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Isolation and Antibiotic Susceptibility Patterns of *Shigella* and *Salmonella* among Under 5 Children with Acute Diarrhoea: A Cross-Sectional Study at Selected Public Health Facilities in Addis Ababa, Ethiopia

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Abstract

Background: Diarrhoeal illness remains one of the leading causes of morbidity and mortality among children<5 years of age worldwide. In Ethiopia, about 230,000 deaths estimated to occur. *Shigella* and *Salmonella* are major causes of gastroenteritis in children and is associated with high resistance levels. Thus, the aims of this study was to isolate and determine susceptibility patterns of *Shigella* and *Salmonella*, isolated from under five children with diarrhoea attending at some selected health facilities in Addis Ababa, Ethiopia.

Methods: A total of 253 children 115 males and 138 females with acute diarrhoea were enrolled. Stool samples were cultured and isolated *Shigella* and *Salmonella* species were run for antimicrobial susceptibility testing using disk diffusion method.

Results: A total of 190 entropathogens were isolated. Sixty one (24.1%) was *E. coli*, (9.1%) was *Shigella* followed by (3.95%) *Salmonella* and *Citrobacter* species and 86 (34.0%) was parasites. The overall resistance rates of isolated *Shigella* and *Salmonella* spp were high for Ampicillin (95.7%, 80.0%) and Augmentin (91.4%, 80) respectively. However, high sensitivity was observed among both isolates for Ciprofloxacin (91.3%, 100%) and Ceftraxion (91.4%, 100%). More than 87% of *Shigella* species were multiple resistances (resistance for two or more antibiotics). Whereas, 70.0% for *Salmonella* species. The prevalence of *Shigella* species was significantly varied among children with different employment parent's status. Raw meat consumption was an independent predictor variable for exposures of *Salmonella* infection ($P \leq 0.05$).

Conclusion: Isolation of high frequency of multidrug resistant *Shigella* and *Salmonella* spp. from children in the study area is an alarming for the present situation of emerging drug resistance. However, there is still a chance to use ciprofloxacin and ceftriaxone in area of no culture and sensitivity test performed.

Keywords: *Shigella*; *Salmonella*; Antibiotic Resistance Pattern; Addis Ababa; Ethiopia

Background

Diarrhoea is the third most common cause of death among children<5 years of age worldwide, accounting for 1.87 million deaths per year [1]. Globally 21% of all deaths in children under five years of age are estimated to be due to diarrhoeal infections [2]. It is one of the top three causes of childhood mortality in Sub-Saharan Africa including Ethiopia. Food given for complementary feeding, early introduction of milk-formula or solid food, drinking of unsafe water, and contaminated food are often considered to increase exposure to enteropathogens and has been associated with increased rates of acute diarrhoea [3,4].

The causes of acute diarrhoea include a wide range of viruses, bacteria, and parasites. However, enteric bacteria and parasites are more prevalent than viruses. Bacterial enteropathogens that cause diarrhoea include Diarrhoeagenic *E. coli*, *Shigella*, *Salmonella* species, and *Campylobacter* species [5,6]. Shigellosis is a highly infectious disease of world significance. Its prevalence is highest in tropical and subtropical parts of the world where living standards are very low and access to safe and adequate drinking water and proper excreta disposal systems are often limited [7]. *Salmonella* infections also remain as an important public health problem particularly in developing countries [8]. Like other developing nations, Shigellosis and Salmonellosis are among the common causes of morbidity and mortality in Ethiopia [7,9]. Moreover, emergence and spread of antibiotic resistance is posing serious problems in antimicrobial treatment worldwide [10].

In view of increasing antibiotic resistance rate in the country, stimulates us to assess the prevalence and resistance patterns of *Shigella* and *Salmonella* species in patients who were presenting with diarrhoea at selected health facilities.

Method and Materials

Study Area and Population

A cross sectional study was conducted in three selected health facilities (two health centre and one teaching hospital), Addis Ababa, Ethiopia between August-December 2012. The study was conducted at outpatient paediatric departments of three selected health institutions in Addis Ababa, Ethiopia. Based on 2007 census results Addis Ababa has a total population of 2,738,248, consisting of 1,304,518 men and 1,433,730 women, and from which 195,932 are children under five years of age. With an estimated area of 530.14 square kilometres (204.69 sq mi), this chartered city has an estimated density of 5,165.1 inhabitants per square kilometre (13,378 /sq mi).

Individuals eligible for enteric bacterial survey were all under five children with acute diarrhoea (passage of three or more loose stools per 24 hours) attending at selected health facilities [11]. But those children with antibiotics were excluded. All care takers, who were volunteers to participate, were interviewed for KAP survey about diarrhoea.

Sample Size and Sampling Procedures

The sample size for the study was calculated using the formula (n=(zα/2)2 p (1-p)/ d2) for estimating a single population proportion at 95% confidence interval (CI) (Zα/2 = 1.96), 5% margin of error, and 25% non-response rates. Based on previous study in northwest Ethiopia, the prevalence of *Shigella* infection among adult diarrhoeal patients was 15.6% [12]. Therefore, the total sample size for *Shigella* and *Salmonella* survey is 253.

Three health facilities were selected using convenient method from a total number of 7 public hospitals and 54 health centers. The estimated sample size was proportionally distributed as 86, 109 and 58 study participants respectively on the basis of population proportion to size. A total of 253 study participants were recruited by using consecutive sampling techniques.

Data Collection

Stool sample collection: The mother or guardian was given a clean plastic stool container and oriented about sample collection after interviewed by nurses with a pretested questionnaire. Once collected, protozoa parasites were identified through direct microscopy using saline wet mount at each study sites by experienced laboratory technicians/technologists. Part of the stool was kept in Cary-Blair transport media, and transported using ice box to microbiology department of St.Paul's hospital millennium medical college for further microbiological investigations. Primarily overnight incubation was performed simultaneously at selenite F broth enrichment media and MacConkey agar (MAC), for further multiplication of *Salmonella* and other enteric pathogen growth. This was then subsequently sub-cultured onto MacConkey agar (MAC), Salmonella Shigella agar (SSA) and Deoxycholate Citrate Agar (DCA), and then incubated aerobically at 37oC for 24 hours. After overnight incubation, colonies which exhibited characteristics of *Salmonella* and *Shigella* species were identified by conventional biochemical methods [13].

Susceptibility testing: Susceptibility was determined both by overnight broth-micro-dilution and agar disk diffusion method, and Clinical and Laboratory Standards Institute using Oxoid- Mueller Hinton agar (Difco Laboratories, Detroit, Mich). The following antibiotics were used to screen for the resistance of the isolates; ciprofloxacin- CIP (10 µg), augumentin-AMC (30 µg), gentamicin-GEN (10 µg), chloramphenicol- C (30 µg), ampicillin-Amp (10µg), nalidixic acid-NA (30 µg), ceftriaxone-CRO (30 µg) and cotrimoxazole- SXT (5 µg) (Difco Laboratories, Detroit, Mich). The zones of inhibition were then measured and the results recorded as sensitive (s), Intermidate (I) or resistance (R) base on World Health Organization Drug information and Clinical and Laboratory Standards Institute [14,15].

Using a sterile wire loop, 3-5 well isolated colonies was picked and emulsified in nutrient broth. A standard inoculum adjusted to 0.5 McFarland was swabbed onto Muller-Hinton agar. Susceptibility testing for all isolates was done using disc diffusion technique at 35oC for 16 to 18 hours against eight antibiotics, and interpreted on the basis of CLSI guide line [16]. Quality control was performed to check the quality of medium, the potency of the antibiotic, to check manual errors. Each new lots was quality controlled before use by testing the *E. coli* ATCC 25922 standard strains [13,14].

Data Analysis

Data were double entered and cross-checked using Epi-data version 3.3, and analysed using SPSS version 20. Enteric bacterial prevalence was determined by dividing the number of enteric bacterial infected individual by the total number of individuals examined for bacterial infection. Frequency distribution tables were used to quantify enteric bacterial and parasitic infection, in addition to, knowledge of respondents related to symptoms, causes, transmission, prevention and control measures of diarrhoea. Logistic regression was used to see the association between independent predictors and dependent enteric bacterial infection. Bivariate and multivariate logistic regression analysis was used to quantify the effect of different risk factors including KAP on bacterial related diarrhoea. 95% confidence intervals were calculated for odds ratio. Values were considered statistically significant at $p<0.05$.

Ethical Considerations

The study obtained ethical clearance from Department Research and Ethical Review Committee (DRERC) of Addis Ababa University School of Allied Health Sciences, Department of Medical Laboratory sciences. Supportive letter was obtained from St.paul's hospital millennium medical college, Selam health center and Addis ketema health center, and written informed consent was obtained from voluntary participants and parents or guardians for children during data collection. Individuals who were found positive for bacterial and parasite were treated as per the national guidelines.

Results

Socio-Demographic Characteristics

Acute Diarrhoea is defined as three or more watery stools in the previous 24 hours as noted by the mother or caretaker. A total of 253 guardians were interviewed make the respondent's rate 100%. Most of respondents were females 220 (87%); 66.0% were between 26-40 years, ranging from 16 to 52 years with a median of 29 years; married 218 (86.2%), and had completed a primary 164 (64.9%) education. Majority 135 (53.4%) of caretakers were house wives; and one hundred nineteen caretaker's (47.0%) income was belonged to less than 500ETB per month. Some of the caretakers had completed secondary or higher level of education. A total of 253 patients provide stool sample for enteric bacterial and parasite identification. The mean age of the patients was 2.61 with 1.26 SD (range 1 month to 5 years) (Table 1).

Variables	Frequency (N=253)	Percent (%)
Sex		
Male	115	45.5
Female	138	54.5
Age (in Year)		
<1		
2 to 3		
≥3		
Sex		
Female	220	
Male		
Age		
≤25	78	30.8
26 to 40	167	66
>40	8	3.2
Marital Status		
Single	15	6
Married	218	86.2
Divorced	12	4.7
Other	8	3.1
Educational Status		
Illiterate	42	16.6
Primary	164	64.9
Secondary	33	13
Higher Education	14	5.5
Occupation		
Government	25	9.9
Merchant	63	24.9
Other	30	11.8
Monthly income (ETB)		
<500	119	47
500-1000	41	16.2
1000-1500	12	4.8
>1500	5	2
Other	76	30

Table 1: Distributions of socio-demographic characteristics of children and caretakers, at Selam health center, Addis ketema health center, and St.Paul's hospital millennium medical college in Addis Ababa, Ethiopia 2012/13

Majority of the study participants 138 (54.5%) were females. The overall prevalence of enteric bacterial infection was isolated among (41.1%) of the patients. The predominant isolated organisms were *E. coli* (24.1 %) species, followed by (9.1 %) of *Shigella* species, *Salmonella* species (3.95 %), and *Citrobacter* species (3.95%). A total prevalence (34%) of parasites was identified. The most frequently identified protozoan parasites were *E. histoletica/dispar* (17.8%), followed by *G. lambia* (10.3%), *H. nana* (3.6%), *A. lumbricoids* (2.0%), and *S. stercolaris* (0.4%) (Table 2). Co-infections were found in (7.1%) of the patients, of these (5.1%) were bacteria/ parasite and (1.9%) were parasite/parasite co-infection.

Etiologic Agents	Frequency (No.)	Percent (%)
E. coli spp.	61	24.1
Shigela spp.	23	9.1
Salmonella spp.	10	3.95
Citrobacter spp.	10	3.95
Total	104	41.1
Entamoeba histolytica/dispar	45	17.8
Gardia lamblia	26	10.3
Hymenolopsis nana	9	3.6
Ascaris lumbricoids	5	2
S.stercolaris	1	0.4
Total	86	34

Table 2: Bacterial pathogens and parasites detected from 253 patients with diarrhoea at Selam health center, Addis ketema health center and St.Paul's hospital millennium medical college in Addis Ababa Ethiopia, 2012/2013

The prevalence of *Shigella* species was significantly isolated (P=0.027 and 0.011) from patients whose parents are merchant and housewife respectively than government employers. Children from those government employers are 78% less likely to have *Shigella* infection than merchants. In crude data, fever and attending daycare service were stastically significant between isolation rates of *Shigella*. However, in the adjusted data there was no stastically significant association detected (Table 3).

The prevalence of *Salmonella* was significantly isolated among children from raw meat user families than non-raw meat users (AOR=12.3, 95% CI=2.8-53.5), P-value=0.001). Multivariate logistic regression revealed that *Salmonella* infection was isolated more likely from children with tensumes. *Salmonella*, strains were 5.7 times more likely to be detected from children with the complaints of tensumes (AOR=5.7, 95% CI=1.1-30.9, P-value=0.04) (Table 3).

Characteristics	Shigella (23)				Salmonella(10)			
	Positive	Negative	AOR (CI)	P-value	Positive	Negative	AOR (CI)	P-value
Marital status								
Ever Married	22(9.3)	215(90.7)	0.63(0.08-4.9)	0.66	9(3.8)	228(96.2)	0.5(0.06-4.8)	0.58
Never married	1(6.3)	15(93.7)	1		1(6.3)	15(93.8)	1	
Educational status								
Illiterate	4(9.5)	38(90.5)	0.6(0.09-3.7)	0.58	0	42(100.0)	-	
Primary	13(7.9)	151(92.1)	0.5(0.10-2.5)	0.39	5(3.0)	159(97.0)	0.4(0.05-3.9)	0.45
Secondary	4(12.1)	29(87.9)	0.68(0.11-4.3)	0.68	4(12.1)	29(87.9)	1.8(0.2-17.7)	0.63
Higher	2(14.3)	12(85.7)	1		1(7.1)	13(92.9)	1	
Occupation								
Government	6(24.0)	19(76.0)			2(8.0)	23(92.0)	1	
Merchant	4(6.3)	59(93.7)	0.22(0.06-0.84)	0.027	4(6.3)	59(93.7)	0.65(0.1-4.1)	0.65
House Wife	9(6.7)	126(93.3)	0.23(0.08-0.9)	0.011	4(3.0)	131(97.0)	0.26(0.04-1.6)	0.15
Others	4(13.3)	26(86.7)	0.5(0.12-1.97)	0.31	0	30(100.0)	NA	
Monthly income								
≤500	11(9.2)	108(90.8)	1.4(0.46-4.3)	0.55	3(2.5)	116(97.5)	0.94(0.2-5.8)	0.95
500-1000	4(9.8)	37(90.2)	1.6(0.4-6.4)	0.53	3(7.3)	38(92.7)	2.9(0.5-17.9)	0.26
1000-1500	2(16.7)	10(83.3)	2.5(0.41-15.2)	0.32	2(16.7)	10(83.3)	7.3(0.9-57.8)	0.06
>1500	1(20.0)	4(80.0)	2.5(0.22-28.5)	0.46	0	5(100.0)	NA	
Others	5(6.6)	71(93.4)	1		2(2.6)	74(97.4)	1	
Other family members with previous diarrhea								
Yes	3(9.7	28(90.3)	1.1(0.3-4.0)	0.94	1(3.2)	30(96.8)	1.2(0.14-10.9)	0.87
No	20(9.0)	202(91.0)	1		9(4.1)	213(95.9)	1	
Attending day care								
Yes	13(14.1)	79(85.9)	1		6(6.5)	86(93.5)	1	
No	10(6.2)	151(93.8)	0.42(0.15-0.95)	0.06	4(2.5)	156(97.5)	0.35(0.09-1.4)	0.13
Feeding Practice								
Exclusive breast milk	7(17.9)	32(82.1)	1		4(10.3)	35(89.7)	1	
Breast Milk plus solid	6(7.5)	74(92.5)	0.4(0.12-1.2)	0.95	0	80(100.0)	NA	
Solid food only	10(7.8)	119(92.2)	0.4(0.14-1.1)	0.072	5(3.9)	124(96.1)	0.3(0.07-1.2)	0.08
Formula Milk	0	5(100.0)	NA		1(2.0)	4(80.0)	1.9(0.17-23.3)	0.59
Usage of latrine								
Yes	22(8.9)	224(91.1)	1		10(4.1)	236(95.9)	NA	
No	1(14.3)	6(85.7)	0.6(0.05-7.2)	0.7	0	7(100.0)		
Raw Meat consumption								

Yes	2(8.7)	21(91.3)	0.98(0.21-4.5)	0.96	4(17.4)	19(82.6)	12.3(1.8-49.7)	0.001
No	21(9.1)	209(90.9)	1		6(2.6)	224(97.4)	1	
Raw Milk consumption								
Yes	10(7.0)	132(93.0)	0.6(0.23-1.4)	0.23	6(4.2)	136(95.8)	0.9(0.22-4.1)	0.93
No	13(11.7)	98(88.3)	1		4(3.6)	107(96.4)		
Hand washing before and after meal								
Yes	23(9.3)	223(90.7)	NA		9(3.7)	237(96.3)	1	
No	0	7(100.0)			1(14.3)	6(85.7)	3.4(0.3-36.3)	0.3
Abdominal Pain								
Yes	19(9.6)	179(90.4)	2.2(0.6-8.04)	0.24	6(3.0)	92(97.0)	0.44(0.08-2.3)	0.33
No	4(7.3)	51(92.7)	1		4(7.3)	51(92.7)	1	
Vomiting								
Yes	13(10.2)	115(89.8)	1.6(0.6-4.2)	0.3	6(4.7)	122(95.3)	1.02(0.25-4.2)	0.98
No	10(8.0)	115(92.0)	1		4(3.2)	121(96.8)	1	
Fever								
Yes	11(6.7)	154(93.3)	2.2(0.13-0.95)	0.09	7(4.2)	158(95.8)	1.5(0.4-6.3)	0.57
No	12(13.6)	76(86.4)	1		3(3.4)	85(96.6)		
Tensumes								
Yes	9(6.6)	128(93.4)	0.5(0.20-1.2)	0.13	8(5.8)	129(94.2)	5.7(1.2-57.1)	0.04
No	14(12.1)	102(87.9)	1		2(1.7)	114(98.3)	1	
Knowledge								
Good	20(9.4)	192(90.6)	1		8(3.8)	204(96.2)	1	
Poor	3(7.3)	38(92.7)	0.9(0.22-3.1)	0.9	2(4.9)	39(95.1)	1.5(0.3-8.2)	0.63
Attitude								
Good	21(9.4)	202(90.6)			8(3.6)	215(96.4)	1	
Poor	2(6.7)	28(93.3)	0.7(0.14-3.3)	0.64	2(6.7)	28(93.3)	1.9(0.4-10.2)	0.45
Practice								
Good	22(9.2)	216(90.8)	1		9(3.8)	229(96.2)	1	
Poor	1(6.7)	14(93.3)	0.95(0.11-8.3)	0.94	1(6.7)	14(93.3)	2.2(0.2-21.6)	0.51

Note: - positive and negative values as No.(%), *= Statistically significant, CI=95% confidence interval, COR= crude odds ratio, AOR=adjusted odds ratio.

Adjusted OR (adjusted odds ratio from multivariable logistic regression model)=when the effect of one factor on Shigella and Salmonella prevalence is evaluated the analysis was adjusted for other remaining factors listed in the table.

Table 3: Associations of selected risk factor with culture positivity of *Shigella* and *Salmonella* at Slame health center, Addis ketema health center and St.Paul's hospital millennium medical college in Addis Ababa Ethiopia, 2012/2013

Antibiotic Sensitivity Patterns

Shigella was isolated from 9.1% stool samples. Among patients who had *Shigella* infections, the resistance rates was high for ampicillin (95.7%), augmentin (91.4%), trimethoprim-sulphamethoxazole (52.2%), and low level of resistance observed against ciprofloxacin (4.3%), and ceftriaxone (4.3%). Resistances for one or more antibiotics were observed among 91.3% of the isolates of *Shigella* species. However, more than 90% of the strains of *Shigella* species were sensitive to ciprofloxacin, and ceftriaxone (Table 4).

Salmonella species were isolated from ten diarrheic (3.9%) patients. Of the *Salmonella* isolates, 80.0% (8/10) were resistant for AMP and AUG. Sixty, 40.0 and 20.0% of the isolates were resistant to SXT, C and NA, respectively. And 70.0% of isolated *Salmonella* species were resistance for one or more antibacterial antibiotics. But all of the *Salmonella* isolates were sensitive to Ciprofloxacin and Ceftraxione (Table 4).

Antibiotics	Shigella spp. (23)			Salmonella spp. (10)			Total (33)		
	(N/%)			(No/%)			(No/%)		
	S	I	R	S	I	R	S	I	R
Amp	0	1(4.3)	22(95.7)	2(20.0)	0	8(80.0)	2(6.1)	1(3.0)	30(90.1)
AMC	1(4.3)	1(4.3)	21(91.4)	1(10.0)	1(10.0)	8(80.0)	2(6.1)	2(6.0)	29(87.9)
SXT	9(39.1)	2(8.7)	12(52.2)	3(30.0)	1(10.0)	6(60.0)	12(36.3)	3(9.1)	18(54.5)
C	16(69.6)	2(8.7)	5(21.7)	5(50.0)	1(10.0)	4(40.00)	21(63.6)	3(9.1)	9(27.3)
GEN	16(69.6)	3(13.0)	4(17.4)	5(50.0)	5(50.0)	0	21(63.6)	8(24.2)	4(12.2)
NA	16(69.6)	2(8.7)	5(21.7)	7(70.0)	1(10.0)	2(20.0)	23(69.7)	3(9.1)	7(21.2)
CIP	21(91.4)	1(4.3)	1(4.3)	10(100.0)	0	0	31(93.9)	1(3.0)	1(3.1)
CRO	21(91.4)	1(4.3)	1(4.3)	10(100.0)	0	0	31(93.9)	1(3.0)	1(3.1)

Table 4: Percent of antimicrobial susceptibility patterns of *Shigella*, and *Salmonella* isolates among under five years of children in Selam health center, Addis ketema health center, and St.Paul's hospital millennium medical college, Addis Ababa, Ethiopia 2012/2013

Discussion

In this cross-sectional study among diarrhoeal patients at some selected health facilities in Addis Ababa Ethiopia, the prevalence of *Shigella* in stool samples was found to be 9.1%. This result was relatively consistent with studies done in Gondar and Bahardar northwest part of Ethiopia, Kenya and Tanzania where 15.6%, 14.9%, 16% and 14% *Shigella* isolates have been reported, respectively [12,16,17]. However, our finding was lower compared to a 34.6% prevalence of *Shigella* species isolated from a study done in Awassa, southern Ethiopia [18]. The difference might be due to age, socio-economic factor and the nature of the public water supply scheme in the setting which is from Lake Awassa and supposed to be more contaminated than the public water supply system of Addis Ababa town which is a protected surface water system.

This study has also attempted to isolate *Salmonella* spp, stools of children. Ten (3.9%) children were found to be infected with *Salmonella* spp. Our finding was comparable with previous reports in northwest and northern Ethiopia and Nigeria in which 1.6%, 1%, 2.01% and 2.3% of *Salmonella* isolates reported, respectively [12,19,20].

Shigellosis is becoming an increasingly significant public health problem due to the development of multiple antimicrobial resistances, frequently resulting in treatment failure, leading in turn to health complications and deaths [21]. In the present study, 91.3% of the *Shigella* species were resistant to one or more antibiotics and 87% multiple resistances (resistance for two up to six commonly used antibiotics) were observed. This finding was in line with a study conducted in southern Ethiopia where 82% isolates were found to be multi drug resistant [18]. Other studies from Ethiopia also showed increased antibiotic resistance [12,19,22,23]. The high resistance rate of *Shigella* isolates observed in this study is nearly in agreement with a study from Vietnam where 78.6% of the isolates were found to be multidrug resistant [24].

Our findings showed that 95.7%, 91.4% and 52.5% of the *Shigella* isolates were resistant to ampicillin, augmentin and cotrimoxazole respectively. These findings were comparable with previous studies conducted in Ethiopia [18,22,23] and other African countries [25,26]. Four percent of the *Shigella* isolates were resistant to ciprofloxacin and this result was in agreement with a study conducted in Gondar, northwest Ethiopia [27]. However, 16% and 28.3% of *Shigella* isolates resistance to ciprofloxacin were reported in South Africa and Nepal, respectively [21,28]. Comparatively high rate of resistance to gentamycin (17.4%) was observed in the present study as compared to a report in Nigeria which 10.1% of *Shigella* isolates were resistant [25].

The resistance rate for the isolated *Salmonella* species in this study were high for ampicipllin, augmentin, cotrimoxazole and chloramphenicol 80.0%, 80.0%, 60.0%, and 40.0% respectively. This study was consistent with previous studies conducted in Ethiopia, South Africa and Mexico [12,21,22,29]. The absence of *Salmonella* isolates resistance for ciprofloxacin and ceftriaxone in the present study suggests that ciprofloxacin and ceftriaxone are commonly used to treat children with *Salmonella* infections, particularly invasive infections, because of its favorable pharmacokinetic properties and the low prevalence of resistance. This is in agreement with other studies conducted in northwest Ethiopia, Nigeria and Ibadan [12,30,31].

Conclusion

The results of the present study showed that high frequency of multi drug resistance *Shigella* and *Salmonella*. However, there is still a chance to use ciprofloxacin and ceftriaxone as a treatment option in the setting because of their low frequency of resistance rate. There are also some risk factors which signify the infection rates of these enteric pathogens. Thus, there is a need of large scale surveillance of the enteric bacterial pathogen and antibiotic susceptibility pattern in line with risk factors in hospitals and in the community which should be the basis for empiric therapy.

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