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Cross-sectional study on prevalence of typhoid and health risk factors among pregnant women attending general hospital, Azare, Bauchi state, Nigeria

Ismail Hassan[*1], Aliyu Abdulhamid Omar[2], Usman Alhaji Mohammed[3], and Faiza Adamu Haladu[4]

[1]*Department of Biological Sciences, Faculty of Science, Bauchi State University, P.M.B 65 Gadau, Bauchi State, Nigeria*
[2,4]*Department of Science Laboratory Technology, Faculty of Science, Bauchi State University, P.M.B 65 Gadau, Bauchi State, Nigeria*
[3]*Department of Biology, Nigerian Army University, P.M.B.1500, Biu, Borno state, Nigeria*

**Correspondence: ismai'lhassan@basug.edu.ng; +2349071634041*

Abstract

Typhoid fever is among the major prevalent disease in Nigeria due to various interconnected factors such as scarce amenities for handling unwanted products and abuse of antibiotics; these among other factors are responsible for the widespread of typhoid fever affecting both underage children and young adults. This study was a descriptive cross-sectional conducted from September to November, 2023. The study population consisted of adults female age ranged from 18 years and above. A pilot study was conducted which tested the validity and reliability of the instruments. The response rate was 100% for there were no non-consenting respondents. The study variables were independent and dependent. Data was analyzed using SPSS Computer software version 11. The processed data was presented in Tables, Pie chart; and Chi-square test of independence (contingency tables) was used to determine if there was a relationship between control measures of typhoid and it's occurrence in the study area. The study revealed that those with low level of education suffered from typhoid more than those who had attained a higher level of education and therefore education played a key role in the prevalence of typhoid among pregnant women based on the study. It has been shown that the higher the level of education the more the typhoid prevalence decreased among the adults as in primary, secondary and college levels respectively. The findings of this study also showed that 63% of the pregnant women had suffered from typhoid fever in one or more times in their life time, and only 37% had not. This is a clear indication that typhoid fever is prevalent among pregnant women attending General hospital in Azare. The results showed that those with low level of education were more than 50% and they suffered from typhoid episodes in their lifetime more than those with higher level of education. This study revealed that 63% did not have water storage facility while 37% provided water storage facilities within their households. The results of the study found that 80.2% of the residents had temporary houses, 14.4% had semi-permanent houses and 5.4% had permanent houses. These statistics reveal that most of the residents were poor and that they were vulnerable to poor housing which could promote poor state of sanitation. Poor sanitation practices are a cause of bacterial, viral, protozoa, and helminthic infections. Similarly, on waste collection 82.9% were dissatisfied about it, and 17.1% were satisfied. The main reason of dissatisfaction on waste collection was that it was done unprofessionally (52.9%) and irregularly (36.3%). The majority (47.1%) of the residents of the area under study felt that the drainage systems posed a problem of leaking, 36% felt the problem with drainage was smell and 16.9% felt that drainage system were contaminating their surface water sources.

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1.0 Introduction

Typhoid fever is a global infection and is responsible for acute life-threatening febrile illness. Typhoid fever is one of the major bacterial infections worldwide (Twort, *et al.*, 2010). It has an estimated case of twenty-two million with two hundred thousand interrelated deaths world-wide annually (WHO, 2017). The well-known occurrence of multidrug-resistant typhoid fever also complicates the problem (Bhutta, *et al.*, 2009; Bhanu *et al.*, 2011). The disease is a major challenge and an essential health setback in some continents such as Asia and Africa particularly in Nigeria owing to poor hygienic environment and the absence of or insufficient clean water supply (Twort, *et al.*, 2010). Typhoid fever is amongst the major prevalent disease in Nigeria due to various interconnected factors such as scarce amenities for handling unwanted products and abuse of antibiotics; these amongst other factors are responsible for the widespread of typhoid fever affecting both little children and young adults (Bhutta, *et al.*, 2006).

Infection of pregnant women with Salmonella occurs as frequently as its infection in the general populace, with a prevalence of 0.2% positive rectal cultures at the point of delivery. It has been projected that the incidence of fetal loss which occurs from untreated typhoid cases all through pregnancy might be as high as 80% in North-Eastern part of Nigeria (James and Phillip, 2012). Special concern arises as soon as pregnancy is complicated by *S. typhi*. Diverse severe outcomes and morbidity connected with typhoid fever in pregnancy include maternal mortality, premature labor, spontaneous abortion and infection of the fetus (James and Phillip, 2012; Gilman, *et al.*, 2011).

Due to the hormonal changes that suppress immunity, pregnant women are at an increased risk for getting food-borne infections (James and Phillip, 2012). Hormonal changes which occur during pregnancy impair the cell mediated immune response and they increase the susceptibility of pregnant women to various infections. Pregnancy is considered as a high-risk factor for acquisition of *Salmonella* infections (Ray, 2012; Pruss and Corralan, 2016).

This study therefore sought was carried out to investigate the prevalence and the risk factors influencing the prevalence of typhoid among pregnant women with a particular reference to General hospital, Azare, Bauchi State.

2.0 Materials and Methods

2.1 Study Area

The study area is General Hospital in Azare, which is the headquarters of Katagum L.G.A in Bauchi State, Azare town has Azare has approximately 4886 households with a population of 60,243 people (National Population Comission, 2006). It is bounded to the East by Dambam LGA and Potiskum Yobe State and to the South by Misau Local Government, in the West by Jama'are Loal Government, and to the north by Itas/Gadau Area of Bauchi State. Azare is located at 11040 27" N 10011' coordinates: 11040'27" N1128E at an elevation nearby towns in the region including Bulkachuwa, Disina, Faggo, Zadawa and Madara.

Figure 1: Map of the study Area (Source: en.m.wikipedia.org)

2.2 Study Design

This was a descriptive cross-sectional study. The design was appropriate to this study which was on the Prevalence of Typhoid Fever among Pregnant Women Attending General Hospital, Azare; because it was descriptive in nature. The study sought carried out to describe the state of affairs as they existed in the study area.

2.3 The Study Population

The study population consisted of adults female age ranged from18 years and above.

2.4 Inclusion Criteria

All pregnant women aged 18 years to above who were attending General Hospital, Azare, at the time of the study were given an informed consent to the study.

2.5 Exclusion Criteria

All pregnant women aged below 18 years and those who were not living in the study area by the time of data collection.

2.6 Sampling Techniques

Systematic random sampling was used to determine the number of pregnant women to be assessed. The sampling interval was determined according to the method described by (Mutai 2000). Sample Size of 350 was determined according to the method

described by **(**Fisher *et al.*, 1998) for population greater than 10,000.

2.7 Data Collection Instruments

The instruments included structured and semi-structured questionnaires, key informant interview schedule and observation checklists. Key informant interviews were given to the pregnant women.

2.8 Methods of Data Collection

A pilot study was conducted which tested the validity and reliability of the instruments. Three research assistants were trained on data collection procedures and monitored during the process of data collection by the researcher. The response rate was 100% for there were no non-consenting respondents.

2.9 Study Variables

The study variables were independent and dependent. The independent study variables were the risk factors associated with the high prevalence of typhoid fever among pregnant women attending General hospital, while the dependent variable was the prevalence of typhoid in study area. Independent variables (predictor variables) are those which manipulate the problem in the study. This means they are the cause of the problem. The dependent variable is the one which relies on the independent variable in order for it to occur thus the dependent variable refers to the effects (outcomes) of the causes.

The independent variables were drainage systems, human waste disposal, personal hygiene, health education, water treatment, sex, age of the respondents, occupation, while the dependent variable is the occurrence of typhoid fever among pregnant women. The respondents were required to show medical evidence of their suffering from typhoid. Those on medical treatment with medical laboratory results as evidence and were suffering from typhoid during the data collection formed the prevalence of typhoid in study area.

2.10 Data Analysis

Data was analyzed using SPSS software version 11. The processed data was presented in Tables, Pie chart; and Chi-square test of independence (contingency tables) was used to determine if there was a relationship between control measures of typhoid and it's occurrence in the study.

3.0 Results and Discussion

Table 1: Incidence of Typhoid Fever among Pregnant women Based on Age, Occupation and Level of Education

Age of respondents (Years)	**N0. of Respondents**	**Percentage (%)**
18-25	90	25.7
26-30	116	33.1
31-40	121	34.6
40-47	23	6.6
Total	**350**	**100%**
Occupation		
Employed	74	21.2
Un-employed	123	35.1
Self-employed	153	43
Total	**350**	**100%**
Educational Level		
Primary	202	57.7
Secondary	115	33.0
Tertiary	23	6.5
Non-formal	10	2.8
Total	**350**	**100%**

As indicated in table 1; 57.7% of the respondents had attained primary education, while 33.0% had secondary level, 6.5% college level and 2.8% non-formal education. These results suggested that more than half of the respondents had attained only primary and non-formal levels of education. This indicates a low level of education in the study area.

Table 2: Levels of Typhoid Awareness in the Study Area

Question	**Responses**	**Frequency**	**Percentage (%)**
Are you aware about Typhoid Fever?	Yes No	309 41	88.3 11.7
	Total	**350**	**100**
Are you aware on typhoid prevention?	Yes No	343 7	98.0 2.0
	Total	**350**	**100.0**

The level of community awareness of typhoid and some common diseases in the community with similar signs and symptoms is indicated in Table 2. The study findings revealed that majority (88.3%) had knowledge about typhoid. The respondents were informed and far much knowledgeable on typhoid suggesting that control of typhoid would be easy for them when such knowledge is applied. Majority of the residents (98%) reported that typhoid was a preventable disease while 2% did not.

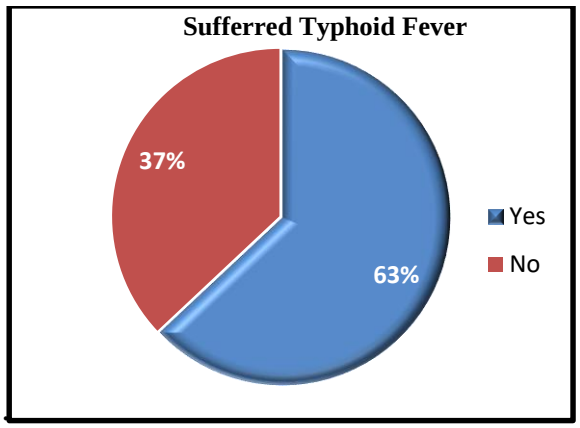

Figure 2: The Prevalence of Typhoid among Pregnant Women in the study

The results in figure 2 shows that majority (63%) of the study population said they suffered typhoid episode one time or another in their lifetime, while (37%) did not. Out of 220(63%) only 121(34.57%) showed medical cards as evidence of having suffered from the disease. 77(22%) showed a medical card and medical laboratory results as evidence. The remaining 22(6.3%) showed positive medical laboratory results and were on medication during the time of data collection. Hence this proves the prevalence of typhoid among pregnant women in the area.

Table 3: Occurrence of Typhoid Based on Level of Education, Occupation and Age

Category	Observed Value (O)	Expected Value (E)	(O – E)	$(O - E)^2$	Chi-square ($X = \frac{E(O-E)^2}{E}$
Educational Level	Tertiary	8(2.29 %)	55	- 47	$\chi^2=\frac{9587}{220}$
	Secondary	79(22.57%)	55	24	$\chi^2=43.6$
	Primary	123(35.14%)	55	68	
	Non formal	10(28.57%)	55	-55	
Occupation	**Observed Value (O)**	**Expected Value (E)**	**(O – E)**	**$(O - E)^2$**	**Chi-square ($X = \frac{E(O-E)^2}{E}$**
	Self-employed	99(28.29%)	33 (14.86%)	-66	$\chi^2=\frac{8833}{99}$
	Un-employed	99(28.29 %)	33 (14.86%)	11	$\chi^2=89.2$
	Employed	22(6.29 %)	33 (14.86%)	-66	
	Observed Value (O)	**Expected Value (E)**	**(O – E)**	**$(O - E)^2$**	
Age in years	18-27	54(15.43%)	40	1600	$\chi^2=\frac{9242}{56}$
	28-37	62(17.71%)	48	2304	$\chi^2=165$
	38-47	87(24.86%)	73	5329	
	Above 47	17(4.86 %)	3	9	

Study results revealed that out of 52% females, 32.28 % of them claimed to have suffered typhoid in one time or another in their life time. This is an indication that females were at risk with equal chances of contracting the disease and therefore equally vulnerable

$(\chi^2=\frac{9587}{220}.$

$\chi^2=43.6$ (Table 4.3)

The study also revealed that those with low level of education suffered from typhoid more than those who had attained a higher level of education and therefore education played a key role in the prevalence of typhoid among pregnant women from the study. In table 4.3 it is shown that the higher the level of education (primary, secondary and college levels) the more the typhoid prevalence decreased among respectively ((Table 4.3):

$\chi^2=\frac{8833}{99}$

$\chi^2=89.2$

In table 4.3 is indicated that self-employed and un-employed people had suffered from typhoid fever in one time or another in their lifetime for both categories were above 65% ($\chi2=5.168$ df=2 p=0.075). The findings presented in table 4.3 showed that age is one of the determinants of typhoid prevalence and its patterns. The majority (73.1%) aged 38-47years suffered from typhoid than others in other age brackets in lifetime $\chi^2=\frac{9242}{56}$

$\chi^2=165$

3. 2 Methods used to diagnose Typhoid

In General hospital, Azare, it was revealed during the focus discussion group session that the only method in use for typhoid diagnosis is clinical diagnosis. The medical staff also disclosed that this method was not reliable. This method was used due to lack of a medical laboratory in the hospital. As a result, residents of Azare District used to carry out self-diagnosis based on experience. The self-diagnosis method was not reliable due to the fact that the respondents were not trained on this and that the method was not reliable. After the self-diagnosis, some residents bought drugs from the counter without a prescription from a trained clinician. Therefore,

much of the data of self-diagnostic method is not captured in the health facility.
The tests used were Widal test which involved blood testing for typhoid pathogenic organisms. It was revealed that even when reagents are available some of the residents of study area do not afford the cost and they go back home without being diagnosed in the laboratory. This method gives results which need sometimes to be confirmed through a culture test which is done through stool.

3.3 Risk Factors Associated with Occurrence of Typhoid:

Table 4: Comparison of Water sources; availability; storage and food eating habits and occurrence of typhoid

Independent variables		Number of Typhoid Cases	No claim of Suffering	n= 350	p-value
Water sources	Tap	45(12.86%)	118(33.71%)	163	$\chi2$= 2.431 df=3 p=0.488
	Spring	10(2.90%)	3(0.86%)	13	
	Well	110(31.43%)	59(16.86%)	169	
	Roof	2(0.57%)	3(0.26%)	5	
	Total	**220**	**130**	**350**	
Availability of treated water at household level	Treated	85(24.28%)	78(22.28%)	163	$\chi2$=2.622 df=1, p=0.103
	Not treated	135(38.57%)	52(14.86%)	187	
	Total	**220**	**130**	**35**	
Water Storage Facilities	Did have	129(36.86%)	101(28.86%)	230	$\chi2$=2.431 df=3 p=0.488
	Did not	91(26%)	29(8.29%)	120	
	Not	111(31.71%)	106(30.29%)	217	
Road side Food	Eat	121(57.6%)	89(42.4%)	121(57.6%)	$\chi2$ = 4.472 df =1 p= 0.034
	Didn't Eat	99(70.7%)	41(29.3%)	140	

Results in table 4 showed that 54.6% of the respondents obtained drinking water from the tap, while 39.6% from the well, 4.6% got water from the river while 1.7% from the roof harvesting. These results indicated that there were more than one sources of water in the study area with the tap water being the most used in the area followed by well, tap and the spring catchment respectively. ($\chi2$=2.431 df= 3 p= 0.488). In the study area, there are many leaky and perforated waste pipes and as such do possibly contaminate the surface water sources. The solid wastes are scattered in many parts without being collected for disposal (Muhammed, 2009).
Those without treated drinking water at home suffered more as reported in table 4. This indicated that clean water was available at home for drinking ($\chi2$ = 2.622 df= 1 p= 0.103). Table 4 shows that all water sources in the study area were near the household. This shows that water was accessible and hence available for many uses in the study area. The resident did not take a lot of time in fetching the water from long distances ($\chi2$ =1.386 df =3 p= 0.709). Water storage increased the availability of water at home level. As in table 4.4 below, it is shown that those with storage facilities and suffered from typhoid were fewer than those without ($\chi2$ = 2.431 df = 3 p = 0.488) (Table 4). The results in table 4 showed that eating kiosk prepared foods was a risk factor to suffering from typhoid infection. Those who ate from such food outlets suffered from typhoid more than those who did not, as indicated in table 4 ($\chi2$ = 4.472 df =1 p= 0.034).

Table 5: Human Waste Disposal, Solid Wastes Disposal, Usage of Pit Latrines, State of Drainage Systems, Nature of the Houses in Relation to Occurrence of Typhoid Fever.

Independent Variables		Claim of suffering	No claim of suffering	Total	p-value
Human wastes disposal	**Disposed**	134(38.28%)	83(23.71%)	217	**$\chi2$=1.129 df=1 p=0.288**
	Not disposed	86(24.57%)	47(13.43%)	133	
	Total	**220**	**130**	**350**	
Solid wastes disposal	**Disposed**	109(31.14%)	24(6.86%)	133	**$\chi2$= 0.529 df=1 p=0.467**
	Not disposed	111(31.71%)	106(30.29%)	217	
	Total	**220**	**130**	**350**	
Drainage systems	**Leaking**	120(34.29%)	51(14.57%)	171	**$\chi2$ = 8.028 df =3 p= 0.045**
	Water pollution	35(10%)	22(6.28%)	57	
	Smell	65(18.57%)	57(16.29%)	122	
	Total	**220**	**130**	**350**	
Washing hands after toilets	**Practiced**	100(28.57%)	40(11.43%)	140	**$\chi2$= 0.587 df=1 p= 0.444**
	Not practiced	120(34.29%)	90(25.71%)	110	
	Total	**220**	**130**	**350**	
Type of housing	**Permanent**	20(5.71%)	10(2.86%)	30	**$\chi2$=6.202** df=2 **p=0.045**
	Semi-permanent	13(3.71%)	20(5.71%)	33	
	Temporary	187(53.43%)	100(28.57%)	287	
	Total	**220**	**130**	**350**	

Eighty three percent (83%) of the residents disposed their human wastes in a pit latrine while 17% did not. Table 5 shows that those who disposed of wastes suffered more from typhoid. It was observed that, the latrines were in deplorable state of repair. Those who disposed of their wastes in a latrine were almost five times more than those who did not, yet they suffered from typhoid as well ($\chi2$=1.129 df=1 p=0.288) (Table 5). In this study 38% of the solid wastes other than human wastes, were disposed of compared to 62% which were not. The results show that 31.14% of those who disposed wastes suffered from typhoid and 30.29% did not dispose of the wastes, yet they did not suffer typhoid ($\chi2$=1.529 df= 1 p=0.467) (Table 5). The findings indicated that 60% of the pit latrines were not in use because they were filled compared to 40% which were in use.

During usage of a pit latrine one can easily contaminate his hands with germs that causes typhoid ($\chi2$= 0.587 df=1 p = 0.444) (Table 5). The finding of this study revealed that 47.1% of drainage system was leaking, 36% were smelly and 16.9% contaminated some water sources. During rainy seasons the situation was worse as observed because of the water stagnation and offensive smell accelerated by the season. The surface water is contaminated by the water runways and if that water was used for drinking without any form of treatment, it becomes a prime suspect of the cause of the typhoid fever.

Those whose drainage leaked, suffered from typhoid most ($\chi2$=8.028, df =3 p= 0.045) (Table 5). Those who washed their hands after visiting a toilet did not suffer much as those who did not wash hands after going to the toilet ($\chi2$= 0.587 df=1 p= 0.444). It was evident from the study that majority (78.29%) lived in temporary houses, 15.14% in semi-permanent houses while (6.57%) lived in permanent houses. Typhoid episodes were more to those who lived in temporary houses as seen in table 5 ($\chi2$ = 6.202 df = 2 p= 0.045). The prevalence of typhoid fever was 63% despite water and sanitation preventive intervention measures being in place. This shows that the preventive measures are ineffective for they had failed to reduce the occurrence of typhoid fever hence its prevalence among pregnant women. It is also possible that other factors would have played a role in transmission of typhoid other than that water and sanitation factors alone. Table 6 shows the measures in place in the area under study.

Table 6: Showing Eating Habits, Food Handling, Education with Cleaning Exercises and Occurrence of Typhoid

Interventions Measures	**Response**	**Claim Suffered**	**Not claim suffered**	**Total (n=350)**	**p-value**
Hand washing before eating	Done	7 (2%)	3(0.86%)	10	$\chi2$=2.423
	Not done	213(60.86%)	127(36.29%)	340	df=3
	Total	**220**	**130**	**350**	p=0.489
Improvement in food premises and handling	Prosecution done	50(14.29%)	38(10.86%)	88	$\chi2$ = 5.211
	Health education	104(29.71%)	59 (16.86%)	163	df=3
	Inspections done	66(18.86%)	33(9.4%)	99	p=0.157
	Total	**220**	**130**	**350**	
Health education done	Carried out	2(0.57%)	7(2%)	341	$\chi2$=4.025
	Not done	218(62.29%)	123(35.14%)	9	df=3
	Total	**220**	**130**	**350**	p=0.045

The results from this study indicated that 69.7% of the respondents practiced hand washing, 30.3% did not. The respondents stated that they did not wash their hands due to either lack of enough water, cost of water, had never suffered from typhoid before and due to eager for food. Those who washed their hands did not suffer from typhoid as much as those who did not as shown in table 6 ($\chi2$=2.423 df=3 p=0.489).

In this study 56.6% suggested that health educating the food handlers on hygienic practices was the way forward towards improving the food premises, 24.3% suggested that there is need of public health officers' involvement, 19.1% felt that prosecution of the food handlers was the solution ($\chi2$ = 5.211 df=3 p=0.157). The results revealed that 98% had heard about typhoid fever through a health education session and the rest 2% had not. These results showed that health education was being carried out immensely as a typhoid preventive measure. ($\chi2$=4.025 df=1 p=0.045).

4.0 Conclusions

In conclusion, this study reveals the prevalence of 63% of typhoid. It was evidenced from the study results that treated water at household level was available at 53% in household level. Low education level ($\chi2$ =9.835 df=3 p=0.020) were some of the causative factors toward contracting typhoid infection, and leaking drainage systems was associated with prevalence of typhoid ($\chi2$=8.028, df=3, p= 0.045). It is clear that typhoid fever is still a serious health problem, therefore, it is recommended that the public should be made aware of the modes of transmission, and the need for proper hygiene and

sanitation should be emphasized. Since both gender are susceptible to infection by typhoid fever, there is need to target both males and females by public health authorities in control of typhoid fever. There is also the need to carry out a longitudinal study on the temporal variations/seasonality of *S. typhi* transmissions in this area.

Declarations

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Ethics approval and consent to participate
Permission to conduct the study was obtained from relevant authorities. Informed consent was obtained from the respondents after providing them with all the necessary details about this study. Confidentiality of the data collected was upheld throughout this study.

Consent for publication
All authors have read and consented to the submission of the manuscript.

Availability of data and material
Not Applicable.

Competing interests
All authors declare no competing interests.

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