



ISSN NO. 2320-5407

Journal homepage: <http://www.journalijar.com>

INTERNATIONAL JOURNAL
OF ADVANCED RESEARCH

RESEARCH ARTICLE

Retrospective and Cross-Sectional Studies of Typhoid Fever in Pregnant Women in a Community in Central Nigeria

* Reuben, C. Rine¹, Hassan, Suleiman C.² and Jatau, A. Geoffrey³

1. Department of Science Laboratory Technology, School of Science and Technology, Nasarawa State Polytechnic, P.M.B 109, Lafia, Nasarawa State, Nigeria

2. Department of Biological Sciences, School of Natural Sciences, Federal University of Technology, Minna, Nigeria.

3. Department of Veterinary Public Health and Preventive Medicine, Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria, Nigeria.

Manuscript Info

Manuscript History:

Received: 27 April 2013
Final Accepted: 10 May 2013
Published Online: May 2013

Key words:

Typhoid fever,
Pregnancy,
Health and hygiene.

Abstract

Typhoid fever remains a major global health problem. *Salmonella* Typhi may be a cause of significant morbidity and mortality in both the mother and foetus in developing countries, where sanitation facilities, personal and food hygiene are inadequate. Thus, the present work was a retrospective and cross-sectional study of *Salmonella* infection among pregnant women in Shabu community of central Nigeria. Serological (Widal test) and bacteriological analyses were conducted and compared. The results obtained showed that 44 (88%) of the subjects were seropositive for typhoid fever, whereas 33 (66%) were positive based on bacteriological technique. Subjects between age groups; <19 and 30-40 years old had the highest prevalence of 100%. There was no statistically significant difference ($P>0.05$) between the prevalence of typhoid fever among the various age groups of the pregnant women examined. Retrospective survey also showed a high prevalence rate of 63%, with subjects belonging to the age group: 20 - 30 years old with the highest rate of infection (92%). Pregnancy makes the host more vulnerable to typhoid fever by affecting the physiology of pivotal organs, as such early and prompts diagnosis so as to avoid the further materno-foetal complications is of great importance.

Copy Right, IJAR, 2013., All rights reserved.

Introduction

Typhoid fever (enteric fever) caused by *Salmonella* Typhi is an endemic disease in the tropic and sub-tropic and has become a major public health problem in developing countries of the world with an estimated annual incidence of 540 per 100,000. The annual incidence of typhoid is estimated to be about 17 million cases worldwide (WHO, 2008). It is often encountered in tropical countries including Nigeria where they constitute serious sources of morbidities and mortalities (Ibekwe *et al.*, 2008). Typhoid and paratyphoid fevers are infections caused by bacteria,

which are transmitted from faeces to ingestion. Clean water, hygiene and good sanitation prevent the spread of typhoid and paratyphoid. Contaminated water is one of the pathways of transmission of the disease (WHO, 2008).

The distribution pattern of the infections seems uncertain in Nigeria and appears to show geographical variation. Some studies found that enteric fevers are more prevalent in males than in females (Kam, 1996; Okome-Nkoumou *et al.*, 2000; Akinyemi *et al.*, 2005), but Zailani *et al.* (2004) found no influence of age, sex and social class on the distribution pattern of *S. Typhi*/Paratyphi in Ile-Ife, south western Nigeria. In Nigeria, enteric fevers caused by *S. Typhi* and *S. Paratyphi* are not only endemic (Tanyigna *et al.*, 1999) but constitute a great

*Corresponding author:

kalomovaah@yahoo.com, matappi@yahoo.com

socio-medical problem (Zailani *et al.*, 2000), being responsible for many cases of pyrexia of unknown origin (Akinyemi *et al.*, 2008), high morbidity and mortality (Ekenze *et al.*, 2008; Nasir *et al.*, 2008; and Effa and Bakirwa, 2008).

Pregnancy is the period of intense biological transformation as almost from the moment of conception, it is the mother and her newborn, which are susceptible to various kinds of diseases. Pregnancy does have deleterious effect on the outcome of infections such as leishmaniasis, malaria, toxoplasmosis, listeriosis and typhoid (Pejic-Karapetrovic *et al.*, 2007; Hedriana *et al.*, 1995). *Salmonella* species infects a variety of hosts and causes broad spectrum of diseases, ranging from acute self-limiting diarrhoea to bacteraemia and enteric fevers (Simango *et al.*, 2000; Rishi *et al.*, 2002).

The incidence of typhoid in endemic areas is typically considered to be low in the first few years of life, peaking in school-aged children and young adults and then falling in middle age (Hatta *et al.*, 2009). The high risk populations for *Salmonella* infections include young, elderly, pregnant woman, immune compromised and HIV infected individuals [Van der Klooster *et al.*, 1997; Doffinger *et al.*, 2005]. Moreover, reports pertaining to typhoid fever during pregnancy are very few but have shown to cause serious maternal infection, with transplacental spread to the foetus (Ault *et al.*, 1993). Complications in pregnancy due to *Salmonella* infections include endomyometritis, salpingitis, chorioamnionitis, transplacental infection of the foetus, septic abortion, neonatal septicaemia, and meningitis, and few reported cases of life-threatening septicemia in the mother (Pejic-Karapetrovic *et al.*, 2007).

In Shabu community of central Nigeria, inadequate water supplies is a serious socio-economic problem that has caused the inhabitants to resort to untreated well water and polluted stream water for domestic water supplies. In the study area, diagnostic laboratory investigations frequently report significant typhoid and paratyphoid antibody titres ($>1/160$) in pregnant women seeking medical attention for feverish conditions; yet epidemiological data on the distribution of the disease in the area seems lacking. This study examined the status of typhoid fever amongst pregnant women from 2012, and also determined the current prevalence of the infection.

Material and Methods

Study Area

This study was conducted in primary health care centre in Shabu community of Lafia Local Government Area of Nasarawa State, central Nigeria.

Shabu is a suburban area of the capital city of the State; Lafia. Lafia lies between longitudes $08^{\circ} 30'$ East and latitudes $08^{\circ} 31'$ North. It is located in the North-Central Nigeria, and is generally very warm and humid with dry and raining seasons. The dry season lasts from November to March, characterized by cold, dry winds in December and January and high temperatures in February and March. The raining season lasts from April to October and is characterized by heavy rains with subsequent floating of banks of rivers, streams, ponds and ditches. Lafia is transverse by streams, rivers, ponds and ditches which constitute the major sources of water supply to the various communities in the area.

Wells, boreholes and rivers formed the major sources of drinking water, with indiscriminate refuse dumped around the residential buildings.

Study Population and Sample Collection

This study was conducted on pregnant women that came for ante-natal care at Shabu primary health care centre with suspected cases of typhoid fever between the months of January to March, 2013. Blood and stool samples were collected using standard procedures as described by Talabi (1994) and Cheesbrough (2000). Previous records on typhoid fever in pregnancy between January to December, 2012 was also obtained. A structured questionnaire was also given to each respondent.

Bacteriological Analysis

Stool samples were inoculated into *Salmonella*-Shigella Agar (SSA) by streaking method after which the plates were incubated at 37°C for 24 hours. Isolates from the primary cultures were sub-cultured into fresh SSA medium to obtain pure isolates. Pure isolates were inoculated in nutrient agar slant and stored at 5°C for further characterization and identification. Pure isolates obtained were identified and characterized based on colonial morphology, cultural characteristics, Gram stain reaction, and biochemical tests (Cheesbrough, 2000).

Serological Analysis (Widal test)

The Widal agglutination test commonly used in typhoid fever diagnosis was carried out in this work. The Widal agglutination technique was carried out according to the manufacturer's instruction using plasmatic reagents (Antec Laboratory Products, UK) containing *S. Typhi* O and H antigens, and *S. Paratyphi* A, B, and C antigens. Positive and negative serum controls were included, and a titer of $> 1/160$ indicated typhoid/paratyphoid fever.

RESULTS

Retrospective study of typhoid fever in pregnant women in 2012 at Shabu community, Nigeria revealed a seroprevalence of 63%. The highest prevalence was in March (100%), September (88%), June (83%), October and November (75%). The least prevalence occurred in April (0%), January (20%) and May (40%) respectively (Table 1). In relation to age distribution, respondents between age groups 20-30 years old had the highest prevalence of 92% (Table 2).

The seroprevalence and prevalence (by bacteriological analysis) of typhoid fever obtained from this study is 88% and 66% respectively (Tables 3 and 4).

The age and occupational distribution of typhoid fever from this study is shown in tables 5 and 6 respectively. Age group of <19 and 30-40 had the highest prevalence of 100%. More so, house wives also had the highest prevalence of 85% under occupational distribution.

Table 1. Serological Result of Typhoid Fever Among Pregnant Women from January to December, 2012 in Shabu Community, Nigeria.

Month	No. Examined	No. Positive	% Positive
January	5	1	20
February	6	3	50
March	2	2	100
April	1	0	0
May	5	2	40
June	6	5	83
July	3	2	67
August	9	6	67
September	8	7	88
October	8	6	75
November	8	6	75
December	9	4	44
Total	70	44	63

Table 2. Age Distribution of Typhoid Fever Among Pregnant Women Between January to December, 2012 in Shabu Community, Nigeria.

Age group	No. Tested	No. Positive	% Positive
<19	11	4	36
20-30	38	35	92
30-40	6	4	67
40>	15	3	20
Total	70	44	63

Table 3. Seroprevalence of Typhoid Fever Among Pregnant Women in Shabu Community, Nigeria.

Month	No. tested	No. Positive	% positive
January	28	21	75
February	7	7	100
March	15	14	93
Total	50	44	88

Table 4. Prevalence of Typhoid Fever Among Pregnant Women in Shabu Community, Nigeria, Based on Bacteriological Technique

Month	No. tested	No. Positive	% positive
January	28	19	68
February	7	4	57
March	15	10	67
Total	50	33	66

Table 5. Age Distribution of Seropositive Cases of Typhoid Fever Among Pregnant Women in Shabu Community, Nigeria.

Age group	No. Tested	No. Positive	% Positive
<19	6	6	100
20-30	27	22	81
30-40	14	14	100
40>	3	2	67
Total	50	33	66

Table 6. Prevalence of Typhoid Fever Among Pregnant Women with Respect to Occupation.

Occupation	No. tested	No. Positive	% positive
Civil servant	12	6	50
Business	9	5	55
Housewife	21	18	85
Students	3	1	33
Others	5	3	60
Total	50	33	66

DISCUSSION

Typhoid fever is still a disease of major importance and has continued to pose considerable health problems world-wide. It is caused by *Salmonella* contaminated foods and drinks, spares no age or sex and poses high risks to the pregnant women. Very few reports are available pertaining to typhoid fever in pregnancy and its effect on physiology of pivotal organs (Geeta *et al.*, 2012). The proportion of paratyphoid fever cases to typhoid fever cases may change due to urbanization and increased dependency on food purchased from street vendors (Roohi *et al.*, 2009).

In this study, 44(88%) of the 50(100%) blood samples gave positive widal reaction. This indicates a high prevalence of typhoid fever among pregnant women in the study area. This is in consonance with the results obtained by other researchers who recorded a very high prevalence rate of typhoid fever. (Okwoko *et al.*, 2010; Ebele *et al.*, 2010; Ishaleku *et al.*, 2011). The number of sera with significant typhoidal antibody titres indicates a high rate of typhoidal infection in the study area, and confirms the endemicity of enteric fever in many rural communities of developing nations (Akinyemi *et al.*, 2005). The bacteriological method used showed a lower prevalence of 66% (33) out of the total tested.

However, some of the subjects may not be having the active disease. This is in agreement with the observations of Outi *et al.* (1989) and Adeleke *et al.* (2006) in a similar study on Widal reaction as being more relevance in diagnosing post-infection complications when *S. typhi* may not be isolated. The Widal test reaction involves the use of bacterial suspensions of *S. typhi* and *S. paratyphi* 'A' and 'B', treated to retain only the 'O' and 'H' antigens. These antigens are employed to detect corresponding antibodies in the serum of a patient suspected of having typhoid fever. The IgM somatic O antibody appears first and represents the initial serologic response in acute typhoid fever, while the IgG flagella H antibody usually develops more slowly but persists for longer (Hoffman *et al.*, 1986; Washington and Henry, 1991; Olopoenia *et al.*, 2000). While bacteriological culture remains the gold standard for definitive diagnosis of typhoid fever, lack of its immediate availability during the acute febrile illness may limit its use. Clinicians usually elect to treat, rather than wait for blood or stool culture results, which may take 3-5 days. While there might be some merit in this approach, particularly in areas where culture facilities are either poor or not available, and where Widal testing is the norm, the use of rapid antigen screening directly from the stool of the suspected patient would be more useful (Olopoenia *et al.*, 2000).

Subjects within the age groups; <19 and 30-40 had the highest prevalence (100%) of typhoid fever. This might be because subjects within these age groups who perform most household chores and fetch water from polluted streams. They also handle foods that are liable to contamination.

In relation to occupation, house wives had the highest prevalence of 85.7% whereas students had the least prevalence of 33.3% respectively. House wives spent their entire time involved in domestic activity that serves as predisposing factors for *Salmonella* infection. Most of them are not educated; therefore they lack the basic knowledge of environmental, food and personal hygiene. Students that are enlightened had the least prevalence of typhoid fever from this study. They have little or more idea on sanitation and hygiene therefore; most of them carry out certain preventive and/or control measures to reduce their risk of getting exposed to infection.

The current study confirms the results obtained from the retrospective survey. High prevalence was recorded in 2012. This shows how endemic the disease is in the study area. With respect to the age groups, the present study concord with the 2012 data, except that subjects within age group 20-30 also had a high rate of infection. Increased cases of typhoidal antibodies in most age groups occurred more in wet season than in the dry season, and support the fact that microbial contamination of foods and water are more likely in the warmer seasons when bacterial pathogens multiply very rapidly (Ebele *et al.*, 2010).

Typhoid and paratyphoid fevers are associated with poor environmental and living conditions especially in economically poor countries (Okome-Nkoumou *et al.*, 2000). In the area studied, treated pipe-borne water is scarce and waste disposal systems are poor. Toilet facilities are usually absent and nearby bushes are used for defecation; while domestic wastes are indiscriminately disposed of in the surroundings. Water is more likely to be polluted in the wet season because the rains may wash debris and littered garbage into wells and streams used as domestic sources of water.

CONCLUSION

This present study indicated that the prevalence of typhoid fever in pregnant women in Shabu community, Lafia is quite high and alarming and can adversely influence materno-foetal outcome. These results may be useful to public health agencies in planning infectious disease prevention and control strategies. Treated sources of domestic and drinking water are very important in rural and suburban areas where these facilities are lacking. Enlightenment programs on basic rules of hygiene for such

communities should be encouraged so as to limit the transmission of faecal-orally transmitted infections

REFERENCES

- Adeleke, O.E., Adepoju, T. J. and Ojo, D. A. (2006).** Prevalence of typhoid fever and antibiotic susceptibility pattern of its causative agent *Salmonella typhi*. *Nigerian Journal of Microbiology*. 20(3): 1191-1197.
- Akinyemi, K. O., Smith, S. I., Bola, A., Oyefolu, O. and Coker, A. O. (2005).** Multidrug resistance in *Salmonella enterica* serovar typhi isolated from patients with typhoid fever complications in Lagos, Nigeria. *Journal of Public Health*. 119: 321-327.
- Ault, K. A., Kennedy, M., Seoud, M. A. and Reiss, R. (1996).** Maternal and neonatal infection with *Salmonella heidelberg* : a case report. *Infectious Diseases of Obstetrics and Gynaecology*. 1(1):46-48.
- Chattopadhyay, A., Robinson, N., Sandhu, J. K., Finlay, B. B., Sad, S. and Krishnan, L. (2010).** *Salmonella enterica* serovar Typhimurium-induced placental inflammation and not bacterial burden correlates with pathology and fatal maternal disease. *Journal of Infection and Immunology*. 78(5):2292-2301.
- Cheesbrough M. (2000).** District Laboratory Practice in Tropical Countries. Cambridge Low-Price Editions, Part 2. Pp. 132-199.
- Doffinger, R., Patel, S. and Kumararatne, D. S. (2005).** Human immunodeficiencies that predispose to intracellular bacterial infections. *Curr Opin Rheumatol*. 17(4):440-446.
- Ebele, U. U. and Christy, O. A. (2010).** Distribution Pattern Of *Salmonella* Typhoidal Serotypes In Benue State Central, Nigeria. *The Internet Journal of Epidemiology*. 8(1) DOI: 10.5580/aa3
- Effa, E. E. and Bukirwa, H. (2008).** Azithromycin for treating uncomplicated typhoid and paratyphoid fever (enteric fever). *Cochrane Database Syst Rev., PubMed*. (4)
- Ekenze, S. O., Okoro, P. E., Amah, C. C., Ezike, H. A. and Ikefuna, A. N. (2008).** Typhoid ileal perforation: analysis of morbidity and mortality in 89 children. *Niger Journal of Clinical Practice*. 11 (1):58-62
- Geeta, S., Ishita, V. and Lalita, S. (2012).** Effect of *Salmonella enteric* Serovar Typhimurium in Pregnant Mice: A Biochemical and Histopathological Study. *Gastroenterology Research*. 5 (3): 103-111.
- Hatta, M., Bakker, M., Beers, S. V., Abdoel, T. H., Smits, H. L. (2009).** Risk factors for clinical typhoid fever in villages in rural south-Sulawesi, Indonesia. *International Journal of Tropical Medicine*. 4 (3): 91-99
- Hedriana, H. L., Mitchell, J.L. and Williams, S. B. (1995).** *Salmonella* Typhi chorioamnionitis in a human immunodeficiency virus-infected pregnant woman. A case report. *Journal of Reproductive Medicine*. 40(2):157-159.
- Hoffman, S. L., Flanigan, T. P., Klancke, D., Leksana, B., Rockhill, R. C., Narain, H. P., Pulungsih, S., Sutomo, A. and Moechtra, M. A. (1986).** The Widal slide agglutination test, a valuable rapid diagnostic test in typhoid fever patients at the infectious disease hospital in Jakarta. *American Journal of Epidemiology*. 123: 869-875.
- Ibekwe, A. C., Okonko, I. O., Onunkwo, A. U., Donbraye, E., Babalola E. T. and Onoja, B. A. (2008).** Baseline *Salmonella agglutinin* titres in apparently healthy freshmen in Aw ka, South Eastern, Nigeria. *Sci. Res. Essay*, 3(9): 225-230.
- Ishaleku, D., Sar, T. T. and Houmsou, R. S. (2011).** *Salmonella typhi* infection in a tertiary institution in Nasarawa State, Nigeria. *Asian Pacific Journal of Tropical Medicine*. 4(2):137-9.
- Kam, K. M. (1996).** Serotype epidemiology and patterns of antibiotic susceptibilities of salmonellae isolated in Hong Kong 1983-93. *China Medical Journal*. 109(4):276-81.
- Nasir, A. A., Adeniran, J. O., Abdur-Rahman, L. O., Odi, T. O. and Omotayo, J. A. (2008).** Typhoid intestinal disease: 32 perforations in 1 patient. *Nigeria Postgraduate Medical Journal*. 15: 55 – 57
- Okonko, I. O., Soley, F. A., Eyarefe, O. D., Amusan, T. A., Abubakar, M. J., Adeyi, A. O., Ojezele, M. O. and Fadeyi, A. (2010).** Prevalence of *Salmonella typhi* among Patients in Abeokuta, South-Western Nigeria. *British Journal of Pharmacology and Toxicology*. 1(1): 6-14

Okome-Nkoumou, M., Ayo Nkana, E., Békale, J. and Kombila, M. (2000). Typhoid and paratyphoid fever in adults in the Internal Medicine Department at Libreville (Gabon). *Sante*. 10 (3):205-9

Olopoenia, L. A., King. A. I. and Santanga, F. A. (2000). Classic methods revisited. Widal agglutination test 100 years later: still plagued by controversy. *Postgraduate Medical Journal*. 76(892): 80-84.

Outi, I., Risto V. and Kaisa, G. (1989). Serological diagnosis of Salmonella infection by enzyme immunoassay. *Lancet*, pp: 1411-1414.

Pejcic-Karapetrovic, B., Gurnani, K., Russell, M. S., Finlay, B. B., Sad, S. and Krishnan L. (2007). Pregnancy impairs the innate immune resistance to Salmonella typhimurium leading to rapid fatal infection. *Journal of Immunology*. 179(9):6088-6096.

Rishi, P., Batra, N., Sood, S. and Tiwari, R. P. (2002). Modulatory effects of Salmonella LAP-LPS on murine macrophages. *Indian Journal of Medical Microbiology*. 20(4):187-193.

Roohi, A. and Rukhshan, K. (2009). Widal Agglutination Titre: A Rapid Serological Diagnosis of Typhoid Fever in Developing Countries. *Pakistan Journal of Physiology*. 5(1)

Simango, C. and Mbewe, C. Salmonella enteritidis diarrhoea in Harare, Zimbabwe. *Journal of Tropical Medicine and International Health*. 5(7):503-50.

Talabi, H.A, I. (1994). Medical aspect of typhoid. *The Nig. Post. Grad.Med.* 1. 1: 51-56.

Tanyigna, K. B., Ayeni, J. A., Okeke, E. N., Onah, J. A. and Bello, C. S. (1999). Antibody levels to Salmonella typhi and paratyphi in Nigerians. *East African Medical Journal*. 76 (11):623-5.

Van der Klooster, J. M. and Roelofs, H. J. (1997). Management of Salmonella infections during pregnancy and puerperium. *Netherlander Journal of Medicine*. 51(2):83-86.

Washington, J. A. II. and Henry, J. B. (1991). Medical Microbiology in Clinical Diagnosis and Management by Laboratory Methods. 18th Edn., WB Saunders, Philadelphia, PA, pp: 1055-1058.

WHO (2008). Prepared for World Water Day 2001. Reviewed by staff and experts from the cluster on Communicable Diseases (CDS) and the Water, Sanitation and Health unit (WSH).

Zailani, S. B., Oyelese, A. O. and Aboderin, A. O. (2003). Determination of baseline antibody titre to S. typhi/paratyphi in Ile-Ife, Nigeria. *African Journal of Medical Science*. 32 (3):307-10.

Zailani, S. B., Aboderin, A. O. and Onipede, A. O. (2004). Effect of socio-economic status, age and sex on antibody titre profile to Salmonella typhi/paratyphi in Ile-Ife, Nigeria. *Nigerian Journal of Medicine*. 13 (4):383-7.