Prevalence of *Samonella sp* and *Shigella sp* among Children with Diarrhoea in Abeokuta, Ogun State, Nigeria

[1, 2]Akingbade OA, [3]Okerentugba PO, [4]Awoderu OB, [1]Shobayo AA

[1]Department of Microbiology, Federal University of Agriculture, Abeokuta, Ogun State, Nigeria
[2]Department of Microbiology, Federal Medical Centre, Idi Aba, Abeokuta, Nigeria
a.olusola @yahoo.co. uk, olusola.akingbade@yahoo.co.uk; +2348063529234
[3]Department of Microbiology, University of Port Harcourt, PMB 5323, Choba, Port Harcourt, Rivers State, Nigeria;
phillip.okerentugba@uniport.edu.ng; +2348033087332
[4]Immunology unit, Microbiology division. Nigerian Institute of Medical Research
bamiyin@yahoo.com; +2348022117832

Abstract: Salmonellosis and Shigellosis continues to be major public health problem worldwide, occurring predominantly in children younger than five years of age in developing countries. A total of 150 stool samples were collected, Salmonella and Shigella were identified using selective media and biochemical tests, and the antibiotic sensitivity patterns were determined. The antibiotic sensitivity was carried out using Kirby-Bauer diffusion method. From the results 5(3.33%) were positive for *Salmonella sp* while 3(2%) were positive for *Shigella sp*. Only age group ≤ 4 - 5years had *Salmonella* infections 5(4.3%). *Shigella* sp was identified among age group ≤ 4 - 5years and age group ≤ 1 – 3 had 1(2.94%). Ceftazidime and gentamycin showed high sensitivity rate to both salmonella and shigella isolates.

[Akingbade OA, Okerentugba PO, Awoderu OB, Shobayo AA. **Prevalence of *Samonella sp* and *Shigella sp* among Children with Diarrhoea in Abeokuta, Ogun State, Nigeria.** *Academ Arena* 2014;6(9):13-16] (ISSN 1553-992X). http://www.sciencepub.net/academia. 3

Keywords: Antibiotic sensitivity, public health, *Salmonella sp*, *Shigella* sp

1. INTRODUCTION

Diarrhoea is one of the commonest problems found in pediatric clinics in any part of world. (Bista *et al*., 1993). It is one of the leading causes of illness in young children in developing countries (Parashar *et al*., 2003). The public health significance of diarrhoeal disease cannot be over - emphasised. Although extensive investigations of diarrhoea have not been reported, the diarrhoea – specific mortality in children younger than five years of age in Africa has been estimated at about 106 per 1000 (Olowe *et al*., 2003).

Epidemiological studies of diarrhoea have been reported from several African countries including South Africa (Househam *et al.*, 1988), Gabon (Presterl *et al.*, 2003), Egypt (Rao et al., 2003) and Kenya (Sang *et al.*, 1996). In the year 2001, diarrhoea was the most common illness reported by the United States military service members deployed to Africa for strategic training and contingency operations (Sanders *et al.*, 2005).

Salmonella species are leading causes of acute gastroenteritis in different countries, especially in the developing countries where substandard hygienic conditions and unsafe water supplies prevails (Fewtrell et al, 2005). It is estimated that about 17 million cases of acute gastroenteritis or diarrhoea due to non-typhoidal salmonellosis (NTS), with 3 million deaths are recorded annually (Rabsch et al, 2001). Although the prevalence of *Salmonella* infections is highest in children (Kotloff, 1999), the real incidence of salmonellosis among children in many countries is not well documented (Kotloff, 1999).

The emergence of antimicrobial resistance is a matter of concern, and the early identification and effective antimicrobial treatment of cases is an important step in the management of young infants with invasive bacterial infections (Kariuki et al, 2006). Because of the increased resistance to conventional antibiotics, extended-spectrum cephalosporins and fluoroquinolones have become the preferable drugs for the treatment of infections caused by multidrug-resistant *Salmonella* serotypes (Sharma, 2006).

Nonetheless, the potential of arthropathy has limited the use of fluoroquinolones in paediatric patients (Sharma, 2006). Therefore, extended-spectrum cephalosporins (example ceftriaxone) are commonly used because of their pharmacodynamic properties and the low prevalence of resistance [Guerrant, 2001].

Shigellosis continues to be a major health problem worldwide, occurring predominantly in children younger than five years of age in developing countries. Thus far, the only available information about diarrhea is from previous studies of enteropathogens associated with diarrhea in an infantile population from a district of Porto Velho,

where rotavirus appeared as the major etiological agent (Orlandi et al. 2001, 2006).

Shigella infection is typically via ingestion (fecal–oral contamination); depending on age and condition of the host, fewer than 100 bacterial cells can be enough to cause an infection (Levinso and Warren 2006). *Shigella* causes dysentery that results in the destruction of the epithelial cells of the intestinal mucosa in the cecum and rectum. Some strains produce the enterotoxin shiga toxin, which is similar to the verotoxin of *E. coli* O157:H7 (Hale *et al,* 1996) and other verotoxin-producing Escherichia coli.

Accurate estimates of the burden of diarrhoeal diseases caused by *Salmonella* species and Shigella species remain essential in setting effective public health goals and allocation of resources to reduce disease burden (Majowicz *et al,* 2001). In recent years, *Salmonella and Shigella* related diseases have been documented by several clinical-based studies conducted in different parts of Nigeria [Akinyemi et al, 2000].

The aim of this study is to determine the prevalence of *Samonella sp* and *Shigella sp* among Children with diarrhoea in Abeokuta, Ogun State, Nigeria among children within age 5years old in Abeokuta, Nigeria.

2. MATERIAL AND METHODS

2.1. Study Population

The study population was diarrhea patients aged ≤ 5 years old attending the Out Patient Department (OPD) of the Sacred Heart Hospital, Lantoro Abeokuta, Ogun State, Nigeria. This study was approved by the Ethical Committee of the Sacred Heart Hospital, Lantoro Abeokuta. Informed assent was also obtained from patients' mothers/guardians and clinicians involved in the management of the patients examined.

2.2. Sample Collection

A total of one hundred and fifty diarrhea faecal samples were collected from the patients in the pediatric ward of Sacred Heart Hospital, Lantoro Abeokuta. The diarrheal stool samples were collected into sterile, transparent, wide mouthed bottles. The name, age and sex of the patients were properly labeled on the universal bottles.

2.3. Processing of Specimens

The specimens were processed according to the guidelines provided by Cheesbrough (2004) for the laboratory diagnosis of enteric pathogens.

2.4. Culture

The stool samples were inoculated aerobically on sterile Salmonella–Shigella agar plates and incubated aerobically at 37^{o}C for 24 hours. Isolated pure cultures were subjected to various morphological and biochemical tests.

3. RESULTS

Of the 150 faecal samples, 5(3.33%) were positive for *Salmonella sp* and 3(2%) were positive for *Shigella sp*. Table 1 shows the prevalence of *Salmonella sp* and *Shigella sp* in relation to sexes of patients.

Table 2 shows the prevalence of *Salmonella sp* and *Shigella sp* in relation to the age groups of patients. It showed that only age group ≤ 4 - 5years had *Salmonella* infections 5(4.3%). Males had the highest prevalence of Salmonella infections [4(5.4%) while females had the highest prevalence of Shigella infection [2(2.6%).

Table 1: Prevalence of *Salmonella* sp and *Shigella* sp in relation to sex

Sex	No. tested (%)	No. positive (%) for *Salmonella sp*	No. positive (%) for *Shigella* sp
Females	76	1(1.3)	2(2.6)
Males	74	4(5.4)	1(1.3)
Total	150	5(3.3)	3(2.0)

Table 2 shows the prevalence of *Salmonella sp* and *Shigella sp* in relation to the age groups of patients. It showed that only age group ≤ 4 - 5years had *Salmonella* infections 5(4.3%). Age group ≤ 4 - 5years had the highest prevalence of *Shigella* infections 2(1.7) while age group ≤ 1 – 3 had the least prevalence of Shigella infection 1(2.94)

Table 2: Prevalence of *Salmonella sp* and *Shgella sp* in relation to age

Age group (years)	No. tested (%)	No. positive (%) for *Salmonella sp*	No. positive (%) for *Shigella sp*
≤ 1 – 3	34	0(0)	1(2.94)
≤ 4 -5	116	5(4.3)	2(1.7)
Total	150	3(3.33)	3(2)

Table 3 shows i*n - vitro* susceptibility patterns of *Salmonella sp and Shigella sp* isolates from diarrheoa stool samples. The susceptibility studies showed that *Salmonella sp* were 100.0% susceptible to ceftazidime and gentamycin but were 60.0% resistance to streptomycin and tetracycline. *Shigella sp* isolates were 100.0% susceptible to ceftazidime, 67.7% susceptible to ceftriaxone, gentamycin and streptomycin respectively while 100.0% resistance were recorded to cloxacillin, cotrimoxazole and teteracycline (Table 3).

Table 3: *In - vitro* susceptibility patterns of *Salmonella sp and Shigella sp* isolates from diarrheoa stool samples

Isolates	Pattern	Ampicillin	Cloxacillin	Ceftazidime	ceftriaxone	Gentamycin	Streptomycin	Cotrimoxazole	Tetracyline
Salmonella sp	Sensitive	4(80)	3(60)	5(100)	4(80)	5(100)	2(40)	1(20)	2(40)
	Resistant	1(20)	2(40)	0(0)	1(20)	0(0)	3(60)	4(80)	3(60)
Shigella sp	Sensitive	1(33.3)	0(0)	3(100)	2(67.7)	2(67.7)	2(67.7)	0(0)	0(0)
	Resistant	2(76.7)	3(100)	0(0)	1(33.3)	1(33.3)	1(33.3)	3(100)	3(100)

4. DISCUSSION

Diarrheal illnesses account for significant morbidity and mortality worldwide. Most cases of diarrhea are caused by bacteria, viruses or parasites. In this study, *Salmonella sp were* detected more than *shigella sp* among faecal samples of the children with diarrhea using a selective media. Ali et al. (2005) in Zliten, Libya reported *Salmonella* in 13.6% and *Shigella* in 3.6% which is in line with the result obtained in this study. Chan et al. (2003) from China reported ratios 34.6 and 6.2% for *Salmonella spp.* and *Shigella spp* respectively. According to studies from Nigeria, rates for *Salmonella* spp. and *Shigella* spp. have been reported as 1.1 to 10.2% and 1 to 10.8%, respectively (Kenan, 2003; Özen, 1999). *Salmonella spp.* was identified in 3.33% and *Shigella spp.* was identified in 2% of the samples in this study. *Shigella* isolate was recovered from the age groups ≤ 1 – 3years. This might be due to many factors.

The patient in this age group might have contracted the *Shigella* infection from close contact with mother or other caregivers who might have passed the infection. Resistance to antibiotics is becoming more prevalent among Salmonellae and Shigellae pathogens in poor resource settings.

In this result, none of the five Salmonella isolates was resistant to ceftazidime and gentamycin but resistance of Salmonella and Shigella isolates were observed against two commonly used antibiotics (Cotrimoxazole and tetracycline). This is of particular concern in the developing world, like Nigeria (Akinyemi et al., 2000).

Appropriate and effective treatment options such as ceftazidime are expensive and are not readily available. Ceftriaxone which is commonly used to treat children with Salmonella infections, particularly invasive infections, because of its favorable pharmacokinetic properties and the low prevalence of resistance showed a good antimicrobial activity against four Salmonella isolates, and it was similar to the study in Ibadan by Ogunleye et al. (2005). Because specific antimicrobial treatment may be required to supplement other supportive anti-dehydration treatment which is the cornerstone of therapy of acute infant diarrhoea, selective use of antimicrobial agents therefore, cannot be overemphasized.

REFERENCES

1. Ali MB, Ghenghesh KS, Aissa RB, Abuhelfaia A, Dufani M (2005). Etiology of childhood diarrhea in Zliten, Libya. Saudi Med. J., 26: 1759-1765.
2. Akinyemi KO, Coker AO, Olukoya DK, Oyefolu, AO, Amorighoye EP, Omonigbehin EO (2000). Prevalence of multi-drug resistant *Salmonella typhi* among clinically diagnosed typhoid fever patients in Lagos, Nigeria, Z Naturfor.; 55:489-93.
3. Bista, M.B., Shrestha, K., Devkota, U. N. (1993). *Gastroenteritis, Encephalitis, Meningitis and Klazar - An Epidemiological Review.* Epidemiology Division of Health Teku, Kathmandu. pp 3 -27.
4. Chan SS, Ng KC, Lyon DJ, Cheung WL, Cheng AF, Rainer TH (2003). Acute bacterial gastroenteritis: a study of adult patients with positive stool cultures treated in the emergency department. Emerg. Med. J., 20: 335-338.
5. Fewtrell L, Kaufmann RB, Kay D, Enanoria W, Haller L, Colford JM (2005). Water, sanitation, and hygiene interventions to reduce diarrhoea in less developed countries: a systematic review and meta-analysis. The Lancet Infect. Dis. 5:42-52.
6. Guerrant RL, Van Gilder T, Steiner TS (2001). Practice guidelines for the management of infectious diarrhoea. Clin Infect Dis.; 32: 331–351.
7. Hale, Thomas L.; Keusch, Gerald T. (1996). "Shigella: Structure, Classification, and Antigenic Types". In Baron, Samuel. *Medical microbiology* (4 ed.). Galveston, Texas: University of Texas Medical Branch.

8. Kariuki S, Revathi G, Kariuki N, Kiiru J, Mwituria J, Hart CA (2006). Characterization of community acquired non-typhoidal Salmonella from bacteriaemia and diarrhoeal infections in children admitted to hospital in Nairobi, Kenya. BMC microbial.6:101.
9. Kenan B, Ak_it F (2003). Akut gastro-enteritli olgularda Campylobacter sikli_inin ara_tirilmasi. Turk. J. Infect., 17(1): 11-14.
10. Kotloff K (1999). Bacterial ddiarrhoeal pathogens. Adv Pediatr Infect Dis.14: 219-67.
11. Levinson, Warren E (2006). *Review of Medical Microbiology and Immunology* (9 ed.). McGraw-Hill Medical Publishing Division. p. 30. ISBN 978-0-07-146031-6. Retrieved February 27, 2012.
12. Majowicz SE, Musto J, Scallan E, Angulo FJM, O`Brien SJ, Jones TF, Fazil A, Hoekstra RM (2001). The global burden of nontyphoidal Salmonella gastroenteritidis. Clin Infect Dis.50:882-889.
13. Orlandi PP, Magalhães GF, Matos NB, Silva T, Penatti M, Nogueira PA, Pereira da Silva LH (2006). Etiology of diarrheal infections in children of Porto Velho (Rondônia, Western Amazon region, Brazil). *Braz J Med Biol Res 39*: 507-517.
14. Ogunleye VO, Ogunleye A, Ajuwape ATP, Olawole OM, Adetosoye AI (2005). Childhood Septicaemia Due To Salmonella Species in Ibadan, Nigeria, Afric J Biomed. Res.; 8:131-134.
15. Olowe, O. A., Olayemi, A. B., Eniola, K. I. T., Adeyeba, O. A. (2003). Aetiological agents of diarrhoea in children under five years of age in Osogbo, Osun State. *African Journal of Clinical and Experimental Microbiology*; 4(2):62-66
16. Orlandi PP, Silva T, Magalhães GF, Alves F, Cunha RPA, Durlacher RR, Pereira da Silva LH (2001). Enteropathogens associated with diar-rheal disease in infants of poor urban areas of Porto Velho, Rondônia: a preliminary study. *Mem Inst Oswaldo Cruz 96*: 621-625.
17. Özen N, Kalelei _, _engül M, Ak_it F (1999). Akut gastro-enteritli olgularda Campylobacter sikli_inin ara_tirilmasi. Microbiol bult, pp.89-98.
18. Parashar, D., Bresee, J. S., Glass, RI. (2003). The global burden of diarrhoeal disease in children. Editorials *Bulletin of the World Health Organization*; 81 (4).
19. Presterl, E., Zwick, R. H., Reichmann, S., Aichelburg, A., Winkler, S., Kremsner, P., Granigner, W. (2003). Frequency and virulence properties of diarrheagenic *Escherichia coli* in children with diarrhea in Gabon. *American Journal of Tropical Medical Hygiene*; 69: 406-410.
20. Rabsch W, Tschäpe H, Bäumler AJ (2001). Non-typhoidal salmonellosis: Emerging problems. Microbes and Infect. 3: 237–247.
21. Rao, M. R., Abu-Elyazeed, R., Salvarino, S. J., Naficy, A. B., Wierzba, T. F., Abdel-Messih, I., Shaheen, H., Frenck, R. W., Svennerholm, A. M, Clemens, J. D. (2003). High disease burden of diarrhea due to enterotoxigenic *Escherichia coli* among rural Egyptian infants and young children. *Clinical Microbiology Infectious;* 41: 4862-4864.
22. Sharma AK (2006). Antimicrobial resistance pattern of *Salmonella* in Kanti Children's Hospital: which drug to choose? J Nepal Paediatr Soc. 1: 20-3.
23. Sanders, J. W., Putnam, S. D., Gould, P., Kolisnyk, J., Merced, N., Barthel, V., Rozmajzl, P. J., Shaheen, H., Fouad, S., Frenck, R. W. (2005). Diarrheal illness among deployed U.S. military personnel during operation bright star 2001-Egypt. *Diagnostic Microbiology Infectious Diseases*; 52: 85-90.
24. Sang, W. K., Iida, T., Yamamoto, H, Saidi, S. M., Yoh, M., Waiyaki, P. G., Ezaki, T., Honda, T. (1996). Prevalence of diarrhoeagenic *Escherichia coli* in Kenyan children. *Journal of Diarrhoeal Diseases Research*; 14(3):216-217.

9/22/2014