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Candida albicans and *Trichomonas vaginalis*: High prevalence and risk factors in women attending a Gynaecology clinic in Jos, Nigeria

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ABSTRACT

Background: *Candida albicans* and *Trichomonas vaginalis* are commonly associated with other Sexually Transmitted Diseases (STDs) and comprise markers of high-risk sexual behavior. **Aim:** To determine the prevalence and risk factors associated with *Candida albicans* and *Trichomonas vaginalis* infections in Jos, Nigeria. **Methods:** A total of one hundred and fifty (150) high vaginal swab specimens were collected from women attending the Gynecological Clinic, Plateau State Specialist Hospital, Jos, Nigeria. The specimens were examined microscopically for motile trichomonads, hyphae, pseudohyphae and budding yeast cells. Culture was carried out on SGA (Sabouraud's Glucose Agar Medium) and germ tube test was also done. Identification of the isolates was done according to microscopic morphology on SGA, and germ tube formation. The data obtained were analyzed using SPSS incorporated. Chi-square values of $p \leq 0.05$ were considered significant. **Results:** *Candida albicans* was detected in 48(32.0%) of the population studied while *Trichomonas vaginalis* was detected in 5.3% of the population. Occurrence of *Candida albicans* with age showed a decrease in occurrence with an increase in age from 19(35.8%) to 2 (28.0%) in age groups 15-25 and 46-55 years respectively, ($p > 0.05$). In relation to marital status, married women had higher infection rates of 38(36.2%) and 6 (5.7%) for both *Candida albicans*, ($p > 0.05$) and *Trichomonas vaginalis*, ($p > 0.05$) respectively. There were higher rates of *Candida albicans* infections in women who used oral contraceptives, antibiotics ($p < 0.05$) and those that were pregnant. **Conclusion:** The prevalence of *Candida albicans* in the study population was high while the prevalence of *Trichomonas vaginalis* was low. These infections can have serious adverse effects on women's reproductive health; hence intervention initiatives should be taken to reduce their prevalence.

Introduction

Vaginal Candidiasis (VC) is a common occurrence in clinical medicine and a frequent cause for hospital visits by women [1]. Consequently,

about 75% of reproductive age women will experience at least one episode of VC in their lifetime [2]. Half of these women will also have a

repeat episode while 5.8% will have multiple occurrences yearly. *Candida albicans* (*C. albicans*) is responsible for most cases of vaginitis in the United States [3-6], and commonly implicated in 75% of cases of vaginal discharge [7]. *Candida albicans* has been the most isolated species although *C. glabrata* and *C. tropicalis* have also been identified [8]. Studies globally show that *C. albicans* accounts for 20- 80% of all cases of vaginal candidiasis worldwide, and vaginal colonization is more common in immuno-compromised persons [8]. Human vaginal yeast infections could be an indication of underlying health issues. Moreover, recurrent and resistant infections could be an early indication of HIV infection [9]. Donne first described *Trichomonas vaginalis* (*T. vaginalis*), the causative agent of Trichomoniasis in 1930. Earlier considered a harmless commensal of the vagina, it is now known to cause vaginitis and sometimes cervicitis in both sexes [10]. Although, *T. vaginalis* has a number of serious health consequences, it still remains an under-recognized condition [11]. Several studies in African populations report trichomoniasis prevalence to range between 11% and 25%. Epidemiological evidence suggests *T. vaginalis* infection to be commonly associated with STDs, as well as a common marker of high risk sexual behavior [12]. Several studies reveal an association between candidiasis and trichomoniasis with HIV [9, 12]. In the light of these evidences, adequate screening and treatment of *C. albicans* and *T. vaginalis* infections are necessary to promote health and aid in control of HIV and other STIs which if allowed to continuously spread will deter economic growth as a result of their associated morbidity and mortality rate. This study aims to determine the prevalence and risk factors of *C. albicans* and *T. vaginalis* infections in women attending the Gynaecology Clinic of Plateau State Specialist Hospital, Jos, Nigeria.

Materials and methods

Study area and population

The study was carried out at the Plateau State Specialist Hospital, Jos North (9°56'N 8°53'E/9.933°N 8.883°E), Plateau State, Nigeria. The hospital is a public health facility with a Gynaecology clinic where samples were collected and a microbiology laboratory where samples were analyzed. The study population consisted of women from ages 16-57 years who attended the

Gynaecology Clinic of the Plateau State Specialist Hospital, Jos.

Ethical consideration

Clearance from the ethical committee in Plateau State Specialist Hospital, Jos was obtained in accordance with the code of ethics for biomedical research involving human subjects (REF. NHREC/05/01/2010b). Informed consent was obtained from all study participants according to the guidelines of the Plateau State Specialist Hospital, Jos, Plateau State, Nigeria.

Sample size and collection

As described by Naing [13], a representative sample size was calculated. Two high vaginal swabs (HVS) were collected from the patients after seeking their consent and administering questionnaires to them. A hundred and fifty (150) (HVS) were collected from the subjects as described by Mabey et al. [14].

Microscopic examination of high vaginal swabs

A saline wet mount of HVS was microscopically examined for budding yeast or pseudohyphae and motile *T. vaginalis* trophozoites. A drop of 10% potassium hydroxide was added and microscopic examination was repeated for budding yeast and pseudohyphae. Candidiasis diagnosis was confirmed by the presence of fungal elements in either preparation respectively.

Culture of high vaginal swab specimens

The other swab specimens collected were inoculated on solidified Sabouraud's Glucose Agar (SGA) medium, and streaked using a sterile wire loop. The inoculated medium was incubated at 37°C for 24-48 hours.

Germ tube test

Small amount of sera (0.5ml) were transferred into clean sterile test tubes using a transfer pipette. Fungal colonies grown on (SGA) were picked using sterile wire loops and inoculated into the sera. The mixtures were shaken properly until slightly cloudy, and then cotton wools were used to plug the mouth of the tubes and incubated at 37°C for 2-3 hours. Dropping pipettes were used to transfer drops of the inoculums to microscope slides and examined using the x 10 and x 40 objectives for germ tubes formation and pseudohyphae. Identification of *C. albicans* depended on the presence of germ tubes.

Assessment of risk factors

Socio-demographic and behavioural data were collected using a structured questionnaire and analyzed statistically.

Statistical analysis

The data obtained were analysed using SPSS Version 15.0. Chi-square values of $p < 0.05$ were considered significant.

Results

Of the 150 high vaginal swabs analyzed, 48(32.0%) and 8(5.3%) were positive for *C. albicans* and *T. vaginalis* infections respectively in women attending the Gynecology Clinic of the Plateau State Specialist Hospital, Jos. The occurrence of *C. albicans* decreased with increase in age, with age group 16-25 years having 19(35.8%) and age group 46-55 years having 2(28.0%). In relation to marital status, married women had the highest occurrence of 38(36.2%) while single women had 10(23.3%) for *C. albicans*. *Candida albicans* occurrence in relation to pregnancy, use of oral contraceptives and antibiotic treatment showed that the subjects who said yes with regards to questions on these risk factors had higher occurrence rates than those who said no (Table 1).

The occurrence of *T. vaginalis* infection in relation to age showed that the group 26-35

years had the highest infection rate of 4(7.1%), followed by age group 36-45 years which had a rate of 2(6.5%). Age groups 46-55 years and 55-65 years had no infection rate. For *Trichomonas vaginalis*, the highest occurrence of 6(5.7%) was recorded in married women while single women had an occurrence rate of 2(4.6%). The occurrence of *T. vaginalis* in relation to previous case of STI showed that those who have had an STI have an occurrence rate of 1(2.9%) while those who had not, have an occurrence rate of 7(7.0). In relation to level of education, those without any formal education had no occurrence rate (0.0%) while those with primary, secondary or tertiary education had occurrence rates of 1(5.0%), 4(6.6%) and 3(4.5%) respectively. Those who knew about *T. vaginalis* infection had no occurrence rate while those who did not know about the infection had a rate of 8(6.2%) (Table 2).

Table 1. Socio-demographic factors associated with *C. albicans* infection among women attending a Gynaecology clinic in Jos, Nigeria

Variable	Number tested	Number positive	Prevalence (%)	p -value
Age (Years)				
16-25	53	19	35.8	>0.05
26-35	56	17	30.3	
36-45	31	9	29.0	
46-55	7	2	28.0	
>55	1	1	33.3	
Marital status				
Married	105	38	36.2	>0.05
Single	43	10	23.3	
Divorced	2	0	0.0	
Pregnancy				
Yes	12	5	41.7	>0.05
No	138	43	31.2	
Antibiotic treatment				
Yes	43	21	48.8	<0.05
No	107	27	25.2	
Use of oral contraceptives				
Yes	53	25	47.2	<0.05
No	97	23	23.0	
Knowledge of <i>Candida albicans</i>				
Yes	30	9	30.0	>0.05
No	120	39	32.5	

Table 2. Socio-demographic factors associated with *T. vaginalis* infection among women attending a Gynaecology clinic in Jos, Nigeria

Variable	Number tested	Number positive	Prevalence (%)	<i>p</i> - value
Age				
16-25	53	2	3.7	>0.05
26-35	56	4	7.1	
36-45	31	2	6.5	
46-55	7	0	0.0	
>55	3	0	0.0	
Marital status				
Married	105	6	5.7	>0.5
Single	43	2	4.6	
Divorced	2	0	0.0	
Previous case of STI				
Yes	34	1	2.9	>0.05
No	116	7	6.0	
Education				
Non-formal	20	0	0	>0.05
Primary	20	1	5.0	
Secondary	61	4	6.6	
Tertiary	67	3	4.5	
Knowledge of <i>T. vaginalis</i>				
Yes	21	0	0.0	>0.05
No	129	8	6.2	

Discussion and conclusion

The occurrence rate of *C. albicans*, 48(32%) in this study agrees with world estimates of genital *Candida* species colonization range of 17% in Turkey to up to 30% in a United States study of asymptomatic young women [15]. However, this finding contrasts that of 15(9.9%) reported among Kenyan Sex workers [16]. The occurrence of *T. vaginalis*, 8(5.3%) was lower than prevalence rates of between 11% and 25% reported for African populations [12]. Also, a study by **Laga et al.** reported that twenty-five percent of university students in Nigeria tested positive for *T. vaginalis* [17]. The prevalence of candidiasis was also determined to be 42.3% (95% confidence interval [CI] 3.8%) while the prevalence of trichomoniasis was 9.8% (95% [CI] 2.3%) in a study by **Limia et al.** using an immunologic latex agglutination test [1].

The prevalence of *T. vaginalis* infection varies according to investigators and subjects. In late 2007, a CDC study in 3,754 women between 14-49 years reported a prevalence of 3.1% for *T. vaginalis* [17]. The occurrence rate of *C. albicans* was observed to partly decrease with an increase in age of the subjects ($p > 0.05$). This is in line with a study by **Trama et al.** [8] in the USA who observed that the overall positivity and detection of *C. albicans* were significantly associated with age group, as age increases, the positivity rate of *C. albicans* gradually decreases. Age group 15-25 years had the highest occurrence of 19(35.8%) while the lowest occurrence of 2(28.0%) was observed in age group 46-55 years. Differences in the occurrence of *C. albicans* with age could be attributed to hormonal changes with age which could change the vaginal environment and characteristics of vaginal flora hence either encouraging or discouraging infection. In addition practices such as douching and the impact of pregnancy, antibiotics and elevated oestrogen levels may also have affected vaginal colonization by *C. albicans* [6]. Higher occurrence rate of *C. albicans* infection in married women, ($p > 0.05$) could also be attributed to the fact that contraceptive usage is more common in married women as family planning measures than in single women. This observation is in line with a study by **Lindau et al.**, who observed that contraceptive use and elevated oestrogen levels are risk factors for *C. albicans* [19]. The higher occurrence of *T. vaginalis* in Married women, 6(5.7%), as opposed to singles or divorced women, 2(6.4%) and 0(0.0%)

respectively, ($p > 0.05$) may be due to a higher frequency of sexual activity and less use of Condoms as contraception or STI prevention measures in married women [19]. The higher occurrence rates of 4(7.1%) and 2(6.5 %) for *T. vaginalis* infection in the middle age groups of 26-35 years and 36-45 years, as opposed to occurrence in other age groups, ($p > 0.05$) can be partly attributed to high sexual activity and this is in accordance with a previous study by **Leon et al.** in which the age group of 36-40 years which was described as the period of greatest sexual activity had the highest prevalence [20]. Older age has been reported as a risk factor for trichomoniasis [21]. Although, contrary to the finding in our study, this could be due to epidemiological peculiarities and other disparities such as a lower sample size used in this study [22]. Occurrence of the infections in relation to educational level shows that for *C. albicans*, there is a decrease in occurrence from primary to secondary level of education. Those with at most primary education had the highest occurrence of 55% while the least occurrence of 19.4% was observed in those who had attained the tertiary level of education. This could be because those with higher education are more enlightened about these infections and their preventive measures unlike those with lower levels of education. The relationship between *T. Vaginalis* infection and educational level was not significant ($p > 0.05$) and differs from that of a previous study by **Leon et al.** in Peru probably due to certain differences in population Characteristics [20]. Knowledge of *C. albicans* and *T. vaginalis* infection was also observed to affect the occurrence rates. The percentage of women who had these infections was higher for those women who did not have knowledge about the infections than for those who admitted to knowing something about these infections with ($p > 0.05$) for *C. albicans* and ($p > 0.05$) for *T. vaginalis*. This may be due to the fact that women who know about these infections take more precautions against them than women who do not know about the infections. The relationship between previous history of STI and occurrence of *T. vaginalis* showed that there is a higher occurrence in women who have not had previous cases of STIs, ($p > 0.05$) which may be due to the disparity in population of women who have had an STI ($n=34$) and those who had not ($n=116$). It could also be due to more care and precaution taken by women who have had an STI than those who have not had any STIs. Occurrence of *C. albicans* infection in relation

to pregnancy ($p>0.05$), antibiotic treatment ($p<0.05$), use of oral contraceptives ($p<0.05$) may be as a result of changes in vaginal microflora which can predispose an individual to overgrowth of *C. albicans* and infection [13]. The high occurrence rate of *Candida albicans* infections can have serious adverse effects on women's reproductive health; hence measures should be taken to reduce its prevalence. Regardless of the observed low prevalence of *Trichomonas vaginalis* infections in the study population it should not be neglected, because effective control of STDs has been proven to go a long way in the control of HIV/AIDS which is a major problem. The general public should be more educated and enlightened on diseases affecting women's sexual and reproductive health so they can take precautions and preventive measures such as use of alternative but still effective contraceptives, avoiding indiscriminate use of antibiotics, use of condoms and improved personal hygiene. Screening and treatment of both husband and wife in cases of STIs is also necessary as the study shows a higher occurrence of *T. vaginalis* in the married women.

Conflict of interest

None.

Financial disclosure

None to disclose.

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