FUDMA Journal of Sciences (FJS)
ISSN online: 2616-1370
ISSN print: 2645 - 2944
Vol. 10 No. 13, July, 2026, pp 192 – 198
DOI: https://doi.org/10.33003/fjs-2026-1013-5220

Typhoid Fever Burden Among Pregnant Women in Gombe Central Zone, Nigeria

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Received: 03 Jun.. 2026
Accepted: 22 Jul. 2026
Published: 14 Aug. 2026

ABSTRACT
Typhoid fever remains a public health concern in endemic settings and may cause serious maternal and fetal complications during pregnancy. Evidence on the burden of typhoid fever among pregnant women and its distribution by maternal age, pregnancy trimester, and gravidity is limited in Gombe Central Zone. This study determined the prevalence of typhoid fever and examined its association with age, trimester, and gravidity among pregnant women in Gombe Central Zone, Nigeria. A cross-sectional study enrolled 600 consenting pregnant women attending antenatal clinics in eight selected health facilities in Akko and Yamaltu/Deba Local Government Areas. Participants were recruited through multistage purposive and consecutive sampling. Serum samples were tested for anti-*Salmonella Typhi* IgM and IgG antibodies using the Typhidot assay. Data were analyzed in SPSS version 23 using frequencies, percentages, and chi-square tests at $p<0.05$. Overall Typhidot seropositivity was 21.8% (131/600). The highest prevalence occurred among women aged 16–24 years (24.6%), those in the third trimester (25.4%), and primigravidae (27.7%). However, age, trimester, and gravidity were not significantly associated with typhoid seropositivity ($p>0.05$). Typhoid seropositivity was common among pregnant women in the study area, but the measured demographic and obstetric characteristics did not significantly explain its occurrence. Antenatal services should strengthen health education on safe water, food hygiene, and sanitation, while improving access to confirmatory diagnosis, timely treatment, and typhoid surveillance.

Keywords: Antenatal care, Trimester, Typhoid, Gravidae, Gombe Central Zone

INTRODUCTION

Typhoid fever is a systemic bacterial infection caused by *Salmonella enterica serovar Typhi*. It is mainly transmitted when a person consumes food or water contaminated with faecal matter from an infected individual. The disease commonly presents with prolonged fever, headache, nausea, loss of appetite, constipation and, in some cases, diarrhea (Okolo and Abu, 2020). Pregnant women living in typhoid-endemic regions remain a vulnerable population because pregnancy involves complex immunological and physiological adaptations that may influence susceptibility to bacterial infections. Typhoid fever, caused by *Salmonella enterica serovar Typhi*, continues to pose a major public health challenge in low- and middle-income countries where inadequate sanitation, unsafe water supplies, and limited access to healthcare services facilitate transmission. During pregnancy, infection with *S. Typhi* may result in serious maternal and fetal complications, particularly when diagnosis and treatment are delayed. Reported complications include prolonged febrile illness, systemic infection, septicemia, miscarriage, preterm labour, fetal loss, and neonatal infection through vertical transmission. Recent evidence indicates that maternal Salmonella infection can cross the maternal–fetal interface and contribute to adverse pregnancy outcomes, emphasizing the need for early diagnosis and effective management among pregnant women in endemic settings (Sethi and Vij, 2017; World Health Organization, 2023).

The burden of typhoid fever remains concentrated in regions affected by inadequate water, sanitation, and hygiene infrastructure. Although global improvements in sanitation and food safety have reduced transmission in many high-income countries, endemic regions in South Asia and sub-Saharan Africa continue to experience substantial disease burden. Recent global estimates indicate that millions of typhoid cases occur annually, with a disproportionate impact on vulnerable populations living in areas with limited public health infrastructure. The persistence of typhoid fever in these settings reflects the interaction between environmental exposure, socioeconomic conditions, healthcare limitations, and challenges in disease surveillance (Stanaway, *et al.,* 2019; World Health Organization, 2023).

The epidemiology of typhoid fever is further complicated by the ability of *S. Typhi* to establish persistent infection and antimicrobial resistance. Because humans are the only known reservoir of *S. Typhi*, individuals with chronic carriage contribute significantly to continued transmission within communities. Advances in genomic surveillance have demonstrated that typhoid strains continue to evolve through genetic changes that enhance transmission capacity and resistance to commonly used antibiotics. Klemm *et al,* (2018) reported the emergence of extensively drug-resistant *S. Typhi* strains, creating additional difficulties in treatment and disease control. These developments are particularly concerning in pregnancy because antimicrobial selection requires consideration of both maternal recovery and fetal safety.

In pregnancy, delayed diagnosis of typhoid fever may increase the likelihood of complications because symptoms often overlap with other common febrile illnesses. Fever, weakness, gastrointestinal disturbances, and general discomfort may be mistaken for malaria or other infections prevalent in tropical regions. Limited laboratory diagnostic capacity in many endemic countries further contributes to delayed confirmation of infection and inappropriate treatment decisions. Recent studies from developing regions have emphasized that inadequate diagnostic resources remain a major barrier to accurate estimation and effective management of typhoid fever. Improved access to reliable diagnostic methods, surveillance systems, and appropriate antimicrobial therapy is therefore essential for reducing maternal and neonatal complications associated with typhoid infection (Stanaway *et al.,* 2019).

The risk of typhoid fever among pregnant women is also influenced by environmental and behavioural factors, including consumption of contaminated food, unsafe drinking water, poor hand hygiene practices, and inadequate waste management. These risk factors are particularly prominent in communities where rapid population growth has exceeded the capacity of existing sanitation systems. In Nigeria and other sub-Saharan African countries, typhoid fever continues to affect vulnerable groups because of persistent challenges associated with water quality, healthcare accessibility, and disease prevention practices. A recent epidemiological study among pregnant women in Nigeria reported considerable occurrence of *Salmonella Typhi* infection, reinforcing the continued importance of investigating typhoid transmission among pregnant populations in African settings (Muhammad *et al.,* 2024).

The emergence of antimicrobial-resistant typhoid strains has introduced further challenges in controlling infection during pregnancy. Resistance to fluoroquinolones, third-generation cephalosporins, and other commonly used antibiotics has reduced available treatment options and increased the possibility of prolonged infection. Klemm *et al,* (2018) identified extensively drug-resistant *S. Typhi* strains capable of limiting conventional treatment approaches. More recent surveillance studies have continued to report increasing antimicrobial resistance patterns, demonstrating the importance of antibiotic stewardship, molecular surveillance, and improved laboratory diagnosis in endemic regions.

Preventing typhoid fever among pregnant women requires a comprehensive approach involving vaccination, improvement of water and sanitation facilities, food safety practices, and health education. The introduction of typhoid conjugate vaccines represents an important development in global typhoid control because these vaccines provide longer-lasting protection and can be incorporated into national immunization programmes in high-risk areas. The World Health Organization recommends typhoid conjugate vaccination as part of broader strategies aimed at reducing disease transmission, particularly in countries experiencing high disease burden or increasing antimicrobial resistance (World Health Organization, 2023).

Despite progress in prevention and treatment, typhoid fever remains a significant health concern among pregnant women in endemic regions. The continued occurrence of infection, maternal complications, fetal risks, and increasing antimicrobial resistance demonstrates the need for improved surveillance, preventive interventions, and evidence-based maternal healthcare strategies. Understanding the prevalence, risk factors, and outcomes of typhoid fever among pregnant women is essential for developing effective interventions aimed at protecting maternal and neonatal health in endemic communities.

MATERIALS AND METHODS

Study Area

The research took place in the central senatorial zone of Gombe State in northeast Nigeria. The zone includes Akko and Yamaltu/Deba Local Government Areas (LGAs), which are among the largest in the state by both population and area. Gombe State, often called the jewel in the savannah, is located in Nigeria within the Sudan Savannah ecological zone (Gombe State Government, 2020). Akko Local Government Area is located at the central part of Gombe State and its population is estimated to be 337,853 (National Population Commission [NPC], 2006). It occupies approximately 2,627km² and lies between latitudes 9°50′N–10°20′N and longitudes 10°40′E–11°30′E (Figure 1). It has its administrative center at the town known as Kumo with a distance of 40km South of Gombe metropolis. Akko LGA is highly diverse in terms of ethnography with Fulani, Tangale, Tera, Hausa, and minority groups with Islam and Christianity being the most dominant religious. There are two different seasons viz the wet and dry defined by the Inter-Tropical Convergence Zone (ITCZ). The LGA has a rainy season that falls between April and October and dry season that falls between November and March with an annual precipitation of between 850 and 1,000mm (Nigerian Meteorological Agency [NMA], 2019). The main occupation of the people is farming and trading. Yamaltu/Deba Local Government Area situated in the central location of the state and the headquarters of this local government area is the Deba Town situated about 25 km, to Gombe city. The LGA has an estimated population of 255,726 (NPC, 2006), and a land area of about 1,981 km², lying between latitudes 10°00′N–10°20′N and 11°20′E–11°50′E (Figure 1). It bears temperatures of 20.0-30.0ºC and is also comparable to Akko LGA in the Sudan Savannah weathers. The population is predominantly Fulani, Kanuri and Tera and the main occupations include crop farming, fishing and leather. Commercial activities are supported in the local markets and the most common types of crops include rice, millet, sorghum, beans and onions.

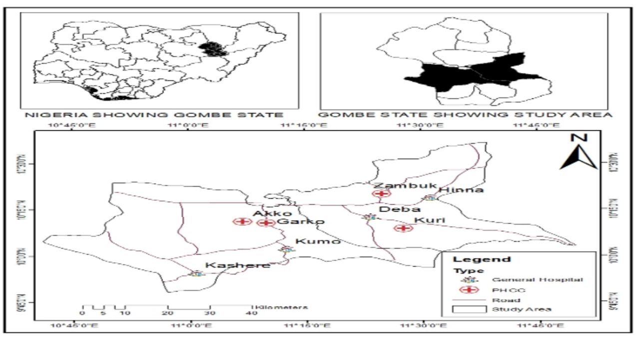

Figure 1: Map of Gombe Central Zone Showing the Study Area (Akko and Y/Deba)

Ethical Approval
Ethical approval for the study was obtained from the Gombe State Ministry of Health Research Ethics Committee. A formal introductory letter from the Department of Zoology, Modibbo Adama University, Yola, together with three copies of the research proposal, was submitted to the committee for review. Following approval, copies of the ethical clearance were presented to the Medical Directors and facility managers of the eight selected healthcare facilities in the Gombe Central Zone. Administrative permission was also obtained from each facility before data and sample collection commenced.

Informed Consent
Informed consent was obtained from the 600 pregnant women who attended the eight selected healthcare facilities in the Gombe Central Zone and agreed to participate in the study. Before enrolment, each participant was informed about the purpose of the research, the procedures involved, the expected duration of participation, and any potential benefits or risks. Participants were also informed that their participation was voluntary, that they could decline or withdraw from the study at any time without affecting the healthcare services available to them, and that all information collected would be treated confidentially. Only pregnant women who understood the information provided and voluntarily agreed to participate were enrolled in the study.

Study Design
Blood samples were collected from consenting pregnant women attending antenatal clinics at the selected healthcare facilities within the study area. Relevant sociodemographic and obstetric information, including age, gestational trimester, and gravidity, was obtained from each participant through an interviewer-administered questionnaire. The collected blood samples were transported to the Laboratory Department of the Federal Teaching Hospital, Gombe, where they were analyzed using the Typhidot test for the serological diagnosis of typhoid fever.

Determination of Sample Size and Study Population
The sample size for this study will be determined using the formula suggested by Araoye (2004), It was stated that for a study population greater than 10,000. The following formula will be applicable.

$$n = \frac{Z^2PQ}{d^2}$$

Where:
n=the desired sample size (when population is greater than 10,000)
z=the normal standard deviation, usually set at 1.96 (or 2.0) which corresponds to 95% confidence level
p=the proportion in the target population estimated to have a particular characteristic. If there is no reasonable estimate then use 50% (i.e. 0.50)
q=1.0-p
d=degree of accuracy desired usually set at 0.05 or occasionally at 0.02.

$$n=\frac{(1.96)^2\times 0.6(1-0.6)}{(0.05)^2} = 384$$

The calculated minimum sample size for the study was 384 pregnant women. However, to ensure adequate representation and equitable distribution of participants across the two Local Government Areas (LGAs) within the Gombe Central Senatorial Zone, the sample size was increased. An additional 216 participants were recruited, resulting in the selection of 300 pregnant women from each LGA. Therefore, a total of 600 pregnant women were enrolled for the study to provide sufficient data for assessing malaria and typhoid co-infection and associated haematological alterations within the study area.

Inclusion/Exclusion Criteria
The pregnant women who visited the selected healthcare and were undergone treatment on the day of sampling and also consented were played out in the inclusion criteria. The exclusion criteria included pregnant women who were absent in the day of the sampling, non-pregnant women and pregnant women who denied taking part in the study.

Sampling Techniques
A multistage sampling technique involving purposive and consecutive (eligibility) sampling methods was employed for this study. In the first stage, Akko and Yamaltu/Deba Local Government Areas (LGAs) were selected because they constitute the Gombe Central Senatorial Zone. Each LGA comprises eleven wards from each LGA totaling 22 wards. Four (4) wards were purposively selected from each LGA based on the presence of functional health facilities providing antenatal care (ANC) services. The selected wards in Akko LGA were Kumo Central, Garko, Akko, and Kashere, while the selected wards in Yamaltu/Deba LGA were Deba, Hinna, Kuri/Lambam, and Zambuk/Kwali. In the second stage, one health facility providing ANC services was purposively selected from each selected ward, resulting in a total of eight (8) health facilities. In the third stage, pregnant women attending ANC clinics in the selected health facilities were recruited using consecutive sampling. Eligible pregnant women who met the inclusion criteria and consented to participate were enrolled consecutively during their ANC visits until the required sample size was achieved. The data was collected for six (6) weeks in each facilities and the final sample size was determined by the number of participants that turn up throughout the period of the study.

Collection of Blood Samples
For the serological diagnosis of typhoid fever, approximately 2–3 mL of venous blood was aseptically collected from each participant using a sterile disposable syringe and needle. The blood was immediately transferred into a properly labelled ethylene-diamine-tetra-acetic acid (EDTA) specimen tube. Each tube was gently inverted several times to ensure adequate mixing of the blood with the anticoagulant and to prevent clot formation. The specimens were subsequently transported under appropriate conditions to the Laboratory Department of the Federal Teaching Hospital, Gombe, for Typhidot testing (Clinical and Laboratory Standards Institute [CLSI], 2025).

Typhoid Fever Diagnosis using the Typhidot Test
The blood sample was centrifuged at 3,000–5,000 rpm for 5 minutes to obtain serum. The separated serum was used for the Typhidot assay. The Typhidot test was performed according to the manufacturer's instructions using a rapid immunochromatographic test kit for the qualitative detection of IgM and IgG antibodies against *Salmonella enterica serovar Typhi.* One drop (approximately 20–50 µL) of serum was dispensed into the sample well of the test cassette, followed by the addition of the assay buffer provided by the manufacturer. The test device was left undisturbed for 15 minutes at room temperature. The appearance of a colored band in the control region (C) indicated that the test was valid, while colored bands in the IgM (M) and/or IgG (G) regions indicated the presence of anti-Salmonella Typhi antibodies. Samples showing only the control line were interpreted as negative, whereas the absence of the control line rendered the

test invalid and necessitated repeat testing (Nguefack *et al.,* 2021).

Data Analysis
Data collected were analyzed using Statistical Package for the Social Sciences (SPSS) version 23.0. Results were presented on frequency distribution tables, and chi-square test was used to determine the association between malaria, typhoid fever, their co-infections and age, trimester and gravidae of the participants.

RESULTS AND DISCUSSION
The prevalence of typhoid fever among pregnant women in relation to age is presented in Table 1. Out of the 600 pregnant women examined, 131 tested positive for typhoid fever, giving an overall prevalence of 21.8%. The highest prevalence was recorded among pregnant women aged 16–24 years (24.6%), followed by those aged 25–34 years (19.3%), while the lowest prevalence was observed among women aged 35–46 years (13.9%). However, statistical analysis showed that age was not significantly associated with typhoid fever infection among the pregnant women studied (χ^2=0.104, df=2, p>0.05), indicating that the occurrence of typhoid fever was independent of age group.

Table 1: Prevalence of Typhoid Fever Among Pregnant Women in Relation to Age

Variable	Category	No Examined	No Positive (%)	$\chi 2$	*p*-value
Age	16-24 years	321	79 (24.6)		
	25-34 years	243	47 (19.3)	5.991	0.104
	35-46 years	36	5 (13.9)		
Sub-total		600	131 (21.8)		

(Typhoid and Age: Calc. $\chi 2$=0.104, Tab. $\chi 2$ =5.991, df=2, Not Significant)

The prevalence of typhoid fever according to pregnancy trimester is presented in Table 2. Pregnant women in the third trimester recorded the highest prevalence, with 71 positive cases (25.4%), followed by those in the second trimester with 52 positive cases (19.3%). The lowest prevalence was observed among women in the first trimester, with 8 positive cases (16.0%). Despite the observed differences in prevalence among the trimesters, the association between pregnancy trimester and typhoid fever infection was not statistically significant (χ^2=0.128, df=2, p>0.05). This suggests that the stage of pregnancy did not significantly influence typhoid fever occurrence among the participants.

Table 2: Prevalence of Typhoid Fever Among Pregnant Women in Relation to Trimester

Variable	Category	No Examined	No Positive (%)	$\chi 2$	*p*-value
Trimester	First	50	8 (16.0)		
	Second	270	52 (19.3)	5.991	0.128
	Third	280	71 (25.4)		
Sub-total		600	131 (21.8)		

(Typhoid and Trimester: Calc. $\chi 2$=0.128, Tab. $\chi 2$=5.991, df=2, Not Significant)

The relationship between gravidity and typhoid fever prevalence among pregnant women is presented in Table 3. The highest prevalence was recorded among primigravidae (27.7%), followed by secondigravidae (20.4%), while multigravidae recorded the lowest prevalence (19.9%). Although primigravidae showed a relatively higher prevalence compared with women who had previous pregnancies, statistical analysis revealed that gravidity was not significantly associated with typhoid fever infection among the study population (χ^2=0.170, df=2, p>0.05). Therefore, the number of previous pregnancies did not significantly affect the occurrence of typhoid fever among pregnant women examine

Table 3: Prevalence of Typhoid Fever Among Pregnant Women in Relation to Gravidae

Variable	Category	No Examined	No Positive (%)	$\chi 2$	*p*-value
Gravidae	Primigravidae	141	39 (27.7)		
	Secondigravidae	147	30 (20.4)	5.991	0.170
	Multigravidae	312	62 (19.9)		
Sub-total		600	131 (21.8)		

(Typhoid and Gravidae: Calc. $\chi 2$=0.170, Tab. $\chi 2$=5.991, df=2, Not Significant)

Discussion
The present study recorded an overall Typhidot seroprevalence of 21.8%, representing 131 positive participants among the 600 pregnant women examined. This finding indicates that exposure to *Salmonella enterica serovar Typhi* remains an important public health concern among pregnant women in the study area. The observed seroprevalence may be associated with environmental and behavioural factors, including the consumption of contaminated food or water, inadequate sanitation, poor food handling practices and limited access to reliable diagnostic services. Typhoid fever remains concentrated in low- and middle-income countries where access to safe water, adequate sanitation and appropriate healthcare services remains limited. The Global Burden of Disease Study showed that typhoid and paratyphoid fevers continue to contribute substantially to global morbidity and mortality, particularly in regions with inadequate water and sanitation infrastructure (GBD 2017 Typhoid and Paratyphoid Collaborators, 2019). A systematic review also demonstrated that untreated water, surface water and limited hygiene were associated with increased odds of typhoid fever, while treated water and basic hygiene reduced the risk of infection (Kim *et al.,* 2023).

The seroprevalence recorded in the present study was lower than the 66.8% seroprevalence reported by Kwala and Asika (2020) among pregnant women attending Specialist Hospital Yola, Adamawa State, Nigeria. Although the two studies were conducted in geographically close locations within northeastern Nigeria, the substantial difference in prevalence may be attributed to variations in diagnostic methods, sample size, study period, seasonal conditions, participant selection and exposure to contaminated food and water. Kwala and Asika (2020) examined 313 pregnant women using the Widal test and bacteriological analysis, whereas the present study assessed 600 pregnant women using the Typhidot test. These methodological differences limit direct comparison of the prevalence estimates.

Variations in reported typhoid prevalence may also result from differences in laboratory methods. Blood culture remains the principal reference method for confirming acute typhoid fever, although its sensitivity may be affected by the volume of blood collected, the stage of infection and antibiotic use before sample collection. Serological rapid diagnostic tests are more accessible in resource limited settings, but they may produce false positive or false negative results because of cross reactivity, previous exposure and differences in test performance. A Cochrane systematic review concluded that currently available rapid diagnostic tests, including Typhidot, do not have sufficient accuracy to replace blood culture for the definitive diagnosis of enteric fever (Wijedoru *et al.,* 2017). A recent evaluation in Ghana also reported suboptimal sensitivity and specificity for Typhidot when compared with culture and polymerase chain reaction methods (Sam *et al.,* 2024). Therefore, the prevalence obtained in the present study should be interpreted as Typhidot seropositivity rather than culture confirmed active typhoid fever.

Radhakrishnan *et al.* (2018) observed that accurate estimation of typhoid burden remains difficult because of inconsistencies in diagnostic methods, limited national surveillance systems and insufficient morbidity and mortality data in many endemic countries. These diagnostic challenges may contribute to substantial differences between serological and culture based prevalence estimates. The use of confirmatory blood culture, stool culture or molecular methods in future studies would improve the accuracy of prevalence estimates and help distinguish active infection from previous exposure.

Regarding age, pregnant women aged 16 to 24 years recorded the highest seroprevalence of 24.6%, while those aged 35 to 46 years recorded the lowest seroprevalence of 13.9%. However, statistical analysis showed that age was not significantly associated with Typhidot positivity at p greater than 0.05. This finding indicates that exposure occurred among pregnant women in all the reproductive age groups examined and was not restricted to a particular age category. Kwala and Asika (2020) also reported differences in typhoid positivity among age groups of pregnant women, although their findings did not establish age as an independent determinant of infection.

The present finding differs from broader epidemiological reports showing a greater typhoid burden among children, adolescents and young adults in many endemic settings. The World Health Organization identifies children as a group with a particularly high risk of typhoid fever, while global burden estimates show considerable variation in incidence according to age and geographical location (GBD 2017 Typhoid and Paratyphoid Collaborators, 2019; World Health Organization, 2023). The absence of a significant association between age and Typhidot positivity in the present study may be explained by the relatively similar environmental exposure experienced by pregnant women attending the selected health facilities.

The present study also showed an increase in seroprevalence with advancing pregnancy. Women in the third trimester recorded the highest seroprevalence of 25.4%, followed by those in the second trimester at 19.3% and the first trimester at 16.0%. Despite the observed differences, trimester was not significantly associated with Typhidot positivity at $p>0.05$. The higher seroprevalence recorded during the third trimester may reflect differences in cumulative exposure, healthcare attendance, nutritional conditions or other unmeasured factors rather than a direct effect of gestational stage.

Pregnancy involves dynamic physiological, hormonal and immunological adaptations that help maintain fetal tolerance while preserving maternal protection against pathogens. These changes vary throughout gestation, but they should not be interpreted as evidence that pregnancy causes general immune suppression or that a specific trimester independently increases susceptibility to typhoid fever (Abu-Raya *et al.,* 2020). The lack of statistical significance in the present study supports the conclusion that trimester alone was not a major determinant of Typhidot positivity.

Typhoid fever may occur during any stage of pregnancy following exposure to food or water contaminated with *S. Typhi*. Published evidence concerning pregnancy outcomes is limited and includes case reports, reviews and a small number of observational studies. Case reports have documented uteroplacental infection, miscarriage and vertical transmission of *S. Typhi* or related enteric fever organisms (Touchan *et al.,* 2009; Vigliani and Bakardjiev, 2013). However, an observational study of culture confirmed typhoid fever did not identify significant differences in measured pregnancy outcomes between pregnant women with typhoid fever and matched pregnant women without the disease (Sulaiman and Sarwari, 2007). Therefore, the relationship between typhoid fever, trimester and adverse pregnancy outcomes should be interpreted cautiously.

Regarding gravidity, primigravidae recorded the highest seroprevalence of 27.7%, followed by secondigravidae at 20.4% and multigravidae at 19.9%. Despite these differences, gravidity was not significantly associated with Typhidot positivity at p greater than 0.05. The higher seroprevalence observed among primigravidae may be associated with differences in antenatal experience, health awareness, hygiene practices, socioeconomic conditions or exposure patterns. However, these factors were not directly assessed as explanations for the observed difference. The absence of statistical significance indicates that the number of previous pregnancies was not an independent determinant of seropositivity in the study population.

The lack of statistically significant associations between age, trimester, gravidity and Typhidot positivity indicates that exposure in the study population may be influenced more strongly by environmental, household and behavioural conditions than by maternal demographic or obstetric characteristics. This interpretation is consistent with evidence showing that the consumption of untreated water, inadequate hygiene and exposure to contaminated food or surface water are important determinants of typhoid transmission (Kim *et al.,* 2023). The World Health Organization recommends a combination of safe drinking water, adequate sanitation, food hygiene, hand-washing, vaccination and effective disease surveillance for the prevention and control of typhoid fever (World Health Organization, 2023).

Overall, the findings demonstrate a considerable level of Typhidot seropositivity among pregnant women in the study area, with approximately one in every five participants testing positive. Although age, trimester and gravidity were not significantly associated with seropositivity, the overall proportion indicates the need for strengthened preventive and diagnostic measures. Antenatal health education should promote the consumption of safe drinking water, proper food preparation, hand-washing with soap and early presentation at health facilities when symptoms occur. Laboratory capacity should also be improved to support culture or molecular confirmation of suspected cases, reduce diagnostic uncertainty and prevent unnecessary antimicrobial treatment. Future studies should assess water sources, sanitation conditions, food handling practices, previous antibiotic use, socioeconomic characteristics and vaccination status to identify the factors associated with typhoid exposure among pregnant women.

CONCLUSION

This facility-based cross-sectional study assessed the burden of typhoid fever among 600 pregnant women attending antenatal clinics in eight selected health facilities in Akko and Yamaltu/Deba Local Government Areas of Gombe Central Zone, Nigeria. Using the Typhidot assay to detect anti-Salmonella Typhi IgM and IgG antibodies, 131 participants were seropositive, giving an overall prevalence of 21.8%. Seropositivity was highest among women aged 16–24 years (24.6%), those in the third trimester (25.4%), and primigravidae (27.7%). Nevertheless, age, trimester, and gravidity were not significantly associated with typhoid seropositivity, suggesting that the observed burden may be more closely related to shared environmental and behavioural exposures, including unsafe water, contaminated food, inadequate sanitation, and limited diagnostic access, than to the maternal characteristics examined.

Because the study was facility-based and used a serological rapid test, the findings should be interpreted as evidence of antibody positivity rather than definitive culture-confirmed active infection, and they cannot establish causation or represent all pregnant women in the zone. Despite these limitations, the observed burden supports stronger integration of typhoid prevention into antenatal care through health education on safe water, food hygiene, sanitation, symptom recognition, and timely healthcare seeking. Health facilities should improve access to confirmatory diagnosis and appropriate treatment, while public health authorities strengthen surveillance, safe-water provision, sanitation, and food-safety interventions. Future studies should incorporate blood culture or molecular confirmation, antimicrobial susceptibility testing, assessment of environmental and socioeconomic risk factors, and follow-up of maternal and fetal outcomes.

ACKNOWLEDGEMENTS

We thank the pregnant women for consenting and being participated in this research. We also acknowledge the management and staff of the Gombe State Ministry of Health as well as Medical Directors/Facility Managers of the selected health facilities in the Gombe Central Zone for the permission, cooperation and support given.

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