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Prevalence and Factors Associated with HIV Testing Among Women in the Reproductive Age in Liberia: Cross Sectional Study from 2019/20 Demographic and Health Survey

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Abstract: *Objective:* This study explored HIV testing prevalence and its associated factors among reproductive-aged women in Liberia. *Study Design*: A secondary and descriptive cross-sectional study was performed among Liberian women aged 15-49 years using 2019 Liberia Demographic and Health Survey (LDHS) data set. *Methods:* Descriptive statistics was used to describe the characteristics of these women. Bivariate and multivariable logistic regression models were applied to determine factors associated with HIV testing. All analyses were adjusted for unequal probabilities of selection and non-response by use of survey weights. *Results:* Among the 8,065 participants in this survey, 490 women never had sex and were excluded leading to the final sample size of 7,575 women. The prevalence of HIV testing among Liberian women aged 15 to 49 years in 2020 was 57.17% (95% CI: 56.2 to 60.4). HIV testing among these women is associated with pregnancy history (aOR 6.40, 95% CI:4.99 to 8.22, p<0.001), STI history (aOR 1.21, 95% CI:1.02 to 3.19, p<0.001), knowledge of vertical transmission (aOR 1.65, 95% CI:1.23 to 2.21, p=0.001), and highest educational level; primary (aOR 1.39, 95% CI:1.16 to 1.68, p<0.001), secondary (aOR 2.10, 95% CI:1.73 to 2.53, p<0.001), higher education (aOR 6.80, 95% CI:3.75 to 12.32, p<0.001). *Conclusion and Contribution:* HIV testing prevalence of 57.17% demonstrates an unmet need for HIV testing among Liberian women aged 15 to 49 years and thus, it is recommended that HIV testing and counselling services should target mostly these women in rural areas, with limited health seeking behaviour and less educated women.

Keywords: HIV testing; factors; reproductive age; women; Liberia; prevalence

Background

Every country's mandate is to provide universal health coverage for all her people. Globally, approximately 38 million people were living with HIV in 2019, with more than 75% living in Sub-Saharan Africa [1]. Approximately 85% of the people living with HIV globally knew their HIV status in 2021, while the remaining 15% did not know they had HIV and still needed access to HIV testing services [1,2]. In 2019, approximately 690,000 people died of AIDS related causes and 1.7 million people were newly infected with HIV[1] . In Sub-Saharan Africa, women and girls accounted for 63% of all new HIV/AIDS infections in 2021 [2]. In 2018, it was reported that 65% of the people living with HIV (PLHIV) in Liberia knew their HIV status [3]. Improvement in strategies to get more people tested for HIV in Liberia will increase antiretroviral treatment (ART) initiation and viral load suppression, which will result in an optimal route in meeting the UNAIDS 95-95-95 targets[3].

Furthermore, HIV testing is the main gateway for HIV prevention, care and treatment.[5] Globally, HIV testing is crucial in building effective strategies toward reducing HIV/AIDS prevalence[6–9]. Previous studies have demonstrated that HIV testing challenges can be addressed

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through improving certain potential risk factors associated with HIV testing [10–14]. Most importantly, there has always been an unmet need for HIV testing among Liberian women[1].

Among others, risk factors for HIV testing include knowledge about vertical transmission, pregnancy history, sexual transmitted infections (STI) history, and higher educational levels for women and their partners [10–13]. Most studies focusing on HIV testing have been done on certain subgroups of women who form part of the high-risk populations such as adolescent girls and young women (AGYW) [6,15–19]. However, this may exclude certain attributes of all Liberian women in their reproductive age and thus, less informed conclusions may be extracted. This study determined the prevalence and associated factors of HIV testing among Liberian reproductive-aged women.

In addition, HIV testing has not been documented among Liberian women. A previous study has documented HIV testing prevalence and its associated risk factors within a single health centre in Liberia [4]. This might have omitted important characteristics which could have otherwise redirected policy makers towards implementing efficient strategies to reduce HIV/AIDS and thus improving SDG 3, universal health coverage in Liberia.

Most importantly, Liberia has taken initiative to respond effectively to the HIV pandemic. Liberia's Ministry of Health, in collaboration with National AIDS Commission of Liberia, have developed a fast-track plan for 2019/2020 that seeks to triple the country's test and treat statistics by treating people who test positive for HIV immediately after diagnosis[3]. This plan includes targeting all population groups mostly at risk of HIV infection with the inclusion of women and the three counties with the highest unmet need for HIV testing, treatment and care services[3].

Slow progress in the prevention of mother to child transmission (MTCT) of HIV has been observed in Liberia from about 28% in 2011 to 15% in 2018[3]. This calls for a review on strategies of HIV testing among women.

Methodology

Study Design

This study is a secondary data analysis of the 2019 Liberia Demographic and Health Survey (LDHS), a national, population-based, analytical cross-sectional study, to determine the prevalence and factors associated with HIV testing among Liberian reproductive-aged women (15-49 years).

Study Setting

Data were collected from all the 15 counties in Liberia grouped to form five geographical regions, with each region consisting of three counties. Each county is divided into districts and each district into clans. In the 2008 National Population and Housing Census (NPHC), each clan was subdivided into enumeration areas (EAs). Results from this sample were representative at the national, urban and rural areas from the five regions. The survey also produced separate representative results for most key indicators of the 15 counties [20].

Study Population

This study included all reproductive aged Liberian women (15-49 years) who resided or had visited the selected households the night before the survey interview. In these households, all adult women aged 18-49 years as well as young women who either were emancipated minors or received parental or guardian consent, were eligible for HIV testing. All women who had never heard of HIV/AIDS and those who never had sex were excluded[20].

Sampling Method

The 2019-20 LDHS followed a stratified two-stage cluster design. A total of 325 clusters were selected consisting of EAs with a probability proportional to their size within each sampling stratum. Then, an average of 129 households were found in each cluster, from which a fixed number of 30

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households were selected with an equal probability systematic selection process. About 9,068 households were successfully interviewed. In the interviewed households, 8,364 women age 15-49 years were identified for individual interviews and 8,065 women were interviewed[20].

Measurements and Variables

This study employed data collection using the Women's Questionnaire, administered to reproductive-aged women (15-49 years). It further involved secondary analysis on the dependent variable HIV testing (No, Yes) and the predictor variables: age of a woman (15-19,20-24,25-29,30-34,35-39,40-44,45-49), educational level (Elementary, Primary, Secondary, Higher education), place of residence (Urban, Rural), Marital Status (Married, Not in union, Living with a man, Widowed, Divorced/ separated), Media Exposure (Not at all, Less than once a week, More than once a week), Partner's highest educational level (Elementary, Primary, Secondary, Higher education), Employment Status (Not employed, Employed), Pregnancy history(No, Yes), Number of Sexual Partners(1 partner, 2 partners, 3 or more partners), Transactional Sex(No, Yes), STI History(No, Yes), HIV knowledge (No, Yes), HIV discriminatory behaviour (No, Yes) and risky sexual behaviour (No, Yes) [20].

Statistical Analyses

All analyses were done using Stata MP 14.0 software. All analyses were weighted to adjust for unequal probabilities of selection and non-response. Descriptive statistics were used to summarize the characteristics of participants. Bivariate analysis was employed to check for association between the HIV Testing outcome and each independent variable using the Chi-square test. Variables with $p<0.05$ were shortlisted and entered onto the multivariable logistic regression model. In the multivariable logistic regression model, manual selection was used to select variables into the multivariable analysis. Crude and adjusted odds ratios, together with their corresponding 95% confidence intervals (CI), were tabulated and a 5% level of significance was applied.

Ethical Considerations

The research protocol was submitted to the University of Pretoria School of Health Systems and Public Health (SHSPH) Academic Advisory Committee (AAC) for approval. It was then approved by the University of Pretoria's Faculty of Health Sciences Research Ethics committee (136/2023). Since this is secondary data analysis, all the DHS ethical considerations were adopted. Finally, permission to use DHS data was obtained from the DHS online database and an agreement of the terms and conditions of using the dataset was signed.

Results

Study Participants

Among the 8,065 women aged 15 to 49 years who were interviewed in this survey, 490 women who never had sex were excluded in this analysis, leading to the final sample size of 7,575 women.

Characteristics of Participants

Among the 7,575 enrolled reproductive-aged women, most of them were young, aged 20 to 24 years (19.6%) and 25 to 29 years (18.3%). About 39.8% of these women had at most a secondary education qualification and mostly reside in the urban areas (61.7%). Furthermore, about 34.3% of these women were living with a man. However, more than three quarters of them were never exposed to media (78.2%). About two thirds of them were not employed (67.1%). Almost half of them had partners with at most a secondary qualification (47.0%). The majority of these women had been pregnant at least once in their lifetime (83.2%). Most had one partner (92.7%) and had never been involved in transactional sex (91.7%). Almost all never experienced gender-based violence (98.0%),

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while most women possess discriminatory behavior towards HIV positive people (98.8%), as shown in Table 1

Table 1. Characteristics of Study Participants among women aged 15-49 years in Liberia.

Variable	Category	Number of participants(n)	Percent of participants. (%)
Age of a woman	15-19	1250	15.2
	20-24	1387	19.6
	25-29	1200	18.3
	30-34	1051	14.8
	35-39	1103	13.6
	40-44	857	10.2
	45-49	727	8.3
Highest educational level	Elementary	2938	32.2
	Primary	2104	22.0
	Secondary	2296	39.8
	Higher education	237	6.0
Place of residence	Urban	4489	61.7
	Rural	3086	38.3
Marital status	Married	2339	28.6
	Not in union	2315	27.5
	Living with a man	2131	34.3
	Widowed	145	1.8
	Divorced/ separated	645	7.8
Media exposure	Not at all	6555	78.2
	Less than once a week	228	4.3
	More than once a week	792	17.5

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Partners highest educational level	Elementary	1306	27.8
	Primary	727	12.8
	Secondary	1936	46.9
	Higher education	364	12.5
Employment status	Not employed	5293	67.1
	Employed	2282	32.9
Pregnancy History	No	1167	16.8
	Yes	6408	83.2
Number of sexual partners	1 partner	7083	92.7
	2 partners	470	6.8
	3 or more partners	22	0.6
Transactional Sex	No	1428	91.7
	Yes	115	8.3
STI History	No	5303	66.8
	Yes	2262	33.2
Gender based violence	No	1675	98.0
	Yes	34	2.0
Discriminatory behaviour	No	24	1.2
	Yes	2018	98.8

Factors Associated with HIV Testing

Amongst 7,575 women who were included in this study, 4,331 women had tested for HIV at least once. The HIV testing prevalence was 57.17% (95% CI: 56.2 to 60.4) among women aged 15 to 49 years in Liberia.

Compared to women having elementary educational level, the odds of HIV testing were higher among women with secondary (OR 1.47, 95% CI: 1.24 to 1.73, p<0.001) or higher education (OR 3.96, 95% CI: 2.37 to 6.65, p<0.001). In adjusted analyses, the association maintained its statistical significance: primary (aOR 1.39, 95% CI: 1.16 to 1.68, p<0.001), secondary (aOR 2.10, 95% CI: 1.73 to 2.53, p<0.001) and higher education (aOR 6.80, 95% CI: 3.75 to 12.32, p<0.001).

In comparison with women who lived in urban areas, the odds of testing for HIV were lower among those in rural areas (OR 0.73, 95% CI: 0.62 to 0.86, p<0.001). In adjusted analyses, the association maintained its statistical significance (aOR 0.82, 95% CI: 0.67 to 0.99, p=0.039).

In comparison with married women, the odds of testing for HIV were higher among those divorced or separated (OR 1.47, 95% CI: 1.14 to 1.90, p=0.004) or living with a man (OR 1.31, 95% CI: 1.09 to 1.58, p=0.005) and lower in women who were not in union (OR=0.70, 95% CI: 0.60 to 0.83, p<0.001). In adjusted analyses, the association maintained its statistical significance: living with a man

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(aOR 1.35, 95% CI 1.03 to 1.51, p<0.001), divorced and separated (aOR 1.37, 95% CI 1.05 to 1.79, p=0.019).

In comparison with women aged 15 to 19 years of age, the odds of testing for HIV were higher among those aged 20 to 24 (OR 2.53, 95% CI: 2.01 to 3.19, p<0.001) or 25 to 29(OR 4.33, 95% CI: 3.29 to 5.70, p<0.001) or 30 to 34(OR 4.27, 95% CI: 3.01 to 6.05, p<0.001) or 35 to 39(OR 3.81, 95% CI: 2.89 to 5.01, p<0.001) or 40 to 44 (OR 2.89, 95% CI: 2.15 to 3.88, p<0.001) or 45 to 49 (OR 1.39, 95% CI: 1.04 to 1.87, p=0.028) years old. In adjusted analyses, the association maintained its statistical significance: 20-24 (aOR 1.58, 95% CI: 1.05 to 2.38, p=0.028), 25-29 (aOR 1.74, 95% CI: 1.09 to 2.79, p=0.022), 30-34 (aOR 1.80, 95% CI: 1.10 to 2.96, p=0.021), 35-39 (aOR 1.95, 95% CI: 1.20 to 3.17, p=0.007) (Table 2).

Pregnancy history

Among 4,331 women who tested for HIV, 93.35% had been pregnant at least once in their lifetime. Compared to women who were never pregnant, the odds of testing for HIV were higher among those who had ever been pregnant (OR 4.75, 95% CI: 3.89 to 5.83, p<0.001), even after adjusting the analyses (aOR 6.40, 95% CI: 4.99 to 8.22, p<0.001). (Table 2).

STI History

Among the 4,327 women who tested for HIV, about 31.94% had sexually transmitted infections (STIs). Compared to women who never had STIs, the odds of testing for HIV were higher among those who had a history of STIs (OR 1.24, 95% CI: 1.07 to 1.45, p=0.006). The association maintained its significance even after adjusted analyses (aOR 1.21, 95% CI: 1.02 to 1.50, p=0.030) (Table 2).

Knowledge of MTCT

Among all women who knew medication to prevent mother to MTCT of HIV, about 88.33% (n=2,860) were tested for HIV. Compared to women who did not know medication to prevent MTCT, the odds of testing for HIV were higher among those who knew about MTCT (OR 1.72, 95% CI: 1.35 to 2.20, p<0.001). The association maintained its significance even after adjusted analyses (aOR 1.65, 95% CI: 1.23 to 2.21, p=0.001) (Table 2).

Table 2. Factors associated with HIV testing among women aged 15-49 years in Liberia.

		Bivariate Logistic Regression			**Multivariate Logistic Regression**		
Variable	**Category**	**OR**	**95%CI**	**P value**	**aOR**	**95%CI**	**P value**
Age in years	15-19	Ref			Ref		
	20-24	2.53	2.00-3.19	**<0.001**	1.58	1.05-2.38	**0.028**
	25-29	4.33	3.29-5.69	**<0.001**	1.74	1.09-2.79	**0.022**
	30-34	4.27	3.01-6.05	**<0.001**	1.80	1.10-2.96	**0.021**
	35-39	3.80	2.89-5.01	**<0.001**	1.95	1.20-3.17	**0.007**
	40-44	2.88	2.14-3.88	**<0.001**	1.35	0.86-2.12	0.193
	45-49	1.39	1.04-1.87	**0.028**	0.83	0.49-1.40	0.483

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Highest educational level	Elementary	Ref			Ref		
	Primary	1.67	0.98-1.38	0.076	1.39	1.16-1.68	**<0.001**
	Secondary	1.46	1.24-1.73	**<0.001**	2.10	1.73-2.53	**<0.001**
	Higher education	3.96	2.37-6.65	**<0.001**	6.80	3.75-12.32	**<0.001**
Place of residence	Urban	Ref					
	Rural	0.73	0.62-0.86	**<0.001**	0.82	0.67-0.99	**0.039**
Marital status	Married	Ref			Ref		
	Not in union	0.70	0.60-0.83	0.110			
	Living with a man	1.31	1.09-1.58	**0.005**	1.35	1.03-1.51	**<0.001**
	Widowed	0.73	0.47-1.12	0.148			
	Divorced/ separated	1.47	1.14-1.90	**0.004**	1.37	1.05-1.79	**0.019**
Media exposure	Not at all	Ref			Ref		
	Less than once a week	1.54	1.03-2.32	**0.037**	0.81	0.36-1.81	0.606
	More than once a week	1.94	1.56-2.43	**<0.001**	1.66	0.91-3.00	0.096
Partners highest educational level	Elementary	Ref			Ref		
	Primary	1.28	1.02-1.63	**0.037**	1.19	0.91-1.55	0.210
	Secondary	1.79	1.47-2.18	**<0.001**	1.41	1.13-1.75	**0.002**
	Higher education	3.24	2.24-4.71	**<0.001**	1.82	1.13-2.93	**0.013**
Employment status	Not employed	Ref			Ref		
	Employed	1.25	1.09-1.45	**0.002**	1.02	0.81-1.30	0.814
Pregnancy History	No	Ref					Ref
	Yes	4.75	3.89-5.83	**<0.001**	6.40	4.99-8.22	**<0.001**
Number of sexual partners	1 partner	Ref					
	2 partners	1.05	0.84-1.32	0.685			
	3 or more partners	0.40	0.13-1.21	0.105			

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Transactional Sex	No	Ref					
	Yes	1.28	0.75-2.19	0.362			
STI History	No	Ref					Ref
	Yes	1.24	1.07-1.45	**0.006**	1.21	1.02-1.50	**0.030**
Knowledge of drugs to avoid MTCT	No	Ref					
	Yes	1.72	1.35-2.20	**p<0.001**	1.65	1.23-2.21	**0.001**
Gender based violence	No	Ref					
	Yes	0.93	0.36-2.37	0.880			
Discriminatory behavior	No	Ref					
	Yes	1.49	0.44-5.04	0.515			

OR=Odds ratio, aOR=Adjusted Odds Ratio, CI=Confidence Interval, p value threshold=0.01.

Discussion

This study aimed to determine the prevalence and factors associated with HIV testing among women aged 15 to 49 years in Liberia using 2019/2020 DHS data.

The prevalence of HIV testing among women aged 15 to 49 years in Liberia was found to be 57.17% (95% CI: 56.2 to 60.4). This prevalence was higher than the one reported in sub-Saharan Africa [21]. The prevalence in this study was lower than many studies conducted in Africa [16,17]. Regional variations in access to HIV testing facilities as well as knowledge related to HIV/AIDS may also be the reasons for the reported regional inequalities in HIV testing implementations [18–23]. The other differences in HIV testing rates between countries could be because of the different periods when HIV testing was reported. In addition, Liberia is a country that has experienced over 14 years of civil unrest, which has left the country with a deteriorated health system and enormous scarcity of health workforce [3].

This study found that women who live in rural areas have lower HIV testing prevalence compared to those who live in urban areas. This might be because women who live in urban areas can easily access primary healthcare services, has better exposure to real information and educational programs about HIV/AIDS [24]. In a rural setting, especially in very small villages, lack of privacy and confidentiality of healthcare personnel may also reduce the rate of HIV testing. Apart from that, cultural and religious beliefs in rural areas discourage discussions about sexual health, which may impede HIV testing process [24,25]. This was contrary to a finding by Deynu et al. who reported that most women from rural areas are more likely to test for HIV than those from urban areas [26].

Women in urban areas are more educated compared to rural areas. We observed that there is a strong association between HIV testing among these women and their highest educational level. Women who had higher education qualification were more likely to test for HIV than the less educated group under this study. This could have been attributed to better comprehension of the importance of HIV testing and its risk factors, access to information, financial ability to seek healthcare services and reduced stigma [27]. This, in return, may decrease fear of women to go for HIV testing services. Bhattarai et al also reported that having primary, secondary, or higher education were associated with increased odds of HIV testing compared to those with no education [23].

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Women who have had STIs had higher odds of testing for HIV than those who never had STIs. This could be attributed to increased awareness on the benefits of proactively seeking testing services, not only for STIs but also for HIV and their frequent visits for treatment and follow up.

Women who had been pregnant at least once in their lifetime are associated with higher odds of testing for HIV, which is motivated by compulsory testing during antenatal care in order to prevent vertical transmission of HIV. Knowledge about PMTCT also influenced HIV testing among women in order to protect their children and encourage partner testing. Pachena & Musekiwa found that women with higher knowledge about MTCT had higher odds of being tested for HIV [28]. Furthermore, Sonny & Musekiwa reported that knowledge regarding mother-to-child transmission of HIV (MTCT) was associated with ever testing for HIV in Lesotho [29]. Pachena & Musekiwa, through a study in Zimbabwe, found that adolescent girls and young women (AGYW) who had been pregnant in the past 24 months had higher odds of HIV testing [30].

Strengths and Limitations

Since this study is a secondary data analysis of the demographic and health survey, it is representative of the entire population of reproductive age women in Liberia and inferences made through this study may be generalized to the entire population of Liberian reproductive aged women. Furthermore, our study had large sample sizes with high response rates. Sample weights were used for this analysis.

However, since this study is a secondary analysis of a cross sectional study, it automatically restricts us from investigating further on the causal relationships between HIV testing and its risk factors. Also, this study may be exposed to reporting and recall biases as most questions required retrospective data. This might have led to HIV testing outcome being under-reported or over-reported.

Conclusion and Recommendations

This study found that prevalence of HIV testing among Liberian women aged 15 to 49 years in 2020 is 57.17% (95% CI: 56.2 to 60.4). Additionally, HIV testing among these women was significantly associated with higher educational level, place of residence, pregnancy history, knowledge of MTCT and STI history. These findings suggest that these factors should further be incorporated in peer education programs on HIV testing. Furthermore, future research especially qualitative research on risk factors for HIV testing will be of great importance in improving HIV testing prevalence.

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Data Availability Statement: The DHS data is publicly available at www.dhsprogram.com

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