

# Four-year longitudinal assessment of the prevalence of typhoid fever among those attending the General Hospital Etinan, Nigeria

Emmanuel C. Uttah, S.E. Osim, Hannah Etta, Emmanuel Ogban, Ndibukke Etim Edet Okon

Department of Biological Sciences, Cross River University of Technology, Calabar, Nigeria

**Abstract-** The study was aimed at ascertaining the prevalence of typhoid fever by *Salmonella typhi* and the four year trend of the infection in Etinan, Akwa Ibom State using hospital-based data. Hospital records of those who attended the General Hospital Etinan for medical attention was collected and collated. The four year cumulative prevalence of *Salmonella* infection was 63.8% (58.0% for males and 68.2% for females), Prevalence was significantly higher among females than among males ( $\chi^2$ -test;  $p < 0.05$ ). Prevalence was comparable in all the years except for the year 2001, which had a significantly higher prevalence than that of each of the other years ( $\chi^2$ -test;  $p < 0.05$  for all the tests). A comparison of the prevalence of *Salmonella typhi* in each of the age groups between 2000 and 2003 showed that in 2001, there was significantly high prevalence (up to 80%) in the first two age groups, 0-4 years and 5-9 years, unlike in the other years where prevalence in the same age groups ranged from 12% to 52% ( $\chi^2$ -test;  $p < 0.05$  for all the tests). Generally, prevalence among the various age groups ranged from: 12% in 0-4 years age group to 90% in the 40-44 years age group in the year 2000, 50% in the 10-14 years age group to 90% in the 39-34 years age group in 2001, 25% in the 5-9 years age group to 82% in the 10-14 years age group in 2002, 25% in the 4-9 years age group to 82% in the 10-14 years age group in the year 2003. Only the age group 5-9 years has prevalence below 50%. Typhoid fever is highly prevalent in Etinan, and urgent steps towards its mitigation are recommended.

**Index Terms-** Typhoid fever, *Salmonella typhi*, potable water, water quality, Hospital.

## I. INTRODUCTION

Typhoid fever is a life-threatening infection caused by *Salmonella* serogroup *typhi* bacterium. There are about 21 million cases and 200, 000 deaths due to typhoid fever around the world (CDC, 2004). It is common in developing world where it affects 12.5 million persons each year. In Nigeria between 10% and 50% prevalence have been reported (Okpokwasili *et al.*, 1996), while over 42,000 cases and 1214 deaths were recorded in the Congo between 2004 and 2005 (WHO, 2006).

It has an insidious onset characterized by fever, headache, constipation, malaise, chills, and myalgia with few clinical features that distinguish it from a variety of other infectious diseases, but diarrhea is uncommon and vomiting is not usually severe. Others clinical signs include confusion, delirium,

intestinal perforation and death may occur in severe cases (CDC, 2004), anorexia, relative bradycardia (slow heart rate), and non-productive cough (Utah State Dept., 2004). The etiologic agent may be recovered from the bloodstream or bone marrow and occasionally from stool or urine.

Typhoid is one of the sicknesses arising from microbiological contamination of water; and this contamination is enhanced by poor sanitation and siting of boreholes close to waste dumps and soakaways (Orji, *et al.* 2006; Nwidu *et al.*, 2008; Akubuenyi *et al.*, 2013). The risk factors of enteric typhoid or paratyphoid fever varies regionally. For example, in Indonesia, paratyphoid fever emanated more significantly from exposures outside the home, such as purchase of food from street vendors than from within the household avenues such as sharing of utensils, presence a patient with typhoid, and inadequate toilet facilities (WHO, 2006). It is contracted when a person takes in water or food contaminated with the *S. typhi* bacterium. The food or water is contaminated when an affected person handles it. This study was therefore undertaken to ascertain the prevalence of typhoid fever by *Salmonella typhi* and the four year trend in Etinan, Akwa Ibom State using hospital-based data; as a prelude to a comprehensive water quality study on the boreholes.

## II. MATERIALS AND METHODS

### A. STUDY AREA

The study area was conducted from July, 2009 through December 2009 in Etinan, a suburban area in Akwa Ibom State, Nigeria. The climate is tropical and the vegetation is predominantly semi-tropical rain forest. The area experiences an average annual rainfall of about 1600mm. There are two distinct seasons, the wet season (April through October) and dry season (November through March). The land is good for farming and farming is the main occupation of majority of the inhabitants.

The Etinan General Hospital is the major health facility in the area. It is the only government owned and subsidized hospital in the area. There are a few privately-owned hospitals in Etinan, which are barely affordable to the people. Etinan has a number of Primary and secondary schools. Etinan has a good number of well-read citizens, however majority of inhabitants are relatively poor as others in other resource limited countries.

Etinan lacks adequate supply of potable water. The people depend on privately owned commercial boreholes that sell water. Most of these boreholes are substandard and there is no effective supervisory system to monitor the water quality produced by these boreholes.

### B. STUDY POPULATION AND DESIGN.

Data on people presenting themselves for medical attention at the General Hospital, Etinan in four years between the year 2000 through 2003 were collected and collated for the study. This hospital was chosen because of its general acceptability and patronage by vast majority of inhabitants of Etinan Local Government Area. As a government-subsidized hospital, it is relatively affordable.

To calculate prevalence, the total number of persons who came to the hospital with various medical complaints was used as the Number of persons examined, while the number of those diagnosed with typhoid fever by the doctors was used as the Number of positives. This was calculated for the various age categories, sexes and years.

### C. ETHICAL CONSIDERATION

The study was approved by the Ethical Committee of the Cross River University of Technology Calabar and the Management of the Etinan General Hospital, Etinan.

### D. ANALYSIS OF DATA

The SPSS 2010 Version was used to enter the data while Epi Info was used to analyze data. The Chi square test was employed to ascertain significance of proportions.

## III. RESULTS

Now it is the time to articulate the research work with ideas gathered in above steps by adopting any of below suitable approaches:

### A. Prevalence of *Salmonella typhii* infection

The four year cumulative prevalence of *Salmonella* infection was 63.8% (58.0% for males and 68.2% for females), Prevalence was significantly higher among females than among males (x<sup>2</sup>-test; p < 0.05). Among the age groups, prevalence ranged from 49.2% to 73.9% (see Table 1).

Comparison of prevalence of *Salmonella typhii* infection of each of the years between 2000 and 2003 in relation to sex is presented in Figure 1. Yearly prevalence was comparable in all the years except for the year 2001, which had a significantly higher prevalence than that of each of the other years (x<sup>2</sup>-test; p < 0.05 for all the tests).

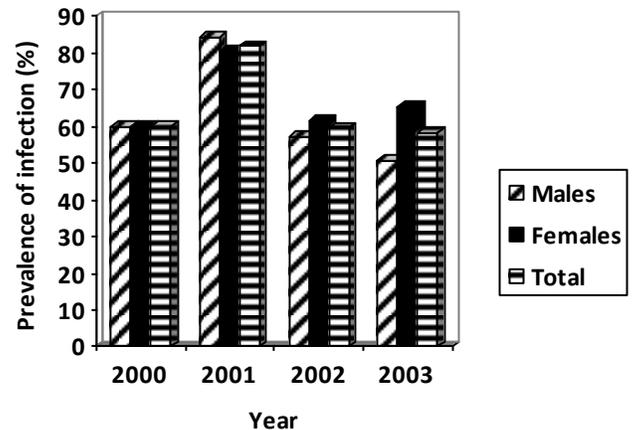


Figure 1: Comparison of prevalence of *Salmonella typhii* between 2000 and 2003 in relation to sex

A comparison of the prevalence of *Salmonella typhi* in each of the age groups between 2000 and 2003 (see Figure 2) showed that in 2001, there was significantly high prevalence (up to 80%) in the first two age groups, 0-4 years and 5-9 years, unlike in the other years where prevalence in the same age groups ranged from 12% to 52% (x<sup>2</sup>-test; p < 0.05 for all the tests). Generally, prevalence among the various age groups ranged from: 12% in 0-4 years age group to 90% in the 40-44 years age group in the year 2000, 50% in the 10-14 years age group to 90% in the 39-34 years age group in 2001, 25% in the 5-9 years age group to 82% in the 10-14 years age group in 2002, 25% in the 4-9 years age group to 82% in the 10-14 years age group in the year 2003.

The age groups 10-14 years as well as age groups between 15 and 44 years have prevalence above 66.6% (two-third of persons with positive cases). Only the age group 5-9 years has prevalence below 50%.

## IV. DISCUSSION

Results from the present study indicate high prevalence of typhoid fever in both sexes and in all age groups in Etinan. There were more positive cases than negative cases. This could be as a result of drinking contaminated water in homes and the use of same for domestic activities. Etinan area in Akwa Ibom State of Nigeria is facing widespread water scarcity and pollution due to effects of thrusts of growth, and urbanization. It is increasingly apparent that discharges of both domestic and cottage effluents have increased and clean water has become increasingly scarce. About a fifth of the world population does not have access to safe drinking water (UN, 2006); most of the affected communities are found in Asia and sub-Saharan Africa. The provision of portable water to the rural and urban population is necessary to prevent health hazards (Akubuenyi et al., 2013). The prevalence recorded in this study was higher than 39.4% recorded in Nassarawa State in middle belt of Nigeria (Iskaku et al., 2013). High prevalence of typhoid fever is widespread in Nigeria (Bello and Tanyigna, 1996).

Further analysis of the prevalence trend in four years showed strikingly high prevalence in 2001. Similar finding of sudden upswing in typhoid fever occurred in some provinces in China in 1991 and was attributed to poor quality of drinking water (Bello and Tanyigna, 1996). The poor quality of water for drinking and general domestic uses had assumed a worrisome dimension. The inhabitants of Etinan depend mostly on water from commercial boreholes for general use. These boreholes are numerous and exist as source of income for their owners. They were not closely supervised and there were no statutory guidelines or existing protocols for quality control. There is no evidence that the World Health Organization minimum permissible limits for drinking water (WHO, 2003, 2005) are adhered to. This is a typical example where the problem of water is more of potability than availability (Akubuenyi *et al.*, 2013). Consequently, in Etinan the major water source available to the people is contaminated. High incidence of typhoid in Nigeria occurs when communal water supplies are lowest and people congregate at few sources left. There are times when contaminated water is spread by the rains (Talabi, 1994).

One of the practices common among the inhabitants that have helped in sustaining high prevalence of typhoid in the area was the habit of not regularly washing containers used in storing drinking water and water for domestic activities. It is common knowledge whenever containers, vessels or utensils are contaminated with *Salmonella*, they remain contaminated and serve as potential source of infection and reinfection until they are thoroughly and regularly washed with detergent (Maudgal *et al.*, 1982).

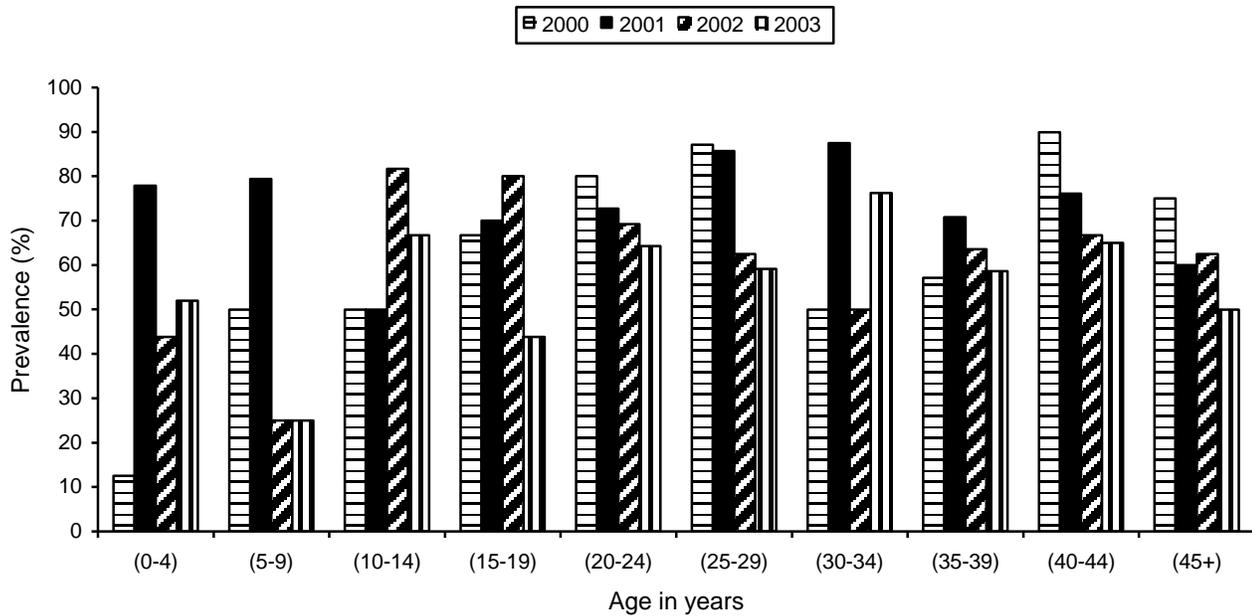
There was high prevalence among the 0 – 4 years age group, even though children under two years of age were given boiled water. Explanation for this could be that the boiled water were served in contaminated plates, utensils and spoons. This unravels the high level of ignorance of the epidemiology of typhoid fever, and underscores the need for awareness campaign to educate inhabitants of the area on the risk factors of the infection as well as the essential practices for mitigating the infection. However, typhoid fever is generally known to be a disease that is predominantly of school age children and young adults (Balraj *et al.*, 1992). In Nigeria some research findings indicate significantly higher prevalence among those less than 19 years of age than those above 20 years (Bello and Tanyigna, 1996).

V. CONCLUSION

In conclusion, there was high incidence of typhoid fever in Etinan in all the subgroups of age and sex between 2000 and 2003. This high incidence was sustained by the paucity of potable water, and the proliferation of unsupervised commercial boreholes that produced non-potable water used by inhabitants for domestic activities. There is need for detailed protocols for monitoring boreholes in the area to ensure that the quality of water sold to the people meet the minimum permissible standard. The need for awareness campaign to enlighten people on the epidemiology of typhoid fever cannot be over-emphasized, so also the need to regularly wash all water-storing containers and utensils on a regular basis and to improve sanitation and personal hygiene.

**Table 1:** Four-year cumulative prevalence of typhoid in relation to age and sex in Etinan

| Age in years | Number examined |        |       | Number positive (%) |             |            |
|--------------|-----------------|--------|-------|---------------------|-------------|------------|
|              | Male            | Female | Total | Male                | Female      | Total      |
| 0-4          | 261             | 168    | 429   | 140 (53.6)          | 90 (52.9)   | 230 (53.5) |
| 5-9          | 79              | 40     | 120   | 39 (49.4)           | 20 (50.0)   | 59 (49.2)  |
| 10-14        | 37              | 68     | 105   | 22 (59.5)           | 48 (70.6)   | 70 (66.7)  |
| 15-19        | 102             | 241    | 343   | 62 (60.8)           | 139 (57.7)  | 201 (58.6) |
| 20-24        | 166             | 283    | 449   | 91 (54.8)           | 208 (73.5)  | 299 (66.6) |
| 25-29        | 190             | 359    | 549   | 122 (64.2)          | 262 (73.0)  | 384 (69.9) |
| 30-34        | 188             | 267    | 455   | 90 (47.9)           | 222 (83.1)  | 311 (68.4) |
| 35-39        | 241             | 311    | 552   | 139 (57.7)          | 238 (76.5)  | 377 (68.3) |
| 40-44        | 156             | 158    | 314   | 100 (64.1)          | 132 (83.5)  | 232 (73.9) |
| 45+          | 219             | 247    | 466   | 146 (66.7)          | 101 (40.9)  | 247 (53.0) |
| Total        | 1639            | 2142   | 3781  | 951(58.0)           | 1461 (68.2) | 2411(63.8) |



**FIGURE 2:** COMPARISON OF THE PREVALENCE OF *SALMONELLA TYPHII* BETWEEN 2000 AND 2003 IN RELATION TO AGE GROUP.

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#### AUTHORS

**First Author** – Emmanuel C. Uttah, PhD, Department of Biological Sciences, Cross River University of Technology, Calabar, Nigeria, [drecuttah@yahoo.com](mailto:drecuttah@yahoo.com)

**Second Author** – S.E. Osim, MSc, Department of Biology, Cross River University of Technology, Calabar, Nigeria.

**Third Author** – Hannah Etta, PhD, Department of Biological Sciences, Cross River University of Technology, Calabar, Nigeria

**Fourth Author** – Emmanuel Ogban, PhD, Department of Biological Sciences, Cross River University of Technology, Calabar, Nigeria

**Fifth Author** - Ndibukke Etim Edet Okon, PhD, Department of Biological Sciences, Cross River University of Technology, Calabar, Nigeria

**Correspondence Author** – Dr. Emmanuel C. Uttah, [drecuttah@yahoo.com](mailto:drecuttah@yahoo.com), +234(0)806-408-7437.