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Original Research Article

Incidence of Typhoid Fever and its Risk Factors among Febrile Patients Attending Ahmad Sani Yariman Bakura Specialist Hospital Gusau, Zamfara State, Nigeria

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Abstract: Typhoid fever is an acute and sometimes life-threatening systemic febrile illness caused by *Salmonella enterica serovar typhi (S. typhi)* and *Salmonella enterica serovar paratyphi (S. paratyphi)* A, B and C. This cross sectional study was carried out to determine the incidence of typhoid fever among febrile patients attending Ahmad Sani Yariman Bakura Specialist Hospital Gusau, Zamfara State. A total of 198 blood samples were collected and processed using Widal test kit. Information such as age, educational level, toilet facilities, and symptoms of the disease were also obtained through structured questionnaire. The study participants were 116(59.5%) females, while 82(31.7%) were males. The overall prevalence of typhoid fever among the study subject was 47.9%. Higher incidence of the disease was recorded among male subjects with 34.8% prevalence while female recorded only 13.1%. There was high incidence (17.7%) of typhoid fever among 18-25 age groups while least by those above 66 years with 2%. There was high incidence among participant using well as water source with prevalence of 13.1%. it is concluded that there are clear and significant occurrence of typhoid fever among the study population. Therefore, enlightenment programs on environmental and personal hygiene should be encouraged among individuals in the study area.

Keywords: Typhoid Fever, Widal, *Salmonella Typhi* and *Salmonella paratyph*i A, B, and C.

INTRODUCTION

Typhoid fever is an acute and sometimes life-threatening systemic febrile illness caused by *Salmonella enterica serovar typhi (S. typhi) and Salmonella enterica serovar paratyphi (S. paratyphi)* A, B and C. Although, the disease caused by *S. paratyphi* has traditionally been thought to run a more benign course Mitra *et al*., (2009), recent observations have indicated that *S. paratyphi* has an almost identical clinical symptoms to *S. typhi* (Woods *et al.,* 2016). Typhoid fever is transmitted by water and food which are contaminated by human feces. Typhoid remains a global health problem with a higher burden in low and middle-income countries due to poverty, limited access to safe water and unhygienic practices (Mogasle *et al*., 2014).

In 2000, there were 21.6 million new cases of typhoid fever, 210,000 typhoid fever-related deaths

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and 5.4 million cases of paratyphoid fever (Crump *et al*., 2014). In 2010, Buckle and his colleagues, estimated that there were 13.9-26.9 million cases of typhoid fever in the world (Buckle *et al*., 2010). Without effective treatment, typhoid fever is associated with a case-fatality rate of 10-30%, although this reduces to 1-4% in those receiving therapy (Crump *et al.,* 2014). Only limited amount of data is available for the burden created by typhoid in several low and middle income countries. Consequently, there is growing interest in carrying out studies of disease burden created by typhoid fever in these settings (Von Kalk *et al*., 2016).

The typhoid fever surveillance in Africa program (TSAP) was established by the international vaccine institute to acquire comparable incidence data on typhoid and invasive non-typhoidal Salmonella disease in Sub-Saharan Africa. This program adopted standardized surveillance protocols in a number of different countries, including Burkina Faso, Ethiopia, Ghana, Guinea Bissau, Kenya, Madagascar, Senegal, South Africa, Sudan and Tanzania (Von Kalck *et al*., 2016). Each TSAP site carried out case detection using standardized methods to isolate and identify aerobic bacteria from the bloodstream of febrile patients. Incidentally, despite being one of the most populous countries in Africa, Nigeria is not among the TSAP sentinel countries. Using a mixed-effects model, which were fitted to data originating from 32 population-based studies of typhoid incidence in 14 countries including some TSAP sentinel countries (Antillon *et al*., 2017). Previously, it was estimated that 17.8 million cases of typhoid fever occur each year in low and middle income countries (Antillon *et al*., 2017).

The isolation of *S. typhi* from blood is considered to represent the gold standard for the diagnosis of typhoid fever (world health organization, 2019). Widal agglutination test remains relevant in the diagnosis of typhoid fever, because it is relatively affordable, easy to perform and requires minimal equipment or expertise especially in resource-limited settings (Wain and Hosoglu, 2012). Treatment of typhoid fever is common among patients especially in tropics even when diagnosis has not been confirmed. This may interfere with diagnosis. A number of studies have shown that typhoid could be co-infecting with malaria (Nwuzo *et al*., 2009). There is limited data on the prevalence of typhoid fever and its associated risk factors in Gusau, Zamfara State, Nigeria. This study thus aimed to provide an epidemiological data on the incidence of typhoid fever among febrile patients attending Ahmed Sani Yariman Bakura Specialist Hospital, Gusau Zamfara State.

MATERIALS AND METHODS

Study Areas

The study was carried out at Ahmad Sani Yariman Bakura Specialist Hospital, Gusau Zamfara State. Gusau is located in the Northwestern part of Nigeria. It is the capital of Zamfara state. It has a total area of 3,364km and a population of 383,162 (Census, 2006). Gusau is located between Latitude 12.168259^0N and Longitude 6.668170^0E. Gusau has an average rainfall of 575-990mm and annual temperature range between 25-36^0C (Kado, 2023). The city is characterized by low level of environmental hygiene and poor housing income population. The major occupation of the inhabitant of this area is farming and trading.

Sample and Study Population

A total of 198 samples were collected from the study participants. The subjects' consent was obtained for the research. The sample size was determined using a previous prevalence of 10% reported by Okoro and his colleagues (2015).

Data Collection Using Questionnaire

Information on the socio-demographic and clinical characteristics of the study participants was collected through a structured questionnaire. Information such as age, sex, education, toilet facility, source of drinking water and history of typhoid fever were obtained.

Eligibility Criteria

Inclusion Criteria

Consenting patients with clinical symptoms of Typhoid fever were enrolled for the study.

Exclusion Criteria

Apparently healthy patients, patients who did not give their consents and those who took antibiotics at least two weeks prior to sample collection were excluded from the study.

Ethical Approval

Ethical approval for this study was obtained from the ethical committee of Ahmad Sani Yariman Bakura Special Hospital Gusau and an informed consent was obtained from the pregnant women attending antenatal care before the commencement of the study.

Sample Collection

Three millimeters of blood sample was collected from each patient by a trained medical laboratory scientist through venipuncture. The sample was collected inside a vial containing ethyl di-amine tetra acetic acid for analysis (Masera *et al.,* 2014).

Widal test

The Widal agglutination test was performed on all the blood samples collected by rapid slide method (Cheesbrough, 2010). Blood samples were placed inside a centrifuge machine at 3000 revolution per minutes for five minutes in order to separate the serum from the blood cells. With the aid of a pipette, a drop of each serum was dispensed into each circle of the test card and a drop of each of the stain antigen was added to the suspension. The mixture was vortexed with the aid of a disposable stirrer and spread over the entire area enclosed by the ring of the circle. The test card was rocked and the degree of agglutination was recorded forthwith (Cheesbrough, 20010). Presence of agglutination was recorded as positive result and this indicate the presence of clinically significant levels of the corresponding antibody in the patients' serum. Absence of agglutination was considered as negative results (Cheesbrough, 2010).

Statistical analysis

Data obtained from the participants were analyzed by statistical software package (SPSS version 20) using X2 test through contingency table to determine the significant differences between the data obtained.

RESULTS

Prevalence of Typhoid fever in Relation to Gender and Age Group

A total of 198 febrile patients suspected of having typhoid fever were included in the study. The study participants were 116(59.5%) females, while 82(31.7%) were males. Table 1 shows the percentage of typhoid fever was highest among patients within the age bracket of 18-25 years representing (17.7%). The overall prevalence of typhoid fever in relation to age group was 47.9%.

Table 1: Prevalence of Typhoid fever in Relation to Gender and Age Group

Variables	Sample examined (%)	Positive cases (n)	Negative cases (n)	Prevalence (%)	P-value
Gender					
Male	116 (58.6)	69	47	34.8	0.36102
Female	82 (41.4)	26	56	13.1	
Total	**198 (100)**	**95**	**103**	**47.9**	
Age group (years)					
18 – 25	69 (34.9)	35	34	17.7	0.21704
26 – 35	34 (17.2)	17	17	8.6	
36 – 45	32 (16.2)	20	12	10.1	
46 – 55	29 (14.6)	10	19	5.0	
56 – 65	27 (13.6)	9	18	4.5	
66 – Above	7 (3.5)	4	03	02.0	
Total	**198 (100)**	**95**	**103**	**47.9**	

Key: Result is statistically significant at p<0.05

Prevalence of Typhoid Fever in Relation to Educational Level

Table 2 shows the prevalence of typhoid fever in relation to level of education. The higher prevalence of typhoid fever was among those without formal education with 19.1% and the least percentage prevalence was seen among patients with primary level of education (7.6%).

Table 2: Prevalence of Typhoid fever in Relation to Gender and Age Group

Variables	Sample examined (%)	Positive cases (n)	Negative cases (n)	Prevalence (%)	P-value
Educational level					
Not schooling	67 (33.8)	38	29	19.1	0.00326
Primary education	53 (26.8)	15	38	7.6	
Secondary education	43 (21.7)	22	21	11.1	
Tertiary education	35 (17.7)	20	15	10.1	
Total	**198**	**95**	**103**	**47.9**	

Key: Result is statistically significant at p<0.05

Prevalence of Typhoid fever in Relation to Risk factors

Table 3 presents the incidence of typhoid fever in relation to associated risk factors. Participants who had no toilet facilities at home recorded prevalence of 7.5% while those with toilet facilities recorded highest frequency of 40.4%. Participants who used well water as their source of

drinking water had the highest incidence of typhoid fever (13.1%), while the least percentage was observed among participants who used tap water with a percentage frequency of (36.7%).

Table 3: Prevalence of Typhoid fever in Relation to Risk factors

Variables	Sample examined (%)	Positive cases (n)	Negative cases (n)	Prevalence (%)	P-value
Toilet facilities					
Yes	176 (88.9)	80	96	40.4	0.46280
No	22 (11.1)	15	07	7.5	
Total	**198 (100)**	**95**	**103**	**47.9**	
Sources of water					
Well water	50 (25.3)	26	24	13.1	0.00211
Tap water	60 (30.3)	22	38	11.1	
Sachet water	23 (11.6)	13	10	6.5	
River water	20 (10.1)	15	05	7.6	
Borehole water	45 (22.7)	19	26	9.6	
Total	**198 (100)**	**90**	**103**	**47.9**	

Key: Result is statistically significant at $p<0.05$

DISCUSSION

Typhoid fever continued to be one of the major diseases of public health concern especially in the tropics. It is known to present clinically similar symptoms with malaria (Igharo *et al.,* 2012). Nigeria, like other tropical and sub-tropical countries, is an area of high endemicity for typhoid fever infection. As a result, people living in Nigeria are at risk of contracting typhoid (Keong and Sulaiman, 2003).

In the present study, a total of 198 febrile patients suspected of typhoid fever were enrolled in the study. In this study, the general prevalence of typhoid fever among the study population was (47.9%). This figure is in agreement with the figured previously reported in Ethiopia (Assefa *et al*., 2008). However, disagreement was evident with the finding of Nwuzo *et al*. (2009) in Abakaliki, Ebonyi State, South Eastern Nigeria, who reported a lower prevalence rate of (41.0%), among febrile patients attending federal medical center Abakaliki. The variations observed between the two studies can be attributed to differences in sample size used.

The study subjects were 116 (59.5%) females, while 82 (31.7%) were male subjects and the differences observed was not statistically significant ($p>0.05$). This can be due to the fact that female subjects may acquire infection during food preparation, child care and other household chores, thus increasing the likelihood of acquiring typhoid fever. This result is in harmony with that of Igbeneghu *et al*. (2009), in Ibadan, Oyo state, Nigeria, who reported 50.4% of typhoid fever among this age group. However, other previous studies conducted in Sokoto, Nigeria, shows a 29.4% frequency of typhoid fever among male subjects and 22.9% among females subjects (Alhassan *et al.,* 2012).

In relation to age groups, typhoid fever was more prevalent among study subjects within the age range of 18-25, having a high frequency of 17.7%. It can be attributed to the fact that these individuals are always in their working places where they buy food from food vendors and drink any available water. Exposure to polluted drinking water, close proximity to human waste and refuse dumps, low standard of food preparation, and ignorance contribute to occurrence, prevalence and transmission of typhoid (Crump *et al*., 2004).

The prevalence of typhoid fever was highest (40.4%) among those who had no toilet facilities at home, compared to those who had toilet facilities with prevalence rate of (7.6%) of typhoid fever. Those who use well as their source of drinking water also recorded highest prevalence (13.1%), compared to those who used tap water with prevalence rate of 11.1% of typhoid fever while those subjects using sachet water recorded the least prevalence (6.5%). Igharo *et al.,* (2009) in Ondo state, Nigeria, observed a higher prevalence rates of 73.9%, the variation in the results could be attributed to differences in the environmental conditions of the studied population. Factors such as poor hygiene resulting to fecal contamination, lack of portable water could have contributed to reasons why they observed higher rates of typhoid fever infection.

Based on level of education, those without formal education recorded the highest incidence (19.1%) of typhoid fever compared with those with tertiary level of education (10.1%) while least prevalence was among those in primary school.

Typhoid fever is a tropical disease, whose risk factors among many include: poverty, mal nutrition, poor sanitation, poor personal hygiene, and low level of education make tropical areas disease laden with typhoid fever infection.

CONCLUSION

Conclusively, the prevalence rate of 47.9% was reported for typhoid fever among the 198 patients investigated. The percentage of prevalence of typhoid fever based on gender was 34.8% for males and 13.1% for females. The higher prevalence of typhoid fever was among those without formal education with 19.1% and the least percentage prevalence was seen among patients with primary level of education (7.6%). Participants who had no toilet facilities at home recorded prevalence of 7.5% while those with toilet facilities recorded highest frequency of 40.4%. Participants who used well water as their source of drinking water had the highest incidence of typhoid fever (13.1%), while the least percentage was observed among participants who used tap water with a percentage frequency of (36.7%).

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