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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 origin[1]. 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 cervix[2,3]. Additionally, *T. vaginalis* infection is associated with increased HIV susceptibility, and has caused great impact on the spread of the HIV epidemic[4,5].

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 STDs[6,7]. 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 specific[8,9] 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 countries[6]. 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 levels[10]. 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 services[11].

Studies conducted in Brazil have shown that the prevalence of *T. vaginalis* infection ranges from 2.6%[9] to 20%[12] in women evaluated in primary care centers of different regions of the country[13,14,15], those living with HIV[16,17], and pregnant women[18]. To improve the infection control, and especially to determine risk factors, some aspects of the approaches should be studied[9]. 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

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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* (54º 06' 25''W, and 31º 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 convenience[19,20].

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 7.3% 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 ($p \leq 0.05$), 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%[10]. 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*[9], 3.56% in *Sergipe*[13] and 3.2% in women from *São Paulo*[14]. 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[4,23]. 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

Table 1
Socioeconomic variables of *Trichomonas vaginalis* infected (positive group) and uninfected (negative group) women, examined in the southwestern region of *Rio Grande do Sul*, Brazil

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

[1/] Brazilian minimum wage = R$788.00 (about US$250.00 in Jan/2015). [2/] 05 subjects had higher education either complete or incomplete. *Chi-Square test ($p \leq 0.05$), comparing the positive and the negative group. OR - odds ratio. **Confidence interval (CI)

Table 2
Presence of *Trichomonas vaginalis* infection symptoms in infected (positive group) and uninfected (negative group) women, examined in southwestern region of *Rio Grande do Sul*, Brazil

Presence of symptoms	Total women (%)	Positive (%)	Negative (%)	*p* value*	OR (CI)**
Yes [1/]	167 (55.7)	18 (66.7)	149 (54.6)	0.23	1.7 (0.72-3.84)
No [2/]	133 (44.3)	09 (33.3)	124 (45.4)		

[1/] Vaginal discharge, burning, itching, pelvic or abdominal pain, bad smell. [2/]Routine examination, pregnancy, follow-up treatment, breast changes. *Chi-Square test ($p \leq 0.05$). OR - odds ratio. **Confidence interval (CI)

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[6]. 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[1].

Sexually transmitted diseases (STDs) are among the 10 leading causes of disease in young adults in the world[24]. 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[25]. In a review of 30 studies on the prevalence of trichomoniasis in Iranian women, a mean age of 24.5 years[26] 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[13].

Regarding the education levels, a study conducted in *Uberlândia*, State of *Minas Gerais,* found a higher prevalence of infection in less educated women[9]. Similarly, when women of Portugal were analyzed, a high frequency of *T. vaginalis* (72.7%) in those who reported only

Table 3
Behavioral variables of the *Trichomonas vaginalis* infected (positive group) and uninfected (negative group) women, examined in southwestern region of *Rio Grande do Sul,* Brazil

Variables	Groups*		*p* value**	OR (CI)***
	Positive	Negative		
Use of oral contraceptive			0.014	2.7 (1.19-6.34)
Yes	18 (66.7)	115 (42.1)		
No	09 (33.3)	158 (57.9)		
Use of condoms in all sexual intercouses			0.230	1.6 (0.73-3.62)
Yes	12 (44.4)	90 (33.0)		
No	15 (55.6)	183 (67.0)		
Number of sexual partners in one year			0.009	3.3 (1.28-8.61)
Two or more partners	07 (25.9)	26 (9.54)		
1 partner	20 (74.1)	247 (90.5)		

*Values expressed in frequency (value observed in the sample - n), and in percentage (%) ***Chi-Square test ($p \leq 0.05$), comparing the positive and the negative group. OR - odds ratio. ***Confidence interval (CI).

the elementary education was observed, showing an inverse correlation between the education level and positivity for this protozoa[10]. In the present study these differences were not significant, probably due to the relative homogeneity of the group, given that only a few women had completed the high school, and only five reported having a higher education (complete or incomplete).

Regarding the symptoms, 66.7% of the positive women had urogenital symptoms compatible with this parasite infection. Among these, vaginal discharge, burning, and itching in the genital area are highlighted. These symptoms are the same reported by women in other studies[9,10]. However, in the United States, no association was found between the presence of symptoms and positivity for *T. vaginalis* in women[27], and in Tanzania less than half of women with *T. vaginalis* had symptoms[28]. Although the presence of certain symptoms may suggest vaginal parasitism, in this study, 33.3% of women had asymptomatic infections, and most negative women actually had signs and symptoms consistent with the presence of the parasite. These data reinforce the perception that the presence of signs and symptoms, though supporting the diagnosis of trichomoniasis, cannot be used alone to achieve an accurate diagnosis[10], reinforcing the importance of conducting laboratory tests to improve the diagnostic rates, and also, that a lack of symptoms does not exclude the possibility of infection, and of infected partners.

Women who had two or more partners in the year before the study period were 3.3 times more likely to have trichomoniasis, and in such cases the mode of transmission is sexual. In women from the United States (New York), the number of partners was also related to a higher incidence of infection. Women who reported having more than one sexual partner were four times more likely to acquire *T. vaginalis* infections[29]. Corroborating these findings, in southern Brazil, sexually transmitted diseases like trichomoniasis are also associated with multiple partners[12] and in the southeast, there was a higher prevalence of STDs in women who had four or more partners in the six months preceding the study[14].

Among the positive women, eleven were pregnant. This information deserves attention, since trichomoniasis during pregnancy is a risk factor for premature birth and low birth weight, and is likely to be vertically transmitted to the newborn, resulting in neonatal disease[30,31]. A review of the literature has provided strong evidence that *T. vaginalis* during pregnancy is associated with an increased risk of pre-term delivery[32]. The study did not monitor these pregnant women to find out whether *T. vaginalis* influences negatively the pregnancy development, however, a study of this nature remains important.

Regarding the use of contraceptives, 66.7% of the positive women for trichomoniasis were using oral contraceptives (OR = 2.7). A methodological question must be considered when examining the association between the use of hormonal contraception and STDs: most of the evidence is obtained from cross-sectional studies, which cannot assess whether the infection occurred before the use of contraceptives. However, two factors might explain the results associating the use of oral contraceptives and trichomoniasis: firstly, oral contraceptive users have, as a rule, more active sexual behavior and therefore a greater risk of acquiring the parasite; and secondly, these women are less likely to use condoms during sexual intercourses, due to the perception that there is no risk of pregnancy[33,34].

Despite the variation of prevalence, it is known that infection rates are usually higher in developing countries, depending on the scope and quality of health care, socioeconomic conditions, and educational status of the population[24]. 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.

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