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| RESEARCH ARTICLE

Zika Virus Knowledge, Perception, Belief, Attitude, and Preventive Practices among Pregnant Women in Plateau State, Nigeria: Public Health Implications

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| ABSTRACT

In this study, 324 pregnant women who visited prenatal clinics in Plateau State, Nigeria, had their knowledge, perception, attitude, and preventive actions regarding Zika virus (ZIKV) infection evaluated. Between July 2022 and January 2023, we collected data using a structured questionnaire and a cross-sectional descriptive design. Descriptive statistics and the Chi-square test were used to analyze the data; $P<0.05$ was considered statistically significant. The results showed that 90.1% of participants lacked knowledge about ZIKV, indicating a significant knowledge gap. The Northern district had the lowest level of knowledge, with an overall knowledge rate of 84.6%, and a statistically significant difference between senatorial districts ($P=0.001$). Inadequate perception was also reported by 82.4% of respondents; however, district-specific differences were not statistically significant ($P=0.064$). Most participants held negative opinions about ZIKV (54.6%), with significant differences observed between districts ($P=0.001$). One particularly concerning finding was that 53.4% of women would not promote condom use or abstinence with a partner who visited an affected area, and 91.0% of women disagreed with delaying conception due to ZIKV concerns. Despite these disparities, a more positive trend in preventive practices was observed; 39.5% of women demonstrated good preventive behaviors, with notable variation among districts ($P=0.001$). The study's findings reveal that pregnant women in the area have significant gaps in their understanding, attitudes, and perceptions about ZIKV. These results underscore the urgent need for targeted public health initiatives to increase awareness and protect maternal and fetal health, especially concerning less-known transmission routes and personal protective measures.

| KEYWORDS

Attitude, Knowledge, Perception, Plateau State, Pregnant Women, Zika Virus

| ARTICLE INFORMATION

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1. Introduction

Currently, there is are paucity of information on Knowledge, perception, attitude, and general preventive practices about ZIKV among pregnant women, which has created a wider gap in understanding the infection, especially in

Plateau State, Nigeria. Zika virus (ZIKV) is a positive-sense, single-stranded RNA virus of the genus Flavivirus, family *Flaviviridae*. ZIKV is an arthropod-borne virus, primarily transmitted to humans by the bite of an infected Aedes mosquito, specifically of the subgenus Stegomyia (Cirne-Santos, 2024; Tajik *et al*., 2024). Sexual contact, intrauterine transfer, perinatal transmission, laboratory exposure, and perhaps blood transfusion are additional transmission pathways (CDC, 2024; Dawurung *et al.,* 2025). In the general population, ZIKV infection is usually asymptomatic; however, it can present with modest symptoms such as fever, arthralgia, non-purulent conjunctivitis, and maculopapular rashes (Pielnaa *et al.,* 2020; Dappa and Ogbonnaya, 2023).

Infection in pregnancy can present with serious negative outcomes; these include miscarriage, Guillain-Barré syndrome, congenital microcephaly, various brain disorders, and stillbirth (Beber *et al*., 2023; Dawurung *et al*., 2025; Pérez *et al*., 2025). The congenital Zika syndrome, which is the aggregate term for severe fetal problems, emphasizes its vital public health significance, particularly for expectant mothers (Pérez *et al.,* 2025), thus, it is considered a serious public health issue of global concern.

In Nigeria, ZIKV infection was first reported in 1975 (Diallo *et al.,* 2023; Moore *et al.,* 1975), and since then, researchers have continued to share their findings. Similarly, a cross-sectional study from Plateau State found a seroprevalence of 14.4% (Anejo-Okopi *et al*., 2020).

It is therefore obvious that there still exists ZIKV, a dearth of comprehensive information on ZIKV infection in Nigeria. Understanding this information on ZIKV infection in the country among the study population is crucial for future health awareness campaigns. This current study investigated the Knowledge, Perception, attitude, and preventive practices of ZIKV infection among pregnant women in Plateau State with a view to bridging this important information gap.

2. Methodology

2.1 Study Area/population

This study employed a descriptive cross-sectional design to assess the knowledge, perception, attitude, and preventive practices of Zika virus infection among pregnant women attending antenatal clinics in Plateau State, Nigeria. We conducted the study in 9 public health facilities among consented pregnant women in Plateau State (July 2022-January 2023). The selected hospitals were Northern Zone: General Hospital Barkin Ladi, Comprehensive Health Centre Dadin Kowa, and Primary Health Centre Rayfield; Central Zone: General Hospital Mangu, Cottage Hospital Bokkos, and Township Primary Health Centre, Pankshin; Southern Zone: General Hospital Shendam, Cottage Hospital Kwalla, and Primary Health Centre Shendam A.

The state is located approximately in North Central Nigeria. Plateau State is geographically distinctive, characterized by its elevated hills surrounding the Jos Plateau (Iro *et al.,* 2019; PSG, 2023). Plateau State shares boundaries with 4 states and has unique temperate weather, which attracts tourists, and has a mean annual rainfall of 1460 mm.

2.2 Study Design and Sampling Technique

This study was cross-sectional in design, and a convenience sampling technique was followed after a series of group health education and enlightenment sessions. We recruited 324 consented pregnant women using the formula by Lwanga and Lemeshow (1991) after an ethical approval was sought from Plateau State Hospitals Management Board (No. HMB/ADM/772/1/173) and Plateau State Ministry of Health Research and Ethical Committee (No. MOH/MIS/209/VOL.T/X). Antenatal clients who attended the clinics during the study period and denied consent were excluded.

2.3 Data Collection

Data were gathered using a structured questionnaire that had been pre-tested and was organized into several sections. Socio-Demographic Characteristics, Knowledge of the Zika Virus, Perception, Attitude, and Preventive Practices of ZIKV. The questions offered response options of "Yes," "No," and "Don't Know." The questionnaire was designed in English, the official language/ means of communication at the college.

2.4 Data Analysis

The collected data were entered into Microsoft Excel and subsequently analysed using the Statistical Package for the Social Sciences (SPSS) version 26.1. Descriptive statistics, including frequencies and percentages, were utilized to summarize the demographic characteristics, knowledge levels, attitudes, perceptions, and Preventive practices of the respondents. For the assessment, a scoring system was implemented to classify participants' responses as very good, good, Fair, and poor. Inferential statistics, specifically the Chi-square test, were employed to assess the association between Senatorial zones regarding the ZIKV. A p-value of less than 0.05 ($p < 0.05$) was considered to indicate statistical significance.

3. Results

3.1 Knowledge of ZIKV Infection among Pregnant Women in Plateau State, Nigeria

The study found that pregnant women in Plateau State, Nigeria, knew very little about Zika Virus (ZIKV) infection. With a noteworthy 90.1% (n=292) of women stating that they had never heard of the virus, awareness was essentially nonexistent (Table 1a). The majority of respondents had very low overall knowledge scores as a result of this lack of basic information; 84.6% (n=274) were categorized as having "Poor" knowledge (Table 1b). There was also a dearth of specific, life-saving information—just 7.4% were aware of the route of transmission (Table 1a), and concerningly, only 4.3% correctly recognized the first trimester as the most infectious time, while 91.0% acknowledged they were unaware (Table 1a).

Furthermore, there was little knowledge of the virus's serious connection to congenital abnormalities; just 18.8% of respondents knew it may result in birth problems, and 14.2% specifically linked it to microcephaly (Table 1a).

Table 1c explores the distribution of knowledge levels across three senatorial districts: North, Central, and Southern. A Chi-square test result was also presented to assess the statistical significance of any observed differences in knowledge distribution among the districts. The Northern senatorial zone showed an extremely high proportion (97.2%) of pregnant women in this district with "Poor" knowledge, with no participants exhibiting "Fair" or "Very good" knowledge. In the central zone, although still high, the proportion of "Poor" knowledge (71.3%) is lower than in the Northern zone. This district includes some participants with "Fair" (9.3%), "Good" (14.8%), and "Very good" (4.6%) knowledge, indicating a slightly better, though still limited, understanding compared to the Northern zone. Like the Northern zone, in the southern zone, a large majority (85.2%) had "Poor" knowledge. There were some participants with "Fair" (7.4%) and "Good" (3.7%) knowledge, and a small percentage (3.7%) with "Very good" knowledge. Statistically, there is a significant association between the senatorial district and the level of knowledge about ZIKV infection among pregnant women (Chi-square = 31.951, $P = 0.001$). This suggests that knowledge levels vary significantly across the different senatorial districts.

Table 1a Knowledge of Pregnant Women Towards ZIKV Infection

Items	Frequency	Percentage
Ever heard about Zika virus		
Yes	32	9.9
No	292	90.1
How Zika virus is transmitted		
Yes	24	7.4
No	300	92.6
Zika virus has potential risk during pregnancy		
Yes	56	17.3
No	268	82.7

Age of pregnancy at which infection with Zika virus could be more dangerous		
< 3 months	14	4.3
3-6 months	8	2.5
>6 months	7	2.2
Don't know	295	91.0
Zika virus can caused birth defect in a child		
Yes	61	18.8
No	263	81.2
Ever seen a child born with a small head (microcephaly)?		
Yes	70	21.6
No	254	78.4
If a woman is infected with Zika virus, her fetus/baby is at risk of microcephaly		
Yes	46	14.2
No	278	85.8
Child born with a small head could be caused by Zika virus		
Yes	48	14.8
No	276	85.2

Table 1b Knowledge of ZIKV Infection among the Pregnant Women in Plateau State

Knowledge	Frequency	Percentage
Poor	274	84.6
Fair	18	5.6
Good	23	7.1
Very good	9	2.8

Key: Poor knowledge = score ≤ 2 points; fair = 3-4; good = 5-6 & very good = > 6 points. NB: the maximum score is 8 points.

Table 1c Knowledge of ZIKV Infection by Senatorial Zone in Plateau State

Knowledge	Overall (%)	Senatorial Districts			χ^2	*P*-value
		North (n = 108)	Central (n = 108)	Southern (n=108)		
Poor	274 (84.6)	105 (97.2)	77 (71.3)	92 (85.2)	31.951	0.001*
Fair	18 (5.6)	0 (0.0)	10 (9.3)	8 (7.4)		
Good	23 (7.1)	3 (2.8)	16 (14.8)	4 (3.7)		
Very good	9 (2.8)	0 (0.0)	5 (4.6)	4 (3.7)		

Key: Poor knowledge = score ≤ 2 points; fair = 3-4; good = 5-6 & very good = > 6 points. NB: the maximum score is 8 points.

*Significant

3.2 Perception, Beliefs, and Attitude

Women's perceptions of the condition were greatly impacted by their ignorance; 82.4% (n=267) had an overall "Poor" perception (Table 2b). The primary cause of this was doubt, as evidenced by the fact that 89.8% of respondents were not aware of any accessible treatment and 85.2% were not aware of a ZIKV vaccination (Table 2a). Positive features surfaced, even though the overall level of beliefs was also bad, with 45.1% expressing "Poor" beliefs (Table 3b). A significant 42.3% of respondents were willing to accept ZIKV vaccination should it be available in the future, and the majority (65.1%) accurately perceived ZIKV as a substantial community hazard (Table 3a).

Nonetheless, there are still worries about the social repercussions; 37.0% of respondents think a woman with a microcephalic infant would be stigmatized (Table 3a). In terms of attitudes, more than half of the women (54.6%) saw prevention as "Poor" (Table 4b). This was mirrored in risky behavioral intentions: 91.0% categorically disagreed with avoiding or postponing pregnancy because of the ZIKV threat, and 53.4% stated they would not promote partner condom use after visiting a place affected by ZIKV (Table 4a).

Table 2a Perception of the Pregnant Women towards ZIKV Infection in Plateau State

Perception	Frequency	Percentage
ZIKV has vaccine		
Yes	20	6.2
No	28	8.6
Don't know	276	85.2
Everybody who gets ZIKV show symptoms		
Yes	17	5.2
No	24	7.4
Don't know	283	87.3
ZIKV can be prevented		
Yes	57	17.6
No	30	9.3
Don't know	237	73.1
There is treatment for ZIKV		
Yes	20	6.2
No	13	4.0
Don't know	291	89.8
ZIKV can be diagnosed in Nigeria		
Yes	26	8.0
No	14	4.3
Don't know	284	87.7

Table 2b Perception of Pregnant Women towards ZIKV Infection in Plateau State

Perception	Frequency	Percentage
Poor	267	82.4
Fair	33	10.2
Good	15	4.6
Very good	9	2.8

Key: Poor knowledge = score ≤ 2 points; fair = 3-4; good = 5-6 & very good = > 6 points. NB: the maximum score is 8 points.

Table 2c Perception of Pregnant Women towards the ZIKV Infection by Senatorial Districts

Perception	Senatorial Districts			χ^2	*P*-value
	North	Central	Southern		
Poor	97(89.8)	84(77.8)	86(79.6)	11.913	0.064*
Fair	6(5.6)	11(10.2)	16(14.6)		
Good	3(2.8)	7(6.5)	5(4.6)		
Very good	2(1.9)	6(5.6)	1(0.9)		

Key: Poor knowledge = score ≤ 2 points; fair = 3-4; good = 5-6 & very good = > 6 points. NB: the maximum score is 8 points.
*Significant

Table 3a Beliefs of Pregnant Women towards ZIKV Infection in Plateau State, Nigeria

Belief	Frequency	Percentage
I feel that if a woman has a baby that has microcephaly or another disability, she will be discriminated against or stigmatized because of the child		
Yes	120	37.0
No	204	63.0
I feel that if a person gets Zika, they and their family are discriminated or stigmatized because of it.		
Yes	98	30.2
No	226	69.8
ZIKV can be transmitted to everyone		
Yes	54	16.7
No	38	11.7
Don't know	232	71.6
If ZIKV vaccine becomes available, can you receive it?		
Yes	137	42.3
No	21	6.5
Don't know	166	51.2
Do you think it is possible to get ZIKV in your community now?		
Yes	79	24.4
No	73	22.5
Don't know	172	53.1
Do you see ZIKV not a serious threat to the community?		
Yes	113	34.9
No	211	65.1
Do you think traditional medicine/concoction prevent/cures ZIKV?		
Yes	61	18.8
No	263	81.2

Table 3b Beliefs of Pregnant Women towards the Zika Virus Infection in Plateau State

Belief	**Frequency**	**Percentage**
Poor	146	45.1
Fair	110	34.0
Good	51	15.7
Very good	17	5.2

Key: Poor knowledge = score ≤ 2 points; fair = 3-4; good = 5-6 & very good = > 6 points. NB: the maximum score is 8 points.

Table 3c Beliefs of Pregnant Women towards the ZIKV Infection by Senatorial District

Belief	**Senatorial District**			χ^2	***P*-value**
	North	**Central**	**Southern**		
Poor	63(58.3)	41(38.0)	42(38.9)	15.862	0.015*
Fair	30(27.8)	41(38.0)	39(36.1)		
Good	13(27.8)	21(19.4)	17(15.7)		
Very good	2(1.9)	5(4.6)	10(9.3)		

Key: Poor knowledge = score ≤ 2 points; fair = 3-4; good = 5-6 & very good = > 6 points. NB: the maximum score is 8 points.

- Significant

Table 4a Attitude of Pregnant Women towards the ZIKV Infection in Plateau State

Attitude	**Frequency**	**Percentage**
Do you agree that pregnant women should postpone unnecessary travel to Zika-infected countries?		
Yes	163	50.3
No	161	49.7
If my spouse has recently traveled to Zika affected countries, I would encourage him to use condoms during sexual intercourse or consider abstinence for 6 months after the trip		
Yes	151	46.6
No	173	53.4
Do you agree that women should avoid getting pregnant due to ZIKV?		
Yes	29	9.0
No	295	91.0
Whose responsibility is to prevent the spread of ZIKV		
I/me	67	20.7
Community	17	5.2
Government	58	17.9
Health worker	22	6.8
Every body	160	49.4

Table 4b Attitude of Pregnant Women towards the ZIKV Infection in Plateau State

Attitude	Frequency	Percentage
Poor	177	54.6
Fair	56	17.3
Good	80	24.7
Very good	11	3.4

Key: Poor knowledge = score ≤ 2 points; fair = 3-4; good = 5-6 & very good = > 6 points. NB: the maximum score is 8 points.

Table 4c Attitude of Pregnant Women towards the ZIKV Infection by Senatorial Districts

Attitude	Senatorial Districts			χ^2	*P*-value
	North	Central	Southern		
Poor	82(75.9)	57(52.8)	38(35.2)	44.328	0.001*
Fair	15(13.9)	15(13.9)	26(24.1)		
Good	7(6.5)	34(31.5)	39(36.1)		
Very good	4(3.7)	2(1.6)	5(4.6)		

Key: Poor knowledge = score ≤ 2 points; fair = 3-4; good = 5-6 & very good = > 6 points. NB: the maximum score is 8 points.
*Significant

3.3 Preventive Practices and Senatorial Disparities

The most encouraging area was preventive behaviors, where 39.5% of respondents had "Good" measures, in contrast to the inadequate knowledge and attitude (Table 5b). Good adherence to environmental control measures is the reason for this achievement; 74.4% of respondents reported cleaning bushes, and 64.2% reported clearing drainages and avoiding stagnant water (Table 5a). Table 5a shows that 37.0% of people do not appropriately cover their bodies with protective gear at night, indicating that there are still large gaps in personal protection.

Significant geographic variations that were statistically significant were present in every area. The senatorial districts demonstrated significant differences in knowledge ($\chi2=31.951$, P=0.001), beliefs ($\chi2=15.862$, P=0.015), attitude ($\chi2=44.328$, P=0.001), and practices ($\chi2=44.917$, P=0.001) (Tables 1c, 3c, 4c, 5c). While the Southern district generally shown the most favorable findings, particularly in preventative activities (52.8% "Good," Table 5c), the Northern district consistently had lowest outcomes, with the greatest proportions of "Poor" attitudes (75.9%, Table 4c) and "Poor" knowledge (97.2%, Table 1c).

Table 5a Preventive Practices towards ZIKV Infection among the Pregnant Women

Practice	Frequency	Percentage
Proximity to stagnant water/drainage		
Very close	30	9.3
Close	82	25.3
Far	103	31.8
Very far	50	15.4
No	59	18.2
Do you clear all drainages and avoid stagnant water?		
Yes	208	64.2
No	116	35.8
Proximity to forest/bush		
Very close	20	6.2
Close	65	20.1
Far	145	44.8
Very far	94	29.0
Do you go to the forest in search of firewood?		
Yes	94	29.0
No	230	71.0

Table 5b Preventive Practices of Pregnant Women towards the ZIKV Infection in Plateau State

Preventive practice	Frequency	Percentage
Poor	47	14.5
Fair	107	33.0
Good	128	39.5
Very good	42	13.0

Key: Poor knowledge = score ≤ 2 points; fair = 3-4; good = 5-6 & very good = > 6 points. NB: the maximum score is 8 points.

Table 5c Preventive Practices of Pregnant Women towards the ZIKV Infection by Senatorial Districts

Preventive practice	Senatorial Districts			χ^2	*P*-value
	North	Central	Southern		
Poor	25(25.0)	18(16.7)	2(1.9)	44.917	0.001*
Fair	48(44.4)	30(27.8)	29(26.9)		
Good	27(25.0)	44(40.7)	57(52.8)		
Very good	6(5.6)	16(14.8)	20(18.5)		

Key: Poor knowledge = score ≤ 2 points; fair = 3-4; good = 5-6 & very good = > 6 points. NB: the maximum score is 8 points.
*Significant

4. Discussions, Conclusions and Recommendations

Assessment of pregnant women's knowledge of ZIKV infection. This study shows that only a small proportion of pregnant women (9.9%) reported having heard about ZIKV, indicating a potential lack of awareness or dissemination of information about the virus in the studied population. Similar findings are seen in studies by Tok and Basam (2019), while contrasting with a study conducted in tertiary health institutions in Northern Nigeria, where participants had good knowledge of the virus (Wali *et al.,* 2022). Additionally, Oche *et al*. (2022) reported that 87.5% of participants had good knowledge of ZIKV. Ibrahim *et al*. (2018) also found that 77.5% of medical students in a university in Jeddah, Saudi Arabia, had poor knowledge. A minority of respondents (7.4%) correctly identified how ZIKV is transmitted, suggesting a need for education and awareness programs to improve understanding of transmission routes. While a larger proportion (17.3%) recognized the potential risk of ZIKV during pregnancy, a significant portion (82.7%) did not acknowledge this risk, highlighting a gap in knowledge regarding ZIKV's impact on maternal and fetal health.

Most respondents (91.0%) were unsure about the stage of pregnancy at which ZIKV infection could be more dangerous, indicating a lack of knowledge about critical fetal development periods susceptible to Zika-related complications. A minority of respondents (18.8%) correctly identified ZIKV as a cause of birth defects in children, emphasizing the need for better education on the link between ZIKV infection during pregnancy and adverse fetal outcomes. While a significant proportion (21.6%) reported having seen a child born with microcephaly, indicating some awareness, there remains a considerable portion (78.4%) who have not encountered this condition, possibly due to limited exposure or understanding. A small portion (14.2%) recognized that if a woman is infected with ZIKV, her fetus or baby is at risk of microcephaly, highlighting the need for better education about vertical transmission and its consequences. Similarly, only a small proportion (14.8%) correctly identified ZIKV as a cause of microcephaly in newborns, indicating a need for increased awareness of the connection between ZIKV infection and congenital anomalies.

Overall, the data reveal significant gaps in knowledge among pregnant women regarding ZIKV infection, transmission, and related risks. The finding that a large majority (84.6%) of pregnant women have "Poor" knowledge about ZIKV is concerning. It suggests a widespread lack of awareness, which could seriously impact prevention, early detection, and appropriate health-seeking behaviors. Many studies across sub-Saharan Africa have documented low awareness of arboviral diseases, including Zika. These findings underscore the importance of targeted educational interventions and public health campaigns in enhancing awareness and understanding of ZIKV among pregnant women, thereby supporting prevention efforts and reducing adverse outcomes.

Regarding pregnant women's perception of ZIKV infection, only a small percentage (6.2%) believed there is a vaccine for ZIKV, while most (85. 2%) were uncertain about its existence. This reflects a lack of clarity among pregnant women about vaccine availability. Their response aligns with findings from a study by Akunne *et al*. (2018)

in Southeastern Nigeria, where 60% reacted negatively to the vaccine's availability. Similarly, Harapan *et al*. (2019) found that among medical students, interns, and general practitioners in Indonesia, 83%, 69%, and 68% respectively, believed that there is no vaccine. This may be due to their medical knowledge of the disease.

When it comes to symptoms, only a small portion (5. 5.2%) thought everyone infected with ZIKV shows symptoms, while most (87. 3%) were unsure, possibly because they do not understand how the disease works. Akunne *et al*. (2018) also reported that most respondents had negative perceptions about ZIKV symptoms, with similar findings by Ndibuagu *et al*. (2021) among caregivers in Southeastern Nigeria. This highlights the need for increased awareness about the fact that ZIKV can be asymptomatic in some cases. Additionally, 17. 6% of respondents believed ZIKV could be prevented, but 73.1% were uncertain about prevention methods, emphasizing the need for better education on strategies like mosquito bite prevention. Only 6.2% believed there is treatment for ZIKV, while 89.8% were unsure, indicating limited knowledge about available treatments. This suggests the importance of raising awareness about ZIKV diagnosis facilities and procedures in the country. Akunne *et al.* (2018) also found that many healthcare professionals in Southeastern Nigeria suggested there is no treatment for ZIKV.

Regarding diagnosis, 8.0% believed ZIKV could be diagnosed in Nigeria, while 87.7% were uncertain about diagnostic capabilities. Overall, the data show various levels of uncertainty and misconceptions among pregnant women about ZIKV's prevention, treatment, and diagnosis. These findings highlight the need for targeted educational campaigns to improve awareness and understanding of ZIKV among pregnant women in Nigeria. Similar studies in Brazil and Colombia found that pregnant women had limited knowledge about ZIKV transmission and prevention measures (Lowe *et al*., 2018; Sikka *et al*., 2016).

In summary, these results underscore the importance of comprehensive public health efforts to address misconceptions and improve knowledge about ZIKV, ultimately leading to better health outcomes and prevention.

The present study also evaluates the preventive measures taken by pregnant women to protect themselves against ZIKV infection. The data is presented in terms of frequency and percentage for various preventive measures. A substantial portion of respondents reported various levels of proximity to stagnant water or drainage, with the majority indicating either being close (25.3%) or far (31.8%) from such areas. Most respondents (64.2%) reported clearing drainages and avoiding stagnant water, which are crucial steps in preventing mosquito breeding sites and reducing the risk of ZIKV transmission. A significant proportion of respondents reported varying degrees of proximity to forests or bushes, with the majority being far (44.8%) or very far (29.0%) from such areas. About 29.0% of respondents reported going to the forest in search of firewood, potentially exposing themselves to mosquito bites and the risk of ZIKV transmission. Nearly half of the respondents (49.4%) reported wearing protective clothing to cover their entire body before going to the forest or bush, which is a recommended preventive measure against mosquito bites and ZIKV transmission. A significant majority (74.4%) reported clearing bushes in their surroundings and avoiding visiting forests, indicating an awareness of the importance of reducing mosquito breeding sites and potential exposure to ZIKV vectors. This correlates with the study conducted by Ndibuagu *et al*. (2021) in Southeastern Nigeria among caregivers, where many respondents take protective measures against mosquito bites. The present data showed varying frequencies of mosquito bites, with the majority experiencing minimal (49.7%) or fewer (28.1%) mosquito bites. Similar reports were recorded by Chaw *et al.* (2018*)* on pregnant women in Brunei, Darusallam, with over 85% of respondents observing preventive measures against mosquito bites. Most respondents (80.2%) reported using mosquito nets as a preventive measure during sleep, highlighting the importance of bed nets in reducing mosquito bites and ZIKV transmission. Most respondents (63.0%) reported covering their bodies properly with thick clothes in the evening and night to avoid mosquito bites, indicating adherence to recommended preventive measures. This is also in agreement with the study done by Michael *et al.* (2017) among women of reproductive age in the outpatient department in Northern Nigeria; over 70% of respondents agreed to use insecticide-treated nets, covering of bodies, and other preventive measures against mosquito bites.

Overall, the findings suggest a moderate to high level of knowledge, belief, attitude, and awareness of preventive measures toward the ZIKV among the study participants. However, there are areas such as forest visits for firewood where further education and awareness efforts may be needed to enhance preventive behaviours and reduce ZIKV transmission risk. The marked differences in beliefs, attitudes, and practices across the senatorial districts imply that socioeconomic, cultural, and educational factors may be influential. For instance, the Southern and Central districts reported a more positive perspective on beliefs and attitudes, as well as better preventive practices, compared to the Northern district. This disparity could be attributed to variations in access to healthcare, education, or media, which are often unevenly distributed across different regions (WHO, 2016). A similar study suggested that higher levels of education and better access to information correlate with improved health-related knowledge and practices (Afolayan *et al.,* 2023).

Despite the overall insufficient knowledge, beliefs, and attitudes, the presence of good preventive practices throughout the state is an encouraging observation. This may stem from general health advice provided during antenatal care or the broader awareness of mosquito-borne diseases like malaria, for which similar preventive measures apply (such as using mosquito nets and removing stagnant water). Therefore, healthcare providers and public health authorities should build on these existing preventive practices and implement targeted educational initiatives to enhance the beliefs and attitudes of pregnant women regarding ZIKV. This can be accomplished by highlighting the specific risks ZIKV poses to both pregnant women and their unborn children.

5. Conclusion

These findings highlight a critical need for targeted public health education to improve awareness, early diagnosis, and prevention of ZIKV infection in vulnerable populations. Based on the findings, we recommend,

Enhanced Public Health Education: Implement comprehensive educational campaigns targeting pregnant women to raise awareness about the transmission of the ZIKV, risks associated with pregnancy, and preventive measures. Utilize antenatal clinics as focal points for disseminating information.

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