to other studies.[22-24]

CONCLUSION

The results showed that *Shigella* type *S. flexneri* and *E. coli* were the most isolated species; respectively. *E. coli* has the most sensitivity to Imipenem (89%) and most resistant to Co-trixamozale (83%). All type of *Shigella* isolated from stool samples have the most sensitivity to Gentamicin, Ciprofloxacine and most resistant to Co-trimaxazole. In *Salmonella* group D, the most sensitivity was seen in Amikacin, Ceftazidime and azithromycin and most resistant to Naldixic acid. The obtained results confirm that for better treatment of dysentery, we must decrease the rate of Co-trimoxazole use between infants and prevent from arbitrary use of antibiotics between children.

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REFERENCES

1. Khorshidi A, Akbari H, Salehi A. Shigellosis frequency, serotyping and antbiotical resistance pattern in Kashan, Iran. KAUMS Journal (FEYZ). 2007;10(4):65-70.
2. Stefanie WR, Simone A, Schaad UB, Heininger U. A 4 year study on clinical characteristics of children hospitalized with rotavirus gastroenteritis. Eur J Ped. 2009;168(11):1343-8.
3. Butleton JR, Calderwood SB. Acute infectious diarrhea disease and food poisoning. In: Antony S, Braun Wald FE, Iddelbacher KS, Wilson SD. Harrison's principles of internal medicine. 14th ed. NewYork: McGraw-Hill Company; 1998: 796-800.
4. Zafar A, Sabir N, Bhutta A. Frequency of isolation of Shigella serogroups/ serotypes and their antimicrobial susceptibility pattern in children from slum areas m Karachi. J pack Med Assoc. 2005;55:184-8.
5. Salmanzdeh-Ahrabi S, Jafari F, Habibi E, Irajian GR, Aslani MM, Baghbani-Arani F, et al. Serotype distribution and antimicrobial resistance rates of Shigella spp. isolates in Tehran, Iran. Mikrobiyol Bul. 2007;41:453-7.
6. Sur D, Ramamurthy T, Deen J, Bhattacharya SK. Shigellosis: challenges and management issues. Indian J Med Res. 2004;120(5):454-62.
7. Jalali A, Nikvash S. The study of drug resistance of salmonella, shigella and pathogenic E.coli in out and inpatients, Tabriz, Iran. Tabriz UMS J. 1998;22(4):24-44.
8. Mache A, Mengisto Y, Cowley S. Shigella serogroups identified from adult diarrheal outpatients in Addis Ababa, Ethiopia: antibiotic resistance and plasmid profile analysis. East Afr Med J. 2007;74:179-82.

9. Bäumler AJ, Hargis BM, Tsolis RM. Tracing the origins of Salmonella outbreaks. Science. 2000;287(5450):50-2.
10. Lal M, Kaur H, Gupta LK. Y enterocolitica gastroenteritis A Prospective study. Indian J Med Microbiol. 2003;16(21):186-8.
11. Sarshar M, Tavafi H, Ghorbani-Dalini S, Souod N, Kargar M, Shahrokhi N. Tetracycline Resistance Genes of Diarrhogenic E. coli in Pediatric Patients. Iranian J Infect Dis and Tropical Med. 2012;17(57):13-8.
12. Jamshidi A, Matbooei A. Shigella spp Frequency, Serotyping and Antibiotic Resistance Pattern in Acute Diarrheic Patients in Zanjan Shahid Beheshti Hospital, During 2003-2007. ZUMS Journal. 2008;16(62):77-84
13. Jafari F, Hamidian M, Rezadehbashi M, Doyle M. Prevalence and antimicrobial resistance of diarrheagenic Escherichia coli and Shigella species associated with acute diarrhea in Tehran, Iran. Can J Infect Dis Med Microbiol. 2009;20(3):56-62.
14. Djie-Maletz A, Reither K, Danour S, Anyidoho L, Saad E, Danikuu F, et al. High rate of resistance to locally used antibiotics among enteric bacteria from children in Northern Ghana. J Antimicrob Chemother. 2008;61:1315-8.
15. Tariq N, Jaffery T, Ayub R, Alam AY, Javid MH. Frequency and antimicrobial susceptibility of aerobic bacterial vaginal isolates. J Coll Physicians Surg Pak. 2006;16:196-9.
16. Garcia PG, Silva VL, Diniz CG. Occurrence and antimicrobial drug susceptibility patterns of commensal and diarrheagenic Escherichia coli in fecal microbiota from children with and without acute diarrhea. J Microbiol. 2011;49:46-52.
17. Theresa JO, Joaquim R, Margarita M, Luis JD. High frequency of antimicrobial resistance of diarrheagenic E. coli in Peruvian infants. Am J Trop Med Hyg. 2009;81:296-301.
18. Al-Moyed KA, Harmal NS, Al-Harasy AH, Al-Shmahy HA. Increasing single and multiantibiotic resistance in Shigella species isolated from shigellosis patients in Sanaa, Yemen. Saudi Med J. 2006;27(8):1157-60.
19. Hosseini MJ, Nabavi M, Nasri Razin B, Hosseini Doost R, Hekmat S. Antibiotic resistance among Shigella serotypes isolated from Shigellosis cases in Booali Hospital, 1999-2001. Pajoohandeh J. 2003;8(1):35-8.
20. Tabatabaei ST. Frequency and antimicrobial susceptibility of bacteria isolated from Urine, stool and blood cultures of Rafsanjan University of Medical Science Laboratories during 2003. J Rafsanjan Univ Med Sci. 2008;17(2):115-20.
21. Ghadamli P. A study on the clinical manifestation and antibiotic susceptibility for shigellosis in children in mofid children hospital 1995-1997. Iranian J Infect Dis Tropical Med. 1999;11(4):33-6.
22. Sharifzadeh A, hmatzadeh F, Namjoo A, danesh A. Antibiotic susceptibility among antibiotic resistant salmonellae isolated from children (0-2 years) affected by diarrhea in Shahrekord and resistance factor transmissibility to E.Coli k12. J Shahrekord Univ Med Sci. 2004;6(1):1-6.
23. Eshraghi S, Soltan Dalall M, Fardsanei F, Zahraii Salehi T, Ranjbar R, Nikmanesh B, et al .Salmonella enteritidis and antibiotic resistance patterns: a study on 1950 children with diarrhea. Tehran Univ Med J. 2010;67(12):876-82.
24. Jomezadeh N, Babamoradi SH, Kalantar E, Javaherizadeh H. Isolation and antibiotic susceptibility of Shigella species from stool samples among hospitalized children in Abadan, Iran. Gastroenterol Hepatol Bed Bench. 2014;7(4):218-23.

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