**ORIGINAL ARTICLE**

*Trichomonas vaginalis* PREVALENCE AND RISK FACTORS FOR WOMEN IN SOUTHERN BRAZIL

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**SUMMARY**

*Trichomonas vaginalis* infections have been associated with other diseases so that epidemiological studies of the parasite are important and help to prevent the spread of the disease. This study aimed to determine the prevalence of *T. vaginalis* in female patients of 19 counties in southwestern Rio Grande do Sul, Brazil. For diagnosis, was used direct examination, followed by applying a socio-epidemiological questionnaire. We analyzed 300 women and 9% were infected by *Trichomonas vaginalis*. The highest frequency occurred in women between 18 and 39 years old, single/divorced/widowed, whose family income was at one minimum wage or less, and they had not completed the primary school. Statistically significant risk factors were: women reporting two or more sexual partners in the last year were 3.3 times more likely to acquire the parasite, and those in use of oral contraceptives were 2.7 times more likely to have *T. vaginalis*. Importantly, 33% of the asymptomatic women were infected, and most of the negative results were from women presenting symptoms consistent with the infection. The findings emphasize that it is necessary to expand the knowledge of individuals about the disease, especially among women with the above mentioned risk factors and also to include the regular screening of *Trichomonas vaginalis* infections in health centers.

**KEYWORDS:** Sexually transmitted diseases (STDs); Trichomoniasis; Prevalence.

**INTRODUCTION**

Trichomoniasis is an infection caused by the protozoan *Trichomonas vaginalis*, is one of the most common sexually transmitted disease of non-viral origin1. The main symptom in women is vaginal discharge, although about half of those infected are asymptomatic. Trichomoniasis is often associated with reproductive tract infections, premature births, low birth weight newborns, infertility, and cancer of the cervix1-3. Additionally, *T. vaginalis* infection is associated with increased HIV susceptibility, and has caused great impact on the spread of the HIV epidemic4-6.

In public health services, diagnosis of vaginal infections is usually based only on the presence of signs and symptoms. This type of evaluation can lead to the misdiagnosis of trichomoniasis, as this infection can be confused with other STDs6,7. Hence, laboratory investigation is important for the diagnosis of trichomoniasis, to ensure the appropriate treatment and the infection control. Although there are studies that suggest other diagnostic approaches in clinical practice, fresh sample examination is the preferred method because of its low cost and simplicity. It is highly specific8,9 and allows the observation of *T. vaginalis* motility. The gold standard for the diagnosis is the culture method, but it is often inaccessible to health professionals and requires some laboratory conditions and expertise that are incompatible with the reality of most public laboratories in developing countries8. Therefore, although the fresh wet examination presents limitation in terms of sensitivity, it is used due to its compatibility with the physical and financial resources of the public sector in Brazil.

Trichomoniasis is a disease with easy diagnosis and prevention, but despite this, the prevalence remains globally high and also at national levels10. Currently, there are STD control programs for gonorrhea, syphilis, and HIV, but there is not a single program for trichomoniasis, so that one can consider it as a neglected infection by most health services11.

Studies conducted in Brazil have shown that the prevalence of *T. vaginalis* infection ranges from 2.6% to 20%12 in women evaluated in primary care centers of different regions of the country13,14,15, those living with HIV16,17, and pregnant women18. To improve the infection control, and especially to determine risk factors, some aspects of the approaches should be studied1. Thus, given the lack of available data for *T. vaginalis* infection in Southern Brazil, the present study aimed to identify the risk factors associated with infection, and to investigate the prevalence of...
the parasite in women of different municipalities in the middle of the southwest region of Rio Grande do Sul State, RS, Brazil.

METHODS

Area and study population

The study was conducted with patients evaluated in Bagé (54° 06' 25”W, and 31° 19’ 31’’S), a municipality located in the southwestern region of Rio Grande do Sul State, RS, Southern Brazil. The municipality was chosen because of recent epidemiological investigations concerning trichomoniasis that were carried out there, and because it is a southwestern regional hub in Rio Grande do Sul State (near the border with Uruguay), and patients from neighboring municipalities also use this health clinic for gynecological consultations.

The research was explanatory, prevalence (cross-sectional) study that aimed to evaluate the factors (characteristics of patients) that determine or contribute to the occurrence of the phenomenon (prevalence of T. vaginalis in women referred to the Clinical Laboratory of the Unified Health System, Bagé/RS). Regarding the procedures, the research was developed through an action involving several patients in order to point out the causes of a collective problem. The study population was composed of women living in the city of Bagé/RS, and neighboring municipalities, who eventually sought the municipality to carry out the diagnosis of trichomoniasis, so that the casuistic was a non-probability sample of convenience19,20.

The calculation of sample size was performed before the execution of the study. The percentage of occurrence of the phenomenon has been established according to the average prevalence of 7.5% of the parasite in the region in recent years (verified data from previous researches). The chosen confidence interval was 95% and the maximum permissible error was 5%21. Thus, the sample consisted of 300 women, who sought the gynecology department of the Basic Health Unit (BHU) of Bagé, in the period from January to June 2013, and they were all sent to the Clinical Laboratory of the Unified Health System (SUS). The inclusion criterion considered women who spontaneously seek the gynecological clinics of the public health units of Bagé/RS presenting signs and symptoms suggestive of trichomoniasis, while the exclusion criterion was age ≤ 18 years. The laboratory in charge of the tests is the only one in the county that performs this screening using fresh samples. All the recruited patients have agreed to participate, and signed the informed consent. The study was approved by the Health Department of the city and by the Ethics Committee of the Faculty of Medicine at the Universidade Federal de Pelotas (protocol number 284/006).

Samples collection

Samples of vaginal secretions were taken by sterile non-absorbent cotton swabs and were analyzed by fresh examination between slide and cover slip using an optical microscope. After the examination, the report was delivered to the patients, and the positive cases were treated by municipal health center medical professionals.

Epidemiological data collection and statistical analysis

To characterize the patient’s socio-epidemiological profile, a semi-structured questionnaire was adopted. Patients were interviewed regarding age, place of birth, marital status, address, socioeconomic status, level of education, reason for the examination, and behavioral habits.

A descriptive comparison of the two study groups (infected women-positive group; uninfected women-negative group) for each variable was developed, expressing values in frequency (observed value-n), and percentage (%). The statistical comparison between groups was performed using the Chi-Square test (p ≤ 0.05), and the evaluation of the odds ratio (Odds ratio) was also performed.

RESULTS

A total of 300 women from 19 municipalities located in the middle of the southwest region of Rio Grande do Sul State participated in the survey. Of these, 27 (9%) were positive for T. vaginalis infection as diagnosed through the direct fresh examination. There were no statistically significant differences regarding all the socioeconomical variables. However, considering the absolute values and only in the positive group, the prevalence was higher in the age group of 18-39 years; the group of single/divorced/widowed; those women living in the periphery of the county; those reporting a family income of one minimum wage or less, and in those who had not completed the elementary education (Table 1).

It can be seen in Table 2, that most women who were positive for T. vaginalis had symptoms that could be attributed to the infection. Nevertheless, 33.3% of the positive women had no symptoms, in most cases they searched for the gynecological evaluation to perform routine checkups or were pregnant.

The behavioral variables analyses are shown in Table 3. We highlight that there were statistical significant differences concerning the presence of T. vaginalis with respect to the following variables: contraceptive use (p = 0.014), women in use of contraceptives were 2.7 times more likely to have the protozoan; and having two or more partners within one year (p = 0.009), women in this situation had 3.3 times more chance to be positive for T. vaginalis. Eleven of the positive women were pregnant (3.6%).

DISCUSSION

Trichomoniasis is a disease with well-known symptomatology and diagnosis, but even though, the prevalence of this infection is globally considerable, as well as the prevalence at national levels. In Brazil, the rate is around 4%.20 The prevalence of trichomoniasis in the participants of this study was 9%, a result similar to that found in a study conducted in the State of Paraná that showed a prevalence of 10.5% for T. vaginalis.22 Other studies conducted in different States of Brazil found lower rates of this infection, 5.7% in Minas Gerais, 3.56% in Sergipe and 3.2% in women from São Paulo. However, studies conducted in the States of Pernambuco and Goiás showed higher prevalence in comparison with this study, of 13.1% and 13.2%, respectively. Characteristics such as the behavior, age, educational level, personal hygiene, access to sanitation, and the type of diagnostic methods employed, taken together, are factors that might explain the existence of different positivity rates depending on the study location.

Although the use of a fresh sample examination can be considered
a limiting factor of this study, mainly because of its low sensitivity, it is commonly used due to its suitability to the physical and economic resources availability for routine diagnostic in the public sector, especially in Units Health of developing countries. The diagnosis of trichomoniasis performed by the Polymerase Chain Reaction (PCR) or by culture methods have a good sensitivity and specificity, however, they are laborious and present higher costs, therefore limiting their use in laboratory routines, in the context of the Unified Health System in Brazil. It is noteworthy that the prevalence estimates for *T. vaginalis* made available by the World Health Organization (170 to 190 million cases worldwide every year) are based mainly on results achieved with the analysis of fresh samples.

Sexually transmitted diseases (STDs) are among the 10 leading causes of disease in young adults in the world. In this study, we observed a higher frequency of *T. vaginalis* in patients in the age group between 18 and 39 years, and these women were 2.3 times more likely to have infection. Similarly, in a study conducted in the State of Ceará, northeastern Brazil, there was a higher positive rate in patients in the age group between 20 and 29 years. In a review of 30 studies on the prevalence of trichomoniasis in Iranian women, a mean age of 24.5 years was found. The higher incidence in younger age groups may be related to sexual behavior, to the lack of awareness regarding DST’s, but also to changes of the vaginal microbiota (especially during the menstrual period), leading to decreased glycogen production, pH changes, hormonal fluctuations, and desquamation of the epithelial tissue, favoring the installation and multiplication of the protozoa in younger patients.

### Table 1

| Socioeconomic variables | Groups |  |  |
|-------------------------|--------|---|---|
|                         | Positive | Negative |  |
| Age Group               |  |  |  |
| 18 - 39                 | 22 (81.5) | 178 (65.2) | 0.087 | 2.3 (0.86-6.39) |
| 40 ou >                 | 5 (18.5) | 95 (34.8) |  |
| Marriage Status         |  |  |  |
| Married                 | 10 (37.0) | 113 (41.4) | 0.661 | 0.8 (0.37-1.89) |
| Single/divorced/widow   | 17 (63.0) | 160 (58.6) |  |
| Address                 |  |  |  |
| Town                    | 07 (26.0) | 44 (16.1) | 0.196 | 1.8 (0.73-4.57) |
| Periphery               | 20 (74.0) | 229 (83.9) |  |
| Fixed family income     |  |  |  |
| Up to 1 minimum wage    | 16 (59.3) | 119 (43.6) | 0.118 | 1.9 (0.84-4.21) |
| 2 to 7 minimum wages    | 11 (40.7) | 154 (56.4) |  |
| Education               |  |  |  |
| Elementary school       | 15 (55.6) | 125 (45.8) | 0.332 | 1.5 (0.67-3.28) |
| High school or superior | 12 (44.4) | 148 (54.2) |  |

*a* Brazilian minimum wage = R$788.00 (about US$250.00 in Jan/2015). *a*5 subjects had higher education either complete or incomplete. *Chi-Square test (p ≤ 0.05), comparing the positive and the negative group. OR - odds ratio. **Confidence interval (CI)

### Table 2

| Presence of symptoms | Total women (%) | Positive (%) | Negative (%) |  |  |
|----------------------|----------------|-------------|-------------|---|---|
| Yes                  | 167 (55.7)     | 18 (66.7)   | 149 (54.6)  | 0.23 | 1.7 (0.72-3.84) |
| No                   | 133 (44.3)     | 09 (33.3)   | 124 (45.4)  |  |

*Vaginal discharge, burning, itching, pelvic or abdominal pain, bad smell. *Routine examination, pregnancy, follow-up treatment, breast changes. *Chi-Square test (p ≤ 0.05). OR - odds ratio. **Confidence interval (CI)
Considering the possible effects on women and their partners, health and consequences for pregnancy, these findings emphasize the need to increase our knowledge on this infection. Therefore, we recommend that *T. vaginalis* becomes a major educational theme propounded, in health centers, to the population, especially, to people with active sexual life.

**CONFLICTS OF INTEREST**

The authors declare no conflicts of interest.
REFERENCES

1. Van Der Pol B. Trichomonas vaginalis infection: the most prevalent nonviral sexually transmitted infection receives the least public health attention. Clin Infect Dis. 2007;44:23-5.

2. Romoren M, Velauthapillai M, Rahman M, Suny J, Klouman E, Hjortdahl P. Trichomoniasis and bacterial vaginosis in pregnancy: inadequately managed with the syndromic approach. Bull World Health Organ. 2007;85:297-304.

3. Fichorova RN. Impact of T. vaginalis infection on innate immune responses and reproductive outcome. J Reprod Immunol. 2009;83:185-9.

4. Lemos PA, Garcia-Zapata MT. The prevalence of Trichomonas vaginalis in HIV-positive and negative patients in referral hospitals in Goiania, Goiás, Brazil. Int J Trop Med. 2010;5:24-7.

5. Mavedzenge SN, Van Der Pol B, Cheng H, Montgomery ET, Blanchard K, de Bruyn G, et al. Epidemiological synergy of Trichomonas vaginalis and HIV in Zimbabwean and South African women. Sex Transm Dis. 2010;37:460-6.

6. Lecke SB, Tasca T, Souto AA, De Carli GA. Perspective of a new diagnostic for human trichomoniasis. Mem Inst Oswaldo Cruz. 2003;98:273-6.

7. Madhivanan P, Krupp K, Hardin J, Karat C, Klausner JD, Reinglod AL. Simple and inexpensive point-of-care tests improve diagnosis of vaginal infections in resource constrained settings. Trop Med Int Health. 2009;14:703-8.

8. Bachmann LH, Hobbs MM, Seña AC, Sobel JD, Schwabek JR, Krieger JN, et al. Trichomoniasis: genital infections: progress and challenges. Clin Infect Dis. 2011;53 Suppl 3:S160-2.

9. Grama DF, Casarotti LS, Limongi JE, Silva AL, Viana JC, Costa FC, et al. Inquérito às infecções sexualmente transmissíveis em mulheres e fatores de risco associados em unidade de atendimento público no município de Uberlândia-MG. Rev Patol Trop. 2010;39:91-103.

10. Alves MJ, Oliveira R, Balteiro J, Cruz A. Epidemiologia de Trichomonas vaginalis em mulheres. Rev Port Saúde Publica. 2011;29:27-34.

11. Soper D. Trichomoniasis: under control or undercontrolled? Am J Obstet Gynecol. 2004;190:281-90.

12. Michel RV, Borges FP, Wiltschung RC, Neves FG, Ribeiro J, Vieiro RC, et al. Prevalência da tricomonose em mulheres residentes na Vila dos Papeleiros em Porto Alegre, RS. Rev Bras Anal Clin. 2006;38:127-30.

13. Almeida MS, Argôlo DS, Almeida Junior JS, Pinheiro MS, Brito AMG. Trichomoníase: prevalência no gênero feminino em Sergipe no biênio 2004-2005. Cien Saude Colet. 2010;15:417-21.

14. Luppy, CG, Oliveira RL, Veras MA, Lippman SA, Jones H, Jesus CH, et al. Diagnóstico precoce e os fatores associados às infecções sexualmente transmissíveis em mulheres atendidas na atenção primária. Rev Bras Epidemiol. 2011;14:467-77.

15. Rocha DA, Filho RA, Marídio JM, dos Santos CM. “Hidden” sexually transmitted infections among women in primary care health services, Amazonas, Brazil. Int J STD AIDS. 2014;25:878-86.

16. Silva LC, Miranda AE, Batalha RS, Monte RL, Talhari S. Trichomonas vaginalis and associated factors among women living with HIV/AIDS in Amazonas, Brazil. Braz J Infect Dis. 2013;17:701-3.

17. Souza RP, de Abreu AL, Ferreira ÉC, Rocha-Brischihari SC, de B Carvalho MD, Pellosi SM, et al. Simultaneous detection of seven sexually transmitted agents in human immunodeficiency virus-infected Brazilian women by multiplex polymerase chain reaction. Am J Trop Med Hyg. 2013;89:1199-202.

18. Miranda AE, Pinto VM, Gaydos CA. Trichomonas vaginalis infection among young pregnant women in Brazil. Braz J Infect Dis. 2014;18:669-71.

19. Marconi MA, Lakatos EM. Técnicas de pesquisa: planejamento e execução de pesquisas, amostragens e técnicas de pesquisa, elaboração, análise e interpretação de dados. 3rd ed. São Paulo: Atlas; 1996.

20. Gil AC. Métodos e técnicas de pesquisa social. 6th ed. São Paulo: Atlas; 2008.

21. Lwanga SK, Lemeshow S. Sample size determination in health studies: a practical manual. Geneva: World Health Organization; 1991.

22. Consolaro ME, Suzuki LE, Marques EB. Estudo da tricomias e a sua abordagem no diagnóstico coloproctológico. Rev Bras Anal Clin. 1999;31:25-8.

23. Lima MC, Albuquerque TV, Barreto Neto AC, Rehn VN. Prevalence and fates of risco independentes à tricomias em mulheres assistidas na atenção bÁsica. Acta Paul Enferm. 2013;26:331-7.

24. Siracusano S, Silvestri T, Casotto D. Sexually transmitted diseases: epidemiological and clinical aspects in adults. Urologia. 2014;81:200-8.

25. Oliveira FA, Pfleger V, Lang K, Heukelbach J, Miralles I, Fraga F, et al. Sexually transmitted infections, bacterial vaginosis, and candidiasis in women of reproductive age in rural Northeast Brazil: a population-based study. Mem Inst Oswaldo Cruz. 2007;102:751-6.

26. Hezjurjarihi HZ, Fakhar M, Shokri A, Teshnizhi SH, Sadough A, Taghavi M. Trichomonas vaginalis infection among iranian general population of women: a systematic review and meta-analysis. Parasitol Res. 2015;114:1291-300.

27. Sutton M, Sternberg M, Kounsarn EH, McQuillan G, Berman S, Markowitz L. The prevalence of Trichomonas vaginalis infection among reproductive-age women in the United States, 2001–2004. Clin Infect Dis. 2007;45:1519-26.

28. Lazenby GB, Taylor PT, Badman BS, McHaki E, Korte JE, Soper DE, et al. An association between Trichomonas vaginalis and high-risk human papillomavirus in rural Tanzanian women undergoing cervical cancer screening. Clin Ther. 2014;36:38-45.

29. Miller M, Liao Y, Gomez AM, Gaydos CA, D’Mellow D. Factors associated with the prevalence and incidence of Trichomonas vaginalis infection among African American women in New York city who use drugs. J Infect Dis. 2008;197:503-9.

30. Simhun HN, Anderson BL, Krohn MA, Heine P, Martinez de Tejada B, Landers DV, et al. Host immune consequences of asymptomatic Trichomonas vaginalis infection in pregnancy. Am J Obstet Gynecol. 2007;196:59.e1-5.

31. Ovalle A, Martinez MA, de la Fuente F, Falcon N, Feliú F, Fuentenalba F, et al. Prevalencia de infecciones de transmisión sexual en mujeres embarazadas atendidas en un hospital público de Chile. Rev Chilena Infectol. 2012;29:517-20.

32. Silver BJ, Guy RJ, Kaldor JM, Jamil MS, Rumbold AR. Trichomonas vaginalis as a cause of perinatal morbidity: a systematic review and meta-analysis. Sex Transm Dis. 2014;41:369-76.

33. Baeten JM, Nyange PM, Richardson BA, Lavreys L, Chohan B, Martin HL Jr, et al. Hormonal contraception and risk of sexually transmitted disease acquisition: results from a prospective study. Am J Obstet Gynecol. 2001;185:380-5.

34. Mohlilaje AP, Curtis KM, Martins SL, Peterson HB. Hormonal contraceptive use and risk of sexually transmitted infections: a systematic review. Contraception. 2006;73:154-65.

Received: 17 September 2015 Accepted: 15 March 2016