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Salmonella typhi infection in a tertiary institution in Nasarawa State, Nigeria

Ishaleku D^{1*}, Sar TT², Houmsou RS³¹Microbiology Unit, Department of Biological Sciences, Nasarawa State University Keffi, P.M.B 1022 Keffi, Nigeria²Department of Biological Sciences, University of Mkar, Mkar, P.M.B 017, Gboko, Benue State, Nigeria³Applied Zoology Unit, Department of Biological Sciences, Taraba State University, Jalingo, P.M.B 1167 Jalingo, Taraba State, Nigeria

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ABSTRACT

Objective: To evaluate the prevalence of *Sabmonella typhi* (*S.typhi*) among subjects attending College of Education Health Clinic, Akwanga, Nasarawa state from the year. 2005 to 2007 and to recommend some preventive measures to the populace. **Methods:** Blood samples were tested for infection using the widal test. **Results:** Out of the 793 patients examined, 579(73.0%) were positive with 174 (30.05%), 254(43.86%) and 151(26.07%) for the years 2005, 2006 and 2007 respectively. The age range with the highest prevalence of infection for the period was 21–30 with 207(35.75%) followed by 31–40 year group with 133 (22.97%). *Chi*-square analysis showed no significant difference in infection between males and females ($P>0.05$). **Conclusions:** The results of this study provide a useful guide in the formulation of *S. typhi* control measures in tertiary institutions in the State and also help to check the spread of the pathogen in the general population.

1. Introduction

Typhoid fever, also called enteric fever, is an acute, potentially life-threatening febrile illness caused by *Salmonella typhic* (*S. typhi*). It is a bacterial infection of the intestinal tract, and occasionally, the blood stream^[1]. *S. typhi* is relatively hardy and can survive in water for 2–3 weeks. This makes it common in water, sewage and certain foods. *S. typhi* is the only species that causes this disease in humans^[2].

The bacterium is transmitted rapidly through foods such as milk, cream, artificial cream and water, through flies, fingers, feces and fomites. The bacteria can also be communicated between people through contaminated objects and through poor hygienic habits such as non-washing of hands after using the toilet^[3].

An estimated 17 million cases of typhoid are reported worldwide each year, resulting in 0.6 million deaths^[4]. Typhoid fever is a health problem in parts of the world with poor sanitary practices. Approximately 5% of people who contract typhoid fever continue to carry the disease after recovery^[5]. In such chronic carriers, the bacilli are

most commonly present in the gallbladder, or rarely in the urinary tract, and are excreted in the feces or urine. The long duration of the carrier state enables the enteric-fever bacilli to survive in the community at non-epidemic times and to persist in small, relatively isolated communities^[6].

This work is aimed at evaluating the prevalence of *S. typhi* infection in a section of the community of Akwanga, Nasarawa State-members of the College of Education, a teacher training institute, from 2005–2007.

2. Materials and methods

2.1. Study population

This was a retrospective study. Records of staff and students of the College of Education Akwanga, Nasarawa State, Nigeria, who attended the college clinic for treatment of febrile illnesses for the period 2005, 2006 and 2007 were collected and evaluated for the study.

Blood samples were tested for infection using the widal test. The inspection of these records was done with the consent of the college management through the Clinic's Ethical Rights Committee. All links to the patients' identities were kept confidential. However, socio-demographic information on the patients' was recorded, including age and sex.

*Corresponding author: Dr. Ishaleku D, Microbiology unit, Department of Biological Sciences, Nasarawa State University Keffi, P.M.B 1022 Keffi, Nigeria.
E-mail: ishalekudavid@rocketmail.com

2.2. Statistical techniques

The statistical techniques used for this study were the descriptive and inferential analytical techniques described by Umeh *et al*[7].

3. Results

The investigation revealed that 793 patients 354(44.6%) males and 439(55.4%) females were examined for infection. Five hundred and seventy nine patients(579), 73% tested positive during the three years under review; 174(21.7%), 254(32%) and 151(19%) for 2005, 2006 and 2007, respectively (Table 1).

Infection rates by age showed that the age group with the highest infection was 21–30 years for the three year period, with a total infection of 36.10%. Within this age group the years 2005 and 2006 recorded the highest infection with 14.0% each. The age group with the lowest infection rate was 51 and above. This age group had prevalence rates of 0.52%, 3.00%, and 2.00% in 2005, 2006 and 2007m respectively. It was noticed that from year to year infection gradually increased as the age increased with peak infection in the 21–30 years age group, and then dropped in the older age groups (Table 2).

Infection rates were higher in females than in males, with total infection rates of 97(56%) to 77(44.3%), 142(56%) to 112(44.1%) and 86(57%) to 65(43.1%) in 2005, 2006, and 2007 (Table 3). However, *Chi*-square analysis however showed no significant difference ($P>0.05$) in *S. typhi* infection between the sexes, implying that either sex had an equal chance of infection.

4. Discussion

The high infection rates observed among the young adults of age range 21–30 years agrees with World Health Organization (WHO) report of 2007 which identified typhoid as a serious public health problem and that its incidence is highest in children and young adults[8]. The age groups 1–10 and 11–19 years also contributed a total of 28.40% total infection rates over the three year period. According to the Public Health Agency of Canada[9], in endemic areas, typhoid fever is most common in preschool and school aged children aged 5–19 years. In this study the highest infection was observed not in this age group. However the agency reported that in Canada, between 1993 and 2002, 806 cases of typhoid were reported, with the age group with the highest infection being 30–39 years, followed by group 25–29 years. Similarly, the report states that in Alberta, prior to 2003, the age group with the highest infection was 20–24 years, followed by 30–39 years. In all cases, both males and females were equally at risk. These findings closely follow the trends observed in this study. Indeed the College of Education Akwanga Community is mostly made up of the young adults, and the high rate of infection is probably due to the low level of hygiene in the hostels and poor eating habits. Between 2004 and 2007, there was an increase in the number of students per room in the hostels. This must have negatively impacted the hygienic and sanitary conditions in the hostels, as the population of students probably overwhelmed the cleaners. The increasing break down in sanitary conditions was also seen in the lecture areas, which became increasingly untidy.

Also, in Akwanga and environs, a local drink made from

Table 1

Prevalence of *S. typhi* infection in 2005, 2006 and 2007.

Months	2005		2006		2007		
	NE	NP (%)	NE	NP(%)	NE	NP(%)	
Dry season	October	22	17(77.30)	34	26(76.50)	NA	NA
	November	23	17(73.90)	39	37(94.90)	NA	NA
	December	20	14(70.00)	20	13(65.00)	NA	NA
	January	22	13(59.10)	NA	NA	25	19(76.00)
	February	23	17(73.90)	10	5(50.00)	11	5(45.40)
	March	28	18(64.30)	21	17(80.90)	21	18(85.70)
Rainy season	April	11	9(81.40)	30	13(43.30)	27	17(62.90)
	May	7	6(85.70)	37	28(75.70)	27	20(74.10)
	June	23	18(78.30)	53	40(75.50)	41	34(83.10)
	July	21	19(90.50)	23	12(52.20)	34	28(82.30)
	August	20	15(75.00)	57	39(68.40)	NA	NA
	September	17	11(64.70)	36	24(66.70)	NA	NA
Total	237	174(73.40)	360	254(70.50)	196	51(26.02)	

NE=Number examined; NP=Number positive; NA=Data not available.

Table 2

Prevalence of *S. typhi* in relation to by age [*n*(%)].

Age (years)	2005	2006	2007	Total
1–10	10(1.72)	21(3.62)	15(2.59)	46(7.93)
11–20	33(5.69)	55(9.49)	30(5.18)	118(20.37)
21–30	81(13.98)	79(13.98)	47(8.11)	207(35.75)
31–40	40(6.99)	60(10.36)	33(5.69)	133(22.97)
41–50	7(1.21)	22(3.79)	16(2.76)	45(7.77)
51– Above	3(0.52)	17(2.24)	10(1.72)	30(5.18)
Total	174(30.05)	254(43.86)	151(26.07)	579(100.00)

NP=number positive.

Table 3Prevalence of *S. typhi* in relation to gender [n(%)].

Months	2005			2006			2007		
	F	M	Total	F	M	Total	F	M	Total
January	11(1.89)	2(0.35)	12(2.07)	NA	NA	NA	9(1.55)	11(1.89)	19(76)
February	9(1.55)	8(1.38)	17(2.93)	2(0.35)	3(0.52)	5(0.86)	8(1.38)	8(1.38)	5(71)
March	10(1.72)	8(1.38)	18(3.10)	9(1.55)	8(1.38)	17(2.93)	13(2.24)	6(1.04)	18(86)
April	5(0.86)	4(0.69)	9(1.55)	10(1.72)	3(0.52)	13(2.24)	6(1.03)	5(0.86)	17(63)
May	3(0.52)	3(0.52)	6(1.03)	14(2.41)	14(2.41)	28(4.83)	15(2.59)	6(1.04)	20(74)
June	10(1.72)	8(1.38)	18(3.10)	26(4.49)	14(2.41)	40(6.41)	21(3.62)	14(2.41)	32(78)
July	10(1.72)	9(1.55)	19(3.28)	7(1.21)	5(0.86)	12(2.07)	14(2.41)	14(2.41)	28(82)
August	4(0.69)	11(1.89)	15(2.59)	18(3.10)	21(3.65)	39(6.74)	NA	NA	NA
September	7(1.21)	4(0.69)	11(1.89)	13(2.24)	11(1.89)	24(4.15)	NA	NA	NA
October	5(0.86)	12(2.07)	17(2.93)	13(2.24)	13(2.24)	26(4.49)	NA	NA	NA
November	13(2.24)	4(0.69)	17(2.93)	23(3.97)	14(2.41)	37(6.39)	NA	NA	NA
December	10(1.72)	4(0.69)	14(2.41)	7(1.21)	6(1.03)	13(2.24)	NA	NA	NA
Total	97(16.6)	77(13.3)	174(30.04)	142(24.5)	112(19.3)	254(43.9)	86(14.9)	65(11.2)	151(26.1)

F=Female; M=Male; NA=Data not available.

the infusion of the calyx of the herb *Hebiscus sabdariffa* called “Zobo” and the drinking of local cow milk called “Nono”, hawked by nomadic herds women is common practice, especially among the students who find these affordable and convenient. The “Zobo” is usually prepared under unhygienic conditions using untreated water. Similarly, “Nono” is unpasteurized and consumed directly with no further processing from the cows. These foods could serve as sources of infection, hence the high infection rates observed. Another factor that could have contributed to observed infection trends is that on campus, most students take meals from local vendors who prepare such meals with no supervision or inspection by health authorities and as such the sanitary quality cannot be ascertained or guaranteed. *Chi*-square analysis, which shows no significant difference in infection among males and females, implies that any sex can be infected by the *Salmonella*.

It has been shown that typhoid fever was prevalent in College of Education Akwanga between 2005 and 2007. Typhoid infection no doubt continues even beyond this period, as conditions that favoured high infection still prevail. It is therefore pertinent that preventive measures be put in place to check the spread of this infection, especially so as other factors such as the HIV infection also lead to increased infection in the community.

The following preventive measures are recommended:

Health education among the staff, students and all food vendors of the institution on the dangers of the infection should be carried out.

Students and staff should be encouraged to receive typhoid vaccination.

All food vendors in the institution should be properly screened to treat all asymptomatic carriers that may serve as reservoirs and foci of infection.

Research on this etiological agent should be carried out to determine susceptibility to commonly used antibiotics so as to put in place an effective treatment policy in the College Community.

Follow-up of cases of infection should be carried as well as proper documentation. This will ensure that infections are completely eliminated and the carrier status reduced or eliminated if possible.

Conflict of interest statement

We declare that we have no conflict of interest.

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