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Title: Determinants of HIV prevalence in Rwanda: secondary analysis of Rwanda demographic health survey 2014/2015

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Abstract

HIV continues to be a major public health concern. Globally 0.8% [0.6%-0.9%] of adults from 15 to 49 years are HIV positive. And it continues to vary enormously between countries and regions. In Rwanda the HIV prevalence has been 3% since 2005. The present study provided a comprehensive data and information on HIV prevalence and its determinants in Rwanda. Determinants associated with HIV prevalence in Rwanda identified using datasets of RDHS 2014-2015. Target population of the study is 12,940 people constituted by Rwandan men aged 15-59 years and women 15-49 years being most sexually active population. A secondary data analysis was done on RDHS 2014-2015 and IBM SPSS Statistics 21 was used for analysis, this showed frequency distribution and cross tabulation of different variables. The low percentage of participants counted 3.21% tested positive while 96.79% participants tested negative. This study also shows that 47.85% were male and 52.15% were female. 25.22% respondents live in urban area as habitants, 74.78% respondents live in rural area as habitants and 91.69% respondents said

that they did not use condom at the last time having sex. The results from multivariate analysis revealed that male respondents were less likely to be infected by HIV [AOR=0.951; 95%CI=0.023-1.748; P=0.004] compared to female. Respondents from rural areas were less likely to be infected by HIV [AOR=0.356; 95%CI=0.276-0.459; P=0.004] compared to respondents from urban areas. The Researcher recommend the Ministry of health to integrate their policies and programs on HIV and the world of work in development plans and poverty reduction strategies and income-generating strategies, as appropriate and should take every opportunity to disseminate information about their policies and programs on HIV.

Keywords: HIV, Rwanda

Introduction

HIV infection remains a worldwide public health concern. Since the beginning of the HIV epidemic, more people have been infected at an estimate of 70 million of infected persons worldwide and around 35 million people have died of HIV. and by the end of 2018, 36.9 million people were HIV infected. and adults between 15 to 49 years worldwide are infected by HIV infection at an estimate of 0.8 % rate. And it continues to vary enormously between countries and regions. Among continents, Africa is the most highly affected by the HIV infection with nearly 1 person in every 25 adults meaning 4.1% are HIV infected and representing for nearly 2/3 of the people who are HIV infected globally [1]

In Pacific Asian People, in 51 studies carried out in that region to assess the prevalence of HIV, risk factors; Ethnicity and gender are the most frequent determinants of community based studies with 7 studies (25%) respectively, followed by age with 6 studies (21.4%) and social support network and sex with 5 studies (17.8%) respectively [2]. Across Sub- Saharan Africa region, HIV prevalence is likely to be greater in women, even though it is higher in males across most other regions.

There are a numerous norm issues of social and gender inequality resulting in slightly more HIV infection in females across many countries; females are mostly at high risk when it comes to the limited role plays in sexual decision making Women and protection, role rates of sexual education and greater rates of transactional sex [3].

The 2015-2016 Malawi DHS indicates that 8.8% of population between 15 to 49 years were HIV infected. HIV prevalence among women is greater for women than for men (10.8% Versus 6.4 %)[4].

Like in other developing countries, Rwanda has still a high HIV prevalence. In a study carried out on the Rwanda Demographic Health Survey 2014-2015, it was found out that in the overall study population, across the country, HIV Prevalence is on 3% among adults age 15-49 and it is on this percentage over a decade.

In Rwanda, HIV Prevalence is estimated at 3% in general with a high rate of 7% in urban settings, including Kigali (8%) while in the rural settings have a rate of 2.2%, and in general women are highly affected than men [5].

The HIV prevalence determinants in Rwanda are different and shows how the prevalence is greater among people with no level of schooling (4%) than among those with a level of primary education (3%) and those with a level of a secondary education or above (2%) [5].

Even though HIV prevalence in Rwanda compared to other countries in Sub-Saharan Region, is relatively low but some sub groups of the population are experiencing high rates of HIV than others. Among them there is females sex workers with 51% as an estimate of HIV infection, one of the greatest rate is found in Kigali city at 56.2% of HIV prevalence whereas Eastern Province is at 32.5% as the lowest rate (Chitou, Boer, Hedt-gauthier, & Gupta, 2018). It has been found that with age, HIV prevalence rate rises and is greatest among women aged 40 to 44 (8%) and men aged 45 to 49 (9%) [5]

HIV epidemic continues to be a major public health concern especially in developing countries. In Rwanda, The Prevalence of HIV has remained stable at 3.0 % since 2005. Urban settings have been highly prevalent at 7%, including Kigali (8%) whereas the rural areas have a rate of 2.2% and women are generally the most affected in comparison to men [5].

The interest of conducting this study is that HIV prevalence have been one of the top epidemic disease and new infections are still high despite more efforts made by the Rwandan Government to tackle HIV AIDS and population which increases every year with a population growth of 2.6%, the prevalence of HIV should be reduced. With annual incidence of HIV among adults from RPHIA 2018-2019 was 0.08% corresponds to 5,400 new cases of HIV annually among adults, this shows that new infections are still at a high number and determinants of HIV prevalence are significant in Rwanda, not only that there is also a gap of 16% of people living with HIV in the community but not yet diagnosed (only 83.8 % aware of their HIV status) [5].

As it is a countrywide public health burden, a study analyzing the HIV prevalence and its determinants is needed, the reason as to why the researchers' choice is the secondary data

analysis of DHS 2014-2015; Its data set has relevant data to the subject matter and its sample is inferred to the National coverage.

Although Rwanda managed to stabilize the HIV prevalence over a decade, some areas and subgroups still have high prevalence; Female sex workers with 51%, people in urban areas with 7%, 14% of widows are HIV positive. However, little is known as to the level of significance of determining factors behind this problem. The study focused on socioeconomic, demographic and sexual risk behavior determinants of HIV prevalence.

Study design

This was a population-based study, quantitative, and cross-sectional in nature. An analysis of secondary data of the Rwanda Demographic and Health Survey 2014-2015. Datasets was analyzed to assess the determinants of HIV prevalence in populations aged 15 to 49 years in Rwanda.

Target Population and Sample size

From the RDHS 2014-2015, the study population constituted Rwandan men aged 15-59 years and women 15-49 years. This range of ages are the most sexually active and have consented in the survey so that there should be tested resulting in a national HIV prevalence. The target population in the study are all tested people with results who are 6749 women and 6191 men totaling 12940.

Sampling procedure

In the sampled Households, The Questionnaire for a woman was administered to all women from 15 to 49 years living in those Households. This was in purpose of collecting information on characteristics of their background, partner's union and sexual activities, Characteristics of husbands as well as females' employment activity, HIV infection and transmissible sexual infections, other health issues. In every second household in the sample, the questionnaire for all men was directed to all men with 15 to 49 years living in those households. This one was the same as the questionnaire for women but did not incorporate questions on some specific questions for women only and not related directly to the scope for this study as well.

Researcher requested data files through DHS program and Variables of interest extracted to form a new dataset in Excel which was exported to SPSS as well for Analysis.

Reliability and validity of questionnaire

For all eligible and consented females and males were taken Blood samples for HIV laboratory testing, samples were tagged with a unique barcode for each and then dried for easy package. Testing were done only after completing questionnaire data collection. Finally, for the purpose of linking the test of HIV with the data from interviews for men and women, barcode was used for that.

Data analysis and ethical consideration

Firstly, variables of interest namely Gender of the respondent, Education level of the respondents, Residence of the respondents, Occupation of the respondents, Religion of the respondents, Province of the respondents, Wealth index of the respondent, Age of the respondents, Marital Status of the respondents, Type of union, Number of frequency the respondent slept away from home in a year passed, Time away from home in past 12 months, Sexual Risk behavior determinants, Age of the respondent at his or her 1st sexual intercourse , Respondent who had more sexual partners and concurrent partners in a year passed (last 12 months), Uses of condom last time having sex with someone in the last 12 months, Number of lifetime partners, Respondent who had paid for sex in a year passed (last 12 months) extracted to form a new dataset. The variables were regrouped and renamed according to the operational definitions of the study and to make them analyzed. A descriptive analysis was done for any HIV prevalence versus other independent variables in the study, this showed the frequency distribution and cross tabulation of different variables. A chi-square test was performed for checking associations between HIV prevalence and the different independent variables.

Significant variables were then put in a multivariate model which is then analyzed using backward stepwise logistic regression; P values, Confidence interval and odds ratio helped to find out the level of significance of different variable by removing the least statistically significant variable and remain with variables with significant p values. Generated tables were manipulated using MS excel software, SPSS and STATA. The results were presented on tables by study objectives.

As mentioned above, this is an analysis of secondary data from Rwanda Demographic Health Survey 2014-2015. DHS had passed through all the ethical considerations before. This means that even the study participants are anonymous. However, an ethical clearance was nonetheless solicited from the Rwanda National Health Research Committee (NHRC) in order to fulfill all

the considerations. Also, an authorization to use DHS dataset was requested from the DHS Program through the National institute of Statistics of Rwanda

Results

Socio-demographic characteristics of respondents

The table below presents socio-demographic characteristics of 12940 respondents all reached and data collected using questionnaire through face to face interview.

Table 1. Socio-demographic characteristics of respondents, 2014-2015 DHS

Variables	Frequency	
	N	%
Sex		
Male	6191	47.85
Female	6749	52.15
Age Group		
15-24	4882	37.72
25-34	4137	31.97
35-44	3290	25.42
45 and above	631	4.89
Marital status		
Never in union	5306	41.00
Married/union	6800	52.55
Divorced/separated/widowed	834	6.45
Type of union		
Once	11965	92.46
More than once	975	7.54
Frequency times slept away		
Never	7302	56.42
Single time	2635	20.36
2 Times and plus	3003	23.22
Time away from home		
No	11752	90.81
Yes	1188	9.19

Source: Researcher, 2020

Table 4.1. of respondents' demographic characteristics interviewed during Demographic Health Survey of 2014-2015 shows that 6191(47.85%) were male and 6749(52.15%) were female. 4882(37.72%) were aged between 15-24 years old, 4137(31.97%) were aged between 25-34 years old, 3290(25.42%) were aged between 35-44 years old while 631(4.89%) were aged 45 years and above. 5306(41.00%) of respondents have never been in union, 6800(52.55%) of

respondents were married and 834(6.45%) respondents were divorced. A large number of respondents did not sleep away from home in the last 12 months, where 11752(90.81%) respondents said that they didn't sleep away from home and only 1188(9.19%) respondents agreed that they did.

Socio-economic characteristics of respondents

The table below presents socio-economic characteristics of 12940 respondents all reached and data collected using questionnaire through face to face interview.

Table 2. Socio-economic characteristics of respondents

Variables	Frequency	
	n	%
Province		
Kigali	2172	16.18
South	4052	31.33
West	3260	25.19
North	2134	16.09
East	1322	10.21
Residence		
Urban	3264	25.22
Rural	9676	74.78
Education level		
Less than secondary	9679	74.99
Secondary and plus	3261	25.01
Religion		
Christian	12457	96.26
Muslim	340	2.62
Other	143	1.12
Occupation		
Employed	5084	39.29
Unemployed	7856	60.71
Wealth index		
Bottom quintile	6894	53.28
Not Bottom quintile	6046	46.72

Source: Researcher, 2020

The table above indicates that 2172(16.18%) respondents live in Kigali, 4052(31.33%) respondents live in Southern Province, 3260(25.19%) live in Western Province, 2134(16.09%) respondents live in Northern Province and 1322(10.21%) respondents live in Eastern Province. According to the distribution by residence, 3264(25.22%) respondents live in urban area as habitants and 9676(74.78%) respondents live in rural area as habitants. For education level participants, the most of them 9679(74.99%) had less than secondary level of education and 3261(25.01%) respondents had secondary and plus level of education. 5084(39.29%) of

participants were employed, 7856(60.71%) were not employed, 6894(53.28%) respondents belonged in bottom quintile of wealth index and 6046(46.72%) respondents were not belonging in bottom quintile of wealth index.

Sexual risk behavior of respondents

The table below presents sexual risk behavior of 12940 respondents who participated in this research.

Table 3. Sexual risk behavior of respondents

Variables	Frequency	
	n	%
Age at first Sex		
Never had Sex	3353	25.91
6-19 years	2860	22.12
20-39 years	2157	16.66
Above 39 years	4570	35.31
Number of sexual partners		
0	11736	90.62
1	1072	8.25
2 and plus	132	1.03
Uses of condom last time having sex		
No	11865	91.69
Yes	1075	8.31
Number of lifetime Partners		
Single Partner	7294	56.37
2 Partners	3384	26.15
3 Partners and plus	2262	17.48
Respondent who had paid for sex		
No	12864	99.41
Yes	76	0.59
Forced to perform unwanted sex		
No	12423	96.00
Yes	517	4.00
Having STIs in the last 12 months		
No	12681	97.99
Yes	259	2.11

Source: Researcher, 2020

Table 3 illustrates descriptive characteristics of sexual risk behaviors and the respondents asked for their age at first sex, 3353(25.91%) respondents said that they never had sex, 2860(22.12%) respondents said that they were aged between 6-19 years old at the first sex and 2157(16.66%) respondents had their first sex when they were aged between 20-39 years old. 1072(8.25%) respondents agreed that they had a single sexual partner, 11865(91.69%) respondents said that

they did not use condom at the last time having sex, only 76(0.59%) respondents had paid for sex, 517(4.00%) respondents had been forced to perform unwonted sex and 259(2.11%) respondents had STIs in the last 12 months.

The prevalence of HIV

The graph below presents the number of people who tested positive and negative in this study as the prevalence might be cross tabulated with different variables to assess the factors which are significant associated with it.

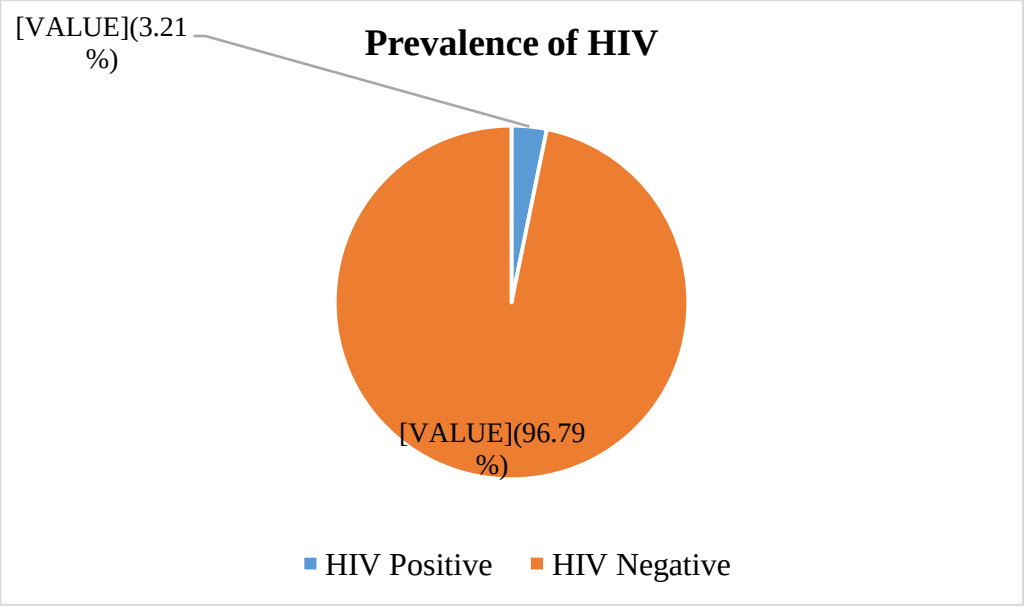

Figure 1. The prevalence of HIV

The low percentage of participants counted 415(3.21%) tested positive while 12525(96.79%) participants tested negative.

Presentation of the findings

The findings of this study are presented according to their research objectives which are to determine demographic factors associated with HIV prevalence, to identify socioeconomic factors associated with HIV prevalence, to determine sexual risk behavior factors associated with HIV prevalence in Rwanda.

Socio-demographic factors associated with HIV prevalence

The first objective of this study was to determine demographic factors associated with HIV prevalence and six variables were used to determine those factors.

Table 4. Demographic factors associated with HIV prevalence (Bivariate analysis)

Variables	HIV Results	P Value

	HIV Negative n(%)	HIV Positive n(%)	
Sex			**0.003**
Male	6030(97.39)	161(2.61)	
Female	6495(96.23)	254(3.77)	
Age group			**<0.001**
15-24 Years	4829 (98.91)	53 (1.09)	
25-34 Years	4034 (97.55)	97 (2.45)	
35 years and above	3698 (94.16)	229(5.84)	
Marital status			**<0.001**
Never in union	5230 (98.28)	91 (1.72)	
Married/union	7295 (95.74)	324(4.26)	
Type of union			**<0.02**
Once	11623 (97.14)	309(2.86)	
More than once	869 (89.12)	106 (10.88)	
Number of times slept away			**<0.001**
Never	7069 (93.13)	251(6.87)	
Single time	2560 (97.15)	75 (2.85)	
2 times and plus	2896 (97.01)	89 (2.99)	
Times away from home in past 12 months			0.495
No	11570 (96.80)	382 (3.40)	
Yes	955 (96.65)	33 (3.35)	

Source: Researcher, 2020

As indicated in the Table 4, there was statistically significant association between Sex, age, marital status, type of union and the number of times slept away and HIV prevalence with P-value of less than 0.05 calculated to 95% CI.

Table 5 Demographic factors associated with HIV Prevalence (Multivariate analysis)

Variables	AOR	95% CI		P value
		Lower	Upper	
Full model				
Sex				
Male	0.951	0.023	1.748	**0.04**
Female	Ref			
Age Group				
15-24 Years	Ref			
25-34 Years	2.958	2.031	4.309	**0.001**
35 and above years	4.388	3.039	6.333	**0.003**
Marital status				
Never in union	Ref			
Married/union	3.419	2.269	5.151	**0.036**
Type of union				
Once	Ref			
More than once	3.248	2.352	4.946	**0.002**

Number of times slept away				
Never	0.621	0.583	1.340	0.214
Single time	0.697	0.523	1.146	0.091
2 Times and plus	Ref			

Source: Researcher, 2020

The results from multivariate analysis revealed that male respondents were less likely to be infected by HIV [AOR=0.951; 95%CI=0.023-1.748; P=0.004] compared to female. Respondents aged between 24-34 years old were more likely to be infected by HIV [AOR=2.958; 95%CI=2.031-4.309; P=0.001] and those aged 35 years old and above were more likely to be infected by HIV [AOR=4.388; 95%CI=3.039-6.333; P=0.003] compared to respondents who were aged between 15-24 years old. Married respondents were more likely to be infected by HIV [AOR=3.419; 95%CI=2.269-5.151; P=0.036] compared to the respondents who had never been in union. The respondents who had more union were more likely to be infected by HIV [AOR=3.248; 95%CI=2.352-4.946; P=0.002] compared to the respondents with single union.

Socio economic factors associated with HIV Prevalence

The second objective of this study was to determine socio-economic factors associated with HIV prevalence and five variables were used to determine such factors.

Table 6. Socio economic factors associated with HIV prevalence (Bivariate analysis)

	HIV Results		
Variables	**HIV Negative n(%)**	**HIV Positive n(%)**	**P Value**
Province			
Kigali	1678 (93.31)	121 (6.69)	**<0.001**
South	3268 (97.32)	90 (2.68)	
West	2836 (97.35)	77 (2.65)	
North	1961 (97.51)	50 (2.49)	
East	2782 (97.31)	77 (2.69)	
Residence			
Urban	3070 (94.05)	294 (9.95)	**<0.001**
Rural	9555 (98.74)	121 (1.26)	
Education level			
Less than secondary	3277 (97.42)	84 (1.85)	**0.019**
Secondary and plus	9372 (96.58)	331 (3.42)	
Religion			
Christian	12064 (96.84)	393 (3.16)	0.46
Muslim	462 (95.65)	22 (4.35)	
Occupation			
Employed	4836 (95.32)	237 (4.68)	**<0.001**
Unemployed	4493 (97.22)	178 (2.88)	

Wealth index			
Bottom quintile	6696 (97.12)	198 (2.88)	0.084
Not Bottom quintile	5829 (96.41)	217 (3.59)	

Source: Researcher, 2020

As indicated in the Table 5, there was statistically significant association between Province, Residence, educational level, occupation and HIV prevalence with P-value of less than 0.05 calculated to 95% CI.

Table 7 Socio-economic factors associated with HIV prevalence (Multivariate analysis).

Variables	AOR	95% CI		P value
		Lower	Upper	
Full model				
Province				
Kigali	Ref			
South	0.347	0.242	0.498	**0.002**
West	0.433	0.277	0.681	**0.001**
North	0.95	0.39	2.31	0.915
East	0.353	0.266	0.679	0.056
Residence				
Urban	Ref			
Rural	0.356	0.276	0.459	**0.004**
Education level				
Less than secondary	Ref			
Secondary and plus	1.488	1.079	2.053	**0.016**
Occupation of the respondent				
Employed	0.413	0.321	0.532	**0.003**
Unemployed	Ref			

Source: Researcher, 2020

Respondents who were living in Southern province were less likely to be infected by HIV [AOR=0.347; 95%CI=0.242-0.498; P=0.002] and the one who were living in Western province were less likely to be infected by HIV [AOR=0.433; 95%CI=0.277-0.681; P=0.001] compared to respondents living in Kigali. Respondents from rural areas were less likely to be infected by HIV [AOR=0.356; 95%CI=0.276-0.459; P=0.004] compared to respondents from urban areas. The respondents with higher educational level were more likely to be infected by HIV [AOR=1.488; 95%CI=1.079-2.053; P=0.016] compared to the respondent with less than secondary level of education. Respondents who were employed were less likely to be infected by HIV [AOR=0.413; 95%CI=0.321-0.532; P=0.003] compared to the respondents who were unemployed.

Sexual risk behavior determinants associated with HIV prevalence

The third objective of this study was to determine sexual risk behavior factors associated with HIV prevalence and seven variables were used to determine such factors.

Table 8 . Sexual risk behavior factors associated with HIV prevalence (Bivariate analysis).

Variables	HIV Results		P value
	HIV Negative n (%)	HIV Positive n (%)	
Age at first Sex			
Never had Sex	3338 (99.55)	15 (2.76)	0.199
6-19	2708 (94.48)	158 (39.37)	
20-39	2046 (95.55)	105 (4.45)	
At first union	4433 (97.00)	137 (3.00)	
Respondent with more sexual partners			
1 Partner	11386 (97.01)	350 (2.99)	**<0.001**
More than one Partner	1141 (94.61)	65 (5.49)	
Uses of condom last time having sex			
No	11580 (97.59)	285 (2.41)	**<0.001**
Yes	945 (87.90)	130 (12.10)	
Number of lifetime Partners			
1	7188 (71.64)	106 (35.63)	**<0.001**
2 and above	5352 (94.79)	294 (5.21)	
Respondent who had paid for sex			
No	12463 (97.18)	361(2.82)	0.236
Yes	72 (57.14)	54 (42.86)	
Forced perform unwanted sexual			
No	12033 (97.19)	347 (2.81)	0.48
Yes	492 (87.85)	68 (12.15)	
Had any STI in last 12 months			
No	12288 (97.06)	372(2.94)	**<0.001**
Yes	237 (84.64)	43(15.36)	

Source: Researcher, 2020

As indicated in the Table 4.8, there was statistically significant association between having more sexual partners, to use condom at last time having sex, number of lifetime Partners, having STIs in last 12 months and HIV prevalence with P-value of less than 0.05 calculated to 95% CI.

Table9 Sexual risk behavior factors associated with HIV prevalence (Multivariate analysis).

Variables	AOR	95% CI		P value
		Lower	Upper	
Full model				
Respondent with more sexual partners				

1 Partner	Ref			
More than one Partner	2.353	1.631	3.395	**0.001**
Uses of condom last time having sex				
No	Ref			
Yes	0.48	0.37	2.56	**0.003**
Number of lifetime Partners				
1	Ref			
2 and above	3.757	2.871	5.388	0.901
Had any STI in last 12 months				
No	Ref			
Yes	8.126	6.324	15.581	**0.001**

Source: Researcher, 2020

The multivariate analysis on sexual risk behavior factors revealed that respondents who had more than one partner were more likely to be infected by HIV [AOR=2.353; 95%CI=1.631-3.395; P=0.001] compared to the respondents with one partner. Respondents who used condom at last time when having sex were less likely to be infected by HIV [AOR=0.48; 95%CI=0.37-2.56; P=0.003] compared to the respondents who didn't use condom at last time when having sex. The respondents who had STIs in last 12 months were most likely to be infected by HIV [AOR=8.126; 95%CI=6.324-15.581; P=0.001] compared to the respondents who didn't have any STI in last 12 months.

Discussion

The aim of this study was to determine demographic factors associated with HIV prevalence, identify socio economic factors associated with HIV prevalence and determine sexual risk behaviors. The discussions are based on the findings in relation with the research objectives and other related studies conducted in different areas.

The present study revealed that the factors including sex, age, marital status, type of union and the number of times slept away were associated with HIV prevalence in Rwanda.

This is consistent with study conducted by Kharsany and Karim, which showed that people aged younger like adolescents and young women have up to 8 times greater rate of HIV in comparison with adults people [6].

This study also revealed that married respondents were more likely to be infected by HIV compared to the respondents who had never been in union. The study conducted in Ethiopia was contrary with the present study where it revealed that adults who were formerly married was found to have more chance of being infected by HIV [8]. Another study in South Africa shows a decreased livelihood with HIV infection that was significantly associated with being married [7].

The residence of the population was associated with HIV infection in this study due to area settings, results shows that respondents from rural areas were less likely to be infected by HIV compared to respondents from urban areas. This is in the same line with the study conducted in Ethiopia where the HIV prevalence in town regions was 4.3% whereas in rural region was 0.7% [8].

An analysis on sexual risk behavior factors revealed that respondents who had more than one partner was more likely to be infected by compared to the respondents with one partner and respondents who used condom at last time when having sex were less likely to be infected by HIV compared to the respondents who didn't use condom at last time when having sex. People who had STIs in last 12 months found to be most likely to be infected by HIV than those who didn't have any STI in last 12 months.

Contrary, the study conducted in Togo revealed that dugs taking before having sex was the most factor associated with being infected which lead to risk of having unsafe sex. People who were using drugs seemed to have uncontrolled mind so then making the good decision become impossible. This suggests relaxation in the observance of preventive behaviors over time by PLWHA (People living with HIV/AIDS) on ART. This study mention that PLWHA, who begin ART usually, live with the symptoms of AIDS, decreasing sexual desire and increasing reluctance to engage in risky sexual practices [9].

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