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Regional Variations in HIV/AIDS Knowledge Among Women of Reproductive Age in Nigeria: A Comparative Analysis

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Abstract

Despite various efforts to curb the spread of HIV, significantly disparities remain, particularly a challenge among women of reproductive age in Nigeria. This study aims to assess the regional differential in comprehensive knowledge of HIV/AIDS among women aged 15 – 49 years across Nigeria. By employing a comparative analysis, the research seeks to understand how sociodemographic factors, including age, marital status, educational level, place of residence, and wealth index influence comprehensive knowledge of HIV/AIDS across region. The study employed data from the 2018 Nigeria Demographic and Health Survey. Descriptive statistics were used to analyze the data and logistic regression was then used to determine factors that influenced the level of HIV knowledge among women of reproductive age. A total of 8,061 women were included in this study. The result showed that the prevalence of comprehensive knowledge of HIV/AIDS was higher (more than 50%) in South East (60.5%), North West (55.5%) and the South West (51.7%) and lower (less than 50%) in North East (36.7%), North Central (41.4%) and South-South (42.2%). Age, place of residence, religion, marital status, educational level, employment status and wealth index and exposure to media and health care services were statistically significant factors associated with comprehensive knowledge of HIV ($p<0.05$). The study reveals that HIV knowledge considerably varies significantly across regions for Nigerian women of reproductive age. These findings indicate, therefore, the need to enhance HIV/AIDS education and prevention activities by developing relevant and practical strategies to reach the regions having poor comprehensive knowledge of HIV/AIDS.

Keywords: *Comprehensive HIV Knowledge, Place of Residence, Socio-Demographic Factors.*

Background

There are 88.4 million people infected with HIV virus with approximately 42.3 million people had died from this disease since inception of the epidemic [1]. As of 2023 globally approximately 39.9 million people are still living with HIV with African region having 1 in every 25-adult living with HIV, hence accounting for two-third of the global statistics of people living with HIV and in sub-Saharan Africa, women and girls all ages accounted for 62% of all new HIV infections unlike in other geographical regions where over 73% of new HIV infections in 2023 occurred among men and boys [2]. Approximately 23.5 million workers worldwide live with HIV with females at the receiving end [3]. Median HIV prevalence among the adult population (ages 15–49) was 0.8% globally in 2023. However,

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because of marginalization, cultural practices, lack of education and poverty, median prevalence was higher among young women and girls aged between 15 and 24 [2].

The 2018 results of the Nigerian AIDS Indicator and Impact Survey (NAIIS, 2018) shows that the prevalence of HIV among Nigerian aged 15-64 is 1.3%, while women between the ages of 15-49 years has prevalence 1.9%; for men of the same age group, it is 0.9% [4, 9, 17]. This statistic indicated that women of reproductive age (15-49 years) are particularly vulnerable to HIV/AIDS, necessitating focus on this demographic.

These statistics motivated this current study to explore regional differences in knowledge of HIV/AIDS. According to WHO, more female than male live with HIV while men acquire and die more from HIV-related illnesses [1]. This further necessitates this study in order to explore the regional differences in knowledge of HIV/AIDS among women of reproductive age (15-49 years) across Nigeria. Nigerian AIDS Indicator and Impact Survey (NAIIS, 2018) also shows that the prevalence of HIV among adult population (15-65 years) is 1.3% while that of general population is 1.4% [4, 9, 17] and since females (15-49 years) have the largest proportion of the population [5], further necessitates the fact that the focus of the study should be on this group. Despite efforts to control the spread, inequities remain a major challenge, particularly among women of reproductive age. These differences are impacted by several factors such as women's physiological vulnerability to HIV, socioeconomic, educational, cultural variables among others [6, 7, 8, 18]. Focusing on comparative analysis is believed to seeks regional differences in HIV/AIDS knowledge among Nigerian women, highlighting how geographic location influences awareness. Understanding geographical differences can help inform targeted actions and policies to improve public health outcomes.

This study aims to explore the regional differences in knowledge of HIV/AIDS among women of reproductive age (15-49 years) across Nigeria. By conducting comparative analysis, the research seeks to understand how sociodemographic factors, including educational level, socioeconomic status, and geographical location, influence comprehensive knowledge of HIV/AIDS within this demographic. The study will utilize data from national health surveys which was conducted by using qualitative interviews to gauge awareness levels, misconceptions, and the sources of information about HIV/AIDS among women in different regions of Nigeria. This analysis will highlight areas with low awareness and identify potential barriers to effective HIV/AIDS education and prevention strategies. The outcomes of this research are expected to guide policymakers, health educators, and NGOs in tailoring interventions that will improve HIV/AIDS knowledge, especially in regions where women are at a higher risk due to lack of information. Comparing these findings with similar studies from other countries will also provide insights into global trends and effectiveness of different HIV/AIDS knowledge dissemination strategies. Recommendations will be made on improving awareness and understanding of HIV/AIDS among women of reproductive age in Nigeria, focusing on culturally and regionally appropriate education and intervention programs. Other studies have shown that HIV prevalence varied significantly among geographic regions [21, 26].

Reliable and complete knowledge of HIV/AIDS is essential for effective preventive and treatment measures. This study can help to shape and tailor educational campaigns and public health interventions that address the specific barriers and problems that women encounter in various places. Empowering women with correct HIV/AIDS information can improve their health and eliminate the disease's stigma. The findings would be useful

to policymakers and health authorities in determining the most efficient allocation of resources and the design of policies that address the unique difficulties women are confronted with across Nigeria. The study adds to the current body of knowledge on HIV/AIDS in Nigeria, focusing on regional variations in awareness and understanding.

Methods

Data Source and Sampling Strategy

The Nigeria Demographic and Health Survey of 2018 (NDHS, 2018) provided data that were accepted and used in this study. The National Population Commission (NPC) carried out the 2018 Nigeria Demographic and Health Survey [22]. Data was gathered between August 14, 2018, and December 29, 2018. The DHS Program, funded by the US Agency for International Development (USAID), offers financial support and technical assistance for demographic and health surveys in numerous nations. ICF supplied technical support through this program. A comprehensive range of population, health, and other critical indicators encompassing all 36 states and the Federal Capital Territory (FCT) are gathered by the National Demographic and Health Survey (NDHS), a nationwide representative household survey, providing current estimates of fundamental demographic and health indicators was the primary goal of the 2018 NDHS [23].

The stratified sample used for the 2018 NDHS was chosen in two stages or phases. By dividing the Federal Capital Territory, all 36 states, and their respective urban and rural areas, stratification was achieved. 74 sampling strata in all were recognized. In each stratum, samples were chosen separately using a two-step selection procedure. By employing a probability proportional to size selection during the first sampling phase and sorting the sampling frame prior to sample selection in line with administrative order, implicit stratifications were realized at each of the lower administrative levels.

The number of homes within the EA was designated as the EA size. All of the chosen EAs underwent a household listing procedure, and the lists of households that were produced were used as a sampling frame for the homes that were chosen for the second part of the study. Using equal probability systematic sampling, a predetermined number of 30 households were chosen from each cluster in the second step of the selection process, yielding a sample size of almost 42,000 households overall. Tablets were used for the household listing, and computer programming was used to select homes at random. Only the pre-selected households were visited by the interviewers. During the implementation phase, no alterations or replacements of the preselected families were permitted in order to prevent bias.

Dependent Variable

The dependent variable was comprehensive knowledge of HIV/AIDS, which was measured using three questions on the knowledge about HIV and two questions about local misconceptions, which are incorrect beliefs about HIV transmission. These variables are (1) the knowledge about the consistent use of condoms during sexual intercourse, (2) knowing that having one uninfected faithful partner could reduce the chances of contracting HIV and (3) knowing that a healthy-looking person can have HIV; (4) knowledge about the misconception that HIV can be transmitted through mosquitoes, as well as (5) misconception that HIV can be transmitted by sharing of food with someone infected with HIV. Respondents who answered each of these questions correctly were assigned 1, implying having comprehensive knowledge of HIV, and 0, if any of these questions were answered incorrectly.

Independent Variable

Independent variables The following respondents' background characteristics were used as independent variables: (1) current use of modern contraceptive methods (no versus yes) – including male and female sterilization, injectables, intrauterine devices (IUDs), contraceptive pills, implants, female and male condoms, the standard days method, the lactational amenorrhea method (LAM) and emergency contraception and any other modern method including diaphragm, contraceptive jelly or foam, (2) age group (15–17, 18–19 and 20–24 years), (3) region (North Central, North East, North West, South East, South South and South West), (4) place of residence (urban versus rural), (5) wealth quintiles – composite index to measure socioeconomic status of households using information on assets, goods and services, dwelling and housing conditions and operationalized using the principal component analysis was divided into quintiles (poorest, poorer, middle, richer and richest), (6) education (no formal education, primary, secondary and above), (7) owning a mobile phone (yes versus no), (8) exposure to mass media (means of communication to reach a large audience) – TV, radio, newspaper or magazine (yes versus no), (9) having access to the internet (yes versus no), (10) covered by health insurance (yes versus no), (11) religion (Catholics, other Christians, Islam and other religion), (12) ethnicity (Fulani, Hausa, Igbo, Yoruba and other ethnic minorities), (13) marital status (never versus ever married), (14) sex of household head (male versus female), (15) currently working (yes versus no) and (16) ever had sexual intercourse (yes versus no).

Data Analysis

The descriptive statistics of variables were presented using frequencies and percentages separated by region. The prevalence of HIV comprehensive knowledge with Clopper–Pearson's 95% confidence intervals (CIs) was computed by respondents' background characteristics and across the six regions. Differences in the prevalence of HIV comprehensive knowledge were assessed using chi-square test. Univariate and multivariable binary logistic regression models were used to determine the factors associated with comprehensive HIV knowledge of women across the regions. The results were presented as crude odds ratio (COR) for unadjusted models and adjusted odds ratio (AOR) together with their 95% CIs. A multicollinearity test does not reveal any collinearity using the variance inflation factor. All analyses were performed using Stata 17.0 (StataCorp LP, College Station, Texas, USA), adjusting for the complex survey design – weighting, clustering and stratification and at a 5% significance level.

Ethical Considerations

The study is using secondary data publicly available from DHS for analyses. Ethical processes are the responsibility of the institutions that commissioned, funded or managed the surveys. DHS surveys are usually approved by ICF international as well as an Institutional Review Board in respective country to ensure that the protocols are in compliance with the U.S. Department of Health and Human Services guidelines for the protection of human subjects.

The 2018 Nigeria Demographic and Health Survey was approved by Nigeria Health Sciences Research Committee and the Institutional Review Board of ICF Macro in Calverton Maryland, USA. Consent for participation in the survey was obtained from all the respondents by enumerators on behalf of the National Population Commission of Nigeria and the DHS program. However, a written request was submitted to the DHS program and permission was granted to use the data for this study. In addition, the approval for the study by Nigeria National Health Research and Ethics Committee (NHREC) was given.

Strengths and Limitation of the Study

The study has few identifiable strengths such as rigorous analysis on variation in comprehensive knowledge on HIV prevalence across regions in Nigeria likewise factors influencing comprehensive HIV knowledge among women of reproductive age. Nevertheless, the study enlightens regional differences in knowledge on HIV/AIDS that is a crucial pointer for formulating appropriate interventions and policies. Despite these strengths the study also has few limitations such as its dependability on secondary data which implies that the researcher has limited control on data collection as well as their accuracy and exhaustiveness. Furthermore, the study focusing on women of the reproductive age, thus other groups like male and women of other age groups are not captured making the findings quite limited in generalizability.

Results

In Figure 1 below, analysis showed that South East region has the highest percentage of women with comprehensive HIV knowledge at 60.5%, followed by the North West at 55.5% and the South West at 51.7%. These results imply that, in comparison to the North East, which may experience difficulties with healthcare education and services, the South East, North West, and South West regions have comparatively better access to HIV-related information and resources. There were also statistically significance disparities in HIV knowledge across the six regions.

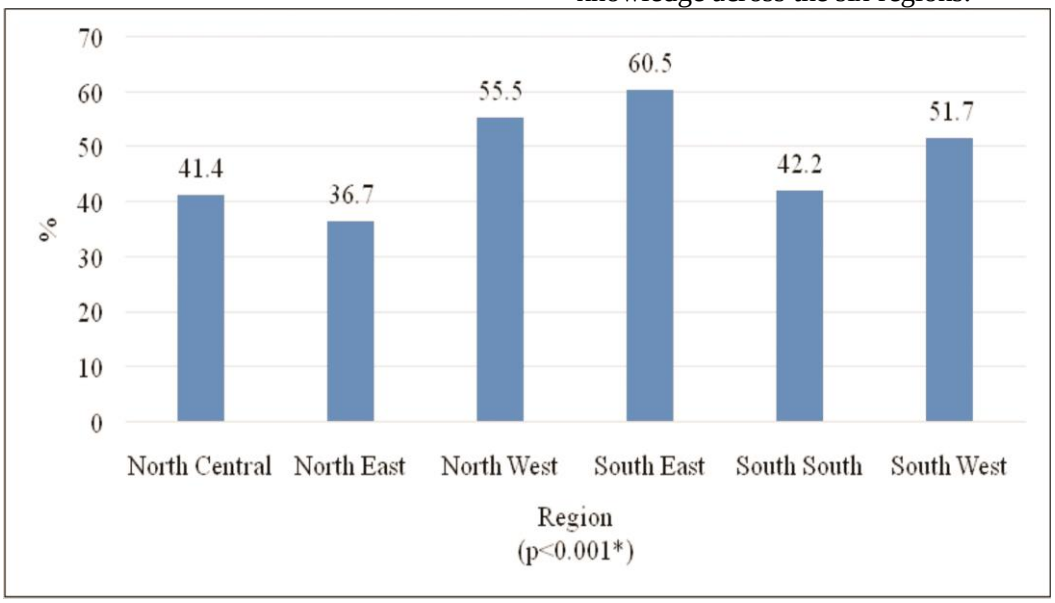

Figure 1. Prevalence of Comprehensive Knowledge of HIV among Women of Reproductive by Region

Table 1. Characteristics of Respondents by Region

	NC n=1451(%)	**NE n=1574(%)**	**NW n=2101(%)**	**SE n=943(%)**	**SS n=793(%)**	**SW n=1199(%)**	**Total N=8061 (%)**
Age group							
15 – 19	65 (4.5)	149 (9.5)	220 (10.5)	15 (1.6)	23 (2.9)	15 (1.3)	487 (6.0)
20 – 24	241 (16.6)	298 (18.9)	411 (19.6)	91 (9.7)	91 (11.5)	126 (10.5)	1258 (15.6)
25 – 29	374 (25.8)	356 (22.6)	488 (23.2)	203 (21.5)	183 (23.1)	282 (23.5)	1886 (23.4)
30 – 34	284 (19.6)	309 (19.6)	378 (18.0)	234 (24.8)	184 (23.2)	279 (23.3)	1668 (20.7)
35 – 39	240 (16.5)	237 (15.1)	286 (13.6)	209 (22.2)	163 (20.6)	270 (22.5)	1405 (17.4)
40 – 44	145 (10.0)	153 (9.7)	183 (8.7)	108 (11.5)	93 (11.7)	136 (11.3)	818 (10.1)
45 – 49	102 (7.0)	72 (4.6)	135 (6.4)	83 (8.8)	56 (7.1)	91 (7.6)	539 (6.7)

Place of residence							
Urban	461 (31.8)	330 (21.0)	491 (23.4)	619 (65.6)	253 (31.9)	855 (71.3)	3009 (37.3)
Rural	990 (68.2)	1244 (79.0)	1610 (76.6)	324 (34.4)	540 (68.1)	344 (28.7)	5052 (62.7)
Religion							
Christian	702 (48.4)	250 (15.9)	114 (5.4)	936 (99.3)	748 (94.3)	778 (64.9)	3528 (43.8)
Islam	742 (51.1)	1323 (84.1)	1979 (94.2)	0 (0.0)	11 (1.4)	419 (34.9)	4474 (55.5)
Others	7 (0.5)	1 (0.1)	8 (0.4)	7 (0.7)	34 (4.3)	2 (0.2)	59 (0.7)
Marital status							
Married	1437 (99.0)	1556 (98.9)	2096 (99.8)	912 (96.7)	686 (86.5)	1070 (89.2)	7757 (96.2)
Living with partner	14 (1.0)	18 (1.1)	5 (0.2)	31 (3.3)	107 (13.5)	129 (10.8)	304 (3.8)
Educational level							
No education	534 (36.8)	1089 (69.2)	1557 (74.1)	31 (3.3)	48 (6.1)	112 (9.3)	3371 (41.8)
Primary	295 (20.3)	198 (12.6)	245 (11.7)	215 (22.8)	163 (20.6)	213 (17.8)	1329 (16.5)
Secondary	455 (31.4)	223 (14.2)	232 (11.0)	585 (62.0)	479 (60.4)	641 (53.5)	2615 (32.4)
Higher	167 (11.5)	64 (4.1)	67 (3.2)	112 (11.9)	103 (13.0)	233 (19.4)	746 (9.3)
Currently working							
No	409 (28.2)	600 (38.1)	993 (47.3)	147 (15.6)	151 (19.0)	118 (9.8)	2418 (30.0)
Yes	1042 (71.8)	974 (61.9)	1108 (52.7)	796 (84.4)	642 (81.0)	1081 (90.2)	5643 (70.0)
Wealth Index							
Poorest	222 (15.3)	660 (41.9)	710 (33.8)	34 (3.6)	16 (2.0)	55 (4.6)	1697 (21.1)
Poorer	335 (23.1)	410 (26)	631 (30.0)	105 (11.1)	82 (10.3)	86 (7.2)	1649 (20.5)
Middle	366 (25.2)	279 (17.7)	428 (20.4)	215 (22.8)	199 (25.1)	195 (16.3)	1682 (20.9)
Richer	300 (20.7)	164 (10.4)	207 (9.9)	321 (34.0)	250 (31.5)	325 (27.1)	1567 (19.4)
Richest	228 (15.7)	61 (3.9)	125 (5.9)	268 (28.4)	246 (31.0)	538 (44.9)	1466 (18.2)
Had HIV Comprehensive knowledge							
No	738 (58.6)	932 (63.3)	898 (44.5)	371 (39.5)	439 (57.8)	548 (48.3)	3926 (51.8)
Yes	522 (41.4)	541 (36.7)	1122 (55.5)	568 (60.5)	320 (42.2)	587 (51.7)	3660 (48.2)
Current use of modern contraceptive							
No	1209 (83.3)	1429 (90.8)	1963 (93.4)	800 (84.8)	661 (83.4)	875 (73.0)	6937 (86.1)
Yes	242 (16.7)	145 (9.2)	138 (6.6)	143 (15.2)	132 (16.6)	324 (27.0)	1124 (13.9)
Owns a mobile telephone							
No	658 (45.3)	1031 (65.5)	1477 (70.3)	207 (22.0)	232 (29.3)	195 (16.3)	3800 (47.1)
Yes	793 (54.7)	543 (34.5)	624 (29.7)	736 (78.0)	561 (70.7)	1004 (83.7)	4261 (52.9)
Use of internet							
No	1333 (91.9)	1528 (97.1)	2034 (96.8)	777 (82.4)	656 (82.7)	850 (70.9)	7178 (89.0)
Yes	118 (8.2)	46 (2.9)	67 (3.2)	166 (17.6)	137 (17.3)	349 (29.2)	883 (11.0)
Covered by health insurance							
No	1401 (96.6)	1559 (99.0)	2044 (97.3)	907 (96.2)	773 (97.5)	1160 (96.7)	7844 (97.3)
Yes	50 (3.4)	15 (1.0)	57 (2.7)	36 (3.8)	20 (2.5)	39 (3.3)	217 (2.7)

NC=North Central, NE=North East, NW=North West, SE=South East, SS=South-South, SW=South West

Table 1 shows that out of the 8061 women selected for this study, 1451 (North Central), 1574 (North East), 2101 (North West), 943 (South East), 793 (South-South) and 1199 (South West). The analysis also showed that 44.1% of the women were between 25 – 34 years. The rural population is predominant in most regions except in the South East (65.6%

urban) and South West (71.3% urban). Majority (96.2%) of the women were married across the six regions. Educational levels reveal significant disparities, with higher illiteracy rates in the North West (74.1%) and North East (69.2%) compared to the South East (73.9%) and South West (72.9%). Majority of the women in South West (90.2%), South East (84.4%) and South-South (81.0%) are currently working. The wealth index shows the highest concentration of the poorest is in the North East (41.9%), while the richest are more prevalent in the South West (44.9%). For the HIV comprehensive knowledge, with the highest awareness in the south East (60.5%) and North West (55.5%). Modern contraceptive use is generally low, with the South West showing relatively higher usage (27.0%). Mobile phone ownership is widespread, especially in the South West (83.7%), whereas internet use is low across all regions, albeit slightly higher in the South West (29.2%). Health insurance coverage is minimal across all regions.

Table 2. Prevalence of HIV Comprehensive Knowledge among Women of Reproductive age by Background Characteristics Across Region

	NC n=522 (%)	**NE n=541(%)**	**NW n=1122(%)**	**SE n=568(%)**	**SS n=320(%)**	**SW n=587(%)**	**p-value**
Age group							
15 – 19	16 (3.1)	36 (6.7)	93 (8.3)	10 (1.8)	6 (1.9)	1 (0.2)	
20 – 24	84 (16.1)	97 (17.9)	233 (20.8)	53 (9.3)	35 (10.9)	61 (10.4)	
25 – 29	135 (25.9)	132 (24.4)	269 (24)	121 (21.3)	73 (22.8)	124 (21.1)	
30 – 34	116 (22.2)	114 (21.1)	216 (19.3)	146 (25.7)	83 (25.9)	141 (24)	
35 – 39	86 (16.5)	89 (16.5)	156 (13.9)	130 (22.9)	65 (20.3)	144 (24.5)	
40 – 44	50 (9.6)	53 (9.8)	89 (7.9)	67 (11.8)	38 (11.9)	73 (12.4)	x^2=202.233
45 – 49	35 (6.7)	20 (3.7)	66 (5.9)	41 (7.2)	20 (6.3)	43 (7.3)	p<0.001*
Place of residence							
Urban	223 (42.7)	169 (31.2)	359 (32)	374 (65.8)	121 (37.8)	463 (78.9)	x^2=490.682
Rural	299 (57.3)	372 (68.8)	763 (68)	194 (34.2)	199 (62.2)	124 (21.1)	p<0.001*
Religion							
Christian	343 (65.7)	126 (23.3)	75 (6.7)	565 (99.5)	299 (93.4)	389 (66.3)	
Islam	178 (34.1)	414 (76.5)	1041 (92.8)	0 (0)	1 (0.3)	197 (33.6)	x^2=74.240
Others	1 (0.2)	1 (0.2)	6 (0.5)	3 (0.5)	20 (6.3)	1 (0.2)	p<0.001*
Marital status							
Married	512 (98.1)	534 (98.7)	1120 (99.8)	555 (97.7)	267 (83.4)	556 (94.7)	
Living with partner	10 (1.9)	7 (1.3)	2 (0.2)	13 (2.3)	53 (16.6)	31 (5.3)	x^2=38.584 p<0.001*
Educational level							
No education	85 (16.3)	307 (56.7)	736 (65.6)	16 (2.8)	8 (2.5)	36 (6.1)	
Primary	100 (19.2)	67 (12.4)	148 (13.2)	94 (16.5)	42 (13.1)	88 (15)	
Secondary	223 (42.7)	117 (21.6)	179 (16)	371 (65.3)	204 (63.7)	304 (51.8)	x^2=1446.762
Higher	114 (21.8)	50 (9.2)	59 (5.3)	87 (15.3)	66 (20.6)	159 (27.1)	p<0.001*
Currently working							
No	141 (27)	183 (33.8)	537 (47.9)	95 (16.7)	65 (20.3)	54 (9.2)	$x^2$363.066
Yes	381 (73)	358 (66.2)	585 (52.1)	473 (83.3)	255 (79.7)	533 (90.8)	p<0.001*
Wealth Index							

Poorest	50 (9.6)	164 (30.3)	308 (27.5)	7 (1.2)	6 (1.9)	21 (3.6)	
Poorer	82 (15.7)	141 (26.1)	303 (27)	51 (9)	19 (5.9)	34 (5.8)	
Middle	116 (22.2)	114 (21.1)	253 (22.5)	109 (19.2)	59 (18.4)	71 (12.1)	
Richer	122 (23.4)	87 (16.1)	150 (13.4)	208 (36.6)	109 (34.1)	147 (25)	x^2=1104.949
Richest	152 (29.1)	35 (6.5)	108 (9.6)	193 (34)	127 (39.7)	314 (53.5)	p<0.001*
Current use of modern contraceptive							
No	390 (74.7)	476 (88)	1010 (90)	466 (82)	258 (80.6)	420 (71.6)	x^2=126.809
Yes	132 (25.3)	65 (12)	112 (10)	102 (18)	62 (19.4)	167 (28.4)	p<0.001*
Owns a mobile telephone							
No	158 (30.3)	297 (54.9)	692 (61.7)	95 (16.7)	62 (19.4)	65 (11.1)	x^2=686.357
Yes	364 (69.7)	244 (45.1)	430 (38.3)	473 (83.3)	258 (80.6)	522 (88.9)	p<0.001*
Use of internet							
No	435 (83.3)	508 (93.9)	1063 (94.7)	448 (78.9)	242 (75.6)	363 (61.8)	x^2=374.436
Yes	87 (16.6)	33 (6.1)	59 (5.2)	120 (21.1)	78 (24.4)	224 (38.2)	p<0.001*
Covered by health insurance							
No	484 (92.7)	531 (98.2)	1075 (95.8)	538 (94.7)	314 (98.1)	561 (95.6)	x^2=25.182
Yes	38 (7.3)	10 (1.8)	47 (4.2)	30 (5.3)	6 (1.9)	26 (4.4)	p<0.001*

**Significant at p<0.05*

Table 2 shows the prevalence of comprehensive HIV knowledge among women of reproductive age across various regions in Nigeria, categorized by specific background characteristics, age group analysis reveals significant differences (p<0.001), with the highest prevalence in the 25-29 age group across most regions, peaking at 25.9% in the North Central (NC) and 24.4% in the North East (NE). Notably, younger age groups (15-19) exhibit lower prevalence, especially in the South West (SW) at 0.2%. Place of residence shows a stark contrast (p<0.001), with urban areas generally having higher comprehensive HIV knowledge compared to rural areas, particularly evident in the SW region, where urban prevalence reaches 78.9%. Religious affiliation also significantly impacts HIV knowledge (p<0.001); Christians dominate in the South East (SE) and South South (SS) regions, with nearly all respondents being Christians in SE (99.5%), while Islamic faith is predominant in the North East (NE) and North West (NW) regions, notably at 76.5% and 92.8% respectively. Marital status shows almost universal prevalence among married women (p<0.001), with the highest rates in the NW (99.8%).

Educational level is another critical factor (p<0.001), with secondary education being most common in the SE (65.3%) and SS (63.7%). However, the NW region shows a high percentage of women with no education (65.6%). Employment status indicates a higher prevalence of HIV knowledge among currently working women (p<0.001), particularly in the SW (90.8%). Wealth index analysis highlights significant disparities (p<0.001), with the richest quintile having the highest prevalence in SW (53.5%) and SE (34%). Modern contraceptive use is more common among women with comprehensive HIV knowledge in the SW (28.4%). Mobile phone ownership, a marker of access to information, is significantly higher among women with HIV knowledge in the SW (88.9%) (p<0.001). Internet use follows a similar trend, particularly in the SW (38.2%) and SE (21.1%) (p<0.001). Health insurance coverage is notably low across all regions, though the SW shows a slightly higher prevalence (7.3%) (p<0.001). The significant p-values across all variables suggest robust associations between comprehensive HIV

knowledge and these background characteristics.

Table 3 shows the crude odds ratios (COR) from a binary logistic regression analysis examining the factors associated with comprehensive knowledge of HIV across different regions in Nigeria. For age groups, individuals aged 20-24 in the North West (COR: 1.65, 95% CI: 1.17 – 2.33), South South (COR: 1.57, 95% CI: 0.55 – 4.48), and South West regions (COR: 14.16, 95% CI: 1.79 – 111.77) show significantly higher odds of having comprehensive HIV knowledge compared to the reference group (15-19). The odds ratios increase with age in the South West, indicating a trend where older individuals possess more HIV knowledge, particularly significant in the 20-24 and 25-29 age brackets (COR: 11.51, 95% CI: 1.48 – 89.29). Rural residence generally decreases the likelihood of comprehensive HIV knowledge, except in the South East, where no significant difference is observed. In terms of religion, Islam is associated with lower odds of comprehensive HIV knowledge compared to Christianity, significantly so in the North Central (COR: 0.42, 95% CI: 0.33 – 0.53), North East (COR: 0.48, 95% CI: 0.36 – 0.63), and North West regions (COR: 0.63, 95% CI: 0.42 – 0.94). For marital status, those living with a partner in the North Central region (COR: 3.58, 95% CI: 1.12 – 11.49) show significantly higher odds of HIV knowledge compared to married individuals, while this trend is not consistent across other regions. Higher educational levels substantially increase the likelihood of HIV knowledge, with secondary (COR: 3.53, 95% CI: 2.61 – 4.79) and higher education (COR: 7.91, 95% CI: 2.25 – 11.93) showing strong positive associations across most regions. Employment status shows no significant impact. Wealth index results indicate that higher wealth correlates with better HIV knowledge, notably in the North Central (COR: 4.87, 95% CI: 3.16 – 7.51), North East (COR: 3.94, 95% CI: 2.26 – 6.88), and North West regions (COR: 7.51, 95% CI: 4.40 – 12.79). Use of modern contraceptives and owning a mobile phone are positively associated with HIV knowledge across most regions. Internet use (COR: 4.72, 95% CI: 3.06 – 7.27) and health insurance coverage (COR: 5.19, 95% CI: 2.63 – 10.25) are also strong positive predictors, highlighting the importance of access to information and healthcare resources.

Table 3. Crude Odds Ratio of Binary Logistic Regression Model of the Factors Associated with Comprehensive Knowledge of HIV among Respondents Across Region in Nigeria

	NC **COR (95% CI)**	**NE** **COR (95% CI)**	**NW** **COR (95% CI)**	**SE** **COR (95% CI)**	**SS** **COR (95% CI)**	**SW** **COR (95% CI)**
Age group						
15 – 19	RC	RC	RC	RC	RC	RC
20 – 24	1.38 (0.71 – 2.67)	1.36 (0.86 – 2.15)	1.65 (1.17 – 2.33)*	0.69 (0.22 – 2.21)	1.57 (0.55 – 4.48) *	14.16 (1.79 – 111.77) *
25 – 29	1.48 (0.78 - 2.81)	1.71 (1.09 – 2.66)*	1.50 (1.08 – 2.10)*	0.75 (0.25 – 2.27)	1.65 (0.61 – 4.51) *	11.51 (1.48 – 89.29) *
30 – 34	1.61 (0.84 – 3.08)	1.66 (1.06 – 2.61)*	1.60 (1.13 – 2.27)*	0.84 (0.28 – 2.54)	1.99 (0.73 – 5.43) *	14.66 (1.89 – 113.28) *
35 – 39	1.39 (0.72 – 2.68)	1.67 (1.04 – 2.66)*	1.42 (0.99 – 2.05)*	0.82 (0.27 – 2.49)	1.65 (0.60 – 4.52) *	16.86 (2.17 – 130.87) *
40 – 44	1.22 (0.61 – 2.44)	1.52 (0.91 – 2.54)	1.09 (0.73 – 1.64)	0.84 (0.27 – 2.63)	1.81 (0.64 – 5.15) *	16.08 (2.04 – 126.54) *
45 – 49	1.35 (0.64 – 2.81)	1.03 (0.54 – 1.97)	1.16 (0.75 – 1.81)	0.50 (0.16 – 1.59)	1.46 (0.48 – 4.41) *	12.70 (1.59 – 101.38) *
Place of residence						
Urban	RC	RC	RC	RC	RC	RC
Rural	0.56 (0.44 – 0.71)*	0.43 (0.33 – 0.55)*	0.34 (0.27 – 0.42)	0.96 (0.73 – 1.27)	0.65 (0.48 – 0.88) *	0.51 (0.39 – 0.66)
Religion						
Christian	RC	RC	RC	RC	RC	RC
Islam	0.42 (0.33 – 0.53)*	0.48 (0.36 – 0.63)*	0.63 (0.42 – 0.94)*	0.65 (0.13 – 3.24)	0.16 (0.02 – 1.24)	0.96 (0.76 – 1.24)
Others	0.24 (0.03 – 2.16)		3.12 (0.36 – 26.84)	1.54 (1.35 – 1.75)	3.13 (1.41 – 6.97) *	0.92 (0.06 – 14.81)
Marital status						
Married	RC	RC	RC	RC	RC	RC
Living with partner	3.58 (1.12 – 11.49)*	1.21 (0.46 – 3.19)	0.53 (0.08 – 3.19)	0.46 (0.22 – 0.95) *	1.62 (1.06 – 2.46) *	0.28 (0.18 – 0.42) *
Educational level						
No education	RC	RC	RC	RC	RC	RC
Primary	1.99 (1.41 – 2.82)*	1.16 (0.84 – 1.61)	1.57 (1.19 – 2.07)*	0.69 (0.32 – 1.49)	1.65 (0.70 – 3.87)	1.23 (0.75 – 2.04)
Secondary	3.53 (2.61 – 4.79)*	2.52 (1.87 – 3.39)*	3.48 (2.51 – 4.81)*	1.52 (0.73 – 3.18)	3.19 (1.44 – 7.05)*	1.52 (0.97 – 2.37)
Higher	7.91 (2.25 – 11.93)*	9.32 (4.89 – 17.76)*	7.45 (3.53 – 15.69)*	3.05 (1.31 – 7.08)*	7.36 (3.08 – 17.58)*	3.58 (2.16 – 5.94)*
Currently working						

	NC **COR (95% CI)**	**NE** **COR (95% CI)**	**NW** **COR (95% CI)**	**SE** **COR (95% CI)**	**SS** **COR (95% CI)**	**SW** **COR (95% CI)**
No	RC	RC	RC	RC	RC	RC
Yes	0.96 (0.75 – 1.24)	1.08 (0.87 – 1.35)	0.86 (0.72 – 1.02)	0.81 (0.61 – 1.26)	0.87 (0.61 – 1.26)	1.08 (0.73 – 1.60)
Wealth Index						
Poorest	RC	RC	RC	RC	RC	RC
Poorer	1.04 (0.68 – 1.59)	1.48 (1.12 – 1.95)*	1.20 (0.96 – 1.49)	3.37 (1.34 – 8.48)*	0.59 (0.19 – 1.83)	0.99 (0.47 – 2.09)
Middle	1.35 (0.90 – 2.02)	1.83 (1.36 – 2.48)*	1.79 (1.39 – 2.29)*	3.71 (1.54 – 8.94)*	0.78 (0.27 – 2.25)	0.79 (0.41 – 1.52)
Richer	1.75 (1.17 – 2.63)*	2.97 (2.08 – 4.24)*	3.41 (2.40 – 4.84)*	6.63 (2.78 – 15.82)*	1.37 (0.48 – 3.88)	1.01 (0.54 – 1.88)
Richest	4.87 (3.16 – 7.51)*	3.94 (2.26 – 6.88)*	7.51 (4.40 – 12.79)*	9.19 (3.81 – 22.15)*	1.82 (0.64 – 5.18)	1.67 (0.91 – 3.07)
Current use of modern contraceptive						
No	RC	RC	RC	RC	RC	RC
Yes	1.99 (1.50 – 2.65)*	1.63 (1.14 – 2.32)*	3.72 (2.40 – 5.75)*	1.81 (1.22 – 2.68)*	1.31 (0.89 – 1.92)	1.12 (0.86 – 1.45)
Owns a mobile telephone						
No	RC	RC	RC	RC	RC	RC
Yes	2.03 (1.61 – 2.58)*	1.83 (1.47 – 2.28)*	2.44 (1.99 – 2.99)*	2.09 (1.53 – 2.87)*	2.18 (1.55 – 3.07)*	2.02 (1.45 – 2.81)*
Use of internet						
No	RC	RC	RC	RC	RC	RC
Yes	4.72 (3.06 – 7.27)*	5.44 (2.73 – 10.85)*	6.17 (2.93 – 12.99)*	1.94 (1.34 – 2.81)*	2.08 (1.43 – 3.02)*	2.15 (1.66 – 2.79)*
Covered by health insurance						
No	RC	RC	RC	RC	RC	RC
Yes	5.19 (2.63 – 10.25)*	4.37 (1.36 – 13.99)*	3.88 (1.95 – 7.73)*	3.39 (1.39 – 8.23)*	0.63 (0.24 – 1.67)	1.91 (0.97 – 3.75)

Significant when p<0.05, *RC*

Table 4 shows adjusted odds ratios (AOR) from a binary logistic regression model examining factors associated with comprehensive knowledge of HIV among respondents across different regions in Nigeria, age appears significant in the North West (NW) and South West (SW) regions. In NW, those aged 20-24 have an AOR of 1.59 (95% CI: 1.12-2.29), and in SW, the same age group has an AOR of 10.34 (95% CI: 1.27-84.19), indicating significantly higher odds of HIV knowledge compared to the 15-19 reference group. Place of residence shows that rural dwellers in the North East (NE), NW, and SW regions are less likely to have comprehensive HIV knowledge compared to their urban counterparts. In NE, the AOR for rural residence is 0.64 (95% CI: 0.45-0.91), and in NW, it is 0.52 (95% CI: 0.39-0.68). In SW, the AOR is 0.61 (95% CI: 0.45-0.84). Religion is influential, particularly in the North Central (NC) and NE regions, where Islamic respondents have lower odds compared to Christians. In NC, the AOR for Islam is 0.45 (95% CI: 0.33-0.59), and in NE, it is 0.65 (95% CI: 0.46-0.92). Marital status shows increased odds for those living with a partner in NC and South-South (SS). In NC, the AOR is 4.85 (95% CI: 1.43-16.47), and in SS, it is 2.23 (95% CI: 1.39-3.56). Educational level significantly affects HIV knowledge, with higher education levels correlating with increased odds in most regions. In NC, higher education has an AOR of 2.84 (95% CI: 1.66-4.86), and in SS, it is 6.59 (95% CI: 2.42-17.90). Other factors, such as employment status, wealth index, contraceptive use, mobile phone ownership, internet use, and health insurance coverage, show varying influences across regions. Notably, owning a mobile phone significantly increases odds in NW (AOR: 1.39, 95% CI: 1.09-1.77) and SW (AOR: 1.48, 95% CI: 1.02-2.15).

Table 4. Adjusted Odds Ratio of Binary Logistic Regression Model of the Factors Associated with Comprehensive Knowledge of HIV among Respondents Across Region in Nigeria

	NC **AOR (95% CI)**	**NE** **AOR (95% CI)**	**NW** **AOR (95% CI)**	**SE** **AOR (95% CI)**	**SS** **AOR (95% CI)**	**SW** **AOR (95% CI)**
Age group						
15 – 19	RC	RC	RC	RC	RC	RC
20 – 24	1.01 (0.50 – 2.01)	1.21 (0.76 – 1.93)	1.59 (1.12 – 2.29)*	0.65 (0.19 – 2.13)	1.52 (0.49 – 4.69)	10.34 (1.27 – 84.19)*
25 – 29	1.07 (0.54 – 2.10)	1.28 (0.81 – 2.04)	1.34 (0.94 – 1.90)	0.65 (0.21 – 2.04)	1.77 (0.60 – 5.25)	7.05 (0.88 – 56.37)*
30 – 34	1.12 (0.56 – 2.24)	1.35 (0.84 – 2.17)	1.47 (1.01 – 2.12)*	0.71 (0.23 – 2.24)	2.04 (0.59 – 6.07)	7.83 (0.98 – 62.91)*
35 – 39	0.97 (0.48 – 1.98)	1.29 (0.79 – 2.12)	1.47 (0.99 – 1.16)	0.75 (0.24 – 2.38)	1.86 (0.62 – 5.61)	9.62 (1.19 – 77.37)*
40 – 44	1.03 (0.49 – 2.20)	1.24 (0.72 – 2.13)	1.08 (0.69 – 1.66)	0.72 (0.22 – 2.35)	2.25 (0.71 – 7.09)	9.75 (1.19 – 79.66)*
45 – 49	0.91 (0.40 – 2.06)	0.74 (0.37 – 1.49)	1.31 (0.81 – 2.10)	0.48 (0.14 – 1.59)	2.07 (0.61 – 7.04)	8.67 (1.05 – 71.95)*
Place of residence						
Urban	RC	RC	RC	RC	RC	RC
Rural	0.88 (0.64 – 1.19)	0.64 (0.45 – 0.91)*	0.52 (0.39 – 0.68)*	0.96 (0.72 – 1.29)	0.86 (0.60 – 1.22)	0.61 (0.45 – 0.84)*
Religion						
Christian	RC	RC	RC	RC	RC	RC
Islam	0.45 (0.33 – 0.59)*	0.65 (0.46 – 0.92)*	0.95 (0.59 – 1.52)		0.16 (0.02 – 1.33)	0.99 (0.77 – 1.29)
Others	0.40 (0.04 – 3.99)		8.91 (1.01 – 78.51)*	0.86 (0.17 – 4.42)	4.44 (1.88 – 10.47)*	0.73 (0.04 – 12.04)
Marital status						
Married	RC	RC	RC	RC	RC	RC
Living with partner	4.85 (1.43 – 16.47)*	0.78 (0.28 – 2.17)	0.41 (0.06 – 2.59)	0.56 (0.26 – 1.21)	2.23 (1.39 – 3.56)*	0.38 (0.24 – 0.59)
Educational level						
No education	RC	RC	RC	RC	RC	RC
Primary	1.50 (1.04 – 2.18)*	0.95 (0.67 – 1.34)	1.17 (0.87 – 1.58)	0.52 (0.23 – 1.19)	1.91 (0.77 – 4.69)	1.09 (0.64 – 1.87)
Secondary	2.08 (1.43 – 3.02)*	1.72 (1.19 – 2.48)*	1.71 (1.16 – 2.53)*	0.81 (0.35 – 1.88)	2.98 (1.26 – 7.06)*	1.16 (0.69 – 1.94)

	NC **AOR (95% CI)**	**NE** **AOR (95% CI)**	**NW** **AOR (95% CI)**	**SE** **AOR (95% CI)**	**SS** **AOR (95% CI)**	**SW** **AOR (95% CI)**
Higher	2.84 (1.66 – 4.86)*	4.68 (2.13 – 10.29)*	1.72 (0.65 – 4.55)	1.21 (0.46 – 3.22)	6.59 (2.42 – 17.90)*	2.03 (1.09 – 3.80)*
Currently working						
No	RC	RC	RC	RC	RC	RC
Yes	0.79 (0.59 – 1.07)	1.11 (0.75 – 1.64)	0.72 (0.59 – 0.88)*	0.97 (0.65 – 1.44)	0.91 (0.59 – 1.37)	0.92 (0.59 – 1.43)
Wealth Index						
Poorest	RC	RC	RC	RC	RC	RC
Poorer	0.83 (0.53 – 1.29)	1.27 (0.95 – 1.69)	1.06 (0.84 – 1.33)	2.96 (1.16 – 7.59)*	0.63 (0.19 – 2.12)	1.10 (0.50 – 2.41)
Middle	1.02 (0.65 – 1.59)	1.18 (0.83 – 1.68)	1.23 (0.93 – 1.63)	2.76 (1.10 – 6.92)*	0.77 (0.25 – 2.38)	0.76 (0.38 – 1.53)
Richer	1.17 (0.72 – 1.92)	1.44 (0.89 – 1.92)	1.66 (1.10 – 2.51)	4.20 (1.66 – 10.62)*	1.01 (0.33 – 3.01)	0.73 (0.37 – 1.43)
Richest	1.77 (0.98 – 3.19)	0.89 (0.42 – 1.92)	1.85 (0.94 – 3.64)	4.85 (1.86 – 12.61)*	0.97 (0.31 – 3.01)	0.76 (0.38 – 1.52)
Current use of modern contraceptive						
No	RC	RC	RC	RC	RC	RC
Yes	1.41 (1.03 – 1.93)*	1.11 (0.75 – 1.64)	2.09 (1.09 – 3.39)*	1.49 (0.99 – 2.25)*	1.27 (0.84 – 1.91)*	1.03 (0.78 – 1.35)
Owns a mobile telephone						
No	RC	RC	RC	RC	RC	RC
Yes	1.13 (0.84 – 1.52)	1.05 (0.61 – 3.35)	1.39 (1.09 – 1.77)*	1.29 (0.89 – 1.86)	1.81 (1.22 – 2.67)	1.48 (1.02 – 2.15)*
Use of internet						
No	RC	RC	RC	RC	RC	RC
Yes	1.77 (1.03 – 3.04)*	1.43 (0.61 – 3.35)	1.05 (0.39 – 2.78)	1.01 (0.65 – 1.57)	1.18 (0.74 – 1.88)	1.33 (0.94 – 1.87)
Covered by health insurance						
No	RC	RC	RC	RC	RC	RC
Yes	1.44 (0.67 – 3.08)	1.13 (0.59 – 7.59)	2.31 (1.09 – 4.94)*	2.07 (0.82 – 5.23)	0.30 (0.10 – 0.88)	0.98 (0.47 – 2.04)

**Significant when p<0.05, RC*

Discussion

The study on regional variations in HIV/AIDS knowledge among women of reproductive age in Nigeria provides crucial insights into the disparities in awareness and understanding of HIV across different regions. The prevalence of comprehensive HIV/AIDS knowledge was higher in the South East (60.5%), North West (55.5%), and South West (51.7%) regions, while it was lower in the North East (36.7%), North Central (41.4%), and South-South (42.2%) regions. These variations indicate a significant disparity in the distribution of HIV knowledge across Nigeria, highlighting the need for region-specific educational interventions.

The prevalence showed regional differences, suggesting a difference in the dynamics of HIV transmission. The result is consistent with other studies [8]. Some regions have a greater case accumulation, and others have a greater rate of new infections. Understanding this dynamic will allow developing health programs focused on HIV prevention or treating people already living with HIV [10]. The variations in socio-cultural and religious practices among about 400 different ethnic groups in Nigeria have consequences on the risk of HIV transmission [11]. In a similar study in United States of America, they found that the number of new HIV infections in the United States in 2021 among persons 13 years of age and older was by far the highest in the South, accounting for an estimated 52% of new HIV infections [12]. Also, the highest incidence rate of new HIV infections per 100,000 population was in the South, followed by the West, then the North East, and with the lowest rates in the Mid-West [12]. These findings also iterate similar studies in Africa [13, 8, 26], stressing the overall challenges and prospects of HIV/AIDS in sub-Saharan Africa and highlighting the importance of education and socioeconomic status in improving HIV knowledge [14, 25] also buttresses this by emphasizing the impact of conflicting HIV/AIDS education policies and the need for consistent messaging to improve knowledge level, particularly among youths.

The present study also found out that sociodemographic factors like age, place of residence, religion, marital status, educational level, employment status, wealth index, exposure to media, and healthcare services were found to be statistically significant in influencing comprehensive HIV/AIDS knowledge. Illustratively, higher education levels correlated with better HIV knowledge, while rural residence and lower wealth indices were associated with poorer knowledge. This was also similar to other studies [15, 16, 24] which identify education, socioeconomic status, and access to information can greatly influence comprehensive knowledge of HIV. The study found that the sociodemographic also varied across the various regions in Nigeria. For instance, use of modern contraceptives and owning a mobile phone are positively associated with HIV knowledge across most regions. Likewise, other factors, such as employment status, wealth index, contraceptive use, mobile phone ownership, internet use, and health insurance coverage, show varying influences across the regions. Notably, owning a mobile phone significantly increases odds in NW (AOR: 1.39, 95% CI: 1.09-1.77) and SW (AOR: 1.48, 95% CI: 1.02-2.15). The significant regional variation underscores the need to factor in this variation while tailoring intervention or policies towards improving comprehensive HIV knowledge of women of reproductive age.

Furthermore, in regions with lower knowledge levels, such as the North East and North Central, efforts should focus on improving access to education and healthcare services, and increasing media campaigns to raise awareness. By implementing educational programs in schools, community centers, and through media can help increase knowledge and correct misconceptions about HIV/AIDS transmission. Healthcare providers should

receive training to deliver HIV/AIDS education during routine health services, particularly targeting women of reproductive age. Policies should address the specific barriers faced by women in these regions, such as limited access to information and healthcare services, cultural misconceptions, and socioeconomic constraints. Government agencies and NGOs should collaborate to design and implement region-specific programs that address the unique challenges faced by women in different parts of Nigeria. In addition, if one assumes that a society's understanding of a problem appears in the form of scientific publications, our findings imply that the problem of HIV/AIDS is conceived to be more behavioral and social in places with higher prevalence rates and the takeaway from this finding for science policy makers is that in defining priorities of research for a specific problem, the problem should not be looked at from an isolated perspective, therefore, it is of the greatest importance to nail down the problem in the context of each region and set priorities based on that perception [20].

Conclusion

In conclusion, the analysis of the findings on the level of knowledge of HIV/AIDS among women of reproductive age in Nigeria demonstrates that there are regional differences in knowledge of the disease, which is associated with the level of education, socio-economic status, and place of residence of women. This means that, although some areas are up to some degree of knowledgeable in a wide array of HIV/AIDS information, other areas are not, which also calls for improved educational campaigns. This study stresses the need to increase the level of knowledge of HIV/AIDS through culturally and geographically sensitive education. That, having identified and explicated the particularities of the limitations to knowledge and the misinformation of the populace, targeted public health interventions can be better tailored to enhance HIV/AIDS knowledge among Nigerian women. These are important measures to ensure that women are informed on how they can discourage the spread of HIV/AIDS and dispose the community of the prejudice of the disease.

Conflict of Interest

There is no conflict of interest in this study

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