Statistical Analysis of Awareness of Other Sexually Transmitted Infections in Relation to Human Immunodeficiency Virus

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ABSTRACT

We studied statistical analysis of the level of awareness on Sexually Transmitted Infections (STIs) in relation Human Immunodeficiency Virus (HIV) across Nigeria utilizing data from the 2018 Demographic and Health Survey (DHS). From the study, variables that influenced the level of awareness were identified and the relationship between these variables was determined using Chi-square and logistic regression model. From the results, it was revealed that there is significant differences in STI awareness compared to HIV knowledge. Urban residents, people with higher education, and older populations showed greater awareness of STIs. There is a strong correlation between HIV and STI awareness implying that increased in the knowledge of HIV could potentially enhance awareness of other STIs. Individuals who were aware of HIV were nearly twice as likely to be informed about other STIs, underscoring the benefits of integrated sexual health education programs. Northern Nigeria exhibiting lower STI awareness compared to the southern regions. This geographical variation pointed to the necessity for region-specific public health strategies to bridge the awareness gap and ensure equiTable access to sexual health information nationwide. Conclusively, more effort is required to boost STI awareness among rural and less educated populations through targeted, region-based in Nigeria.

Keywords: Logistic model, Human Immunodeficiency Virus, Public Health, Spatial Analysis, Geographical variation

Introduction

Sexually Transmitted Infections (STIs) are a significant public health concern globally, causing substantial morbidity and mortality. This is set of infections that is primarily transmitted through sexual contact when at least one partner is affected. These infections can lead to severe health complications if unattended to on time. The burden of STIs are widely influenced by social, economic, behavioral and biological factors which cut across different regions and populations.

From the from World Health Organization (WHO), it was estimated that, in the mid-1990s, 30 million curable sexually transmitted infections (syphilis, gonorrhea, Chlamydia, and trichomoniasis) occurred every year in North America and Western Europe, with an additional 18 million cases in Eastern Europe and Central Asia. These counts do not include incurable sexually transmitted infections (STIs) such as genital herpes and Human Papillomavirus (HPV) infections, for which no up-to-date estimates have been derived by the WHO. Approximately 74,000 new HIV infections are estimated to have occurred in 1997 in North America and Western Europe (Centers for Disease Control and Prevention, 2011). Research shows that awareness of other STIs varies significantly across different populations and regions.

According to a study by Akinyemi *et al.* (2019), there

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is low awareness of some STIs such as gonorrhea, syphilis, and chlamydia in rural area in Nigeria compared to those in urban region. The awareness of HIV is higher compare to STIs in these regions due to the focus of public health campaigns.

The Demographic and Health Surveys (DHS) from 2003 up till date conducted in Nigeria reflects that there are disparities in the level of awareness between sex, educational levels and age groups in Nigeria. The same study emphasized that with the knowledge of HIV, STIs still lag behind creating gaps to curb the transmission. Some risk factors that greatly influenced the awareness and knowledge of STIs like Socioeconomic status, education and access to health care services paly important roles in shaping this trend. There is tendency to have great consequences in the public health if there is low awareness of STUs in a community.

According to Ezeanolue *et al*., (2019), individuals with limited knowledge of STIs are less likely to seek timely medical intervention and if not properly done, it can contribute to the spread of infections within communities. Low level of awareness of STIs in rural area in Nigeria occurred due to limited access to healthcare, lower literacy rates and cultural beliefs that discouraged open discussion on sexual health. Gender is also a noTable factor in STI awareness.

Michielsen *et al*. (2019) argued that effectiveness of well-structured sexual education programs that goes beyond abstinence-only and details information about contraception, condom use and its prevention have proven effective in lowering STI prevalence rates. Additionally, behavioral factors such as multiple sexual partners, inconsistent condom use, and engaging in transactional sex are also linked to lower awareness and increased risk of both STIs and HIV (Fatusi & Wang, 2017).

In the study of Adepoju *et.al* (2020), they discovered that sexual health education in schools are effective when people in the community were involved in the teaching. It brings great awareness of STIs in

Nigeria. In their findings, students who received comprehensive sexual education are more likely to prevent these infections compared to those that have no such opportunity.

Effect of the incidence of sexually transmitted diseases and survival among different age groups and gender were studied by Aladeniyi *et.al*, (2017). They used the variables mentioned earlier and others like duration of hospital and type of sexually transmitted disease as independent variables. They considered three diseases which were Staphylococcus, Urinary Tract Infection (UTI) and retroviral disease (RVD). Ng'ang'a *et al*. (2020) revealed that people who were aware of the risks associated with HIV were more likely to practice defensive behaviors, such as condom use, that also reduce the transmission of other STIs. On the other hand, those with lower awareness were more vulnerable to both HIV and STIs, showing a clear link between education and better health outcomes. Stigmatization is another factor that brings about barrier to managing STIs and HIV both globally and within Nigeria. This factor deters the individuals who are diagnosed with or suspected of having STIs from seeking the medical help, accessing sexual health services, or even disclosing their health status to partners and healthcare providers. Identification of stigma-related discrimination is common in health care setting as pointed out in the study of Nyblade *et al*. (2019). They discovered that individuals living with HIV or STIs face discriminatory attitudes, breaches in confidentiality, and in some cases, outright denial of care. These conditions not only limit access to healthcare but also undermine public health efforts aimed at STI/HIV prevention. There is deeply knotted connection with cultural, religious beliefs and the issue of stigma in Nigeria, particularly those surrounding morality and sexual behavior. In Nigeria, there are cultural belief that makes women to be on receiving end when it's comes about infections transmission which worsens stigmatization. This was discovered by Chukwuocha *et al*. (2018). This is particularly problematic given the role that gender inequality and social determinants such as poverty and low education play in increasing vulnerability to

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these infections. Women, in particular, often lack the autonomy to seek healthcare or access information about prevention and treatment, placing them at higher risk of not only contracting STIs but also experiencing long-term health complications as a result. Moreover, the fear of social stigmatization can be so severe that many individuals, especially in rural communities, prefer to endure symptoms in silence rather than face potential public shaming. This fear is compounded by the fact that many STI prevention campaigns have historically focused on the moral aspects of sexual behavior rather than providing neutral, factual information.

This study was conducted for meaningful progress in the fight against STIs and HIV about getting the association and relationship on some variables about awareness of the public addressing these socio-cultural barriers and incorporating stigma reduction strategies. This could be achieved by community dialogues, engaging of religious and cultural leaders by promotion of confidential and non-discriminatory health care services.

Materials and Methods

Data from the Demography and Household Survey 2018 (DHS) were used in this study. The survey was a cross-sectional that investigated and compared the awareness of other STIs in relation to HIV, along with the factors contributing to awareness levels among Nigeria's population.

Descriptive statistics as shown in Table 1.0 below and logistic regression model were used to summarize the demographic variables and for the analysis respectively for the sample and overall awareness levels of HIV and other STIs with the relationship that exist between them while controlling for demographic factors like age, gender, education, and socioeconomic status. Chi-square tests were used to examine the association between HIV awareness and awareness of other STIs. Additionally, spatial analysis was used to explore the geographical distribution of STI awareness across Nigeria, identifying regional disparities by mapping

awareness levels across different geopolitical zones, including North-East, North-West, North-Central, South-South, South-West, and South-East.

The Logit and Odd ratio model are given as in equation 1-3

$$\vartheta(z) = \left(\frac{p(z)}{1 - p(z)} \right) = exp(\beta_0 + \beta_{iz}) \quad (1)$$

Where,

$$p(z) = \left(\frac{exp(\beta_o + \beta_{iz})}{1 + exp(\beta_0 + \beta_{iz})} \right) \quad (2)$$

And the chi square model is given as

$$X^2 = \frac{(O_1 - E_1)^2}{E_1} + \frac{(O_2 - E_2)^2}{E_2} + \cdots + \frac{(O_k - E_k)^2}{E_k}$$

$$= \sum_{k=1}^{f} \frac{(O_f - E_f)^2}{E_f} \quad (3)$$

Results

The descriptive statistics of the variable used were presented in Table 1.0 Total observations considered in this study is 8,061. It was noticed that the ratio of male to female, the age group of 40-45 years to other ages are very high compared to the resident in rural and urban region that are very close. Awareness of others STIs were presented in the Table also.

The variables highlighted above was analyzed on awareness of others STIs using Chi-Square to establish the association between awareness of HIV and others STIs also with logistic regression model for the relationship that exist between the awareness level of HIV and others STIs

A.   Chi-Square Test for Independence

We used Chi-square tests to examine the relationship between awareness of HIV and awareness of other STIs. The hypotheses tested were:
H_0: There is no significant association between awareness of HIV and awareness of other STIs.
H_1: There is a significant association between

Table 1: Descriptive Statistics of the Variables

Variables		Overall	Awareness of other STIs	
			Yes	No
Gender	Male	7,966	5,207	2,759
	Female	95	78	17
Residence	Urban	3,009	2,365	644
	Rural	5,052	2,920	2,132
Education Level	No Education	3,371	1,668	1,703
	Primary	1,329	902	427
	Secondary	2,615	2,051	564
	Higher	746	664	82
Age Class	<20	47	18	29
	20-29	874	499	375
	40-49	5,544	3,678	1,866
	50-59	1,444	970	474
	>60	152	120	32

awareness of HIV and awareness of other STIs.

From the Chi-square test, the P-value was 0.00 which is below the significance threshold of 0.05.
This shows that there is a strong relationship between awareness of HIV and that of others STIs and also statistically significant. This result indicates that people that are aware of HIV has a significant impact on the awareness of other STIs. The null hypothesis H_0 is rejected, meaning that there is a significant association between awareness of HIV and others STIs

B.   Logistic Regression Analysis

To further explain the relationship that exist between the awareness level of HIV and others STIs, the use of logistic regression models was employed. The response variable was awareness of other STIs coded as 1 and 0 for either Yes or No respectively, the explanatory variables were age, sex, residence, educational level, awareness of HIV and that of STI.

The results of logistic regression analysis in Table 2.0 revealed key relationships between variables like sex, age, residence, education, awareness of STIs, and awareness of HIV, and how they impact awareness of other STIs. From the Table, there is positive and significant effect of age, educational level and awareness of HIV/AIDS to the awareness of others STIs since their p-values are less than 0.001. Meanwhile, residence has a significant negative impact on the awareness level of other STIs most especially the rural dwellers. Awareness of HIV also significantly influences the awareness level of STI. Sex and general awareness of STI are not significant variables from their p-values since they are greater

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Table 2: Descriptive Statistics of the Variables

Awareness of other STIs	Estimates	Std. Err.	Z	p> |z|
Sex	0.501564	0.2794861	0.18	0.858
Age	0.0192648	0.0026204	7.35	0.000
Residence	-0.484828	0.0581962	-8.33	0.00
Educational level	0.5999552	0.0275431	21.78	0.000
Awareness of STIs	-0.147329	0.2860742	-0.52	0.607
Awareness of HIV/AIDS	0.6162058	0.2532896	2.43	0.015
_cons	-0.4030317	0.3402591	-1.18	0.236

LR chi2(6)   =   953.90   Prob > chi2   =   0.0000
Log likelihood =   -4713.4801   Pseudo R2   =   0.0919

than 0.005 suggesting they do not have a meaningful impact on STI awareness in this sample.

C.   Spatial Distribution

Spatial Distribution of Awareness and Knowledge of STIs across Geopolitical Zones in Nigeria. This map in Figure 1 illustrates the levels of awareness and knowledge of sexually transmitted infections (STIs) across the six geopolitical zones in Nigeria.
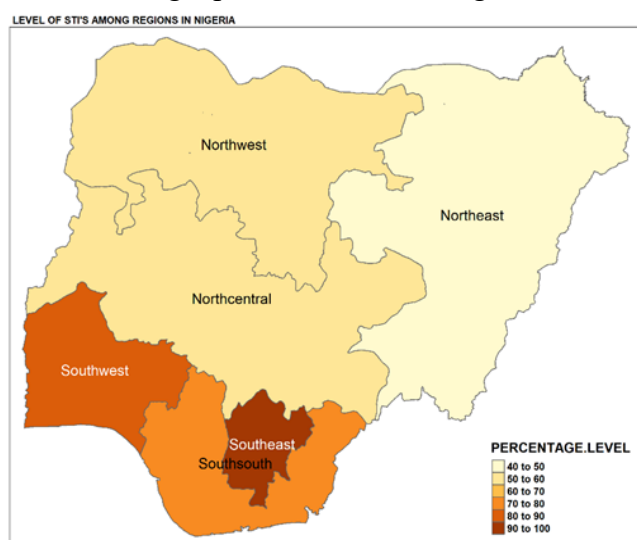

Figure 1: Representation of level of STIs in Nigeria Regions

In Figure 1 above, the percentage level of awareness of STIs was shown in relation to HIV across Nigeria.

Southeast and Southwest have a very high percentage level of awareness respectively while Northeast shown lowest percentage level of awareness. This Figure highlights the need to address regional disparities and improve STI awareness throughout the country most especially the less privileged ones.

Discussion

Lower education holder, people living in rural area and the younger ones especially under 20 are less aware of STIs in Nigeria. Meanwhile, those with higher education, urban residents and older age people show greater awareness. There is need to target the rural and younger ones for public health discussion about STIs and its awareness. Since there is a strong link between HIV and STI, this suggests that enhancement overall STI knowledge is possible. Northerners in Nigeria are less awareness compared to the people in South, which stressed the importance of region-specific strategies.

Conclusively, there remained critical need to improve STI awareness level particularly among rural dwellers, young adults and those with lower educational levels. In order to reduce the prevalence of STI, there is need to address the gaps through targeted educational initiatives and tailored regional

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strategies for enhancing overall sexual health awareness and its reduction in Nigeria.

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