Prevalence and factors associated with Trichomonas vaginalis infection among men who have sex with men and female sex workers in Togo, 2017.

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Abstract

Background

The aim of this study was to estimate the prevalence and factors associated with *Trichomonas vaginalis* (*T. vaginalis*) among men who have sex with men (MSM) and female sex workers (FSW) in Togo in 2017. A cross-sectional bio-behavioral study was conducted from August to October 2017 using a respondent-driven sampling method in four cities in Togo.

Methods

A standardized questionnaire was used to record socio-demographic data and sexual behavior patterns. *T. vaginalis* detection by molecular biology tests was performed using Allplex STI Essential Assay which detect also 6 others micro-organisms. A blood sample was drawn and serological test using SD Bioline Duo VIH/Syphilis rapid test was performed for HIV and syphilis testing.

Results

A total of 517 key populations including 310 FSW and 207 MSM with median age 24 years, interquartile range (IQR) [20–28 years] were included. The overall prevalence of *T. vaginalis*, HIV, *Mycoplasma genitalium*, *Chlamydia trachomatis (C. trachomatis)*, *Neisseria gonorrhoeae* were 3.9%, 16.8%, 9.3%, 7.5% and 7.2% respectively. *T. vaginalis* prevalence among FSW was 6.5% (95%CI= [4.1–9.9]) and 0.0% (95%CI= [0.0-2.3]) among MSM. Logistic regression was conducted to identify factors associated with *T. vaginalis* infection. Living in Lomé (AOR = 3.19; 95%CI= [1.11–11.49]), having had sexual intercourse before the age of 18 (AOR = 5.72; 95%CI= [1.13–10.89]), and being infected with *C. trachomatis* (AOR = 3.74; 95%CI= [2.95–12.25]) were factors associated with *T. vaginalis* among FSW.

Conclusion

The prevalence of *T. vaginalis* infection using molecular test was low among MSM and FSW in Togo. Extensive studies are needed to confirm and better understand the epidemiology of *T. vaginalis* in these populations and in other populations in Togo.

Introduction

Trichomonas vaginalis (T. vaginalis) is the most common, curable parasitic sexually transmitted infection (STI) worldwide affecting both men and women [1]. In 2012, 143 million cases of *T. vaginalis* had been diagnosed in women aged 15–49 years worldwide, including 17.5 million in Africa [2]. In 2016, Bayesian meta-analysis was used to generate estimates of the prevalence of STI. In women, prevalence estimates for *T. vaginalis* was 5.3%, for *Chlamydia Trachomatis (C. trachomatis)* 3.8%, for *Neisseria gonorrhoeae*

(N. gonorrhoeae) 0.9%, and for syphilis 0.5%. In men, prevalence estimates for *T. vaginalis* was 0.6% which was very low compared to *C. trachomatis* (2.7%) and *N. gonorrhoeae* (0.7%) [3]. *T. vaginalis* vaginal infection in the African region are estimated at 42.8 million, and in the same region, this infection is ten times more common in women than in men [4]. Despite the estimated high burden of *T. vaginalis* infection in this region, data regarding clinical presentation, demographic, behavioral and microbiological factors associated with the infection are relatively limited [5]. In contrast, multiple studies on *T. vaginalis* have been performed in the other regions of the world [6–9].

As most STI, *T. vaginalis* infection is largely associated with an increased risk in HIV acquisition. [10–13]. In a meta-analysis of 11 studies, *T. vaginalis* infection was a risk factor for HIV (95% CI 1.3 to 1.7; $p < 0.001$) [14]. Data on *T. vaginalis* are mainly described in pregnant women [15, 16] and few data are available on key populations as populations with high risk of HIV infection. In Lagos (Nigeria), the prevalence of *T. vaginalis* infection among HIV-positive and HIV-negative pregnant women was 10.0% and 8.1%, respectively ($p = 0.559$) [17]. In Togo, HIV prevalence is higher among key populations (22.0% among MSM [18] ; 10.6% among FSW [19]) than in the general population (2.3% [20]).

To our knowledge, no study on *T. vaginalis* infection using molecular technique has been conducted in Togo, especially among key populations. The objective of this study was to estimate the prevalence and factors associated with *T. vaginalis* among key populations in Togo.

Methods

Study design and recruitment

This study was a bio-behavioral cross-sectional study conducted among MSM and FSW from August to October 2017 in four cities of Togo: Lomé, the capital city, Kpalimé, Atakpamé, and Tsévié. Togo is a West African country with 7.6 million inhabitants in 2018, covering 57,000 square kilometers with HIV prevalence in general population estimated at 2.3% in 2018 [20].

Participants were included through the respondent-driven sampling method [21, 22]. MSM were defined as men who have had sex with other men within 12 months prior to recruitment, and FSW were defined as women having had sex in exchange for money as a compensation in the previous 12 months. Additional inclusion criteria were being age ≥ 18 years, living in Togo more than 3 months and having given written informed consent.

Study procedures and detection of *T. vaginalis* and other STI

A standardized questionnaire adapted from a Family Health International (FHI) 360 validated guide for bio-behavioral surveys was administered during a face-to face interview to collect information regarding socio-demographic characteristics, risky sexual behaviors.

Cervical and anal swabs were collected respectively from FSW and MSM with Cervex-Brush® Combi and Anex-Brush®, respectively (Rovers Medical Devices, Oss, the Netherlands) and conserved in preservative solution (BDSurePath™ liquid-based Papanicolaou tests, Becton-Dickinson, Franklin Lakes, NJ, USA). These samples were stored at 4 °C and sent at room temperature to France for analyses. Nucleic acids were extracted using a STARMag 96 × 4 Universal Cartridge kit (Seegene, Seoul, Korea) on the MICROLAB NIMBUS automat (Seegene). *T. vaginalis* and six other STI (*N. gonorrhoeae, C. trachomatis, M. genitalium, Mycoplasma hominis, Ureaplasma urealyticum, Ureaplasma parvum)* were identified using the Allplex STI Essential Assay (Seegene).

Venous blood samples were collected to test for HIV and Syphilis using SD Biolane Duo (Abbott). Each HIV positive case was confirmed with a second rapid diagnosis test, First Response HIV 1–2-O Card Test (Premier Medical Corporation Pvt. Ltd). In case of discordant results, samples were performed with the INNO-LIA HIV I/II Score (20T) (Fujirebio) line immunoassay (Fujirebio, Göteborg, Sweden).

Statistical analysis

Descriptive analyses were performed and results were presented with frequency tabulations and percentages. Prevalence were estimated with their 95% confidence interval (95%CI). Chi-square or Fisher's exact tests were used to compare categorical variables. In multivariable analysis, logistic regression was conducted to identify factors associated with *T. vaginalis* infection.

Associations in the regression model were expressed as adjusted odds ratio (AOR) using all variables that had $p < 0.2$ in the univariable regression. Predictor variables were selected as those found to be relevant according to the literature review. All computations were conducted using R© version 3.4.3 software and the level of significance was set at 5%.

Results

Socio-demographic and clinical characteristics

A total of 517 key populations including 310 FSW (60%) and 207 (40%) MSM with median age of 24 years, interquartile range (IQR) [20–28 years] were surveyed. Almost half (46.2%) of FSW were over 25 years old and 34.4% MSM were aged between 21 and 25 years old and. More than two-thirds (64.6%) of the survey population were living in Lomé. The majority of the sample had at least secondary school level (79.9%). Sociodemographic characteristics are summarized in Table 1.

Prevalence of *T. vaginalis* infection and others STI

No case of *T. vaginalis* infection was identified among MSM (95%CI= [0.0-2.3] and the prevalence of *T. vaginalis* was 6.5% (95%CI= [4.1–9.9]) among FSW. Overall prevalence of other STI ranged from 7.2% (95%CI= [5.2–9.8]) for *N. gonorrhoeae* to 16.8% (95%CI= [13.8–20.4]) for HIV. The prevalence of HIV, *M. genitalium and N. gonorrhoeae* were significantly higher among MSM ($p < 0.001$) (Table 2).

Factors associated with *T. vaginalis* infection among FSW

As the prevalence of *T. vaginalis* among MSM was 0.0%, univariable and multivariable analyses were performed only for FSW. After adjustment on the other variables, three factors were positively associated with *T. vaginalis* infection among FSW: living in Lomé (AOR = 3.19; 95%CI= [1.11–11.49]), having had sexual intercourse before the age of 18 (AOR = 5.72; 95%CI= [1.13–10.89]), and being infected with *C. trachomatis* (AOR = 3.74; 95%CI= [2.95–12.25]) (Table 3).

Discussion

This study provided an update on the epidemiology of *T. vaginalis* infection and showed the absence of the infection among MSM (0.0%) and a low prevalence among FSW (6.5%) in Togo. The overall prevalence of other STI were 16.8%, 9.3%, 7.5% and 7.2% for HIV, *M. genitalium, C. Trachomatis* and *N. gonorrhoeae* infections respectively. Among FSW population, risk factors associated with *T. vaginalis* infection were the geographic area (capital city, Lomé), lower age at first intercourse and infection with *C. Trachomatis*.

Our study reported that prevalence of *T. vaginalis* infection was 6.5% among FSW. In Rwanda, a descriptive cross-sectional study conducted in 2015 among 1,168 FSW reported a prevalence of 11.9% [23]. In a 2-year longitudinal study conducted among 350 Kenyan FSW, baseline prevalence of *T. vaginalis* was 9.2% [24]. In an another prospective cohort study among 352 South African youths including lesbian, gay, bisexual, transgender, and queer (LGBTQ), an overall prevalence of 4.8% has been reported (8.1% among female and 0.7% among male participants) [25]. In a prospective, interventional cohort study of FSW aged 18 to 25 years in Ouagadougou among 321 HIV-uninfected FSW the prevalence of *T. vaginalis* was 3% [26]. A prospective study among 302 pregnant women conducted in 2011 in Togo reported a prevalence of *T. vaginalis* of 3.7% [27]. In a cross sectional study conducted in Mexico in 2011 among 105 FSW, the prevalence of *T. vaginalis* was 25.7% [28] which contrasts with that reported in FSWs in our study (6.5%). This difference could be explained by the methods used for the diagnosis of *T. vaginalis*, the age of the population and the associated risk factors.

Concerning associated risk factors among FSW, as observed in our study, *C. trachomatis* infection (adjusted Prevalence Ratio (aPR) = 8.53; 95%CI= [3.35–21.71]) was identified as a risk factor of *T. vaginalis* infection in Kenya [24]. Also, in the same study, a significant association was reported between positive HIV status and *T. vaginalis* infection (aPR = 3.01; 95% CI= [1.45–6.24]). In South Africa, factors associated with *T. vaginalis* infection were marital status (not married) (OR 2.4; $p < 0.001$) and HIV positive infection (OR 1.6; $p = 0.041$) [5]. These results contrast with that reported in our study.

Early age at first intercourse was associated with positive *T. vaginalis* infection in our study. Similar results have been reported by other studies such as in India in 2006 (AOR = 2.09; 95%CI: 1.09–4.00) [29]. Overall prevalence of *T. vaginalis* among sexually active women aged 15–30 years was 8.5% and 14.4% for women under fifteen years at first sex. Another study of a nationally representative sample of 9,844 respondents aged 18 to 26 years in the United States found a significantly higher risk of *T. vaginalis*

infection among adolescents and young adults who were younger at the time of their first sexual intercourse [30].

Also consistent with our result, a cross-sectional study conducted in four cities in sub Saharan Africa (Kisumu, Kenya; Ndola, Zambia; Cotonou, Benin and Yaoundé, Cameroon) among a random sample of 8,000 adults (2,000 in each city), aged 15–49 years showed a prevalence of *T. vaginalis* respectively of 29.3% in Kisumu, 34.3% in Ndola, 3.2% in Cotonou and 17.6% in Yaoundé. Early sexual debut (before age 15) was a significantly risk factor associated with *T. vaginalis* infection in women in Ndola (Zambia) [31].

In our study, no *T. vaginalis* was detected in MSM, which is different from prevalence found in similar population in African countries: 2,1% reported in Côte d'Ivoire in 2008 [32] and 9% in South Africa in 2018 [33]. In the Netherlands in 2014, the overall prevalence of *T. vaginalis* infection among 1,204 heterosexual men and MSM was respectively 1.1% and 0.0% [34], nearing our results. Reasons of prevalence disparities between FSW and MSM are not clear and the hypotheses are not confirmed. One of the most likely hypotheses is that *T. vaginalis* probably does not develop in the rectum and is therefore not often present in MSM [35]. A cross-sectional study conducted in rural South Africa among women in 2017 noted a prevalence of vaginal and rectal *T. vaginalis* of 20.0% and 1.2%, respectively [5].

There was a special attention on the fact that *T. vaginalis* is much low among FSW than women in the general population especially among pregnant women. A possible explanation could be the systematic use of treatment in case of genital infection for FSW. In Togo, in case of STI symptoms, syndromic approach which includes the use of azithromycin, ceftriaxone, doxycycline, metronidazole as first line treatment are systematically used in care centers. However, additional and comparative studies are needed to shed light on interventions or hypotheses that could explain it.

Most of studies on *T. vaginalis* in Africa are conducted in pregnant women and report high prevalence in this population. A nested case-control study in Kenya among pregnant women reported a *T. vaginalis* infection prevalence of 35.4% (n = 79) [36], while in Nigeria [37] and South Africa [38], the prevalence of *T. vaginalis* infection among pregnant women was 18.7% and 15.0%, respectively.

To our knowledge, this was the first study reporting prevalence of *T. vaginalis* infection and STI among MSM and FSW in Togo. Another strength of this study includes the use of a sensitive laboratory assay for the reliable detection of *T. vaginalis* infection and the relationship with HIV. Finally, our study which was the first assessing factors associated with *T. vaginalis* among FSW in Togo, also provided useful information in order to design specific interventions within these populations.

There were few limitations to this study including the lack of data on treatment use among study participants, which may have certainly impacted observed STI prevalence. Furthermore, the standardized questionnaire submitted to participants can be biased (memory bias and social desirability bias) by the fact that it was based on self-reporting and may not reflect the overall sexual activity. Additionally, due to the cross-sectional nature of this analysis, we are unable to analyze the causality and temporality of the associations between *T. vaginalis* infection and other factors. Finally, because *T. vaginalis* infection was

null among MSM in the study, we were unable to assess the relationship of *T. vaginalis* infection and predictor variables among this population.

Conclusion

The prevalence of *T. vaginalis* infection using molecular test among MSM and FSW in Togo was null and low, respectively. However, extensive studies are needed to confirm and better understand the epidemiology of *T. vaginalis* in these populations in Togo. Comprehensive health promotion programs for FSW and MSM, and active surveillance that include preventive education are needed.

Abbreviations

95%CI: 95% confidence interval; AOR: adjusted Odds Ratio; *T. vaginalis*: Trichomonas vaginalis

Declarations

Ethics approval and consent to participate

Ethical approval was obtained from the national Bioethics Committee for Health Research of Togo (ethics clearance number 19/2017/CBRS of 22 June 2017) and each participant included in the study signed a written consent signed.

Consent for publication

Not applicable

Availability of data and materials

All data generated or analyzed during this study are included in this published article [and its supplementary information files].

Competing interests

The authors declare that they have no competing interests

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Author’s contribution

DKE and MKT conceived this study and participated in its design and coordination. AJS, VMF, WICZC, FAGK, AMD, BS, ACD, CC participated in the study design and data collection. MKT and DKE performed statistical analyses. MKT and WICZC wrote the first draft of the manuscript and AJS, VMF, WICZC, FAGK, AMD, BS, ACD, CC and DKE subsequently revised the manuscript. All authors read and approved the final manuscript.

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References

1. Gerwen OTV, Muzny CA. Recent advances in the epidemiology, diagnosis, and management of Trichomonas vaginalis infection. F1000Research. 2019;8. doi:10.12688/f1000research.19972.1.
2. Newman L, Rowley J, Vander Hoorn S, Wijesooriya NS, Unemo M, Low N, et al. Global estimates of the prevalence and incidence of four curable sexually transmitted infections in 2012 based on systematic review and global reporting. PloS One. 2015;10.
3. Rowley J, Hoorn SV, Korenromp E, Low N, Unemo M, Abu-Raddad LJ, et al. Chlamydia, gonorrhoea, trichomoniasis and syphilis: global prevalence and incidence estimates, 2016. Bull World Health Organ. 2019;97:548.
4. World Health Organization (WHO). Global incidence and prevalence of selected curable sexually transmitted infections-2008. World Health Organization; 2012.
5. Waaij DJ de, Dubbink JH, Ouburg S, Peters RPH, Morré SA. Prevalence of Trichomonas vaginalis infection and protozoan load in South African women: a cross-sectional study. BMJ Open 2017;7. doi:10.1136/bmjopen-2017-016959.
6. Schwebke JR, Hobbs MM, Taylor SN, Sena AC, Catania MG, Weinbaum BS, et al. Molecular testing for Trichomonas vaginalis in women: results from a prospective US clinical trial. J Clin Microbiol. 2011;49:4106–11.
7. van der Schee C, van Belkum A, Zwijgers L, van der Brugge E, O'neill EL, Luijendijk AD, et al. Improved diagnosis of Trichomonas vaginalis infection by PCR using vaginal swabs and urine specimens compared to diagnosis by wet mount microscopy, culture, and fluorescent staining. J Clin Microbiol. 1999;37:4127–30.
8. Sena AC, Miller WC, Hobbs MM, Schwebke JR, Leone PA, Swygard H, et al. Trichomonas vaginalis infection in male sexual partners: implications for diagnosis, treatment, and prevention. Clin Infect Dis. 2007;:13–22.
9. Vatanshenassan M, Rezaie S, Mohebali M, Niromand N, Kazemi B, Babaei Z, et al. Trichomonas vaginalis: investigation of a novel diagnostic method in urine samples using cysteine proteinase 4

gene and PCR technique. Exp Parasitol. 2010;126:187–90.

10. Poole DN, McClelland RS. Global epidemiology of Trichomonas vaginalis. Sex Transm Infect. 2013;89:418–22.
11. Moodley P, Wilkinson D, Connolly C, Moodley J, Sturm AW. Trichomonas vaginalis is associated with pelvic inflammatory disease in women infected with human immunodeficiency virus. Clin Infect Dis. 2002;34:519–22.
12. McClelland RS, Sangaré L, Hassan WM, Lavreys L, Mandaliya K, Kiarie J, et al. Infection with Trichomonas vaginalis increases the risk of HIV-1 acquisition. J Infect Dis. 2007;195:698–702.
13. Serwin AB, Koper M. Trichomoniasis–an important cofactor of human immunodeficiency virus infection. Przegl Epidemiol. 2013;67:47–50.
14. Masha SC, Cools P, Sanders EJ, Vaneechoutte M, Crucitti T. Trichomonas vaginalis and HIV infection acquisition: a systematic review and meta-analysis. Sex Transm Infect. 2019;95:36.
15. Donbraye E, Donbraye-Emmanuel OOB, Okonko IO, Okedeji IO, Alli JA, Nwanze JC. Detection and prevalence of Trichomonas vaginalis among pregnant women in Ibadan, Southwestern Nigeria. World Appl Sci J. 2010;11:1512–7.
16. Preethi V, Mandal J, Halder A, Parija SC. Trichomoniasis: An update. Trop Parasitol. 2011;1:73.
17. Ijasan O, Okunade KS, Oluwole AA. The prevalence and risk factors for Trichomonas vaginalis infection among HIV-infected pregnant women attending the antenatal clinics of a university teaching hospital in Lagos, South-western, Nigeria. Niger Postgrad Med J. 2018;25:21.
18. Sadio AJ, Gbeasor-Komlanvi FA, Konu YR, Sewu EK, Zida-Compaore W, Salou M, et al. Prevalence of HIV infection and hepatitis B and factors associated with them among men who had sex with men in Togo in 2017. Med Sante Trop. 2019;29:294–301.
19. Ferré VM, Ekouevi DK, Gbeasor-Komlanvi FA, Collin G, Le Hingrat Q, Tchounga B, et al. Prevalence of human papillomavirus, human immunodeficiency virus and other sexually transmitted infections among female sex workers in Togo: a national cross-sectional survey. Clin Microbiol Infect Off Publ Eur Soc Clin Microbiol Infect Dis. 2019;25:1560.e1-1560.e7.
20. Central Intelligence Agency (CIA). THE WORLD FACTBOOK: HIV/AIDS - adult prevalence rate. 2018. https://www.cia.gov/library/publications/the-world-factbook/fields/363.html. Accessed 4 Mar 2020.
21. Malekinejad M, Johnston LG, Kendall C, Kerr LRFS, Rifkin MR, Rutherford GW. Using Respondent-Driven Sampling Methodology for HIV Biological and Behavioral Surveillance in International Settings: A Systematic Review. AIDS Behav. 2008;12:105–30.
22. Heckathorn DD. Respondent-driven sampling: a new approach to the study of hidden populations. Soc Probl. 1997;44:174–99.
23. Ingabire R, Parker R, Nyombayire J, Ko JE, Mukamuyango J, Bizimana J, et al. Female sex workers in Kigali, Rwanda: a key population at risk of HIV, sexually transmitted infections, and unplanned pregnancy. Int J STD AIDS. 2019;30:557–68.

24. 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;46:458–64.
25. Kaida A, Dietrich JJ, Laher F, Beksinska M, Jaggernath M, Bardsley M, et al. A high burden of asymptomatic genital tract infections undermines the syndromic management approach among adolescents and young adults in South Africa: implications for HIV prevention efforts. BMC Infect Dis. 2018;18:499.
26. Traore IT, Meda N, Hema NM, Ouedraogo D, Some F, Some R, et al. HIV prevention and care services for female sex workers: efficacy of a targeted community-based intervention in Burkina Faso. J Int AIDS Soc. 2015;18:20088.
27. Tchelougou D, Karou DS, Kpotsra A, Balaka A, Assih M, Bamoke M, et al. Infections vaginales chez les femmes enceintes au centre hospitalier régional de Sokodé (Togo) entre 2010 et 2011. Médecine Santé Trop. 2013;23:49–54.
28. Munoz-Ramirez A, Lopez-Monteon A, Ramos-Ligonio A, Mendez-Bolaina E, Guapillo-Vargas MR. Prevalence of Trichomonas vaginalis and Human papillomavirus in female sex workers in Central Veracruz, Mexico. Rev Argent Microbiol. 2018;50:351–8.
29. Madhivanan P, Bartman MT, Pasutti L, Krupp K, Arun A, Reingold AL, et al. Prevalence of Trichomonas vaginalis infection among young reproductive age women in India: implications for treatment and prevention. Sex Health. 2009;6:339–44.
30. Kaestle CE, Halpern CT, Miller WC, Ford CA. Young age at first sexual intercourse and sexually transmitted infections in adolescents and young adults. Am J Epidemiol. 2005;161:774–80.
31. Buvé A, Weiss HA, Laga M, Van Dyck E, Musonda R, Zekeng L, et al. The epidemiology of trichomoniasis in women in four African cities. AIDS. 2001;15:89.
32. Vuylsteke B, Semde G, Sika L, Crucitti T, Traore VE, Buve A, et al. High prevalence of HIV and sexually transmitted infections among male sex workers in Abidjan, Cote d'Ivoire: need for services tailored to their needs. Sex Transm Infect. 2012;88:288–93.
33. Hoffman CM, Fritz L, Radebe O, Dubbink JH, McIntyre JA, Kock MM, et al. Rectal Trichomonas vaginalis infection in South African men who have sex with men. Int J STD AIDS. 2018;29:1444–7.
34. van der Veer C, van Rooijen MS, Himschoot M, de Vries HJC, Bruisten SM. Trichomonas vaginalis and Mycoplasma genitalium: age-specific prevalence and disease burden in men attending a sexually transmitted infections clinic in Amsterdam, the Netherlands. Sex Transm Infect. 2016;92:83–5.
35. Mandell G, Bennet J, Dolin R. Trichomonas vaginalis. In: Principles and Practice of Infectious Diseases. Elsevier/Churchill Livingstone; 2005. p. 3661.
36. Masha SC, Cools P, Descheemaeker P, Reynders M, Sanders EJ, Vaneechoutte M. Urogenital pathogens, associated with Trichomonas vaginalis, among pregnant women in Kilifi, Kenya: a nested case-control study. BMC Infect Dis. 2018;18:1–7.

37. Oyeyemi OT, Fadipe O, Oyeyemi IT. Trichomonas vaginalis infection in Nigerian pregnant women and risk factors associated with sexually transmitted infections. Int J STD AIDS. 2016;27:1187–93.
38. Davey DLJ, Nyemba DC, Gomba Y, Bekker L-G, Taleghani S, DiTullio DJ, et al. Prevalence and correlates of sexually transmitted infections in pregnancy in HIV-infected and-uninfected women in Cape Town, South Africa. PloS One. 2019;14.

Tables

Table 1: Sociodemographic characteristics of MSM and FSW in Togo (2017)

	Total (N = 517)	MSM (n = 207)	FSW (n = 310)	p-value*
Age (years), n(%)				<0.001
[18-20]	143 (27.7)	70 (33.8)	73 (23.5)	
[21-25]	178 (34.4)	84 (40.6)	94 (30.3)	
>25	196 (37.9)	53 (25.6)	143 (46.2)	
Geographic area, n(%)				<0.001
Other cities	183 (35.4)	51 (24.6)	132 (42.6)	
Lomé (capital city)	334 (64.6)	156 (75.4)	178 (57.4)	
Living with a partner, n(%)				<0.001
Yes	260 (50.3)	24 (11.6)	236 (76.1)	
No	257 (49.7)	183 (88.4)	74 (23.9)	
Education level, n(%)				<0.001
Primary school or below	104 (20.1)	25 (12.0)	79 (25.5)	
Secondary school	329 (63.6)	127 (61.4)	202 (65.1)	
At least high school	84 (16.3)	55 (26.6)	29 (9.4)	
Age at first sex (years), n(%)				<0.001
≤15	152 (29.4)	64 (30.9)	88 (28.4)	
]15-18]	229 (44.3)	68 (32.9)	161 (51.9)	
>18	136 (26.3)	75 (36.2)	61 (19.7)	

*Chi square test; FSW: female sex worker; MSM: men who have sex with men

Table 2: Prevalence of *Trichomonas vaginalis,* HIV, *Mycoplasma genitalium, Chlamydia trachomatis* and *Neisseria gonorrhoeae* among MSM and FSW in Togo (2017)

	Total (N = 517)			MSM (N = 207)			FSW (N = 310)			p-value
	n	%	95CI%	n	%	95CI%	n	%	95CI%	
TV[a]	20	3.9	[2.4-6.0]	0	0.0	[0.0-2.3]	20	6.5	[4.1-9.9]	<0.001**
HIV	87	16.8	[13.8-20.4]	54	26.1	[20.4-32.7]	33	10.6	[7.5-14.7]	<0.001*
MG[b]	48	9.3	[6.9-12.2]	31	14.9	[10.5-20.7]	17	5.5	[3.3-8.8]	<0.001*
CT[c]	39	7.5	[5.5-10.3]	20	9.7	[6.1-14.7]	19	6.1	[3.8-9.6]	0.136*
NG[d]	37	7.2	[5.2-9.8]	24	11.6	[7.7-16.9]	13	4.2	[2.3-7.2]	0.001*

[a]: *Trichomonas vaginalis* [b]: *Mycoplasma genitalium* [c]: *Chlamydia trachomatis* [d]: *Neisseria gonorrhoeae*

Table 3: Factors associated with *Trichomonas vaginalis* among female sex workers in Togo, 2017.

	N	n	Prevalence (%)	Univariable			Multivariable		
				OR	95%CI	P-value	aOR	95%CI	P-value
Age (years)									
≤24	287	12	4.2	-					-
>24	230	8	3.5	0.58	[0.22-1.45]	0.249			-
Geographic area									
Others	183	4	2.2	-					-
Lomé	334	16	4.8	3.16	[1.13-11.24]	**0.044**	3.19	[1.11-11.49]	**0.045**
Living with a partner									
Yes	260	17	6.5	-					-
No	257	3	1.2	0.54	[0.12-1.68]	0.343			-
Education level									
Primary school or below	104	5	4.8	-					-
Secondary school	329	14	4.3	1.10	[0.41-3.51]	0.857			-
High school	84	1	1.2	0.53	[0.03-3.47]	0.568			-
Age at first sex (years)									
>18	136	1	0.7	-					-
≤18	381	19	5.0	4.96	[1.01-8.90]	**0.122**	5.72	[1.13-10.89]	**0.029**
HIV status									
Negative	430	19	4.4	-					-
Positive	87	1	1.1	0.42	[0.02-2.15]	0.411			-
Mycoplasma genitalium									
Negative	469	18	3.8	-					-
Positive	48	2	4.2	2.04	[0.31-8.00]	0.368			-
Neisseria gonorrhoeae									
Negative	480	19	4.0	-					-
Positive	37	1	2.7	1.22	[0.07-6.71]	0.853			-
Chlamydia trachomatis									
Negative	478	16	3.3	-					-
Positive	39	4	10.3	4.58	[1.20-14.44]	**0.014**	3.74	[2.95-12.25]	**0.038**

OR: Odds Ratio; aOR: adjusted Odds Ratio 95%CI: 95% Confidence interval

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