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Prevalence and Antimicrobial Susceptibility Patterns of *Salmonella spp* Isolated from Gastroenteritis Patients, Southwestern, Libya.

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Abstract:

To determine the prevalence and antimicrobial susceptibility patterns of *Salmonella* spp isolates from patients attending Health Centers in Brack town, Southwestern, Libya. A total of 80 stool samples were collected randomly from both sexes in all ages. Microbiological analysis of all specimens was carried out by using standard methods of bacterial identification. Antimicrobial susceptibility testing was performed manually according to CLSI recommendation against 5 types of antibiotics.
Of 80 examined specimens, 14 (17.5%) *Salmonella spp* were isolated. (36%) *Salmonella* species were isolated from children and (17.6%) were isolated from adult males and (5.3%) from adult females patients. All isolated *Salmonella* species were highly sensitive (>80%) to Ceftriaxone, Ciprofloxacin and Levofloxacin. The *Salmonella* isolates presented high resistance rate to Ampicillin (25%) and Chloramphenicol (22.5%).

Key Words: *Salmonella*, antibiotic, Prevalence, Gastroenteritis, Libya.

Introduction

Genus *Salmonella* are heterogeneous group, gram negative rods, non- lactose fermenter, facultative anaerobic, non-spore forming, motile, produces acid and gas from glucose, normally inhabit the intestines of animals and humans [1]. They are one of the major pathogenic bacteria in humans as well as in animals [2].

Salmonella species are leading causes of acute gastroenteritis in several countries and salmonellosis is the most common food borne disease in both developing and developed countries although incidence rates vary according to the country disease in both developing and developed countries [3, 4]. The fecal wastes from infected animals and humans are important sources of bacterial contamination of the environment and the food chain [5]. Two hundred million to more than

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one billion cases of diarrhea result worldwide due to *Salmonella* infections every year, leading to 3 million deaths [6].The highest incidence of infection is among the very young and elderly. Mortality is highest in children less than one year old. The increase susceptibility of this age group may be due to the fact that children less than 2 months old produce little hydrochloric acid, a natural barrier to many microorganisms [1, 6]. During the last decade, antibiotic resistance and multiresistance of *Salmonella* spp. have increased a great deal, especially in developing countries with an increased and indiscriminate use of antibiotics in the treatment of humans and animals [7]. Various *Salmonella* serovars resistant to conventional antibiotics such as Ampicillin, Chloramphenicol, Trimethoprim-sulfamethoxazole, and other newer antibiotics (Quinolones and extended-spectrum Cephalosporins) have been reported with increasing frequency in many areas of the world [8]. High resistance rates for Ampicillin were reported in 1979 - 2008 from Tripoli, Libya. A study carried out in Zliten city between 2001 and 2002 reported multidrug resistance (MDR, resistance to three or more antibiotics) of more than 75% among *Salmonella* species isolated from diarrheic children [9]. Recently, Rahouma *et al* reported that 63% of *Salmonella* species isolated from diarrheic children in Tripoli were resistant to ciprofloxacin [10]. The aim of this study was to determine the prevalence and the antibiotic susceptibility patterns of *Salmonella* serogroups isolated from patients attending Brack Hospital, Al-Hayat Clinic Laboratory and Medical Technology Laboratory, Brack, Southwestern, Libya.

Materials and Methods:

This study conducted during the period of March 2011 to July 2011. A total of 80 stool sample were collected randomly from patients with enteric symptoms (diarrhea, fever and abdominal pain) who attending Brack Hospital, Al-Hayat Clinic laboratory and Medical Technology Laboratory, Brack for detection of *salmonella* infection. All necessary permissions and data were obtained from patients and related departments.

Each sample was inoculated immediately after collection into Selenite broth (Oxoid, UK) and incubated for 24 hours at 37°C aerobically in bacteriological incubator followed by subculture on Xylose Lysine Deoxycholate (XLD) and *Salmonella-Shigella* agar (SSA) (Oxoid) at 37°C for 24 hours for isolation of *Shigella* and *Salmonella* species. Pure culture was done for any suspected colonies in Trypticsoy agar.

Isolation and identification of *Salmonella* colonies were performed based standard methods including their colony morphology, gram stain, motility and results of biochemical tests such as indole, urea and carbohydrate fermentation tests (Triple Sugar Iron (TSI)).

Antimicrobial susceptibility testing for 14 *Salmonella* isolates was performed through disc diffusion method to determine the drug sensitivity pattern. Using 5 types of antibiotics (Oxoid) including Nalidixic acid (NA), Ampicillin (AM), Chloramphenicol (C), Trimethoprim-sulfamethoxazole (SXT) and Ciprofloxacin (CIP).

Results:

Out of 80 stool sample were collected during the study period, 14 (17.5%) sample were positive to *Salmonella* species. Higher percentage of infection (36%) by *Salmonella* species appear with childe age (Less than 15

year), followed by 17.6% and 5.3% in adult males and adult females (aged more than 15 year), respectively (table 1).

Table 1: Prevalence of *Salmonella* infections.

	Number of stool samples	Number of positive stool samples	Percentage (%) of infection
Adult Males	17	3	17.6
Adult Females	38	2	5.3
Children	25	9	36

Depend on the information that obtained from patients who subjected to this study, Abdominal pain 21 (26.25%) is the most common clinical symptom reported. 8 (10%) patients have diarrhea and 2 (2.5%) have some kind of fever (table 2).

Table 2: Clinical symptoms of patients.

	Symptomatic patients	
	Number	Percentage (%)
Diarrhea	8	10
Fever	2	2.5
Abdominal pain	21	26.25

Among all isolated *Salmonella* species 89% of isolates showed highly sensitive (more than 80%) to Ciprofloxacin, Trimethoprim-sulfamethoxazole and Nalidixic acid, respectively. High percentages of resistance (more than 20%) appeared for Ampicillin and Chloramphenicol (table 3).

Discussion:

Salmonella may cause gastroenteritis in people of all ages, and is responsible for severe invasive disease in infants, the elderly [11]. Frequency of antimicrobial resistance and number of resistance determinants in *Salmonella* has risen markedly [12]. A surveillance study by Su *et al* demonstrated an obvious increase in overall antimicrobial resistance among *Salmonella* from 20%–30% in the early 1990s to as high as 70% in some countries at the turn of the century [13] Several studies worldwide have reported increased morbidity and mortality in patients infected with resistant *Salmonella* strains [4, 6, 14].

Resistance to antibiotics is posing a serious problem in the treatment of salmonellosis. Few studies have been conducted to determine the prevalence of *Salmonella* and their sensitivity to the recommended antibiotic between the patients in Libyan Hospitals.

However in Libya, a comprehensive study was conducted on patients, who were hospitalized with acute diarrhea during 1975-1980 [15]. A low prevalence of *S. Typhi* and *S. Paratyphi* in stool samples of patients was shown. In recent years, an increased rate of typhoid has been observed.

In this study, the overall *Salmonella* infection prevalence was higher (17.5%) compared to previous study done in Tripoli, Libya (7.9%) [10] and Zliten, Libya (13.6%) [9]. The highest prevalence of salmonellosis was found in children less than 15 years old. The higher occurrence of salmonellosis in children compared to adults suggests a higher vulnerability of children to *Salmonella* infections [9, 10]. Children are at high risk for *Salmonella* infection. In the European Union, more than 100,000 cases of Salmonellosis were reported each year [11].

The prevalence and the local patterns of antimicrobial susceptibility of *Salmonella* species are important for reducing the burden of the disease [8, 16, 17].

Table 3: Antimicrobial susceptibility pattern of isolated *Salmonella* species.

	Sensitive		Resistant	
	Number	Percentage (%)	Number	Percentage (%)
Ampicillin	60	75	20	25
Chloramphenicol	62	77.5	18	22.5
Nalidixic acid	65	81	15	19
Trimethoprim-sulfamethoxazole	68	86	12	14
Ciprofloxacin	71	89	9	11

In this study, all *Salmonella* isolates were tested for sensitivity against 5 antibiotics. Results revealed that all *Salmonella* species isolates were highly sensitive to Ciprofloxacin (89%), Trimethoprim-Sulfamethoxazole (86%), Nalidixic acid (81%), Chloramphenicol (77.5%) and Ampicillin was 75%.

This was in agreement with the results obtained by Altayyar and Abdalla. (2015) in their study in Eastern Province, Saudi Arabia [14], Elhadi *et al*. (2013) in their study in Saudi Arabia [18], Demissie *et al*. (2014) in their study in Ethiopia [19, 20] with some differences in the percentage resistant to one or more antibiotics [16, 21, 22] that results may be due to many environmental and physiological factors.

References

1. **CDC (2005).** *Salmonella* Surveillance Annual Summary, 2004. Atlanta, Georgia; U.S. Department of Health and Human Services, CDC.
2. **Nesa MK, Khan MSR and Alam M (2011).** Isolation, Identification and Characterization of *Salmonella* Serovars from Diarrheic Stool Samples of Human. *Bangl. J. Vet. Med.* 9(1): 85 – 93.
3. **Rotimi VO, Jamal W, Pal T, Sonnevend A, Dimitrov TS, Albert MJ (2008).** Emergence of multidrug-resistant *Salmonella* spp. and isolates with reduced susceptibility to ciprofloxacin in Kuwait and the United Arab Emirates. *Diagn Microbiol Infect Dis.* 60:71-7.
4. **Stevens A, Kabore Y, Perrier-Gros-Claude JD, Millemann Y, Brisabois A, Catteau M, Cavin J, Dufour B (2006).** Prevalence and antibiotic-resistance of *Salmonella* isolated from beef sampled from the slaughter house and from retailers in Dakar (Senegal). *Int J Food Microbiol.* 110:178-86.
5. **Ponce E, Khan AA, Cheng CM, Summage WC, Cerniglia CE (2004).** Prevalence and characterization of Salmonella enteric serovar Weltevreden from imported seafood. *Food Microbiology.* 25:29-35.
6. **Coburn B, Grassl GA, Finlay B (2006).** *Salmonella*, the host and disease: a brief review. *Immu Cell biol.* 85(2):112-8.
7. **Kasper DL, Fauci AS, Longo DL, Braunwald E, Hauser SL, Jameson JL Eds (2005).** Harrison's Principles of Internal Medicine. New York: The McGraw-Hill companies. 897-906.
8. **Su LH, Chiu CH, Chu C, Ou JT (2004).** Antimicrobial resistance in nontyphoid *Salmonella* serovars: a global challenge. *Clin Infect Dis.* 39(4):546-51.
9. **Ali M, Ghenghesh KS, Aissa RB, Abuhelfaia A, Dufani MA (2005).** Etiology of childhood diarrhea in Zliten-Libya. *Saudi Med J.* 26: 1759-65.
10. **Rahouma A, Klena JD, Krema Z, Abobker AA, Treesh K, Franka E, et al (2011).** Enteric pathogens associated with childhood diarrhea in Tripoli-Libya. *Am J Trop Med Hyg*. 84: 886-891.
11. **Getachew (2014).** Prevalence of human Salmonellosis in Ethiopia: a systematic review and meta-analysis. *BMC Infectious Diseases*, 14:88.
12. **Pulsrikarn S, Pornreongwong C, Tribuddharat C, Meethai S (2013).** Serogroup and Serovar Distribution of *Salmonella* in Siriraj Hospital. *Siriraj Med J.* 65: 34-37.

13. **Goldberg MB, Rubin RH (1998).** The spectrum of *Salmonella* infection. *Infect Dis Clin North Am*. 2:571–598.
14. **Altayyar IA, Abdalla AM. (2015).** Antibiotic Susceptibility Patterns and Sero-grouping of Salmonella Isolated from Clinical Specimens in Eastern Province, Saudi Arabia. *Emer Life Sci Res.* 1(2): 8-12.
15. **El Nageh MM (1988)**. *Salmonella* isolations from human faeces in Tripoli, Libya. *Trans R Soc Trop Med Hyg*. 82: 324-6.
16. **Castro FA, Santos VR, Martins CH, Fernandes SA, Zaia JE and Martinez R (2002).** Prevalence and Antimicrobial Susceptibility of *Salmonella* Serotypes in Patients from Ribeirão Preto, São Paulo, Brazil, between 1985 and 1999. *Brazilian Journal of Infectious Diseases.* 6: 244-251.
17. **Helms M, Vastrup P, Gerner-Smidt P, Mølbak K (2002).** Excess mortality associated with antimicrobial drug-resistant *Salmonella Typhimurium*. *Emerg Infect Dis*. 8:490–495.
18. **Elhadi E, Aljindan R, Aljeldah M (2013).** Prevalence of nontyphoidal Salmonella serogroups and their antimicrobial resistance patterns in a university teaching hospital in Eastern Province of Saudi Arabia. *Infection and Drug Resistance*. 6: 199–205.
19. **Demissie TA, Wubie MT, Yehuala FM, Fetene DM, Gudeta GA (2014).** Prevalence and antimicrobial susceptibility patterns of *Shigella* and *Salmonella* Species among patients with diarrhea attending Gondar town health institutions, Northwest Ethiopia. *Science Journal of Public Health*, 2(5): 469-475
20. **Huruy K, Kassu A, Mulu A, Gebretsadik S, Andargie G, Tadesse T, Birhan W, Worku N, Ghebreselassie D, Belyhun Y, Yifru S, Adugna S, Tiruneh M (2008).** High level of antimicrobial resistance in Shigella Species isolated from diarrheal patients in University of Gondar teaching Hospital, Gondar, Ethiopia. *Pharmaonline*. 2:328-340.
21. **Firoozeh F, Shahcheraghi F, Zahraei ST, Karimi V, Aslani MM (2011).** Antimicrobial resistance profile and presence of class I integrongs among *Salmonella* enterica serovars isolated from human clinical specimens in Tehran, Iran. *Iran. J. Microbiol*. 3 (3): 112-117.
22. **Ammari S, Laglaoui A, En-nanei L, Bertrand S, Wildemauwe C, Barrijal S, Abid M (2009).** Isolation, drug resistance and molecular characterization of *Salmonella* isolates in northern Morocco. *J Infect Developing Countries.* 3(1): 41-49.