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The Prevalence of Malaria and Typhoid among Undergraduates in Nigeria

(A Case Study Of Ekiti State University Students)

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Abstract

This study analysis the prevalence of Malaria and Typhoid among Nigerian Undergraduates especially in Ekiti State University, Ado-Ekiti, Nigeria between 2008 and 2017. The data was collected from Ekiti State University health center which is a secondary data. Using Chi-square was used as the estimating techniques, and from it, the Study deduces that females are liable to have malaria more than males at both point of age range. Though at Age (less than 20) there is a slight difference of 0.08 and also with the aid of the cross tabulation it was gotten that the expected count and the actual count for the females are greater than that of the male which support the interpretations gotten from the bar chat on malaria. The study will encourage the government of Ekiti State to swing into actions by creating various measures to prevent or reduce the prevalence and outbreak of malaria and typhoid among Ekiti State University students and in Ekiti State as a whole.

Keywords; Malaria, Typhoid, Undergraduates

1.0 Introduction

Malaria and Typhoid infections have been associated with increasing poverty, deterioration in sanitation, poor public health services, compounded by increasing drug resistance of the two etiologic agents. Owing to this high poverty rate, a large number of residents live in houses where there are no clean, safe drinking water and poor or no drainage system. Also, because both malaria and typhoid fever share similar predisposing factors (such as poverty, poor sanitation and public health services etc.), and present in the same way, individuals in areas endemic for these infections are being put at a substantial risk of contracting both concurrently. Malaria originates from Medieval Italian: mala aria meaning "bad air"; the disease was formerly called ague or marsh fever due to its association with swamps and marshland (Reiter, 1999). It is a mosquito-borne infectious disease that affects man and other animals and is caused by parasitic protozoans belonging to the Plasmodium species (World Health Organization, 2014).

In humans, malaria is caused by P. falciparum, P. malariae, P. ovale, P. vivax and P. knowlesi (Collins, 2012). P. falciparum traditionally accounts for the majority of deaths, recent evidence suggests that P. vivax malaria is associated with potentially life-threatening conditions about as often as with a diagnosis of P. falciparum infection (Baird, 2013). Malaria infection develops via two phases: one that involves the liver (exoerythrocytic phase), and one that involves red blood cells or erythrocytes (erythrocytic phase). When an infected mosquito pierces a person's skin to take a blood meal, sporozoites in the mosquito's saliva enter the bloodstream and migrate to the liver where they infect hepatocytes, multiplying asexually and asymptomatically for a period of 8–30 days (Bledose, 2005). Mosquito parasite is therefore relatively protected from attack by the body's immune system because for most of its human life cycle it resides within the liver and blood cells and is relatively invisible to immune surveillance.

The World Health Organization (WHO) estimates that in 2015 there were 214 million new cases of malaria resulting in 438,000 deaths (World Health Organization, 2014). Others have estimated the number of cases at between 350 and 550 million for falciparum malaria. According to Layne (2007), malaria is presently endemic in a broad band around the equator, in areas of the Americas, many parts of Asia, and much of Africa; in Sub-Saharan Africa, 85–90% of malaria fatalities occur. The bacterium that causes typhoid fever may be spread through poor hygiene habits and public sanitation conditions, and sometimes also by flying insects feeding on feces. Public education campaigns encouraging people to wash their hands after defecating and before handling food are an important component in controlling spread of the disease. Sanitation and hygiene are important to prevent typhoid. Typhoid does not affect animals other than humans. Typhoid can only spread in environments where human feces or urine are able to come into contact with food or drinking water. Careful food preparation and washing of hands are crucial to prevent typhoid. Changes in haematological parameters are likely to be influenced by any disease condition including endemic diseases, such as malaria and typhoid fever, which can affect human health with various clinical presentations. Haematological changes are some of the most common complications in these infections and they play a major role in their pathogenesis.

These changes involve the major cell types such as red blood cells, leucocytes and thrombocytes. The similarities in the predisposing factors to both malaria and typhoid fever infections and the similar signs and symptoms presented by both infections have propelled researchers into investigating the co-infection of these diseases. Apparently, this present study may be useful to individuals, medical practitioners, government policy makers and researchers. Typhoid and malaria fever are two leading febrile illness affecting humans, especially in sub-Saharan Africa. They remain the diseases of major public health importance and the cause of morbidity and mortality. Both diseases are common in many countries of the world where poor sanitary habit, poverty and ignorance exist. Typhoid fever is a systemic bacterial infection caused by Salmonella enterica serotype Typhi (S. typhi). It is characterized by acute illness. The first non-specific manifestations include fever, headache, abdominal pain and vomiting. On the other hand, malaria is a protozoan infection caused by Plasmodium species. It is transmitted by female Anopheles mosquito and characterized by intermittent fever, headache, abdominal pain, vomiting, and weakness.

Typhoid is a common worldwide bacterial disease, transmitted by the ingestion of food or water contaminated with the feces of an infected person, which contains the bacterium *Salmonella typhi* bacteria. The bacterium lives in the intestines and bloodstream of humans. There are about 33 million cases of typhoid annually resulting in 216,000 deaths in endemic areas. The World Health Organization (WHO) identifies typhoid as a serious public health problem with high incidence on children and young adults. Typhoid fever also has a very high social and economic impact because of the hospitalization of patients with acute disease and the complications and loss of income during the duration of the clinical illness. Typhoid is spread by the fecal-oral route and closely associated with poor hygiene; lack of clean, safe drinking water; and poor sanitation. The disease is exclusively transmitted through food and water contaminated by the urine and feces of patients and carriers. Polluted water is the most common source of typhoid transmission.

2.0 Signs and Symptoms of Malaria and Typhoid

The causes of both diseases are totally different. Whereas mosquitoes are responsible for malaria, typhoid is caused by the *salmonella typhi* bacteria. However, there is one common factor between the two. *Salmonella typhi* is known to breed in dirty water and unhealthy conditions which are prevalent in developing third world nations. Coincidentally, most of these countries lie in the tropical regions which are ideal conditions for the breeding of mosquitoes as well.

The symptoms of both these diseases also do vary to a certain extent. Mostly, malaria infection will manifest itself through chills, fevers, nausea, vomiting and sometimes even diarrhea. However, the symptoms of typhoid may be different at various stages of the disease. The initial stages of the disease are manifested through stomach pain, skin rashes, extreme muscle weakness and fatigue along with high fever. As the illness progresses, patients may witness stomach distension and further weight loss. The third and the final stage can see complete lack of body motion. Sometimes, the patient might also enter a delirious phase. Most often, the diagnosis of malaria is considered to be far simpler than that of typhoid. A simple blood test is enough to decide whether the person is suffering from malarial infection or not. However, in order to detect the presence of *salmonella typhi*, doctors have to test the blood, stool, urine as well as bone marrow of the patient in question. The samples need to be stored in a controlled environment for about 48-72 hours, before the presence of *salmonella typhi* can be detected.

Prevention and Control Strategies; Contaminated water and food are important vehicles of transmission of typhoid fever. Historical surveillance data suggest that enteric fever was endemic in Western Europe and North America and that rate declined in parallel with the introduction of treatment of municipal water, pasteurization of dairy products, and the exclusion of human feces from food production. Today enteric fever prevention focuses on improving sanitation, ensuring the safety of food and water supplies, identification and management of chronic carriers of *S*. Typhi, and the use of typhoid vaccines to reduce the susceptibility of hosts to infection.

3.0 Statement of Problem

Developing countries are still having a chunk of their national budget being used for malaria eradication. Studies according to (GNA, 2010) have established the fact that malaria affects mostly the poor, impacting negatively on their socio-economic lifestyle. The burden of malaria is therefore greatest among the world's poorest countries (Worrall, 2003). The disease in Nigeria has impoverished most of the poor communities. The adult population is mostly affected reducing working hours and lowering productivity and economic livelihood impacting substantially on the national gross domestic product, (Asante and Asenso-Okyere, 2003).

Malaria and typhoid has become very common and is increasing in an uncontrollable way throughout Nigeria and other countries, due to the bite of the female anopheles' mosquitoes which carries plasmodium. A large number of staff and students live off-campus (cannot be accommodated on campus) because of limited space. Most of them live in houses where there are no clean, safe drinking water and poor or no drainage system. In addition, shellfish taken from sewage contaminated beds, unwashed vegetables fertilized with night-soil and eaten raw, drinking sachet water of questionable hygienic quality especially on a journey could expose them to infection, contaminated milk and milk products have been shown to be a ready source of infection.

The overall aim of this study is to determine the prevalence of malaria and typhoid in students of Ekiti State University (EKSU) Ado-Ekiti, Nigeria by collecting data from the School Health Center as a case study. The study seeks to determine the prevalence of malaria fever and typhoid in the University community using Chi-square tests. Determine the gender mostly affected and the age range. And finally determine the most common disease (i.e. malaria and typhoid) among the students. This research work is very relevant in several ways to communities, personnel, School authorities, hospitals, and government. The work will expose the prevalence of malaria and typhoid and enlighten the school authorities and students on the prevalence of malaria and typhoid among University Students in Ekiti state. Also, it will give proper measure in preventing the diseases. This study will also enlighten students on how the parasite plasmodium invades the host body the transmission by the vector mosquito.

4.0 Research Methodology

Sampling and Sampling Technique

The study employed both probability and non-probability sampling techniques. The purposive sampling techniques were adopted in sampling research participants for the study. The population of interest comprised patients who accessed health care at the Ekiti State University Health center with symptoms of fever. The patients were screened by physicians, for the clinical symptom of malaria and typhoid fever. The patients after purposely identified as having symptom of Malaria or Typhoid were recruited randomly.

4.1 Chi-Square Test of Independence

The chi-square (χ^2) test of independence is used to determine if there is a significant relationship between two nominal (categorical) variables. The frequency of each category for one nominal variable is compared across the categories of the second nominal variable. The table can be displayed in a contingency table where each row represents a category for one variable and each column represents a category for the other variable.

Calculating the chi-square independence we have;

$$\chi^2 = \sum_{i=1}^{r}\sum_{j=1}^{c}\frac{\left(O_{ij} - E_{ij}\right)^2}{E_{ij}}$$

χ^2 = Chi-square test of independence

O_{ij} = Observed value of two nominal variables

E_{ij} = Expected value of two nominal variables

Hypothesis

Null hypothesis H_0: there is a relationship between the two variables.

Alternative hypothesis H_1: there is no relationship between the two variables.

Hypothesis testing: The test statistics is computed and compared to a critical value. The critical value for the chi-square statistic is determined by the level of significance (typically 0.05) and the degree of freedom.

The degree of freedom is calculated by using the following formula:

df = (r – 1)(c – 1)

df = Degree of freedom

r = number of rows

c = number of columns

5.0 Data Analysis

The data was collected from Ekiti State University Health Center for a period of 10 years (2008 to 2017). It indicates F = female, M = male, Age (F) < 20 = the age range of female less than 20years, Age (F) $\geq$ 20 = the age range of female greater or equals to 20years, Age (M) < 20 = the age range of male less than 20years, Age (M) $\geq$ 20 = the age range of male greater or equals to 20years.

Table 1; DATA SUMMARY

Year	F	M	Malaria	Age(F)		Age(M)	
				<20	≥20	<20	≥20
2008	388	575	963	176	212	370	205
2009	488	444	932	255	233	201	243
2010	451	416	867	206	245	204	212
2011	405	453	858	192	213	261	192
2012	411	430	841	206	205	219	211
2013	386	378	764	181	205	184	194
2014	385	362	747	182	203	172	190
2015	501	484	985	245	256	229	255
2016	503	500	1003	249	254	260	240
2017	470	478	948	236	234	232	246

Table 2, ANALYSIS ON TYPHOID

Year	F	M	Typhoid	Age(F)		Age(M)	
				<20	≥20	<20	≥20
2008	84	66	150	34	50	25	41
2009	45	40	85	18	27	16	24
2010	31	23	54	11	20	11	12
2011	32	30	62	15	17	12	18
2012	32	21	53	15	17	9	12
2013	27	30	57	15	12	13	17
2014	30	26	56	13	17	12	14
2015	33	23	56	13	20	12	11
2016	23	17	40	9	14	6	11
2017	24	15	39	10	14	5	10

Table 3; Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Age * Sex	8703	100.0%	0	0.0%	8703	100.0%

BAR CHART CONTAINING THE COUNT OF MALARIA ON GENDER BASED ON AGE

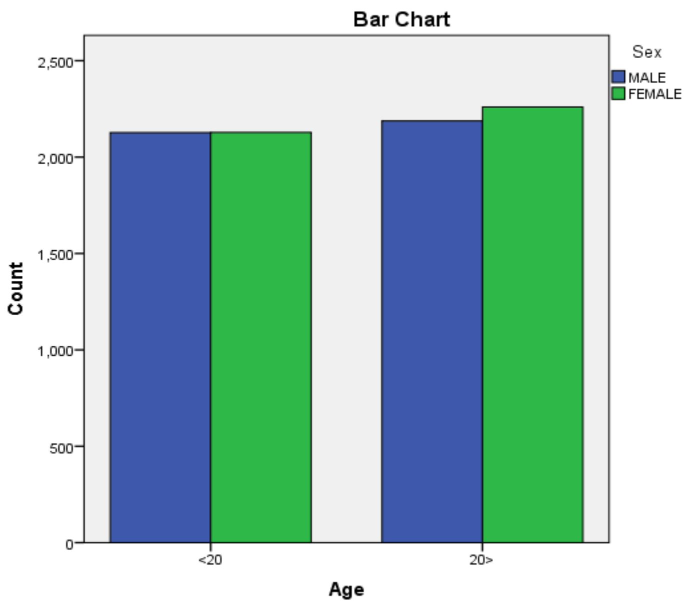

Fig. 1: Bar chart containing the count of malaria on gender based on age

Interpretation: From the bar chart above it is noticed that for Age (less than 20) for male with count 2127(50.0%) and female with count 2128(50.0%) are almost at equilibrium (i.e. they have almost the same count/value), and Age (20 and above) for female with count 2260(50.8%) is higher compared to that of the male with count 2188(49.2%) Which implies females with total count 4388(50.4%) has more reported cases of malaria than the male with total count 4315(49.6%).

Table 4; Age * sex Cross Tabulation

			Sex		Total
			Male	female	
Age	< 20	Count	2127	2128	4255
		Expected Count	2109.7	2145.3	4255.0
		% within age	50.0%	50.0%	100.0%
	≥ 20	Count	2188	2260	4448
		Expected Count	2205.3	2242.7	4448.0
		% within age	49.2%	50.8%	100.0%
Total		Count	4315	4388	8703
		Expected Count	4315.0	4388.0	8703.0
		% within age	49.6%	50.4%	100.0%

From the cross tabulation above it is gotten that the expected count of male that have malaria at Age (less than 20) is 2109.7 but the expected count of female who have malaria at Age (less than 20) is 2145.3 which is greater than the expected count of male. This implies that female at Age (less than 20) are more infected by malaria. While for Age 20 and above, the expected count of male that has malaria is 2205.3 but the expected count of female that have malaria at Age 20 and above is 2242.7 which is greater than the expected count of male. This implies that female at age 20 and above tends to have more malaria.

TEST OF SIGNIFICANCES

Table 5; Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	0.553[a]	1	0.457		
Continuity Correction	0.522	1	0.470		
Likelihood Ratio	0.553	1	0.457		
Fisher's Exact Test				0.466	0.235
Linear-by-Linear Association	0.553	1	0.457		
N of Valid Cases	8703				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 2109.65.
b. Computed only for a 2x2 table

TEST OF HYPOTHESIS

Hypothesis: Since ρ = 0.457 is greater than the significant level 0.05 we accept the null hypothesis H_0 and reject the alternative hypothesis H_1, i.e. there is no significant relationship between gender and age, they are independent of each other, $\chi^2(1, N = 8703) = 0.553$, $\rho = 0.457$
From the cross tabulation (Female 42.4% to male 41.6%), at Age (less than 20) female are liable to be affected by malaria more than the male while at Age 20 and above, male are liable to be affected by malaria more than the female (Male 58.4% to 57.6%).

ANALYSIS ON TYPHOID

Table 6; Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
AGE * SEX	652	100.0%	0	0.0%	652	100.0%

Figure 2; Bar chart containing the count of Typhoid on gender based on age

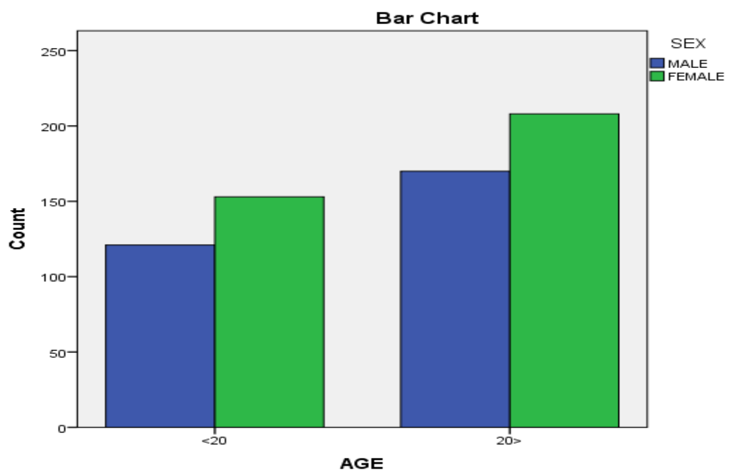

Fig 4: Bar chart containing the count of typhoid on gender based on age

Interpretation: From the bar chart above it is noticed that for Age (less than 20), female with count 153(55.8%) is higher than male with count 121(44.2%) and for Age 20 and above, female with count 208(55.0%) is also higher compared to the male with count 121(44.2%) which implies females with total count 361(55.4%) has more reported cases of typhoid than the male with total count 291(44.6%).

Table 7; AGE * SEX Cross-tabulation

			SEX		Total
			MALE	FEMALE	
AGE	<20	Count	121	153	274
		Expected Count	122.3	151.7	274.0
		% within AGE	44.2%	55.8%	100.0%
	≥ 20	Count	170	208	378
		Expected Count	168.7	209.3	378.0
		% within AGE	45.0%	55.0%	100.0%
Total		Count	291	361	652
		Expected Count	291.0	361.0	652.0
		% within AGE	44.6%	55.4%	100.0%

Interpretation

From the cross tabulation above it is gotten that the expected count of male that have malaria at Age (less than 20) is 122.3(44.2%) but the expected count of female who have malaria at Age (less than 20) is 151.7(55.8%) which is greater than the expected count of male. This implies that female at Age (less than 20) are more infected by malaria. While for Age 20 and above, the expected count of male that has malaria is 168.7(45.0%) but the

expected count of female that have malaria at Age 20 and above is 209.3(55.0%) which is greater than the expected count of male. This implies that female at age 20 and above tends to have more malaria.

Table 8; Test of Independence

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	0.042[a]	1	0.837		
Continuity Correction[b]	0.016	1	0.899		
Likelihood Ratio	0.042	1	0.837		
Fisher's Exact Test				0.873	0.450
Linear-by-Linear Association	0.042	1	0.837		
N of Valid Cases	652				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 122.29.

b. Computed only for a 2x2 table

TEST OF HYPOTHESIS

Hypothesis: Since ρ = 0.837 is greater than the significant level 0.05 we accept the null hypothesis H_0 and reject the alternative hypothesis H_1, i.e. there is no significant relationship between gender and age, they are independent of each other**,** $\chi^2(1, N = 652) = 0.042$, ρ = 0.837
From the cross tabulation (Female 55.8% to male 44.2%), at Age (less than 20) female are liable to be affected by typhoid more than the male at Age less than 20 (Female 55.8% to male 44.2%) while at age 20 and above, female are liable to be affected by typhoid more than the male (Female 55.0% to 45.0%).

SUMMARY AND CONCLUSION

From each of the calculations in chapter four we are able to deduce that females are liable to have malaria more than male at both point of age range though at Age (less than 20) there is a slight differences of 0.08 and also with the aid of the cross tabulation it was gotten that the expected count and the actual count for the female is greater than that of the male which support the interpretations gotten from the bar chat on malaria. For the independence and relationship at 0.05 level of significance, ρ > 0.05 which implies that there is no significant relationship between variables and they are independent. For typhoid, the same process was observed using bar chat and it was gotten that females tend to have typhoid compared to the male and also with the aid of cross tabulation it was gotten that females with total percentage 55.4% are prone to typhoid fever than males (44.6%). The test of independence and relationship for typhoid at 0.05 level of significance,

ρ = 0.873 which is greater than 0.05 reveals that there is no significant relationship between the variables and they are independent of each other.

The value of male and female from the bar chart and cross tabulation shows that female has a high tendency of having malaria compared to male at both age range and also for typhoid, female has a higher tendency of having typhoid compared to the male with wide different. According to the total counts of Malaria (8703) it shows that malaria is the most common disease amidst the student in Ekiti State University compared to that of typhoid (652) which has a lower number of effects on the students. Based on the summary and conclusion of the research work, the following recommendation is suggested to the State government and Ekiti State University management. Creating of necessary awareness on cleanliness and hygiene, Provision of necessary infrastructure; Laboratory equipment and Medical diagnostic equipment. Staff Recruitment to fill essential vacancies such; X-ray Technician, Laboratory Technician, Medical Doctors Nurses, Ambulance Driver, Hospital Assistant/Cleaners

REFERENCES

Breiman, RF, et al. (2012). Population-based incidence of typhoid fever in an urban informal settlement and a rural area in Kenya: implication for typhoid vaccine use in Africa. PLOS One 7: e29119.

Marks, F., et al. (2017). Incidence of invasive *Salmonella* disease in sub-Saharan Africa: a m multi-center population-based surveillance study. Lancet Global Health 5: 310–323.

Mogasale, V., Maskery, B., Ochiai, R. L, Lee, J.S, Mogasale, V.V., Ramani, E. KKim, Y. E., Park, J.K., Wierzba, T.F., (2014). Burden of typhoid fever in low-income and middle-income countries: a systematic literature-based update with risk-factor adjustment. Lancet Glob Health 2: e570–e580.

Antillón, M., Warren, J. L., Crawford, F.W., Weinberger, D.M., Kürüm, E., Pak, G G. D, Marks, F.V., Pitzer, V.E., (2017). The burden of typhoid fever in low-and middle-income c countries: a meta-regression, approach. PLoSNegl Trop Dis 11: e0005376.

World Health Organization (2008). Typhoid vaccines: WHO position paper. WklyEpidemiol Rec 83: 49–5

Talabi, H. A., (1994). Medical aspects of Typhoid. Niger postgrad Med J 1: 51–56.

Akinyemi, K.O, Smith, S.I, Oyefolu, A.O, Coker, A.O, (2005).Multidrug resistance in *Salmonella enterica* serovar Typhi isolated from patients with typhoid fever complications in Lagos, Nigeria. Public Health 119: 321–327.

Ameh IG, Opara WEK, (2004). Typhoid: a record of cases in Sokoto, Nigeria. Pak BiolSci 7: 1177–1180.

Akinyemi, K.O, Coker, A.O., Olukoya, O.K., Oyefolu, A.O, Amorighoye, E.P., Omonigbehin, E. O, (2000). Prevalence of multi-drug resistant *Salmonella typhi* among clinically diagnosed typhoid fever patients in Lagos, Nigeria. Naturforsch C 55: 489–493.

Fashae, K, Ogunsola, F, Aarestrup, F.M., Hendriksen, R.S, (2010).Antimicrobial susceptibility and serovars of *Salmonella* from chickens and humans in Ibadan, Nigeria Journal of Infectious Dev Ctries 4: 484–494.

Uyigue, P.O., Osadolor, H.B., (2011). Monitoring of enteric fever and diarrhoea- causing organisms in rural settings in Edo State, Nigeria. Am J C ClinPathol 138: A301.

Kingsley, O.C., Ifeanyi, A.O, Edet, A.E., Smart, O.C, (2013).Bacteriologic profile and antibiotic susceptibility pattern of suspected septic emic patients in Uyo, Nigeria. Res. Journal of Medical Science 7: 35–39.

Akinwusi, P. A., Komolafe, A.O., Olayemi, O.O., Adeomi, A. A., (2013) Communicable diseases-related sudden death in the 21st century in Nigeria. Infect drug resist 6: 125–132.

Obaro SK, et al. (2015). *Salmonella* bacteremia among children in central and northwest Nigeria, 2008–2015, Clin Infect Dis 61: S325–S331.

World Health Organization (2003). *Background Document: The Diagnosis, treatment and Prevention of Typhoid Fever* Available at: http://www.who.int/rpc/TFGuideWHO.pdf. Accessed June 1, 2016.

Adeleye, A.I., Adekosoye, A.I., (1993). Antimicrobial resistance pattern and p plasmids survey of *Salmonella* and *Shigella* isolated in Ibadan, Nigeria. East Africa Med J 70: 259–262.

Oboegbulam SI, Oguike JU, Gugnanai HC, 1995. Micro-biological studies on cases diagnosed as typhoid/enteric fever in south-east, Nigeria. J Commun Dis 27:97 100.

Feasey NA, Dougan G, Kingsley RA, Heyderman RS, Gordon MA, 2012. Invasive non-t typhoidal *Salmonella* disease: an emerging and neglected tropical disease in Africa. Lancet 379: 2489–2499.

Steele DA, Burgess DC, Diaz Z, Carey ME, Zaidi KMA, 2016.Challenges and opportunities for typhoid fever control: a call for coordinated action. Clin infect Dis 62: S4–S 58. [PMC free article][PubMed]

Hall RP, van Koppen B, van Houweling E, 2014. The human right to water: the importance of domestic and productive water rights. SciEng Ethics 20: 849– 868.

Population Reference Bureau , 2016. *2016 World Population Data Sheet, With S special focus on Human Needs and Sustainable Resources* Available at: https://assets.prb.org/pdf16/prb-wpds2016-web-2016.pdf. Accessed A August 1, 2016.

National Bureau of Statistics, (2012). *Federal Republic of Nigeria. Annual A abstract of Statistics, 2012* A

International Monetary Fund (IMF) World Economic Outlook (WEO) , 2016. *Nigeria Data Portal; GDP by Country 1980–2015*. Washington, DC: International Monetary Fund.

Liu, L, Oza, S., Hogan, D., Perin, J., Rudan, I., Lawn, J.E., Cousens, S., Mathers, C, Black, R. E, (2015). Global, regional, and national causes of child m mortality in 2000– 13, with projections to inform post-2015 priorities: an updated systematic analysis. Lancet 385: 430–440

Obaro S, et al. (2011). Community acquired bacteremia in young children from central Nigeria—a pilot study. BMC Infect Dis 11: 137.

Cowan, S.T, Steel, S., (1993). Identification of family Entero-bacteriaceae Barrow, GI, Felthan, R. K .A, eds. *Manual for the Identification of Medical Bacteria*. Cambridge, United Kingdom: Cambridge University Press.