Austin Journal of Nursing & Health Care

Open Access

Austin Publishing Group

Research Article

Determinants of Syphilis and Trichomonas Infections among Women Attending Selected Health Facilities in Kigali, Rwanda

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Received: July 27, 2021; **Accepted:** August 18, 2021; **Published:** August 25, 2021

Abstract

Background: Syphilis and Trichomonas are among more than 30 known Sexually Transmitted Infections (STIs). They make part of the four (4) most prevalent treatable STIs globally, together with Chlamydia and gonorrhea. They are associated with lifelong health problems, especially among women and their babies, including but not limited to exacerbation of HIV acquisition risks, preterm labor, birth defects, and deaths. This study was conducted to determine the prevalence and determinants of Syphilis and Trichomonas infections among women attending selected Health Facilities (HFs) in Kigali, Rwanda.

Methods: This study was a cross-sectional survey that collected data from 174 women who attended eight (8) HFs in Kigali, Rwanda from October 7 to December 6, 2019, for Outpatient Diagnosis (OPD) services. The HFs were purposefully selected while women participants were recruited using a systematic random sampling strategy. Vaginal swabs were microscopically examined for the presence of *Trichomonas vaginalis* and Syphilis was diagnosed using FaStep Syphilis Rapid tests to detect IgG and IgM specific to *Treponema pallidum*. The questionnaire captured information on the socio-demographic characteristics and sexual behaviors of the participants. Fisher exact test, Phi, and logistic regression were the main statistical analysis of the study.

Results: This study recruited 174 women; aged between 17 and 49 years old, with a mean age of 29 years. The findings show that 12% (21 out of 174) of the women had either Syphilis (9.8%) or Trichomonas (2.3%), but none had both. Syphilis infections significantly affected women living in slums (40%, p=0.001), with a history of STI before (15.2%, p=0.028), not always using a condom (14.9%, p=0.014), and self-reporting to have had one lifetime sex partner (23.5%, p= 0.002). Living in slums, not always using a condom, and self-report of one lifetime sex partner uniquely increase the risks of getting syphilis up to 6.305, 5.53, and 5.81 times compared to their counterparts who are not, respectively. Trichomonas infection was significantly high (p <0.01) among women in economic category one (18.2%, p=0.029), self-reporting to lack transport (13.6%, p <0.001) and health cover (12.5%, p <0.001) as barriers of not attending a health facility while they are sick. Lacking transport means and health cover uniquely exacerbate the risks of Trichomonas infection up to 36.7 and 22.32 times, respectively.

Conclusion: This study concludes that Syphilis and trichomonas infections are still major public health problems among women attending health facilities in Kigali, Rwanda. Therefore, there is still a need to enhance health promotion programs to improve healthcare-seeking behaviors and empower women to negotiate safe sexual activities.

Keywords: Determinants; Syphilis infection; Trichomonas infection

Abbreviations

AIDS: Acquired Immune Deficiency Syndrome; aOR: Adjusted Odds Ratio; CI: Confidence Interval; DH: District Hospital; HC(s): Health Center(s); HF(s): Health Facility (ies); HIV: Human Immunodeficiency Virus

Background

Sexually Transmitted Infections (STIs) are infections mainly transmitted from one person to another through sexual intercourse. However, in rare cases; other routes of transmission are possible including direct contact with contaminated blood for blood-borne STIs, or materials like towels or toilets for non-blood-borne STIs. Trichomonas and Syphilis, currently under study, are among more than 30 known STIs and make part of the four (4) leading STIs globally, together with Chlamydia and gonorrhea. Trichomonas is caused by a protozoon called *Trichomonas vaginalis*, while Syphilis

Citation: Nzeyimana Z, Mochama M, Dzinamarira T and Safari E. Determinants of Syphilis and Trichomonas Infections among Women Attending Selected Health Facilities in Kigali, Rwanda. Austin J Nurs Health Care. 2021; 8(2): 1061.

is due to a bacterium in the family of spirochetae called *Treponema pallidum*.

STIs remain a major public health concern globally. Every year, more than 160 million people get infected with *T. vaginalis* [1]. This incidence of trichomonas was 88 times higher than that one of HIV in 2017; 160 versus 1.8 million [2]. While trichomonas was the most prevalent STI (5%) in 2012, syphilis was the last among the four leading STIs globally with 0.5%, together with Chlamydia (4.2%) and gonorrhea (0.8%) [3].

Women present the highest health problems of STIs. It is well documented that women are more exposed to syphilis and trichomonas than their male counterparts due to anatomical and socio-demographic reasons. Anatomically, women have a larger exposed surface of the genital parts including vaginal and labial areas, as opposed to the male organ (penis) in men, *via* which these infections can pass. More so, the vaginal mucosa is more susceptible to be affected when compared to the hardened penile skin [4]. Socio-demographic factors include increased financial dependence of the females on their male counterparts, especially in resource-limited countries, and transactional sex mostly reported in sub-Saharan Africa.

Women in Sub-Saharan Africa engage in transactional sex for basic needs, luxury life, or as a means to express love to men. Considering sex for basic needs, women engage in sex to survive because men in Sub-Saharan Africa are considered as the source of financial support to women while women recognize that they need men to live. This renders them more vulnerable to the HIV epidemic and other STIs. Regarding sexual activity for luxury life, women accept sexual activities to get modern materials to fit in with their peers in a higher category and for smart life with upcoming technological materials/gadgets. Regarding sexual intercourse as an object to show love, men are considered as providers and women have to do sex with them to show that they love and obey them [5].

Syphilis and trichomonas are associated with lifelong health problems. They increase the risk of getting HIV up to 3 times and more [6,7] by weakening the vaginal wall and accumulating HIV susceptible cells around the reproductive organs [8]. They disproportionately affect pregnant women and their babies. About 38% (350,000/900,000) of all births from syphilis-infected women presented one or more birth problems in 2012. WHO reported that, of all pregnant women infected with syphilis, there was an estimate of 143 thousand of early fetal deaths or stillbirths, 62 thousand of neonatal deaths, and 44 thousand preterm born babies and/or babies with birth weight below 2.5kg due to mother-to-child syphilis transmission (Congenital syphilis) [9,10]. Similarly, Trichomonas increases the risk of preterm births, stillbirths, and deaths of neonates during pregnancy [7,11].

As a response to the worldwide STI burden; WHO initiated a global STI strategy in 2017, calling for country-based actions to fight against STIs, to reduce the global STI burden. In the plan, countries are entitled to understand their national STI epidemics for a well-informed action plan to foster continuum services of STI treatment and prevention [3]. Despite the above WHO call for STI prevention, several countries are still struggling to understand their national STI epidemic, especially those with low incomes, where both financial and healthcare resources are limited.

According to the Rwanda Demographic and Health Survey (DHS) of 2014/2015, STIs disproportionately affected women (13%) more than men (4%) in Kigali. Women from Nyarugenge district presented the highest prevalence (20%) of STIs than those from Gasabo (12%) and Kicukiro (10%). However, the survey relied on self-reported STI signs and symptoms to confirm the STI Cases [12].

Studies have proven the vital role of laboratory tests in STI diagnosis because as many as 70% of the treatable STIs remain asymptomatic [11]. The prolonged incubation period of Syphilis can mislead its symptom-based diagnosis. More so, Syphilis chancre is self-healed and can disappear within 21 to 42 days of its appearance. Its incubation period can go up to 90 days from the time of bacterial acquisition. Asymptomatic patients present the highest risk of disease transmission while patients with signs and symptoms of STIs present the lowest due to decreased sexual desire (libido).

Drug-resistant STIs pose can a public health threat. Although syphilis is still effectively treatable with penicillin, *Treponema pallidum* strains resistant to macrolides, a second line substitute to penicillin, have been reported [13]. Thus, the importance of early diagnosis and proper treatment of trichomonas and syphilis infections to prevent possible transmission of drug-resistant strains.

The present study was conducted to determine the prevalence and determinants of syphilis and trichomonas infections among women attending selected HFs in Kigali, Rwanda.

Methodology

Study area

This study collected data from 8 HFs; 2 District Hospitals (DH), and 6 Health Centers (HCs) including 4 HFs in Nyarugenge District, namely Muhima DH, Biryogo HC, Muhima HC, and Cor-unum HC; and 4 HFs in Gasabo District comprising Kibagabaga DH, Remera HC, Gihogwe HC and Kagugu HC.

Study design and population

This study was a cross-sectional survey, collecting data from 174 women, aged between 17-49 years, selected using a systematic random sampling strategy by considering every fourth woman who attended selected HFs for Outpatient Diagnosis (OPD) services during the period of data collection ranging from October 7 to December 6, 2019.

Sample size calculation

This study collected information from 174 women attending selected HFs in Kigali. This sample size was determined using the following formula:

$$n = \frac{z^2 p(1-p)}{d^2}$$

Where: Z is the level of confidence at 95% Confidence Interval (CI) of 1.96, p is the current prevalence of STIs which is 13% among women in Kigali in 2015 [14], d is the margin of error held at 5%.

$$n = \frac{1.96^2 0.13(1-0.13)}{0.05^2}$$
$$= \frac{3.8416 \times 0.13 \times 0.87}{0.0025} = 174$$

Therefore, the sample size was 174 women.

Data collection methods

Laboratory data: Selected women signed informed consent before being tested for the infections. On one hand, Capillary blood specimens were used to screen them for syphilis infection using FaStep Syphilis Rapid tests. This test is 99.6% sensitive and 99.1% specific to *Treponema pallidum* IgG and IgM. On the other hand, vaginal swabs were collected from the women and examined using a light microscope for the presence of *Trichomonas vaginalis*. Laboratory test results were captured using a Laboratory data collection sheet.

To collect information on determinants, a questionnaire was developed to capture information on participants' demography, socio-economic characteristics, risky sexual behaviors, and environmental risk factors like living near a nightclub, football stadium, or in densely populated areas or where urbanization activities are taking place. The questionnaire was piloted for reliability and validity testing before actual data collection.

Reliability and validity of data collection instruments

Reliability: A structured questionnaire was piloted on 15 female respondents at Muhima HC to detect possible confusion from any included question, appropriateness of questions order, acceptability of the questionnaire length, and repeatability of responses if different raters interview the same person. Moreover, the Reliability of the questionnaire was tested by computing Cronbach's alpha which was 0.707 for variables in the category STI risk factors, which was acceptable for internal consistency. Moreover, Cronbach's alpha for healthcare-seeking behaviors and barriers was 0.643, which could increase by adding more items. Finally, participants were given a questionnaire version, written in their mother tongue, and proof red by two reviewers for translation accuracy.

Laboratory techniques were performed adhering to Good Laboratory Practices (GLP), and following the Standard Operating Procedures (SOPs) and test kit's manufacturer's instructions. Quality control samples were run before testing participants' samples for syphilis. Qualified laboratory personnel, with a valid professional license and more than 7 years of working experience in clinical diagnostic laboratories, performed microscopic identification of *Trichomonas vaginalis* from collected vaginal swabs.

Validity: A structured questionnaire was developed based on abroad range of known risk factors of STIs from peer-reviewed publications and WHO guidelines including the WHO questionnaire entitled "Illustrative Questionnaire for Interview-Surveys with Young People" (Cleland, 2014). Proposed statistics were computed from the pilot data to check whether current study questions can be answered, using developed data collection tools. Used faStep Rapid tests are 99.6% sensitive and 99.1% specific to *Treponema pallidum* IgG and IgM.

While conducting this study, predefined procedures for data collection, analysis and interpretation were vigorously followed to protect internal validity by preventing order and researcher biases. The research assistants were also trained on how to use the tools. To ensure the external validity of the research methods, capillary blood samples were used for syphilis testing and vaginal swabs were microscopically analyzed within 30 minutes of their collection.

Statistical analysis

Data were entered in IBM SPSS version 21 and analyzed using descriptive statistics and cross-tabulation analysis of the software. Fisher exact and Phi tests were computed to find out whether there is a statistical relationship between the occurrence of syphilis and trichomonas and various women characteristics and health determinants, considering a 5% margin of error and confidence interval of 95%. In addition, Binary logistic regression was computed to find out the extent to which factors associated with trichomonas and syphilis uniquely predict the occurrence of these diseases.

Results

This study was conducted to determine the prevalence of Syphilis and trichomonas among women attending eight (8) selected HFs in Kigali, Rwanda. It was also done to establish determinants of these infections among the women. This section presents study findings encompassing demographic characteristics of the study participants, the prevalence of syphilis and trichomonas, and risk factors associated with each of the diseases.

Demographic characteristics of the study participants

Study women aged between 17 and 49 years of age with a mean age of 29 years, and 49% of them aged between 20-29 years. Out of 174 study participants; 82.8% of them were married (52.3%) and single mothers (30.5%), 84.5% were occupied by unpaid jobs, 60.9% were in economical category III, 59.8% had high school, and 36.8% primary as their highest education level attained, and 83.3% were from Gasabo district. Detailed information is found in Table 1.

Prevalence of Syphilis and Trichomonas among women

The prevalence of Syphilis was higher (9.8%) than that of Trichomonas (2.3%). There was no co-infection between syphilis and trichomonas. Full information is found in Table 2.

Prevalence of Syphilis infection by age

Young aged women (19 years old and less) and old-aged ones (40-49 years) were the most affected by syphilis infection with 15.38% and 28.57% prevalence in the age groups, respectively. Detailed information is found in Figure 1.

Factors of Syphilis and Trichomonas infections

On one hand; Syphilis infection was significantly higher ($p < 0.05$) among women living in slums (40%) than those who were not (7.9%); who had ever had STI before (15.2%), who do not always use a condom (14.9%), and those women who self-reported to have had one lifetime sexual partner (23.5%). However, there was no significant correlation between syphilis infection and age groups ($p=0.075$); marital status ($p=0.669$); occupation ($p=0.248$); economic category ($p=0.834$); district of residence ($p=0.055$); education level ($p=0.29$); living near a hotel, lodge, or guesthouse ($p=0.139$); living near a football stadium ($p=0.475$); living near a bus parking station ($p=0.771$); poor services ($p=0.237$), lack of transport ($p=0.513$) or lack of health insurance ($p=0.628$) as reasons of not attending a health facility while sick; and use of internet as a source of sexual health information ($p=0.455$).

On the other hand, Trichomonas infection was significantly high ($p<0.05$) among women in economic category one (18.2%), self-

Table 1: Demographic characteristics.

Variables	Outcome
Age Mean ± 2SD (Min-Max)	29 ± 7, (17-49)
Age Groups n (%)	
≤19	13 (7.5)
20-29	86 (49.4)
30-39	61 (35.1)
40-49	14 (8)
Marital Status n (%)	
Single	19 (10.9)
Single mother	53 (30.5)
Married	91 (52.3)
Divorced	8 (4.6)
Widowed	3 (1.7)
Occupation, n (%)	
Unpaid jobs	147 (84.5)
Trade	11 (6.3)
Other	16 (9.2%)
Economical Category, n (%)	
Category I	12 (6.9)
Category II	56 (32.2)
Category III	106 (60.9)
Education Level n (%)	
University	6 (3.4)
High School	104 (59.8)
Primary and Below	64 (36.8)
District of Residence n (%)	
Gasabo	145 (83.3)
Nyarugenge	25 (14.4)
Kicukiro	4 (2.3)
Total	**174 (100%)**

Source: Field data (2019).

Table 2: Prevalence of syphilis and trichomonas.

Infection Type	Prevalence n (%)
Syphilis	17 (9.8%)
Trichomonas	4 (2.3%)
Total	**21 (12%)**

Source: Field data (2019).

reporting lack of transport (13.6%), and health insurance (12.5%) as a reason for not visiting a health facility while they are sick, and women who do not use the internet as a source of sexual health information (20%). Contrary, it was not significantly affected by age groups (p=0.343), marital status (p=0.825), occupation (p=0.494), district of residence (p=1), education levels (p=0.68), living near a hotel, lodge, or a guest house (p=0.358), living in slums (p=0.173), living near a football stadium (p=1), a bus park (p=0.299), history of STI before (p=0.852), not always using a condom (p=0.392), lifetime sexual partners (p=0.864), poor healthcare services as a reason of not attending a health facility while they are sick (p=0.148). Detailed information is found in Table 3.

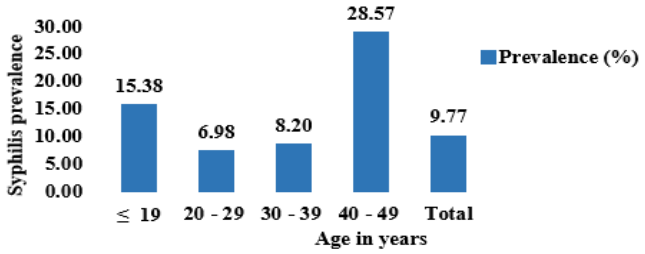

Figure 1: Prevalence of Syphilis infections by age.
Source: Field data (2019).

Association between Trichomonas and frequency of public toilet use

The use of public toilets was not associated with trichomonas infection (p=0.8) among the study participants.

Logistic regression analysis of factors associated with Syphilis infection

Women self-reporting to have had one lifetime sexual partner had 5.81 more risks of getting syphilis than those reporting 5 sex partners and above while women with two to four lifetime sexual partners were 4.25 folds at risk of syphilis as compared to the latter. Not always using a condom while doing extramarital sex was associated with 5.53 folds of risks of syphilis infection as compared to those who always use a condom. Moreover, women living in slums were 6.305 times more likely to get the infection (p=0.021) and compared to those who are not. Conversely; women's history of STI before did not show a uniquely significant contribution to the syphilis occurrence (p=0.136). Further information is found in Table 5.

Logistic regression analysis of factors associated with Trichomonas infection

Lack of transport and health cover as reasons for not visiting a health facility while they are sick were significantly (p<0.05) associated with 36.7 and 22.32 times of getting trichomonas infections among the women, respectively. However, economic category and the internet as a source of sexual health information did not show any unique contribution to the occurrence of the disease. Detailed information is found in Table 6.

Discussion

This study was conducted to determine the prevalence of Syphilis and Trichomonas infections and risk factors associated with them among women attending selected health facilities in Kigali Rwanda. Current results show that 12% of the women had either Syphilis (9.7%) or Trichomonas (2.3%) but there was no coinfection between these two infections. Syphilis infections were significantly higher (p=0.001) among women in slums (40%) than those who were not (7.9%) while trichomonas infection was significantly high among women who self-reported to lack transport or health cover to reach a health facility while they are sick.

Although there was no significant statistical association between the diseases and HFs (p >0.05), HFs located in areas where the population is living slums or places with ongoing urbanization

Table 3: Factors associated with Syphilis and Trichomonas infections.

Variable	Syphilis		*P* value	Trichomonas		*P* value
	Pos., n (%)	Neg., n (%)		Pos., n (%)	Neg., n (%)	
Demographic Characteristics						
Age Group						
≤19	2 (15.4)	11 (84.6)	0.075*	0 (0)	13 (100)	0.343*
20-29	6 (7)	80 (93)		4 (4.7)	82 (95.3)	
30-39	5 (8.2)	56 (91.8)		0 (0)	61 (100)	
40-49	4 (28.6)	10 (71.4)		0 (0)	14 (100)	
Marital Status						
Single	3 (15.8)	16 (84.2)	0.669*	0 (0)	19 (100)	0.825*
Single Mothers	6 (11.3)	47 (88.7)		2 (3.8)	51 (96.2)	
Married	7(7.7)	84 (92.3)		2 (2.2)	89 (97.8)	
Divorced	1 (12.5)	7 (87.5)		0 (0)	8 (100)	
Widowed	0 (0)	3 (100)		0 (0)	3 (100)	
Occupation						
Unpaid Jobs	14 (9.5)	133 (90.5)	0.248*	3 (2)	144 (98)	0.494*
Trade	0 (0)	11 (100)		0 (0)	11 (100)	
Others	3 (18.8)	13 (81.3)		1 (6.3)	15 (92.8)	
Economic Category						
Category I	0 (0)	11 (100)	0.834*	2(18.2)	9(81.8)	0.029*
Category II	6 (10.7)	50(89.3)		1(1.8)	55(98.2)	
Category III	11(10.3)	96(89.7)		1(0.9)	106(99.1)	
District of Residence						
Gasabo	11 (7.6)	133 (92.4)	0.055*	4 (2.8)	141(97.2)	1*
Nyarugenge	6 (24.0)	19 (76)		0 (0)	25 (100)	
Kicukiro	0 (0)	4 (100)		0 (0)	4 (100)	
Highest Education Level						
University	2 (33.3)	4(66.7)	0.29*	0(0)	6(100)	0.68*
High School	6 (5.7)	99(94.3)		2(1.9)	103(98.1)	
Primary and Below	9 (14.3)	54(85.7)		2 (3.2)	61 (96.8)	
Residential Area Characteristics						
I Live Near a Hotel, Lodge or a Guest House						
Yes	6(6.6)	85 (93.4)	0.139**	3 (3.3)	88 (96.7)	0.358**
No	11(13.3)	72 (86.7)		1 (1.2)	82 (98.8)	
I Live In a Slum Area						
Yes	4 (40)	6 (60)	0.001**	1 (12.5)	7 (87.5)	0.173**
No	13 (7.9)	151 (92.1)		3 (1.8)	163 (98.2)	
I Live Near a Stadium						
Yes	3 (13)	20 (87)	0.475**	0 (0)	23 (100)	1.00**
No	14 (9.3)	137 (90.7)		4 (2.6)	147 (97.4)	
Living Near a Bus Park						
Yes	2 (11.8)	15 (88.2)	0.771**	1 (5.9)	16 (94.1)	0.299**
No	15 (9.6)	142 (90.4)		3 (1.9)	154 (98.1)	
Sexual Behaviors						
Ever Diagnosed an STI						

Yes	12(15.2)	67 (84.8)	0.028**	2 (2.5)	77 (97.5)	0.852**
No	5(5.3)	90(94.7)		2 (2.1)	93 (97.9)	
Not Always Using a Condom During Extra-Marital Sex						
Yes	14(14.9)	80(85.1)	0.014**	1 (5.0)	19(95)	0.392**
No	3 (3.8)	77(96.3)		3 (1.9)	151(98.1)	
Lifetime Sex Partners						
1 sex partners	4(23.5)	13(76.5)	0.002*	0(0)	7(100)	0.864*
2 to 4 sex partners	9 (17.3)	43 (82.7)		1(1.8)	54(98.2)	
5 sex partner and above	4(3.8)	101 (96.2)		3(2.7)	109(97.3)	
Barriers To Healthcare Seeking						
Unsatisfactory Services						
Yes	0 (0.0)	12 (100.0)	0.237**	1(8.3)	11(91.7)	0.148**
No	17(10.5)	145 (89.5)		3(1.9)	159 (98.1)	
Lack of Transport Means to visit HF						
Yes	3(13.6)	19 (86.4)	0.513**	3 (13.6)	19 (86.4)	<0.001**
No	14(9.2)	138 (90.8)		1 (0.7)	151 (99.3)	
Lack of Health Insurance						
Yes	3 (12.5)	21 (87.5)	0.628**	3 (12.5)	21 (87.5)	<0.001**
No	14 (9.3)	136 (90.7)		1 (0.7)	149 (99.3)	
Source of Sexual Health Information						
Internet as a Source of Sexual Health Information						
Yes	0(0)	5(100)	0.455**	1 (20)	4 (80)	0.007**
No	17 (10.1)	152(89.9)		3(1.8)	166 (98.2)	

*Fisher exact test *p* value; **Phi *p* value.
Source: Field data (2019).

Table 4: Association between Trichomonas and frequency of public toilet use.

Frequency of Public Toilet Use in a Week	Trichomonas Pos., n (%)	Trichomonas Neg., n (%)	N	*FET* P value*
≤1	4 (2.5)	153 (97.5)	157	0.8
2-4	0 (0)	9 (100)	9	
≥5	0 (0)	8 (0)	8	

*Fisher exact Test.
Source: Field data (2019).

activities were disproportionally affected by syphilis and trichomonas infections; Kagugu HC presented the highest prevalence of syphilis infection (17.6%) followed by Kibagabaga DH (16.7) and Remera HC (13.6%) while Muhima DH and Kagugu HC had no case of syphilis infection (0%). Similarly, higher prevalence rates of Trichomonas infection were recovered among women attending Cor-unum HC (8.3%) in Nyarugenge district and Remera HC (4.2%) in Gasabo district.

The current prevalence of syphilis and trichomonas of 12% is comparable to that reported in Rwanda in 2015 of 13% [12] among women in Kigali. The slight decline shows that national STI prevention measures are working to stabilize the prevalence of the infections and need to be re-inforced for a significant decline of the infections. The prevalence of Syphilis (9.7%) among the women, on one hand, is lower than that reported among USA women in 2018 of 14% [15] but far higher than that reported in a household-based survey of 1.3% among urban women in Rwanda in 2013 [16], and a South African study of 0.4% [11]. The present prevalence of Trichomonas (2.6%) [17], on the other hand, is far less than that reported among women in Indian studies of 14% in Surat and 15.7% in Haryana [18], and in South Africa of 4.6% [11]. Observed variations can be attributed to geographical and social-economical differences in the respective studies.

Determinants of Syphilis infections, on one hand, include living in slums (40%), history of STI before (15.2%), not always using a condom (14.9%), and self-report of one lifetime sex partner (23.5%). Logistic regression shows that women who live in slums were 6.305 times more likely to get the infection (aOR=6.305, 95% CI: 1.317-30.19, p=0.021) while who self-reported to have had one lifetime sex partner and do not use condom always had 5.81 (aOR=5.81; 95% CI: 1.18-28.58, p=0.03) and 5.53 (aOR=5.53; 95% CI: 1.36-22.56, p=0.015) folds of syphilis infections, respectively. However, ever diagnosed with an STI before factor did not show a significant independent contribution to syphilis occurrence (p>0.05). The present determinants of Syphilis have been reported in several other studies including those in South Africa [13], Ethiopia [19], Kenya [20], Papua New Guinea [21] and

Table 5: Logistic regression analysis of factors associated with syphilis infection.

Variables	aOR	95% CI		Sig.
		Lower	Upper	
Lifetime Sex Partners				
1	5.81	1.18	28.58	0.03
2-4	4.25	1.13	15.93	0.032
≥5	ref			
Ever Diagnosed STI Before				
Yes	2.53	0.74	8.58	0.136
No	ref			
Not Always Using a Condom During Extra-Marital Sex				
Yes	5.53	1.36	22.56	0.017
No	ref			
Living in Slums				
Yes	6.305	1.317	30.19	0.021
No	ref			

N: Sample Size; aOR: Adjusted Odd Ratio; Sig: Statistical Significance of the association in P-value; CI: Confidence Interval.

Table 6: Trichomonas infection by demographic characteristics.

Variables	aOR	95% CI		Sig.
		Lower	Upper	
Economical Category				
Category I	7.64	0.44	131.46	0.161
Category II	0.49	0.01	27.81	0.732
Category III	Ref			
Lack of Transport Means				
Yes	36.7	1.89	714.24	0.017
No	Ref			
Lack of Health Cover				
Yes	22.32	1.245	400.22	0.035
No	Ref			
Internet as a Source of Sexual Health Information				
Yes	9.38	0.133	661.68	0.133
No	Ref			

N: Sample Size; aOR: Adjusted Odd Ratio; Sig: Statistical Significance of the association in P-value; CI: Confidence Interval.
Source: Field data (2019).

Bangladesh [22]. Although the current study did not find out the significant contribution of the history of STI before [23], a Brazilian study reported this factor to increase risks of getting Syphilis up to 10.3 folds among women attending family health programs [24], 9.7 times among women attending 7 hospitals in Recife, Brazil [25], and 2.67 folds among women in Ethiopia. Similar to the number of sex partners, an Ethiopian study showed that an increased number of previous sex partners was significantly associated with 5.25 folds higher risk of infections among women attending HFs [26].

Although an Ethiopian study showed that an increased number of previous sex partners was significantly associated with 5.25 folds higher risks of syphilis infection among women attending health facilities [26], current findings show that women self-reporting to have had one lifetime sexual partner presented 5.81 times higher risks of syphilis infection. Moreover, current findings show that women aged less than 20 (28.9%) and 40-49 years old (15.4%) were disproportionally affected by the disease. Current findings can be explained by the increased number of female sex workers in the less than 20 years age group and transgenerational sex among young women and old men, which may transmit this infection from young aged women to late aged ones, 40 to 49 years old, self-reporting to have had one lifetime sexual partner, and vice versa.

Trichomonas infection, on the other hand, was found to significantly affect women in economic category one (18.2%, p=0.029), self-reporting lack of transport (13.6%), and health insurance (12.5) as a reason for not visiting a health facility while they are sick, and women who do not use the internet as a source of sexual health information (20%). Binary logistic regression shows that only lack of transport and health cover as reasons for not visiting a health facility while they are sick were significantly ($p < 0.05$) associated with 36.7 (aOR=36.7; 95% CI: 1.89-714.24, p=0.017) and 22.32 (aOR=22.32; 95% CI: 1.245-400.22, p=0.035) times of getting trichomonas infections among the women, respectively. However, economic category and use of the internet as a source of sexual health information do not uniquely contribute to the occurrence of trichomonas infections ($p > 0.05$). The reported significant association between trichomonas infection and economic category one, lack of health cover and transport to visit a health facility while they are sick, can be attributed to the increased likelihood of financial dependence of these women to their male counterparts, which render them to engage in transactional sex, commonly reported in sub-Saharan Africa [27]. Similarly, it was reported that women's financial dependence prevents them from negotiating safe sex [22,28].

Moreover, even if the current study did not show a significant correlation between age groups and the investigated STIs (trichomonas and syphilis), women aged less than 30 were disproportionately affected by the diseases. This is in agreement with other reports that adolescent girls and young women (14-24 age) present 5 times higher risks of encountering trichomonas and syphilis infections than men of the same age [11].

Overall, Syphilis and Trichomonas infections are still major public health problems among women attending HFs in Kigali, Rwanda. Syphilis is higher among women, living in slum areas, self-reporting to have had one lifetime sexual partner, and those who do not always use the condom during extramarital sex while trichomonas is more prevalent among women in economic category one, self-report of lacking transport means and health cover to visit health facility as compared to their counterparts who are not.

Conclusion

This study shows that Syphilis and Trichomonas infections are still major public health problems; respectively affecting 9.7% and 2.3% of the women attending selected health facilities in Kigali, Rwanda.

Syphilis infections are determined by living in slum areas, not always using a condom, history of STI before, and self-report of one lifetime sexual partner. Trichomonas infections are significantly

associated with self-report of lacking transport and health cover as a reason for not visiting HF while sick and lower economical category (I and II).

Sexual health promotion programs should be enhanced by focusing on practicing safe sex among women in slum areas and aiming to increase healthcare-seeking behaviors among women in the lower economic category.

Strength and Limitations

This study relied on Laboratory diagnosis to confirm Syphilis and Trichomonas infections; FaStep Syp Rapid test strips, 99.6% sensitive and 99.1% specific to *Treponema pallidum* IgG and IgM, for Syphilis diagnosis, and Microscopy of vaginal swabs for identification of *Trichomonas Vaginalis*. However, voluntary participation and mass debrief about the intent of the study and benefits to the participants might have induced self-suspected participants to be screened for STIs more than expected. Nevertheless, current study findings can guide policymaking to prevent Sexually Transmitted Infections.

Declarations

Ethics approval and consent to participate: An ethical clearance letter was obtained from the Ethical Review Board of Mount Kenya University, Rwanda. Study participants signed informed consent before responding to the questionnaires. No participant was requiring a parent or guardian ethical approval; all women were aged 17 and above. Safety and good laboratory practices were followed. Participants who tested positive for any of the diseases were linked to treatment, counseling, and follow-up in the same HF. All generated wastes were disposed of following local and international standards for medical waste management.

Acknowledgements: We would like to express our deep and sincere gratitude to the Research committees of Muhima and Kibagabaga District Hospitals for allowing us to collect data from their HFs. Our sincere thanks also go to the Heads of Muhima, Biryogo, Cor-unum, Remera, Gihogwe, and Kagugu health centers for their support during the data collection process including laboratory testing of the samples and granting us an interview room. Thanks may not be enough!

Authors' contributions: ZN conceptualized the study and developed the proposal. ES and MM critically reviewed the proposal and data collection tools. ZN collected and analyzed data. All authors (ZN, ES, and MM) contributed to the revised draft version of the manuscript and approved the final version. TD proofread the final version.

References

1. Kalpana K. *Trichomonas vaginalis* – Alchetron. The Free Social Encyclopedia. 2019.
2. Michel S. Global HIV and AIDS statistics. AVERT. 2018.
3. World health organization. Casting light on old shadows: Ending sexually transmitted infection epidemics as public health concerns by 2030: advocacy brief. 2017; 10: 1-8.
4. Canadian AIDS Society. Canadian AIDS Society HIV Transmission: Factors that Affect Biological Risk. 2012.
5. Leclerc-Madlala S. Centre for Social Science Research Transactional Sex and the Pursuit of Modernity Suzanne Leclerc-Madlala. Soc Sci. 2004.
6. Korenromp EL, Rowley J, Alonso M, Mello MB, Wijesooriya NS, Mahiané SG, et al. Global burden of maternal and congenital syphilis and associated adverse birth outcomes-Estimates for 2016 and progress since 2012. Vellakkal S, editor. PLoS One. 2019; 14: e0211720.
7. National Institutes of Health. What are some types of and treatments for sexually transmitted diseases (STDs) or sexually transmitted infections (STIs)? NICHD-Eunice Kennedy Shriver National Institute of Child Health and Human Development. 2017.
8. Nagesha CN, Rama NK. Clinical and microbiological aspects of vaginitis. Indian J Med Sci. 1998; 52: 526-532.
9. World health organization. Global strategy for the prevention and control of sexually transmitted infections: 2006-2015. World Heal Organ. 2016.
10. World health organization. Growing antibiotic resistance forces updates to recommended treatment for sexually transmitted infections. 2016.
11. Francis SC, Mthiyane TN, Baisley K, Mchunu SL, Ferguson JB, Smit T, et al. Prevalence of sexually transmitted infections among young people in South Africa: A nested survey in a health and demographic surveillance site. PLoS Med. 2018; 15: 1-25.
12. National institute of statistics Rwanda. Rwanda DHS 2014-15. Kigali. 2016.
13. Stamm LV. Global challenge of antibiotic-resistant *Treponema pallidum*. Antimicrob Agents Chemother. 2010; 54: 583-589.
14. National institute of statistics Rwanda. Demographic and Health Survey Rdhs/2014-15. 2016.
15. Center for Diseases control and prevention. Syphilis - 2018 Sexually Transmitted Diseases Surveillance. 2018.
16. Mutagoma M, Remera E, Sebuhoro D, Kanters S, Riedel DJ, Nsanzimana S. The Prevalence of Syphilis Infection and Its Associated Factors in the General Population of Rwanda: A National Household-Based Survey. J Sex Transm Dis. 2016; 2016: 1-8.
17. Sturm AW, Wilkinson D, Ndovela N, Bowen S. Pregnant Women as a Reservoir of Undetected Sexually Transmitted Diseases in Rural South Africa: Implications for Disease Control. 1998: 1243-1245.
18. Arora BB, Maheshwari M, Devgan N, Arora DR. Prevalence of Trichomoniasis, Vaginal Candidiasis, Genital Herpes, Chlamydiasis, and Actinomycosis among Urban and Rural Women of Haryana, India. Sanchez JL, editor. J Sex Transm Dis. 2014; 2014: 963812.
19. Fissehatsion K, Ali I, Getachew A. Seroprevalence and Risk Factors of Sexually Transmitted Infections (HIV, HBV and Syphilis) Among Pregnant Women Provided Health Care Services, Addis Ababa, Ethiopia. Am J Heal Res. 2017; 5: 154-161.
20. Lockhart A, Senkomago V, Ting J, Chitwa M, Kimani J, Gakure H, et al. Prevalence and risk factors of trichomonas vaginalis among female sexual workers in Nairobi, Kenya. Sex Transm Dis. 2019; 46: 458-464.
21. Vallely LM, Toliman P, Ryan C, Rai G, Wapling J, Tomado C, et al. Prevalence and risk factors of Chlamydia trachomatis, Neisseria gonorrhoeae, Trichomonas vaginalis and other sexually transmissible infections among women attending antenatal clinics in three provinces in Papua New Guinea: a cross-sectional survey. Sex Health. 2016; 13: 420.
22. Rana J. Social determinants of awareness and behavior regarding STDs and HIV/AIDS among ever-married women in Bangladesh. Fam Med Prim Care Rev. 2016; 18: 460-469.
23. Mayer L, Mathews C, Little F. Condom Use and Sexual Behaviors Among Individuals Procuring Free Male Condoms in South Africa. Am Sex Transm Dis Assoc. 2002; 239.
24. Miranda AE, Figueiredo NC, Pinto VM, Page K, Talhari S. Risk factors for syphilis in young women attending a family health program in Vitória, Brazil. An Bras Dermatol. 2012; 87: 76-83.
25. Macêdo VC de, Lira PIC de, Frias PG de, Romaguera LMD, Caires S de FF, Ximenes RA de A. Risk factors for syphilis in women: case-control study. Rev Saude Publica. 2017; 51: 78.

26. Tareke K, Munshea A, Nibret E. Seroprevalence of syphilis and its risk factors among pregnant women attending antenatal care at Felege Hiwot Referral Hospital, Bahir Dar, northwest Ethiopia: A cross-sectional study. BMC Res Notes. 2019; 12: 1-7.

27. Stoebenau K, Heise L, Wamoyi J, Bobrova N. Social Science & Medicine Revisiting the understanding of "transactional sex" in sub-Saharan Africa: A review and synthesis of the literature. Soc Sci Med. 2016; 168: 186-197.

28. Mutagoma M, Balisanga H, Remera E, Gupta N, Samuel S, Riedel DJ, et al. Women in Rwanda and correlates of syphilis-HIV co-infection. 2018; 28: 45-53.