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# Prevalence of Typhoid Infection among Antenatal Clients Attending Abdullahi Wase Specialist Hospital Kano, Nigeria

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***Abstract:*** *Typhoid infection is among the major prevalent disease in Nigeria due to various interconnected factors such as scarcity of social amenities for handling unwanted products, poor hygienic environment, absence of or insufficient clean water supply and abuse of antibiotics. The disease is a significant health concern in most developing countries especially Nigeria. The study was aimed to determine the prevalence of typhoid infection among antenatal clients at Abdullahi Wase Specialist Hospital Kano, Nigeria in relation to age, Level of education, occupation and location, assess factors associated with the infection and to provide useful information on its prevention and control measures. A hospital based cross sectional study from July to September 2023 was carried out in pregnant women aged 17-45 years at the Abdullahi Wase Specialist Hospital Kano. Serology (Widal test) and bacteriological analyses (stool culture) were conducted and compared among 250 participants. Questionnaires were administered to the correspondents to evaluate the level of knowledge, occupation and location. Results were finally presented on bar charts and tables. The results obtained showed that 175 (70.0%) of the participants were seropositive for typhoid fever, whereas 142 (56.6%) were positive based on bacteriological analysis. Participants between age groups; 26-35 years old had the highest prevalence rate of 115 (73.9%) and the least was found in the age 36-45 years where 42 out of 77 were positive with a prevalence of 54.5%. There was no statistically significant difference (P>0.05) between the prevalence of typhoid fever among the various age groups of the pregnant women analyzed. In relation to the level of education, participants with Non-formal education had the highest prevalence rate of typhoid infection 161 (64.4%). There was no statistically significant difference (P>0.05) between the prevalence of typhoid fever based on the educational level of the pregnant women investigated. Based on occupation of the participants, women who were involved in businesses recorded the highest prevalence rate of 65.9% and the least was found in those that are employed with a prevalence of 32.3%. The study shows a significant difference between typhoid and the occupation of the pregnant women in the area (p < 0.05). With respect to the location of the participants, Semi-urban areas recorded the highest prevalence of 67.8%. Therefore, age, level of education, occupation and location have a major impact on the burden of typhoid infection among pregnant women. Thus, state of pregnancy makes women more vulnerable to typhoid infection by affecting the physiology of pivotal organs, therefore early and prompt diagnosis of the infection is highly essential.*

***Keywords:*** *Pregnancy; typhoid fever; Salmonella typhi; Widal test; bacteriological analysis.*

## INTRODUCTION

Typhoid infection is amongst the major prevalent disease in Nigeria due to various interconnected factors such as scarcity of social amenities for handling unwanted products, poor hygienic environment, absence of or insufficient clean water supply and abuse of antibiotics; these amongst other factors are responsible for the widespread of typhoid fever affecting both young children and adults [1]. Typhoid fever caused by *Salmonella typhi* is a bacterial, gram-negative anaerobes which is endemic in the tropic and sub- tropic and has become a major health problem in developing countries of the world with an estimated annual incidence of 540 per 100,000 [2].

Each year, typhoid and paratyphoid fever, cause an estimated 26 million and 5 million illnesses globally [3]. Typhoid fever is a systemic infection; the acute illness is characterized by prolonged fever, headache, nausea, loss of appetite, constipation and sometimes diarrhea. Symptoms are often non- specific and clinically non-distinguishable from other febrile illnesses. However, clinical severity varies and severe cases may lead to serious complications or even death It is also worth mentioning that cutaneous manifestations (presence of pink spots on the trunk: roseola) and dissociation between pulse and temperature can occur [4].

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 [2]. Due to the hormonal changes that suppress immunity, pregnant women are at an increased risk for getting food-borne infections [5]. Risk factors associated with typhoid infection include eating food prepared outside the home, such as ice creams or flavored ice drinks from street vendors, drinking contaminated water and eating vegetables and salads that have been grown with human waste as fertilizer [6]. Indirect environmental transmission may have also contributed to disease spread and transmission of infection via house flies from human waste to food may also be a possibility in the environment [7].

Humans are the only known hosts of Salmonella typhi. Bacteria are shed in the faeces of an infected person and transmitted from person to person via ingestion of food or water contaminated by these faeces (faecal-oral route). Large outbreaks of typhoid fever are often associated with contamination of a drinking water [8]. Typhoid fever in pregnancy is associated with adverse pregnancy outcomes such as premature deliveries, spontaneous abortions, low birth weight babies and intra-uterine foetal deaths [5]. *Salmonella typhi* causes septicemia of digestive origin that can cross the placenta resulting in chorioamniotitis. Vertical transmission of *S. typhi* occurs via trans-placental spread of the organism and neonatal infection canals occur by transmission through the lower birth canal or from exposure to maternal blood [9]. The manifestation of *S. typhi* may vary; however abdominal pain, fever, nausea, and vomiting are usually present. In pregnancy, this combination of symptoms presents a diagnostic challenge, as the differential diagnosis of abdominal pain is long [9]. Typhoid and paratyphoid fever are clinically indistinguishable and bacterial culture remains the gold standard for diagnosis [10, 11]. Antimicrobial therapy has reduced typhoid case-fatality rates from 15%– 20% to <1% [6]. However, antibiotic resistance is a challenge for effective treatment of typhoid infection and is likely to become increasingly problematic with the spread of multi-drug resistant strains [9].

It is very important to screen for *Salmonella typhi* in view of its negative impacts on pregnant women and the high morbidity and mortality rates that characterize the disease, especially in the developing countries like Nigeria. Although, studies have been carried up on typhoid infection in most parts of the country, information is still inadequate on the prevalence of typhoid infection among pregnant women in Kano State. Thus, the main objective of the study was to determine the prevalence of typhoid infection among antennal clients in Kano State in relation to age, educational level, occupation and location, explore factors associated with the infection and to provide information on its prevention and control strategies. From the results of this research, the knowledge will help to bring about rationale control strategies of the disease thus mitigating its spread among pregnant women.

## MATERIALS AND METHODS

### Study design, study area and study period

A hospital-based cross-sectional study was conducted at Abdullahi Wase Specialist Hospital located at Nassarawa, Kano. Nassarawa is the town which lies geographically on latitude $11^{0}58'37N$ and $8\ ^{0}33'44E$. It has an area of $34km^{2}$ and a population of 596,669 according to the National Population Report (2006). The study period was between July to October, 2023.

### Study population and sample size

All adult women patients (age ≥ 16 years) suspected of typhoid fever who visited the hospital during the study period were invited to participate in the study. The sample size used for the study was 250. Participants already on antibiotic treatment within 2 weeks and diagnosed with other known febrile illness were excluded from the study. Typhoid fever suspected patients were defined as patients (axillary temperature, ≥ 38 °C) who reported having a fever for at least 3 days and headache. In addition, if there was clinical suspicion of typhoid fever by the attending senior clinical staff at the study sites. Typhoid fever confirmed cases were defined as a patient with fever (axillary temperature, ≥ 38 °C) for at least 3 days with a laboratory-confirmed positive blood culture of *Salmonella typhi.*

### Sample Collection

The samples were collected in antenatal care unit of Abdullahi Wase Specialist Hospital Kano, located at Lodged Road, Nassarawa Local Government Area. The samples were collected in July 2023 from 250 pregnant women who reported in the unit for medical care and consented to participate in the study.

### Socio‑demographic and clinical data

All adult febrile patients visiting the hospital were clinically examined by the physicians and those suspected of typhoid fever were requested for blood culture. After obtaining written informed consent socio-demographic and clinical data were collected by nurses using a structured questionnaire that was validated and edited after small pilot study.

### Blood sample collection and Widal test

In the laboratory, a total of 5 ml blood sample was collected aseptically using 70% alcohol and 2% tincture of iodine from a peripheral vein in each patient. Then the blood sample was dispensed into a sterile bottle containing 45 ml of Tryptic soy broth culture medium (Becton, Dickinson- USA).

### Stool sample collection and culture

Pregnant patients were instructed on how to collect the early morning stool, which is more concentrated into sterile plastic container. The stool samples were equally transferred to the laboratory for culturing. The culture plates were labeled according to the participant's number, a pinch from each stool sample were inoculated into freshly prepared Deoxycholate Citrate Agar (DCA) and Salmonella-Shigella Agar(SSA) using sterilized wire loop and incubated at 37°C for 24 h aerobically in bacteriological incubator [12].

### Isolation and identification of bacteria

The procedure involved the isolation and identification of *Salmonella* on the basis of their *morphology, staining property, motility and biochemical* tests using Kligler iron

agar (KIA)-(Becton, Dickinson-USA), Motility, Indole, Ornitine (MIO) (Park Scientific Unlimited-England), Citrate Utilization test (OXID LTD England), Urease test (Mast Group Ltd, UK) and lysine Iron agar (LIA)-(Liofilchem-Italy) test, for identification of suspected *Salmonella typhi* according to the methods described (Cheesbrough, 2006). biochemical analysis was also carried out for the identification test of *S. typhi*.

**Ethical clearance**

Introductory letter was obtained from the department of science laboratory technology, Kano State Polytechnic. The letter was taken to the hospital management to seek for their permission before the commencement of the research work. Consent was sought and obtained from participants before they were enrolled into this study. Approval for the study was obtained from the hospital management, the approval was on the agreement that good laboratory practice must be ensured, and that every participant's finding was treated with utmost confidentiality and for the purpose of the research only.

**Results Analysis**

One-way ANOVA was performed to check whether the population of respondents differed significantly with respect to risk factors tested. Results were finally presented in tables.

**RESULTS**

**Culture and identification**

The freshly prepared early morning stool samples transferred to the laboratory were subjected to culture technique for identification of etiological agent of typhoid infection as described by Chukwuma *et al.*, [12]. The procedure employed were isolation and identification of *Salmonella typhi* on the basis of their *morphology, staining property, motility and biochemical test.* The established method of Cheesbrough [13], was adopted for the identification of the suspected *Salmonella typhi*. Using stool culture technique, all positive plates yielded pinkish/ red mucoid colonies with black centers on *Salmonella/Shigella* Agar medium. The colonies were large with smooth, margin and convex. The biochemical analysis revealed the isolates to be catalase positive, oxidase negative, urease negative and motility positive. The Gram staining reaction and microscopy revealed the isolates to be Gram negative rods with polar flagellates.

*Table 1: Shows Widal and Stool test results*

| Method | No. examined | No. infected (%) | No. uninfected (%) |
|---|---|---|---|
| Widal test | 250 | 175 (70.0) | 75 (30) |
| Stool culture | 250 | 142 (56.6) | 108 (43.3) |

The Widal and stool tests for sero-prevalence and prevalence of typhoid infection obtained from this study were 70.0% and 56.6%, respectively (see Table 1). 250 samples of pregnant women were subjected to analysis during this study. Out of 250 samples analyzed, 142 were found to be positive for *S. typhi* with a general prevalence of 56.6%.

*Table 2: Prevalence of Salmonella typhi in pregnancy according to age group*

| Age group (years) | No. examined | No. infected (%) | No. uninfected (%) | P-value |
|---|---|---|---|---|
| 17-25 | 58 | 35 (60.3) | 23 (39.7) | 0.311 |
| 26-35 | 115 | 85 (73.9) | 30 (26.1) | |
| 36-45 | 77 | 42 (54.5) | 30 (38.9) | |
| Total | 250 | 62 (64.8) | 83 (33.3) | |

Table 2 above shows prevalence of typhoid infection with respect to age of the pregnant women in the study site; the results showed that *Salmonella typhi* infection was highest in the age group of26-35 years where 85 out of 115 were positive with a prevalence of 73.9% and the least was found in the age 36-45 years where 42 out of 77 were positive with a prevalence of 54.5%. The distribution of the infection was statistically insignificant to the age of the pregnant women in the study area ($p > 0.05$).

*Table 3: Prevalence of typhoid infection in relation to Educational level of the pregnant women in the study site*

| Educational level | No. Examined | No. Infected (%) | No. Uninfected (%) | P-value |
|---|---|---|---|---|
| Primary | 35 | 20 (57.1) | 15 (42.9) | 0.911 |
| Secondary | 132 | 76 (57.6) | 56 (42.4) | |
| Tertiary | 78 | 41 (52.6) | 37 (47.4) | |
| Informal education | 5 | 3 (60.0) | 2 (40.0) | |
| Total | 250 | 161 (64.4) | 89 (35.6) | |

Table 3 shows the prevalence of typhoid infection in relation to educational level ofthe studied participants; the results showed that *S. typhi* infection was highest in informal education participants where 3 out of 5 were positive with a prevalence of 60.0% and the least was found in those with tertiary education where 41 out of 78 were positive with a prevalence of 52.6%. The distribution of the infection was statistically insignificant to the educational level of the participants ($p > 0.05$).

*Table 4: Prevalence of typhoid infection based on occupation of the study participants*

| Occupation | No. Examined | No. Infected (%) | No. Uninfected (%) | P-value |
|---|---|---|---|---|
| Employed | 65 | 21 (32.3) | 44 (67.7) | 0.002 |
| Business | 88 | 58 (65.9) | 30 (34.1) | |
| Student | 48 | 22 (45.8) | 26 (54.2) | |
| Unemployed | 49 | 31 (63.3) | 18 (36.7) | |
| Total | 250 | 132 (52.8) | 118 (47.2) | |

Table 4 revealed the prevalence of typhoid infection in relation to occupation of the studied participants. The results showed that, *S. typhi* infection was highest in those who engaged tirelessly in business where 58 out of 88 were positive with a prevalence of 65.9% and the least was found in those that are employed where 21 out of 65 were positive with a prevalence of 32.3%. The study shows a significant difference between typhoid and the occupation of the pregnant women in the area ($p < 0.05$).

*Table 5: Prevalence of typhoid infection in relation to location of the study participants*

| Location | No. Examined | No. Infected (%) | No. Uninfected (%) | P-value |
|---|---|---|---|---|
| Urban | 135 | 48 (60.0) | 87 (64.4) | 0.001 |
| Semi-urban | 115 | 78 (67.8) | 37 (32.2) | |
| Total | 250 | 161 (64.4) | 89 (64.4) | |

Table 5 summarizes the prevalence of typhoid infection in relation to location of the study participants. The results revealed that, *S. typhi* infection was highest in those that stay in semi-urban areas where 78 out of 115 were positive with a prevalence rate of 67.8% and the least was obtained in those that stay in the urban areas where 48 out of 135 were positive with a prevalence rate of 60.0%. The distribution of the infection was statistically significant to the location of the participants ($p < 0.05$).

## DISCUSSION

The results of the current study correlate with the conclusions of other researchers and reports by the World Health Organization (WHO) that, typhoid fever is endemic in Nigeria and other developing countries. The study was carried out in the hospital among pregnant women at the antenatal care unit of Abdullahi Wase Specialist Hospital Kano, Northern Nigeria. 250 pregnant women were recruited for the study, their blood and stool samples were analyzed for *Salmonella typhi*, while socio demographic characteristics were assessed using questionnaires. Typhoid infection rate of 56.6% was found among the pregnant women tested, indicating that typhoid is endemic in Nigeria which has proceeded to cause considerable health associated problems to the pregnant women and the general public. It is caused by *Salmonellae* contaminated foods, drinks and poor hygiene. Age or sex also contributes significantly to high risk of infection to the

pregnant women. Very few reports were found to be available regards to typhoid infection in pregnancy [14]. In this study, 175 (70.0%) of the 250 blood samples gave positive reaction with the Widal test and thus, indicates a high prevalence of typhoid infection among pregnant women in the study site. This agrees with the findings documented by other researchers who recorded a very high prevalence rate of typhoid fever among pregnant women for antenatal care [2, 15, 16, 17].

The results obtained in this study also similar to what have been reported by Omoya and Atobatele [18] among pregnant women. The bacteriological analysis used revealed a lower prevalence of 142 (56.6%) compared with the Widal test result of 175 (70.0%) out of the total analyzed. However, some of the pregnant women may not be having the active disease. Thus, agrees with the observations of Abioye *et al.*, [6] and Ezeigbo *et al.*, [10] who documented a higher positive rate of Widal test compared to stool cultures. The higher positive results of Widal test may be due to prior antibiotic therapy by some subjects that could have hindered the growth of the bacteria on culture medium. Typhoid fever presents a greater diagnostic challenge. Widal test has even been pointed out to be of diagnostic value in the early stage of disease and thus, assist in reducing morbidity and mortality from typhoid infection [19]. This is also similar with the findings of Reuben *et al.,* [2] and Odikamnoro [19] that, Widal reaction as being relevance in diagnosing post-infection complications when *Salmonella typhi* may not be isolated.

Therefore, bacterial culture remains an important criterion for final diagnosis of typhoid infection. Clinicians usually choose treatment rather than waiting for the results of blood or stool cultures (which may take the results up to 3-5 days). Although this approach may have some advantages, particularly in areas where cultural facilities are poor or unavailable, and where Widal test analysis is the norm, the use of rapid antigen/ antibody screening directly from suspected patient stool is much more preferred [2].

Typhoid fever during pregnancy steadily increases the risk of adverse pregnancy outcomes such as premature birth, intrauterine fetal death, and spontaneous abortion Pam *et al.*, [5]. Patients who travel to endemic areas during pregnancy should be aware of the risk of contracting typhoid fever. To minimize this risk while traveling, patients should practice strict food hygiene and avoid eating raw food [20]. Participants in the 26- to 35-year-old group had the highest prevalence of typhoid fever at 85% (73.9%). This may be due to the fact that women in this age group do most of the household chores, fetch water from contaminated sources and handle potentially contaminated food. This result could also be attributed to the fact that women in this age group are more actively involved in reproduction than women in other age groups. This is in agreement with the findings of [21].

With regard to educational level of the study participants, the prevalence of typhoid fever was highest among women with informal education 3 (60.00%) and the lowest among those with tertiary education 41(52.6%). The high prevalence of typhoid infections among pregnant women with non-formal, Secondary and primary education may be related to the use of local herbs to treat the disease by less educated women. This may reflect poverty and cultural beliefs [22].

In terms of occupation, those in business had the highest prevalence rate of 58 (65.9%) and those in employment the lowest prevalence rate of 21 (32.3%), respectively. Business women spend most of their time in business activities, which is believed to predispose them to Salmonella infections. Most of them are uneducated. As a result, they lack basic knowledge of the environment, food and personal hygiene. Enlightened working women had the lowest incidence of typhoid fever in this study. So you will have a better understanding of hygiene and personal hygiene. Most of them have implemented specific preventive and/or control measures to reduce the risk of infection.

Based on study participants' location, the prevalence was highest in semi-urban women at 78 (67.8%) and lowest in urban women at 48 (60.0). This may be due to the poor environmental conditions associated with semi-urban areas Meseret et *al.,* [22]. Differences in the prevalence of typhoid infections may be due to differences in diagnostic methods, years of study, timing, cultural practices, and toilet facilities.

The high prevalence of typhoid fever during pregnancy means that typhoid fever has been reported to cause several complications such as spontaneous abortion, stillbirth, premature birth and low birth weight [5]. With respect to age group, the current study is consistent with results from other scientific researchers, who found the highest incidence of typhoid fever in pregnant women aged 20–30 years, Lillian *et al.,* [1] and Michael [4]. As a result of this study, Monica and Heather [23] documented that, the prevalence of typhoid fever was highest in pregnant women aged 41–50 years.

With regard to education level, the results of this study were similar to those of MarcChoisy et *al.,* [21] that, the highest prevalence of typhoid fever was found in subjects with low levels of education. Regarding participants that were employed, the results of this research disagree with those of Lillian *et al.,* [1] that, typhoid fever was highest among housewives and lowest among students. MarcChoisy *et al.*, [21] also found that the prevalence of typhoid fever was highest among participants working in a small scale industry and lowest among farmers. For pregnant typhoid patients, newborns should be monitored for signs of typhoid respiratory distress after delivery. Sepsis, jaundice, and pneumonia may indicate neonatal infection and may occur within the first 10 days of life Guirguis *et al.,* [20].

The recommended antibiotic regimens for typhoid fever during pregnancy are third-generation cephalosporins or azithromycin. Fluoroquinolones, such as ciprofloxacins, can

be given to susceptible non-pregnant patients [24]. Hemolysis with fever and liver dysfunction has been reported during pregnancy [9]. Pregnancy complications also include second-trimester loss and pre-term delivery [25]. The differential diagnosis of pregnant patients with abdominal pain and fever after travel to endemic areas should include *S. typhi*. Factors affecting drinking water contamination include unavailability of tap water, poor sanitation and inadequate sanitation [26]. Risky individual behaviors, such as poor hand-washing habits, may also be associated with typhoid fever [23].

## CONCLUSION AND RECOMMENDATIONS

This current study revealed that the prevalence of typhoid infection antenatal women at Abdullahi Wase Specialist Hospital, Nassarawa, Kano is quite high and could be an alarming factor that can adversely cause materno-foetal complications during pregnancy. Therefore, age, level of education, occupation and location have a major impact on the burden of typhoid infection among pregnant women. Thus, state of pregnancy makes women more vulnerable to typhoid infection by affecting the physiology of pivotal organs, therefore early and prompt diagnosis of the infection is highly essential.

More efforts should be imposed on enlightenment programs so as to promote enteric fever awareness. Communities should also be educated on the importance of personal hygiene; washing of hands regularly, daily cleaning of household items and avoid consuming risky foods and drinks. The government should also improve the living conditions of the people, especially in the areas of environmental sanitation as well as provision of basic life utilities, like the provision of portable water and public toilet most especially in rural and suburban areas where these facilities are lacking. Therefore, reducing the prevalence of typhoid infection in antennal clients may be of tremendous significance on pregnant women and child growth and development.

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## COMPETING INTERESTS

We declared no conflicts of interest in this research.

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