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Original paper

Prevalence and factors associated of *Trichomonas vaginalis* infection among pregnant women in Bobo-Dioulasso, Burkina Faso

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ABSTRACT. Epidemiological studies of vaginalis trichomonosis, especially in pregnant women are rare in Africa due to the lack of screening programs. The present study aimed to assess the prevalence of *T. vaginalis* infection and its associated factors in pregnant women who attended the antenatal care clinics in three primary health centers of Bobo-Dioulasso. We carried out a cross-sectional study for descriptive and analytical purposes from February to April 2015 in pregnant women seen in prenatal consultations. The study took place in 3 primary public health centers: Guimbi (Central Urban), Bolomakoté (Peri-urban) and Yéguérésso (rural). The trophozoites of *Trichomonas vaginalis* was carried out by microscopy on vaginal swabs and urine samples. Sociodemographic, obstetric and biological variables were also collected. A total of 315 pregnant women were included in the study. The overall prevalence of urogenital trichomonosis was 3.2%. It was 1.9% in Guimbi, 2.9% in Bolomakoté, and 4.7% in Yéguérésso. The prevalence of HIV infection was 2.2%. Married women were less exposed to *T. vaginalis* infection than single women (p=0.03). The prevalence of urogenital trichomonosis obtained was considered lower compared to the previously reported from Burkina Faso. Thus, it is essential to extend this study to the whole country periodically by integrating other STIs not subject to a surveillance system and by integrating molecular epidemiology tools.

Keywords: sexually transmitted infections, *Trichomonas vaginalis*, pregnancy, Burkina Faso

Introduction

Trichomonas vaginalis infection (TVI) is the most common non-viral sexually transmitted infections (STIs), with an estimated 156 million cases recorded in 2016 in the world [1]. The health impact of urogenital trichomonosis is associated with gynecologic and obstetric consequences, including premature births, low birth weight, atypical pelvic inflammatory syndromes, and post-hysterectomy infections [2,3].

Recent evidence suggests that *T. vaginalis* infection is associated with increased vaginal HIV-1 RNA shedding in antiretroviral therapy (ART)-naive women [4,5]. In Tanzania, the authors reported that the adequate treatment of symptomatic STIs after etiologic diagnosis decrease to 38% incidence of HIV infection [6]. Thus, the World Health Organization advocated the control of STIs as a priority strategy against the HIV epidemic. The success of this strategy needs to elaborate the STIs pathogen agent surveillance.

The prevalence of *T. vaginalis*, especially in pregnant women is rare in Africa due to the lack of screening programs. The few data available in West Africa show a prevalence ranging between 2.5% in Côte d'Ivoire to 20.4% in Guinea Bissau [7,8].

In Burkina Faso, since the adoption of STIs syndromic management in 1996, HIV infection is the only documented STIs with a drastic reduction in prevalence estimated at 7.2% in 1997 to 0.9% in 2013 and 0.8% in pregnant women [9].

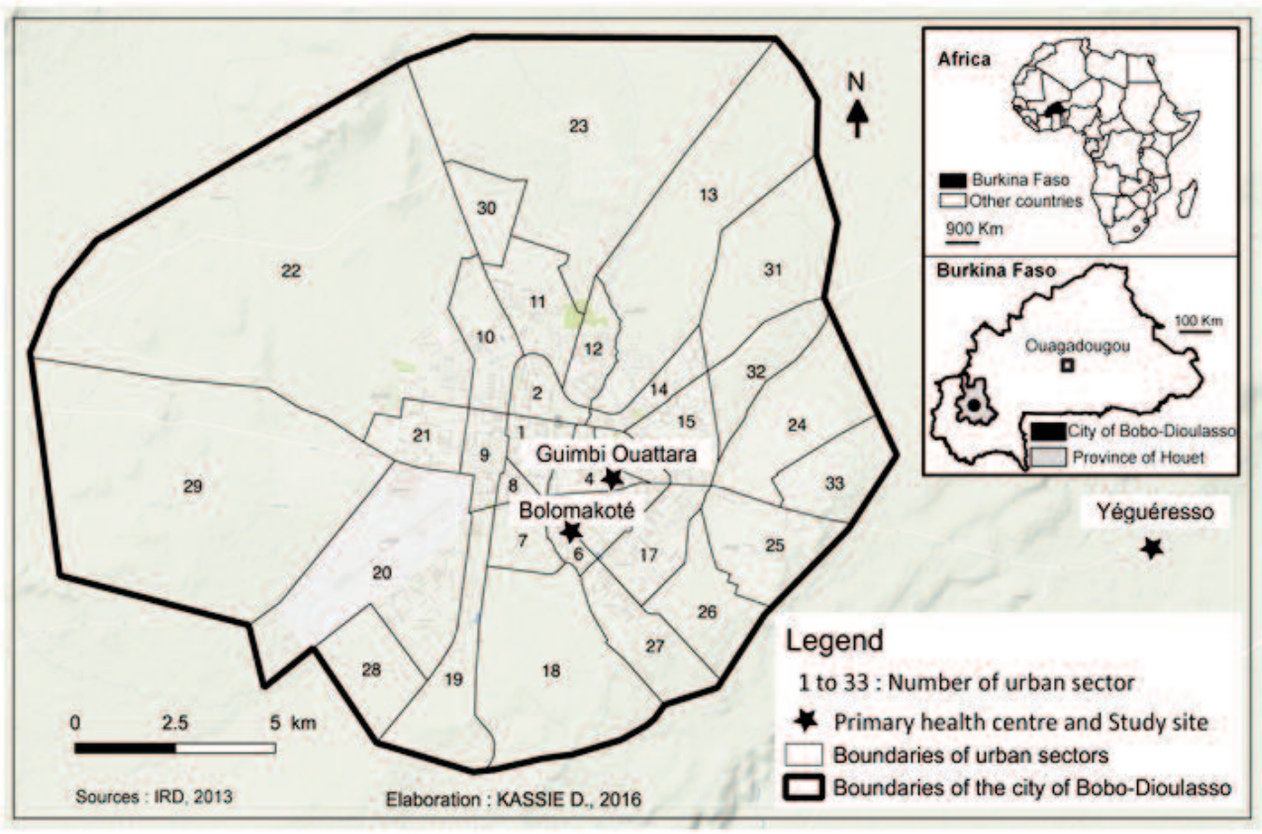

Figure 1. Maps of study areas in Bobo-Dioulasso

For urogenital trichomonosis, only a few data exist. Indeed, the prevalence of 17% has been reported in sex workers in Ouagadougou [10] and 27.8% in reproductive aged women in Bobo-Dioulasso [11,12]. However, in a cohort of sex workers, a prevalence of 3.3% was obtained in Bobo-Dioulasso [13]. Concerning pregnant women in Burkina Faso, there are no published data focused on *T. vaginalis* infection to our best knowledge. Understanding the epidemiology of urogenital trichomonosis during pregnancy will be facilitate the control strategies. Hence, the present study aimed to assess the prevalence of *T. vaginalis* infection and its associated risk factors in pregnant women who attended the antenatal care in three primary health centers of Bobo-Dioulasso.

Materials and Methods

Study sites and design

Pregnant women attending routine antenatal visits in three primary health centers (PHC) in Bobo-Dioulasso (Burkina Faso) were enrolled in a cross sectional study carried out from February to April 2015. These PHC were: Guimbi Ouattara (urban central area), Bolomakoté (peri urban area) and Yéguéresso (rural area) (Figure 1).

Guimbi Ouattara PHC served a population of 18 537 inhabitants, the number of reproductive age women is 4 860 with 1 042 expected pregnancies and 868 births planned. Bolomakoté PHC has a population of 22 752 inhabitants with 5 965 reproductive aged women and, 1 278 expected pregnancies. The population of Yéguéresso PHC was estimated at 14 098 inhabitants, with 3 688 reproductive aged women and, the expected number of pregnancy was 2 897. All data were from 2015 of national health statistics.

Based on those statistics, the total number of expected pregnancies in our three primary health centers sites was 9035 during the year 2015. The sample size was determined using the single population proportion formula considering the following assumptions: P=27.8% (the expected proportion of urogenital trichomonosis among pregnant women), 95% confidence level and marginal error of 5%, the minimum sample size must be at 280. Simple stratified random sampling was used to select each trimester of pregnancy and per site.

Table 1. Distribution of population study by sociodemographic and obstetrical characteristics

Variables		Bolomakoté N=105	Guimbi N=104	Yéguéresso N=106	Total N=315 (%)
Age (year)					283
	Minimum	15	16	16	14.9
	Median	25	25	26	25
	Mean	25,50	24,4	26,8	25,9
	Maximum	49	42	40	49
	≤ 17	5	0	6	11 (3.9)
	18-34	92	95	85	272 (96.1)
	≥ 35	8	9	14	31 (7.4)
Formal educational level					315
	Illiterate	39	24	64	127 (40.3)
	Read and writes in local language	6	6	10	22 (7.0)
	Elementary	34	29	26	89 (28.3)
	College and High school	26	45	6	77 (24.4)
Socioeconomic level					314
	Low (≤500 XOF/day)	16	0	88	104 (33.1)
	Intermediate (501-1000 XOF/day)	88	53	16	157 (50.0)
	High (≥ 1001 XOF/day)	1	50	2	53 (16.9)
Living with husband/partner					315
	No	9	16	5	30 (9.5)
	Yes	96	88	101	285 (90.5)
Marital status					315
	Monogamy	85	80	71	236 (74.9)
	Polygamy	11	8	30	49 (15.6)
Gestational trimester					312
	First trimester	31	32	17	80 (25.6)
	Second trimester	33	41	43	117 (37.5)
	Third trimester	40	30	45	115 (36.9)

After obtaining the consent of the woman, urine and vaginal swab were taken, a questionnaire was completed for each participant regarding the social and demographic profile, obstetric history including parity, gestational age.

Urine, vaginal swab and blood samples collection

The sample collection was done in PHC. The woman was previously warned not to do an intimate toilet the morning before coming. Vaginal secretions swabs sample were obtained in lithotomic position with the aid of a sterile disposable speculum and transported to the lab immediately. A sterile urine collection pot was given to each woman the day before coming to the PHC, through the community health worker and was brought back the next day if possible a sample of urine collected in the morning without the intimate toilet. Besides all these

Table 2. Distribution of patients according immunovirology status

Parameters		Bolomakoté	Guimbi	Yéguérésso	Total N (%)
HIV status		97	98	83	278
	Positive	2	2	2	6
	Negative	95	96	80	271
	Undetermined	0	0	1	1
	Prevalence	2.1	2.0	2.4	2.2
	HIV1	2	2	1	5
	HIV2	0	0	0	0
	HIV1+HIV2	0	0	0	0
CD4 T Lymphocytes		94	83	81	258
	Minimum	186	260	179	179
	Median	829	798	813	811,5
	Mean	925	801	863	866
	Maximum	5474	1715	2192	5474
	Normal (≥500/mm3)	90	67	77	234 (90.7%)
	Immunodepression (<500/mm3)	4	16	4	24 (9.3%)

samples, Three to four milliliter of venous blood was also collected in EDTA containing tube to perform HIV testing and the numeration of CD4 T cells.

Laboratory procedures

The wet preparation from the sterile cotton-tipped vaginal discharge was made immediately using a clean glass slide with cover and examined microscopically for motile *T. vaginalis* under ×10 and ×40 objectives. Urine sample were centrifuged in Falcon® tubs at 5 000 rpm and the pellet was used for microscopic observation to identify vegetative forms of *T. vaginalis*.

Two validated rapid HIV tests were used for testing: DETERMINE® HIV-1/2 Ag/Ab Combo (DETE) (Alere Laboratories, Chiba, Japan) for screening and SD BIOLINE HIV® (Standard Diagnostic Inc., Korea) for confirmation in accordance with manufacturer instructions and the national HIV testing guideline. HIV positive or HIV negative status was screened using DETERMINE®. All samples reactive for HIV were re-tested for confirmation. The screening antibodies (HIV types 1 and 2) were discriminate using the SD BIOLINE® kit. A result was considered positive if both the first and second tests were positive.

CD4 T cells count was performed using BD FACScount® (Becton Dickinson, East Rutherford, NJ, USA) flow cytometer regardless of HIV status.

Data analysis

All data were double entered into a database established using EpiData 3.1 software. Statistical analysis was performed using Epi Info™ 7.2.0.1 software (CDC, Atlanta, USA).

Descriptive statistics were performed. Frequencies and percentages were used to describe the data. Continuous variable variables were described using median, interquantile range, and

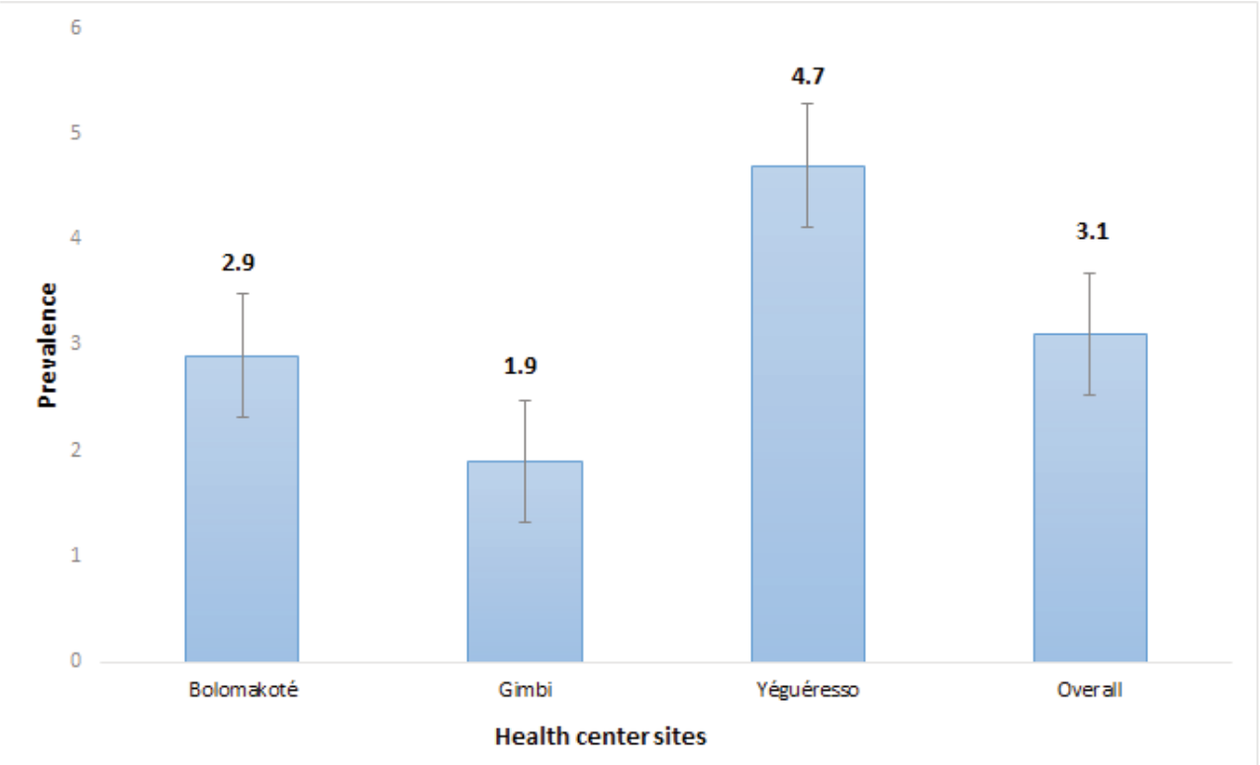

Figure 2. Overall prevalence of *T. vaginalis* infection and according the health Centre sites

mean. The Chi-square test with 95% confidence interval or Fisher's exact test was used to compare categorical variables and prevalence. Differences were considered statistically significant at p value < 0.05.

Ethics statement

Ethical approval was obtained from an institutional ethic committee of Centre MURAZ, Bobo-Dioulasso, Burkina Faso (No. CE 0015/2015). Permission to conduct the study was given by health and local community authorities of Bobo-Dioulasso. A public awareness campaign has been conducted previously on study sites to provide information about the study aim. Participation was voluntary and the written informed consents were obtained from each participant. Personal data from participants and all laboratory results were kept strictly confidential. Individuals with trichomonosis were treated according to Burkina Faso control guidelines for the treatment and management of sexually transmitted diseases.

Results

Baseline participants characteristics

A total of 315 pregnant women were included in the study: 105 in Bolomakoté, 104 in Guimbi, and 106 in Yéguéreso (Table 1). It was a young population with a mean age of 25.9 years. We have counted 47 (14.92%) cases of pregnancy in minor age. Of these, 11 (3.9%) had age inferior to 15 years. The majority of women lived with a husband or partner (90.5%) in monogamy (74.9%), with no formal education (40.3%).

The prevalence of HIV infection in our study population was estimated at 2.2% and exclusively HIV1. There were a significant proportion of immunosuppressed patients (9.3%) (Table 2).

Prevalence of T. vaginalis infection

The overall prevalence of *T. vaginalis* infection was 3.2% (10/315) IC95% [0.59–8.12] and distributed as follows: 2.9% (3/105) IC95% [0.59–8.12] in Bolomakoté, 1.9% (2/104) IC95% [0.23–6.77] in Guimbi and 4.7% (5/106) IC95% [1.55–10.67] in Yéguéreso (Figure 2).

Factors associated with T. vaginalis infection

For different factors that may be associated with urogenital trichomonosis including socio-demographic, obstetrical and biological factors, only Living with husband/partner was significantly associated with *T. vaginalis* prevalence (Table 3).

Table 3. Prevalence of *T. vaginalis* infection in relation to sociodemographic, obstetrical and clinical characteristics

Variables	Total	Prevalence (%)	Chi-square	*P value*
Site (Health Centre)				
Bolomakoté	105	2.9		
Guimbi	104	1.9	1.4	0.5
Yegueresso	106	4.7		
Age group (year)				
≤ 17	11	9.1		
18-34	272	2.6	2.6	0.3
≥35	31	6.5		
Gestational age				
First trimester	80	1.3		
Second trimester	117	4.3	1.4	0.5
Third trimester	115	3.5		
Living with husband/partner				
No	30	10.0	5.0	0.02
Yes	285	2.5		
Marital status				
Monogamy	236	2.1	0.7	0.4
Polygamy	49	4.1		
Socioeconomic level				
Low (≤500 XOF)	104	2.9		
Intermediate (501-1000 XOF)	157	3.8	0.5	0.8
High (≥ 1001 XOF)	53	1.9		
Formal educational level				
Illiterate	127	3.1		
Read and writes in local language	22	9.1	2.9	0.6
Elementary	89	2.5		
College and High school	77	2.6		
HIV serology status				
Positive	6	0	0.2	0.7
Negative	271	3.3		
CD4 T lymphocytes (cell/mm^3)				
Normal	234	3.4	0.0	0.8
Immunosuppression	24	4.2		

Pregnant women not living with partner had a higher prevalence (10.00% *versus* 2.45%; P=0.02).

Discussion

Urogenital trichomonosis is a sexually transmitted parasitic disease that can disrupt the normal course of pregnancy. Indeed, the parasite may be responsible for premature rupture of membranes during pregnancy, premature birth, low birth weight and also infertility [2].

Also, the results of the systematic review of epidemiological studies have shown that *T. vaginalis* infection is a risk factor for HIV infection with an odds ratio of 1.64, 95% CI [1.28–2.08] [4]. Despite this, literature data are scarce on urogenital trichomoniasis in HIV endemic countries as in Burkina Faso.

In this study, we assessed *T. vaginalis* infection prevalence and associated factors in pregnant women on stratified sample urban, peripheral and rural sites. Our study population was predominantly young, illiterate, with intermediate socioeconomic level and living with a husband or partner. This

profile reflects the pregnant women's socio-demographic characteristics in Burkina Faso [14].

The prevalence of HIV-infection was 2.2%. This prevalence was high compared to the national prevalence among sexually active persons, which is estimated at 0.9% and 0.8% in 2013. Generally, the Hauts-Bassins region is considered as an area of the highest prevalence of HIV infection in the country. Indeed, the HIV rate in 2013 was higher than the national rate of 2.2% and 1.7% for pregnant women. In our study, unlike many studies [11,12], there is no link between HIV infection and urogenital trichomonosis. This could be explained by our sampling method, which used pregnancy as the main criteria to include participant. While including the pregnant women infected with HIV would give probably the different trends.

The prevalence of urogenital trichomonosis was estimated at 3.2% in this study.

We noted a high prevalence in rural areas (4.7% in Yéguéresso) compared to the urban peripheral PHC (2.9% in Bolmakoté) and the urban PHC center (1.9% in Guimbi), although this trend is not statistically significant (P=0.5). The prevalence (28%) of urogenital trichomonosis in Bobo-Dioulasso was published since 1995 [12,15] and no updated data has been reported yet. In this study, we noticed an important decrease in the prevalence from 1995 to 2015. This suggests the effectiveness of the national syndromic management of STIs which recommends the treatment of STIs including urogenital trichomonosis in urethral discharge in men and vaginal discharge in women. The recommended therapeutic regimen in Burkina Faso is oral administration of metronidazole tablet 2 g in a single dose.

In addition, many strategies to fight STIs, including awareness campaigns in Burkina Faso, have a positive impact on urogenital trichomonosis. However, the recent prevalence has been found in countries such as Papua New Guinea, 21.3% [15].

On the other hand, the prevalence of the disease in the unmarried was significant, at least 4 times higher compared to the groom (P=0.02). Similarly, Naidoo et al. [16] reported the same result.

One limitation of our study was the use of direct examination of clinical sample by microscopy. The molecular diagnosis could be to improve the sensitivity and specificity of biology diagnosis.

Our epidemiological study offers some perspectives in molecular biology field. In fact, literature data show worldwide circulation at equal rates of two types of *T. vaginalis* genotypes, type 1 and 2 using microsatellite markers [17]. A subsequent study showed that 36% of repeated infections and treatment failures in the HIV positive patient were attributable to genotype 1 [18]. Using the RFLP PCR of the actin coding gene with enzymatic digestion, with the restriction enzymes HindII, MseI and RsaI, 8 genotypes of *T. vaginalis* were identified in the Democratic Republic of Congo, labeled A to H [19]. It would, therefore, be interesting to extend the present epidemiological study throughout Burkina Faso by integrating other parasitic or non-parasitic STIs, such as urogenital, bacterial and viral candidiosis, to establish the profile of sensitivity to available treatments and to focus on the molecular profile.

This study allowed us to update the epidemiology of urogenital trichomonosis in the Hauts-basins region after the adoption of the strategy of syndromic treatment of genital infections in Burkina Faso. We obtained an overall prevalence of 3.1%, which was considered lower compared to the previously reported few data from the country. Thus, it is essential to extend this study to the whole country periodically by integrating other STIs not subject to a surveillance system and by integrating molecular epidemiology tools.

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