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Trichomonas vaginalis infection in Nigerian pregnant women and risk factors associated with sexually transmitted infections

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Abstract

Trichomoniasis poses a public health threat to pregnant women and neonatal health. This study evaluated *Trichomonas vaginalis* and other common sexually transmitted infections (STIs) status in pregnant women, and risk factors associated with them. The study was cross-sectional and descriptive and a total of 198 pregnant women were recruited for *T. vaginalis* screening by microscopic examination. Questionnaires were also administered to 108 pregnant women to access information related to socio-demography and other factors associated with STI transmission. The overall prevalence of *T. vaginalis* was 18.7%. While prevalence of *T. vaginalis* was neither age nor parity dependent ($p > 0.05$), women in their first trimester showed significantly higher prevalence of trichomoniasis compared to women in their second and third trimesters ($p < 0.05$). The frequency of STIs was lowest (18.2%) and highest (71.4%) in age groups ≥ 39 and 15–20 years, respectively. Low levels of education, multiple sexual partners, lack of knowledge on partners' STI history, and having sex under the influence of alcohol or drugs were risk factors of for STIs ($p < 0.05$). We found a high prevalence of *T. vaginalis* in pregnant women, with those at an early gestational age at greater risk. The improved education of women on safe sex and the need to know partners' STI status are advocated.

Keywords

Maternal trichomoniasis, sexually transmitted infection, women, *Trichomonas vaginalis*, pregnancy, Africa, transmission risk factors

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Introduction

Over 25 infectious agents are transmitted primarily through sex; however, hepatitis B virus, *Trichomonas vaginalis*, herpes simplex, human immunodeficiency virus (HIV), *Neisseria gonorrhoeae*, chlamydia and *Treponema pallidum* infections are more common.[1,2] In the last decade, approximately 340 million new cases of gonorrhoea, chlamydial infection, syphilis, and *T. vaginalis* infection occurred annually, with the majority of them in developing countries.[2] Across the world, 2.5, 3.0, 5.6, 6.7, and 11% prevalence of syphilis, gonorrhoea, HIV, herpes, and chlamydia, respectively, have been reported in pregnant women.[3–6]

T. vaginalis infection is one of the most prevalent sexually transmitted infections (STIs).[7] The disease spectrum ranges from an estimated 10–50% asymptomatic carriers to individuals with profound acute, inflammatory disease.[8,9] Symptoms of *T. vaginalis* infection in women include frothy/greenish/foul smelling vaginal discharge, dysuria, vulvo-vaginal irritation, and lower abdominal pain, which is more pronounced during pregnancy and menstruation.[10]

In pregnancy, *T. vaginalis* has been implicated in adverse birth outcomes such as low birth weight, preterm labour, neonatal morbidity and mortality.[11] Others include upper reproductive tract post-caesarian

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infections and reversible infertility.[12] Neonatal infection through direct vulvo-vaginal contamination occurs in 2–17% of female babies born to infected women.[13]

The transmission of the infection is primarily related to sexual contact, with incidence depending on the proportion of the population infected, poor personal hygiene, multiple sex partners and low socio-economic status.[14] *T. vaginalis* has traditionally been a marker for risk of other common STIs such as *Chlamydia trachomatis* and *Neisseria gonorrhoeae*.[15,16]

There is also a strong association between *T. vaginalis* and HIV.[17,18]

In this study, we tested pregnant women for *T. vaginalis* and investigated other common STIs through a questionnaire, in order to determine their prevalence in this population and established common risk factors implicated in STIs.

Materials and methods

Study population

The study was conducted in Ifako Ijaiye General Hospital, Agege, Lagos State, Nigeria between May and August, 2014. Agege is a suburb and local government area in Ikeja division of Lagos State and is inhabited majorly by the Aworis and traders from different parts of the country. It is a highly commercialised community with many recreational centres.

Study design and sample size determination

The study was cross-sectional and descriptive and included only pregnant women who gave informed consent and had not received antibiotics at least two weeks prior the study. The average prevalence ($12.5\% \pm 5.5$) computed from various similar studies across Nigeria [19–22] and 5% precision was used to calculate the minimum sample size of 168 subjects. Overall, 198 pregnant women were recruited for *T. vaginalis* infection prevalence study. However due to resource limitation, 108 women were recruited for questionnaire analysis for other STIs. These women were recruited from those who presented to the STIs out-patient clinic at Ifako Ijaiye General Hospital, Lagos State.

Laboratory testing and questionnaire administration

Patients to be screened were first counselled by a trained counsellor before specimen collection. High vaginal swab (HVS) exudates were collected by sterile swab via speculum examination and wet smears were made using a drop of normal saline on microscope slides. The preparations were covered with a cover slip and examined immediately under the microscope. The women who were diagnosed positive for *T. vaginalis* infection were referred, counselled and administered treatment accordingly. A pretested structured questionnaire was administered to pregnant women to obtain information related to age, education, occupation, number of sexual partners, condom use pattern, and obstetric history. The occurrence of other STIs such as chlamydia, pelvic inflammatory disease (PID), HIV, herpes, gonorrhoea, genital warts and syphilis was determined through the use of questionnaire. The women's responses regarding their STI status were confirmed by their medical record.

Ethical approval

The study protocol was reviewed and approved by the Olabisi Onabanjo University, Ethics Review Committee.

Statistical analysis

Chi square and Fisher's exact tests were used to assess differences in proportions between maternal *T. vaginalis* infection and variables such as age, trimester and parity. The same was used to assess differences in proportions of other questionnaire responses. A p value less than 0.05 was statistically significant.

Results

The mean age of the women was 35.1 ± 6.2 years. The overall prevalence of *T. vaginalis* in pregnant women in the study area was 18.7%. While prevalence of *T. vaginalis* was neither age nor parity dependent ($p > 0.05$), women in their first trimester showed a significantly higher prevalence of *T. vaginalis* compared to those in their second and third trimesters ($p < 0.05$) (Table 1). The proportion of women with a single sexual partner increased with age while younger women were more likely to report multiple sexual partners. The proportion of women with multiple sexual partners varied significantly across the ages of the women ($p < 0.0001$). The overall prevalence of STIs as obtained from response to questionnaire was 45.4%. Self-reported history of STIs was least (18.2%) and highest (71.4%) in age groups ≥ 39 and 15–20 years, respectively (Table 2). STIs occurrence (except for chlamydia and gonorrhoea) was not associated with the women's ages ($p > 0.05$).

The prevalence of chlamydia (28.6%) and gonorrhoea (71.4%) in age group 15–20 years was significantly higher than the prevalences reported in other age groups ($p < 0.05$). Although the occurrence of herpes and syphilis were not associated with ages

Table 1. Prevalence of *Trichomonas vaginalis* by wet mount microscopy in pregnant women (n = 198).

Variables		No. examined	No. infected	Prevalence (%)	*p*
Age (years)	21–26	8	1	12.5	0.910
	27–32	64	11	17.2	
	33–38	77	14	18.2	
	≥ 39	49	11	22.4	
Trimester	1st	83	20	24.1	0.042
	2nd	61	5	8.2	
	3rd	54	12	22.2	
Parity	Primigravidae	16	4	25.0	0.471
	Secundigravidae	47	6	12.8	
	Multigravidae	135	27	20.0	

Note: Data presented are from direct laboratory diagnosis.

Table 2. Association between age, number of sexual partners and STIs (n = 108).

		Number of partners (%)			Number (%)	
Age (years)	Number	Single	Multiple	*p*	STDs	*p*
15–20	7	0 (0.0)	7 (100)	< 0.0001	5 (71.4)	0.146
21–26	13	6 (46.2)	7 (53.8)		3 (23.1)	
27–32	39	31 (79.5)	8 (20.5)		17 (43.6)	
33–38	38	32 (84.2)	6 (15.8)		13 (34.2)	
39+	11	11 (100)	0 (0.0)		2 (18.2)	

Note: STIs included HIV, chlamydia, herpes, syphilis, *T. vaginalis*, gonorrhoea, pelvic inflammatory disease and genital warts.
STI: sexually transmitted infection.

Table 3. Age-related prevalence of other STIs (n = 108).

Age (years)	Number examined	Chlamydia (%)	Gonorrhoea (%)	Herpes (%)	PID (%)	Syphilis (%)	Warts (%)	HIV (%)	*T. vaginalis*
15–20	7	2 (28.6)	5 (71.4)	1 (14.3)	0 (0.0)	2 (28.6)	0 (0.0)	1 (14.3)	0 (0.0)
21–26	13	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (7.7)	0 (0.0)	1 (7.7)	0 (0.0)
27–32	39	1 (2.6)	5 (12.8)	0 (0.0)	1 (2.6)	2 (5.1)	0 (0.0)	9 (23.1)	3 (7.7)
33–38	38	1 (2.6)	2 (5.3)	1 (2.6)	1 (2.6)	1 (2.6)	0 (0.0)	5 (13.2)	2 (5.3)
39+	11	0 (0.0)	1 (9.1)	0 (9.1)	0 (0.0)	0 (0.0)	1 (9.1)	0 (0.0)	0 (0.0)
p		0.010	<0.0001	0.122	0.936	0.076	0.064	0.328	0.664
Overall	108	4 (3.7)	13 (12.0)	2 (1.9)	2 (1.9)	6 (5.6)	1 (0.9)	16 (14.8)	5 (4.6)

Note: Data presented are sourced from questionnaire and patient medical records.
PID: pelvic inflammatory disease.

of the women ($p > 0.05$), the highest proportions 14.3% and 28.6%, respectively, were recorded in the age group 15–20 years (Table 3). HIV (14.8%) and genital warts (0.9%) were the most and least prevalent STIs according to the women's questionnaire report (Table 3). HIV infection was significantly associated with *T. vaginalis* ($p < 0.0001$).

Women's level of education was associated with STIs ($p < 0.05$) (Table 4). The occurrence of STIs was significantly higher in those with only primary school education (61.1%) compared with those with secondary (36.4%) and tertiary education (25.3%). Housewives (50.0%) and civil servants (20.0%) had the highest and lowest occurrence of STIs. However,

Table 4. Risk factors of sexually transmitted infections in pregnant women (n = 108).

Risk factors	Respondents	Number of STIs	Prevalence (%)	*p*
Education				
Primary	18	11	61.1	0.013
Secondary	11	4	36.4	
Tertiary	79	20	25.3	
Occupation				
Trader	45	19	42.2	0.107
Civil servant	48	10	20.8	
Student	7	2	28.6	
Housewife	8	4	50.0	
No. of sexual partners				
Single	80	19	23.8	0.002
Multiple	28	16	57.1	
Condom use				
Always	61	18	29.5	0.378
Sometimes	23	7	30.4	
Never	22	10	45.5	
Partner(s) STI history				
Yes	25	20	80.0	< 0.0001
No	64	5	7.8	
Don't know	19	10	52.6	
Sexual activity influenced by alcohol/drugs				
Yes	35	22	62.9	< 0.0001
No	73	13	17.8	

Note: STIs included HIV, chlamydia, herpes, syphilis, *T. vaginalis*, gonorrhoea, pelvic inflammatory disease and genital warts.
STI: sexually transmitted infection.

proportions of STIs in relation to occupation of the women were not significant ($p > 0.05$). STIs were significantly higher in those with multiple sexual partners (57.1%) than those with single sexual partners (23.8%) ($p < 0.05$). Women who never used condoms (45.5%) had a higher occurrence of STIs than those with regular condom use (29.5%), although variation in condom use pattern was not significant with occurrence of STIs ($p > 0.05$) (Table 4). The prevalence of STIs in those whose partners had history of STIs (80.0%) was significantly higher than those whose partners did not have an STI history (7.8%) ($p < 0.0001$). Prevalence of STIs was significantly higher (62.9%) in those who had had sex under the influence of drugs or alcohol than those whose sexual behaviour was not influenced by drugs or alcohol (17.8%) ($p < 0.0001$).

Discussion

The mean age of the women (35.1 ± 6.2 years) was high and seemed not to be a typical representative of the pregnant women population. This aberration was probably due to a higher proportion of multigravid pregnant women in the study population. There was a high prevalence of *T. vaginalis* in this study. The women were likely to be at high risk as the samples were taken from women who self-presented to the STI clinic.

Implicated in the transmission of *T. vaginalis* are the physiological changes that occur during pregnancy, including pelvic vascularity and oestrogenic activity on the vaginal epithelium which causes growth, maturation and exfoliation of the squamous cells and an increase in glycogen deposits in vaginal epithelial cells,[23] the effects of which favour parasite multiplication and transmission. Preterm labour, low birth weight and increased rates of neonatal death are the major adverse effects of maternal trichomoniasis.[21,24]

The prevalence of *T. vaginalis* (18.7%) recorded in this study is higher than most reports in Nigeria. For example, prevalences of 4.7, 5.2, 11.0, 12.3 and 17.7% have been reported in Ilorin, Calabar, Maiduguri, Abakaliki and Uyo, respectively. [21,22,25–27] Our study, however, showed a similar prevalence with the 18.7% recorded in Zaria,[19] but a lower prevalence than the 24.1% observed in Jos.[28] Compared with the rest of the world, our study showed a higher prevalence than the values reported in Iran (3.3%), Turkey (12.3%) and the Australian aboriginal population (8.4%),[29–31] but lower than the prevalences of 24.7%, 34.0% and 49.2% reported in Tanzania,[32] Kenya[33] and South Africa,[34] respectively. This prevalence suggests that maternal *T. vaginalis* infection is an important public health threat in Nigerian urban populations. The differences observed in the prevalence of *T. vaginalis* in this study compared with others could be attributed to socio-cultural and environmental differences.[22] Compared to other STIs like HIV and gonorrhoea, *T. vaginalis* infection is neglected in terms of public awareness and the implementation of concerted control measures. Thus, the significantly higher rate of infection recorded in this study's microscopic diagnosis compared to the relatively low prevalence in the women's questionnaire and medical reports.

Our study contradicted others that reported age as an important risk factor of *T. vaginalis* transmission in pregnant women.[19,20,25] All age groups were equally predisposed to infection. The exact transmission dynamics of *T. vaginalis* infection are not known; however, consistently high prevalence of the disease in sexually active women in resource-poor populations is the most striking epidemiological feature.[35] The gestational age of the women is closely associated with the transmission of *T. vaginalis* in the present study. While our study reported the highest prevalence in the first trimester women, similar to other studies,[26,36] other reports have favoured a higher prevalence in women in the latter stages of gestation.[21,27,37–39] Although sexual activities in women are

believed to generally decline during pregnancy, most early-stage first trimester women who are pregnant for the first time may engage in more sexual acts than others in later trimesters because they are sometimes unaware of their pregnancy, resulting in the probable higher prevalence of *T. vaginalis* observed in this group. The high prevalence also observed in the third trimester women could have serious implications for pregnancy outcomes and neonatal health.

The significantly higher distribution of chlamydia and gonorrhoea in the lower age group category contrasted with that of *T. vaginalis*, which showed no association with the age of the women. The higher proportion of multiple sexual partners in younger women corroborated with a higher prevalence of STIs observed in the group. The high prevalence of gonorrhoea (12.0%) and HIV (14.8%) and occurrence of other STIs in the population are indicators that *T. vaginalis* could aid their transmission. Studies have strongly linked pathological changes induced by *T. vaginalis* to an increase in HIV shedding.[20,40] Therefore, detection and treatment of *T. vaginalis* is central to HIV prevention.[41]

This study showed that education, number of sexual partners, partners' STI history and having sex under the influence of alcohol or drugs were risk factors for STIs. Educational status has been previously reported to be a risk factor for *T. vaginalis* transmission[22,25,42] with consistent significantly higher prevalence rates in those with lower level of education. Therefore, proper counselling and education on sexual behaviour and genital hygiene is necessary for control and prevention of *T. vaginalis* during pregnancy.[22] The high prevalence of STIs among housewives is surprising. However, this could be as a result of the uneven distribution of the group compared to others in the survey. The high prevalence in traders is similar to other reports.[39,43] Implicated in this is their more active social life with little or no preventive measures.

The high occurrence of STIs in women whose partners have a history of STIs is expected. Therefore, the screening of both sexual partners is advocated to prevent the spread of STIs. Of more importance is the high prevalence of STIs in those without knowledge of their partners' STI status. This further stresses the need for each partner to know their STI status and make informed decisions regarding their sexual behaviour.

A limitation in this study was the use of a single HVS sample from the pregnant women for the diagnosis of *T. vaginalis*. The true prevalence of the disease might therefore be underrepresented. Similarly, the use of a questionnaire to estimate the prevalence patterns of other STIs and the low number of pregnant women recruited in this category might as well lead to underpresentation of the true infection status.

This study showed a high prevalence of maternal *T. vaginalis* infection in the study population. The routine screening of pregnant women for *T. vaginalis* during antenatal consultations should be prioritized to abate probable adverse effects on the foetus. Retesting for *T. vaginalis* is recommended for all sexually active women within three months following initial treatment with 500 mg of metronidazole twice a day for seven days. Concurrent treatment of all sex partners is critical for symptomatic relief, microbiologic cure, and prevention of ongoing transmission and reinfections.[44] Emphasis should be placed on the education of women about safe sex and the need to know their partners' STIs status. Standard and accessible health care services should be made available for all for the effective management of STIs.

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Declaration of Conflicting Interests

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