

Demographic Predictors of HIV Testing in Women of Childbearing Age in Nigeria

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ABSTRACT

Background: Nigeria accounts for about one third of global mother to child transmission of HIV (MTCT). HIV testing is the entry point for the prevention of MTCT. Therefore, there is a need to strengthen HIV testing in women of childbearing age to achieve the sustainable goal of zero new infections by 2030.

Methodology: This study examined demographic factors as predictors of HIV testing in women of childbearing age using data from the 2013 Nigeria Demographic and Health Survey. Logistic regression was used to examine the predictive effects of the independent variables using IBM SPSS V27.

Results: Age, marital status, educational status and employment status were positive predictors of HIV testing. Women aged 24 to 34 years (OR = 3.05, 95% CI 2.89 - 3.22), living with a partner but not married (OR = 3.46, 95% CI 2.99 - 3.98), separated from husband (OR = 3.56, 95% CI 2.91 - 4.31), employed (OR = 2.18, 95% CI 2.08 - 2.29) and having post-secondary education (OR = 23.95, 95% CI 21.87 - 26.29) were more likely to test for HIV. The geographic location had a negative predictive effect on HIV testing (OR = 0.34, 95% CI 0.33 - 0.36), with women living in rural areas less likely to test for HIV.

Conclusion: The result suggests the need to focus on adolescents and older women, unemployed women, less educated women and women living in rural areas to enhance HIV testing towards the positive social change of eliminating MTCT. It is recommended that future research will use recent HIV testing to examine predictors of HIV testing in contrast to lifetime HIV testing used in this study.



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INTRODUCTION

Human immunodeficiency virus (HIV) is still a disease of public health importance despite the efforts geared to control HIV/AIDS. According to the Joint United Nations Programme on HIV/AIDS (UNAIDS), 37.9 million people lived with HIV globally by the end of 2018^[1]. Nigeria is having the second highest burden of HIV globally^[2]. It was estimated that about 1.7 million new HIV infections occurred in 2018 with 770,000 dying from HIV related illnesses^[1]. It was also estimated that 6,000 young women aged 15-24 years become infected with HIV weekly worldwide and the chance of women living with HIV is higher than that of men of the same age group^[1]. In Nigeria, the prevalence of HIV in women aged 15-49 years is 1.9% which is higher than that of males of same age group^[3]. Nigeria also accounts for 30% of mother to child transmission of HIV (MTCT) globally^[4]. HIV testing is the entry point for HIV treatment as prevention and the entry point for utilization of prevention of mother to child transmission of HIV (PMTCT) services. In Nigeria, various studies have found low HIV testing rates of less than 40% among adolescents and pregnant women which is lower than the target of 90%^{[5][6][7]}. Various factors, including demographic factors can influence HIV testing among women of childbearing age which is a vital step in the elimination of new HIV infections. Understanding demographic factors that influence HIV testing is vital in developing strategies to ensure that 95% of people, including women aged 15-49 years know their status. UNAIDS launched the 90-90-90 by year 2020 and the 95-95-95 by year 2025 target in 2017 to achieve the sustainable development goal of eliminating HIV infection as a public health problem by the year 2030^[8]. The

UNAIDS' 95-95-95 target is aimed at 95% of people knowing their status, 95% of those who know their status placed on antiretroviral therapy, and 95% of those on antiretroviral therapy achieving viral suppression by the year 2025^{[9][10]}. Effective HIV treatment leads to viral suppression, which reduces the chance of transmitting HIV infection. Treatment can only occur when HIV status is known through HIV testing. The purpose of this study is to examine the extent to which demographic variables predict HIV testing in women of childbearing age (15-49 years) at a national level in Nigeria. Women aged 15-49 years are the sexually active age group and the childbearing age; therefore, increasing HIV testing in this age group can prevent transmission of HIV to their sexual partners and their children. The aim of this study is to determine to what extent demographic factors relate to HIV testing in women of childbearing age in Nigeria. The objectives of the study are: To determine how age relates to HIV testing in women of childbearing age, to determine how marital status relate to HIV testing in women of childbearing age, to determine how geographic location relates to HIV testing in women of childbearing age, to determine how educational status relates to HIV testing in women of childbearing age and to determine how employment status is related to HIV testing in women of childbearing age in Nigeria.

MATERIAL AND METHODS

It was a quantitative secondary data analysis utilizing data from the 2013 Nigeria Demographic and Health Survey (NDHS) which was a cross sectional survey that was conducted nationwide

using questionnaires administered on a representative sample of households. A three-stage stratified sampling method was used in selecting the households included in the sample for the 2013 NDHS. Women aged 15-49 years and men aged 15-59 years were the target population for the survey. The survey was conducted in all 36 states, including the federal capital territory covering all the 744 local government areas in Nigeria. Details of the method and mode of data collection for the survey can be found in the report of the 2013 NDHS [11]. The content of the questionnaires used for the survey was based on model questionnaires developed by the MEASURE DHS programme. Thirty-eight thousand nine hundred and forty-eight women (38,948) women out of 39,902 identified eligible women were interviewed in the survey yielding a response rate of 97.6%. The responses to the women's questionnaire provided the data used for this study. The survey result provided information on the demographic variables and HIV testing among women aged 15-49 years.

Variables The independent (predictor) variables are age, marital status, educational status, occupational status, and geographical location, while the dependent variable is lifetime HIV testing. The study aimed at determining to what extent the independent variables are predictive of lifetime HIV testing which is the dependent (outcome) variable.

HIV testing: The dependent (outcome) variable is lifetime HIV testing. The variable "Ever tested for HIV" in the 2013 NDHS dataset was used as HIV testing variable. "Ever tested for HIV" variable has a dichotomous response of "yes" or "no" was used as such in this study.

Age: The 2013 NDHS female questionnaire

dataset has a variable "Age in 5-year groups" in which the ages were grouped as 1-19, 20-24, 25-29, 30-34, 35-39, 40-44, and 45-49 years. The age in 5-year groups was regrouped into four groups (15-24, 25-34, 35-44, and 45-49) and used as an age variable in this study.

Geographic Location: The variable "Type of place of residence" with a dichotomous response of "urban" and "rural" in the 2013 NDHS dataset was used as a geographic location variable in this study.

Educational Status: The variable "Educational level" with a response of "no education, primary, secondary, and higher" was used as an educational status variable in this study.

Marital Status: The variable "Current marital status" in the 2013 NDHS data with options of "never in a union, married, living with a partner, widowed, divorced, and no longer living together /separated" was used as a marital status variable for this study.

Occupational Status: The variable "currently working" in the 2013 NDHS dataset, which has options of "yes" or "no," was used as occupational status for this study. Descriptive statistics and logistic regression were used to summarize the data and to determine the presence or absence of a significant association between independent variables and HIV testing (the dependent variable). The survey protocol for the 2013 NDHS was reviewed and approved by the National Health Research Ethics Committee of Nigeria (NHREC) and the ICF Institutional Review Board. Ethical approval for the secondary analysis of the 2013 NDHS data in this study was received from Walden University institutional review board (Approval number 07-17-20-0544515).

RESULTS

Out of the 38,948 women who participated in the survey, 209 and 482 women had no response to employment status and HIV testing questions, respectively. The cases with missing data were excluded from the analysis. The final sample size of 38,258 women was used for analysis. IBM Statistical Package for Social Sciences (SPSS) version 27 was used for data analysis. The analysis showed an HIV testing rate of 30.5% amongst the women aged 15-49 years in Nigeria. The frequency distribution of the predictor variables shows that most of the women are within the age range of 15-34 years (69.2%), married (67.6%), live in the rural area (60%), and are employed (61.9%) as shown in Table 1. The result also showed that about one-third of the women (35.2%) had no education while

Frequency Distribution of Independent Variables

Sociodemographic variables	Frequency (n)	Percentage (%)
Age distribution (years)		
15 - 19	14363	37.5
20 - 24	12133	31.7
25 - 29	8244	21.6
30 - 34	3518	9.2
Marital status		
Single	8715	25.4
Married	25862	67.6
Living with partner	848	2.2
Widowed	986	2.6
Divorced	421	1.1
Separated	426	1.1
Place of residence		
Urban	15291	40.0
Rural	22967	60.0
Employment status		
Not Employed	14560	38.1
Employed	23698	61.9
Educational status		
No education	13456	35.2
Primary	6970	18.2
Secondary	14178	37.0
Higher	3654	9.6

Descriptive Statistics for Independent Variables

Variable	Mean	Standard deviation	Skewness	Standard error of skewness	Kurtosis	Standard error of kurtosis
Age	28.88	9.708	0.388	0.013	-0.923	0.025
Marital status	0.90	0.804	2.282	0.013	8.690	0.025
Geographic location	1.60	0.490	-0.410	0.013	-1.832	0.025
Employment status	0.62	0.486	-0.492	0.013	-1.758	0.025
Educational status	1.21	1.030	0.097	0.013	-1.328	0.025

37.1% had secondary education. A summary of the descriptive statistics of the independent variables is shown in Table 2. The mean age for the respondents is 28.9 years.

Age: Results of binary logistic regression as shown in Table 3 revealed that there is a significant positive predictive relationship between age and HIV testing for women aged 25-34 years (OR = 3.05, 95% CI 2.89 - 3.22, $p < 0.001$), 35-44 years (OR = 2.46, 95% CI 2.32 - 2.62, $p < 0.001$) and 45-49 years (OR = 1.18, 95% CI 1.08 - 1.29, $p < 0.001$). The reference age was 15-24 years. The model correctly classified 69.5% of the cases, indicating the model was able to distinguish between participant's HIV testing status. The result also showed that age explained 5% (Cos & Snell R^2) to 7% (Nagelkerke R^2) of the variance in HIV testing by women aged 15-49 years. Hosmer and Lemeshow's test is insignificant ($p > 0.001$), further supporting the significance of age. Age was significantly associated with HIV testing; $\chi^2(3, N = 38258) = 1946.780, p < 0.001$

Marital status: Results from the logistic regression test as shown in Table 3 indicated that there is a statistically significant association between marital status HIV testing; $\chi^2(5, N = 38258) = 718.961, p < 0.001$. There is a positive predictive association between marital status and HIV testing as shown in Table 3. Women living with a partner were 3.445

times more likely to test for HIV than single women. Women separated from their partners are also 3.545 times more likely to test for HIV than single women who are not in a relationship. The result also showed that marital status explained 19% (Cos & Snell R²) to 26% (Nagelkerke R²) of the variance in HIV testing by women aged 15-49 years. Furthermore, the model correctly classified 69.5% of the cases, indicating the model was able to distinguish between participant's HIV testing status.

Geographic location: The result revealed a statistically significant association between geographic location and HIV testing; $\chi^2(1, N = 38258) = 2278.296, p < 0.001$. Geographic location was also found to be negatively predictive of HIV testing as shown in Table 3. Women living in rural areas were 0.34 times less likely to test for HIV than women living in urban areas. The result also showed that geographic location explained 5.8% (Cos & Snell R²) to 8.2% (Nagelkerke R²) of the variance in HIV testing by women aged 15-49 years. The model also correctly classified 69.5% of the cases indicating that model could distinguish between participant's HIV testing status.

Employment status: The results showed a statistically significant association between employment status and HIV testing; $\chi^2(1, N = 38258) = 1072.853, p < 0.001$. Logistic regression in Table 3 shows that employment status is positively predictive of HIV testing (OR = 2.18, 95% CI 2.08 2.29, P < 0.001). The model also correctly classified 69.5% of the cases indicating the model was able to distinguish between participant's HIV testing status. The result also showed that employment status explained 2.8% (Cos & Snell R²) to 3.9% (Nagelkerke R²) of the

variance in HIV testing by women aged 15-49 years in Nigeria.

Educational status: The logistic regression test results as shown in Table 3 revealed a strong positive predictive association between educational status and HIV testing (OR = 23.94, 95% CI 21.87 26.29, p < 0.001) for post-secondary, (OR = 5.57, 95% CI 5.21 5.94, p < 0.001) for those with secondary education, and (OR = 3.89, 95% CI 3.60 4.19, p < 0.001) for those with primary education. The result also showed that employment status explained 15.5% (Cos & Snell R²) to 21.9% (Nagelkerke R²) of the variance

Logistic Regression Predicting HIV Testing by Demographic Variables

Predictor variable	Category	S.E	Wald	df	Sig	95% confidence interval		
						Odds Ratio	Lower	Upper
Age	15-24		1841.710	3	<0.001			
	25-34	1.114	0.028	1579.149	1	<0.001	3.048	2.885 3.220
	35-44	0.901	0.031	838.282	1	<0.001	2.463	2.317 2.617
	45-49	0.165	0.046	12.838	1	<0.001	1.179	1.077 1.290
	Constant	-1.431	0.021	4594.732	1	<0.001	0.238	
Marital status	Single		682.524	5	<0.001			
	Married	0.627	0.028	492.443	1	<0.001	1.871	1.771 1.978
	Living with partner	1.237	0.073	285.919	1	<0.001	3.445	2.985 3.976
	Widowed	0.782	0.071	122.594	1	<0.001	2.187	1.904 2.511
	Divorced	0.481	0.109	19.325	1	<0.001	1.617	1.305 2.003
	Separated	1.265	0.100	159.784	1	<0.001	3.545	2.913 4.313
Geographic location	Constant	-1.331	0.025	2845.813	1	<0.001	0.264	
	Rural	-1.080	0.023	2224.124	1	<0.001	0.340	0.325 0.355
Employment status	Constant	-0.226	0.016	192.429	1	<0.001	0.798	
	Employed	0.779	0.024	1014.195	1	<0.001	2.179	2.077 2.286
Educational status	Constant	-1.333	0.020	4273.844	1	<0.001	0.264	
	No Educational			4979.701	3	<0.001		
	Primary	1.356	0.039	1238.944	1	<0.001	3.882	3.600 4.187
	Secondary	1.716	0.033	2660.413	1	<0.001	5.564	5.212 5.939
	Post secondary	3.177	0.047	4578.543	1	<0.001	23.974	21.866 26.285
	Constant	-2.173	0.028	5830.168	1	<0.001	0.114	

in HIV testing by women aged 15-49 years. The model also correctly classified 73.9% of the cases. There is also a statistically significant relationship between educational status and HIV testing. $\chi^2(3, N = 38258) = 6431.955, p < 0.001$.

DISCUSSION

The study showed that the demographic factors of age, marital status, geographic location, and educational status are significantly associated with lifetime HIV testing in women aged 15-49 years in Nigeria. The findings on age as predictive of HIV testing is similar to the result of studies by other researchers amongst men in Malawi^[12], amongst men and women in Ethiopia^[13], in pregnant women in Nigeria^{[14][15]}, and in women of childbearing age in one community in Nigeria^[16]. But age was not a significant predictor of HIV testing in the study conducted among people who inject drugs in Tehran^[17]. The result of this study showed that the age range of 25-34 years had higher odds which is contrary to the findings by Ajayi et al. and Gunn et al. wherein pregnant women 34 years and above had higher odds for HIV testing^{[14][15]}. Therefore, this study indicates a need to target all women, including the younger than 25 years and older than 35 years, because they are within the reproductive age and can transmit HIV to their babies and partners when infected. The result of this study also showed that marital status a significant predictor of HIV testing. This is similar to reports in Haiti^[18] and in Malawi^[12], but the studies showed that those that are married had higher odds of testing for HIV contrary to the findings of this study whereby those living with a partner and those separated had higher odds testing for HIV. This implies a need to stress the importance of HIV testing and encourage single, married, widowed, and divorced women to test for HIV to reach the 95-95-95 target by the year 2025. Respondents in urban areas were more likely to test for HIV, similar to the finding amongst men and women in Ethiopia^[13] and amongst pregnant women in Nigeria^{[14][19]}. Occupational status, in this study, was predictive of HIV testing. This agrees with the

findings of Nigatu et al.^[13]. Employed women had a higher odd of testing for HIV. The educational status is also significantly associated with HIV testing. Other authors asserted to this finding in previous studies^{[12][13][14][15][16][17][18]}. Women with secondary and higher education had higher odds of testing for HIV. Therefore, the education of the girl child seems to play an important role in HIV testing. The inclusion of sex education in the school curriculum may play an important role in awareness of HIV and improving the testing rate amongst girls and young women. There is a need for sustained efforts to educate women of childbearing age, including targeted and tailored messages on HIV prevention, including HIV testing, to prevent mother-to-child transmission. The study was conducted using the 2013 NDHS dataset because the 2018 NDHS dataset had no response for the dependent variable in the study, limiting the generalization of the result of this study. This study used a dataset from a cross-sectional study. Therefore, the result is limited to how respondents responded at one moment in time rather than over some time and there could also be recall bias. The result of the study is specific to Nigeria. As such, it cannot be generalized to other African or non-African countries. The result of the study can form a baseline to determine progress when comparison with analysis of a recent dataset. The study showed a need for concerted effort to improve HIV testing amongst women aged 15-49 years to achieve the 95-95-95 target by the year 2025 and zero new infections. The target groups are the single, married, divorced, uneducated, unemployed, and women living in rural areas. The findings can have the social impact of influencing future policies of HIV prevention targeting women

of childbearing age, starting from young girls out of school and those in various school levels. It is recommended that this study should be replicated with the next version of the Nigeria demographic and health survey, which may likely include response on HIV testing or the 2018 NAIIS survey when the dataset is available to the public to ascertain the present level of HIV testing amongst women aged 15-49 years in Nigeria and the possible predictors as a means of HIV prevention.

CONCLUSION

Demographic factors of age, marital status, geographic location, employment status and educational status are all significant predictors of HIV testing amongst women of childbearing age in Nigeria. Women within the age of 24-35 years, living with a partner or separated, living in urban areas, employed, and with higher education were more likely to test for HIV. Therefore, other categories need to be targeted to improve HIV testing as an HIV prevention strategy towards attaining the sustainable development goal of eliminating HIV as a public health problem by the year 2030

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