



PREVALENCE OF *CANDIDA ALBICANS* AND *TRICHOMONAS VAGINALIS* INFECTION AMONG WOMEN PRESENTING WITH VAGINITIS IN JAMA'A HOSPITAL, SAMARU, ZARIA, NIGERIA

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Received: 15th November, 2021 Accepted: 25th December, 2021 Published: 31st December, 2021

ABSTRACT

Background: Vulvovaginal Candidiasis (VVC) is a fungal infection of the female lower genital tract and it is commonly caused by *Candida albicans*. Complications of untreated VVC include abortion, preterm delivery, menstrual disorders and infertility. Trichomoniasis is caused by parasitic protozoa called *Trichomonas vaginalis*. Trichomoniasis is associated with vulvovaginal erythema and frothy yellow-gray or green vaginal discharge. The research aimed to determine the prevalence of *Candida albicans* and *Trichomonas vaginalis* infections among women presenting with vaginitis in Jama'a Hospital, Samaru, Zaria, Nigeria.

Methods: A Total of 100 samples were collected from female patients using sterile swab sticks. The samples were screened for *Candida albicans* and *Trichomonas vaginalis* using cultural and microscopic tests. Structured questionnaires were used to collect relevant data on socio-demographic factors, risk factors, signs and symptoms of the infection from the women.

Results: It was observed that (38%) of the women were positive for *Candida albicans* and (2%) positive for *Trichomonas vaginalis*. It was also noted that women within age group 36-40 years had highest prevalence of *Candida albicans* (57.1%). Prevalence of *Trichomonas vaginalis* among age group 26-30 years was 4.3% and 11.1% among age group 31-35 years. *Candida albicans* was found to be more prevalent among single women (39.6%), non-pregnant women (39.1%), and students (47.8%) compared to married women (36.5%), pregnant women (25.0%), and non-students 30.0% respectively. Non-pregnant women had the higher prevalence of *C. albicans* (39.1%), compared to pregnant women with prevalence of 25.0%. Prevalence of *T. vaginalis* among non-pregnant women was 2.2% and no prevalence was recorded among the pregnant women. Those with multiple sex partners had *C. albicans* prevalence of 46.7% and *T. vaginalis* was 2.2%. Patients with vaginal discharges had *C. albicans* prevalence of 40.0%, and 3.1% for *T. vaginalis*. Patients with dyspareunia had *C. albicans* prevalence of 6.4% and 18.2% for *T. vaginalis*.

Conclusion: It was therefore concluded that 38 out of 100 women attending Jama'a hospital had vulvovaginal candidiasis and 2 out of 100 had trichomoniasis at detectable level. Control measures including health education, treatment of infected individuals, personal hygiene are highly recommended. Further research should also be carried out in the study area to determine prevalence of bacterial vaginitis.

Keywords: Vaginitis, Candidiasis, Trichomoniasis, *Candida albicans*,

INTRODUCTION

Vaginal infections affect women worldwide and could be of exogenous or endogenous origin (Olowe *et al.*, 2014). They are associated with considerable discomfort and adverse outcomes during pregnancy and child birth (Konadu *et al.*, 2019). The

common ones include vulvovaginal candidiasis, bacterial vaginosis, and trichomoniasis (Olowe *et al.*, 2014). Vulvovaginal candidiasis (VVC) is a fungal or yeast infection of the female lower genital tract, the vulva, and the vagina (Emeribe *et al.*, 2015).

Citation: Abdullahi, B. and Danyaya, R. (2021): Prevalence of *Candida Albicans* and *Trichomonas vaginalis* Infection among Women Presenting With Vaginitis in Jama'a Hospital, Samaru, Zaria, Nigeria BJMLS. 6(2):69 - 77

It is caused by *Candida* spp commonly *C. albicans*, *C. glabrata* and *C. tropicalis* (Sobel, 2004). *Candida albicans* is the causative agent in most cases (El Ahmed *et al.*, 2012). Vulvovaginal candidiasis is asymptomatic in about 20 to 50% of healthy women (Ali, 2011). Approximately 75% of the female population suffers at least one episode during their lives (El Ahmed *et al.*, 2012). Pregnancy, diabetes mellitus, and antibiotic treatment are the most common predisposing factors (Cohen, 2000). Some studies have shown that vulvovaginitis has increased in the past three decades due to antifungal resistance in the *Candida* species and a change in women's health quality (Mohanty *et al.*, 2007). Symptoms are thought to be caused by an overgrowth of yeast and its penetration of vulvovaginal epithelial cells (Apalata *et al.*, 2014). The signs and symptoms of uncomplicated VVC include a thick cheese-like discharge associated with vaginal and vulvar pruritus, pain, burning, erythema, and/or edema. Dysuria and dyspareunia may also occur and may result in marital and sexual disharmony. Complications of untreated VVC in pregnancy include chorioamnionitis, abortion, preterm delivery and congenital infection in the neonate. Other complications in the non-pregnant woman include pelvic inflammatory disease, infertility, pelvic abscess, and menstrual disorders (Nnadi and Singh 2017).

Trichomoniasis is caused by parasitic protozoa called *Trichomonas vaginalis* and it is the most prevalent non-viral sexually transmitted infection worldwide with an estimated 180 million infections acquired annually (Nelson and Macones, 2002). *Trichomonas vaginalis* usually found in the vagina, cervix and periurethral gland (Workowski and Berman, 2010). Approximately, 25% of women with trichomoniasis infection are asymptomatic. Symptomatic patients experience signs and symptoms such as vulvovaginal erythema,

dysuria, pruritus, edema, frothy yellow-gray or green vaginal discharge and an elevated pH (> 6) (Arleneet *et al.*, 2007).

Reproductive women are an appropriate group for studying vaginal infection. This is due to the risk of infection in pregnant and non-pregnant women. As such, this study will be conducted to determine the prevalence of *C. albicans* and *T. vaginalis* with their associated socio-demographic and risk factors among women presenting with vaginitis in Jama'a Hospital, Samaru, Zaria, Nigeria.

METHODOLOGY

Study Area and Ethical Approval

The study was carried out at Jama'a Hospital, Samaru, Zaria-Nigeria. Ethical approval was requested from the hospital management.

Sample Size and Study Population

The sample size was determined using data from a prevalence study conducted in Abuja, Nigeria with a prevalence of vulvovaginal candidiasis of 6.5%, as demonstrated by Anthony *et al.*, (2015). Therefore, the minimum sample size required for this study with a 5% margin of error and 95% confidence level was 94. However, 100 High Vaginal Swab specimens were collected from women presenting with vaginitis and attending Jama'a Hospital Samaru, Zaria-Nigeria. The study population consisted of both pregnant and non-pregnant who were attending the hospital and presenting with vaginitis.

Sample Collection

High Vaginal Swab (HVS) sample was aseptically collected from the patients through the assistance of the medical laboratory scientists using sterile cotton swab stick.

The samples were labeled appropriately with patient's information regarding their ages and pregnancy status including trimester of pregnancy.

Samples collected were immediately transported to the Microbiology Laboratory, Department of Microbiology, Ahmadu Bello University, Zaria, Nigeria for immediate analysis.

Identification of *Trichomonas vaginalis*

Microscopic examination was carried out by suspending small portion of the discharge on the high vaginal swab in one drop of 0.85% of physiological saline and cover with cover slip. The wet mount preparations were then examined under X10 and X40 objectives. Using its characteristic morphology and darting motility, *T. vaginalis* can be identified (Akinbo *et al.*, 2017).

Isolation and Identification of *Candida albicans*

The samples collected were inoculated each on the surface of previously dried SDA plate. Primary inoculation was made using the cotton swab stick on each plate and streak out using sterile wire loop. The plates were kept at room temperature for 2-3 days and were examined for white cream colonies characteristic of *Candida* spp. A smear of the suspected *Candida* spp colony was prepared on a clean grease-free slide, air dry, heat fixed and Gram stained as described by Cheesbrough (2006). Abundant budding yeast cells with hyphae are indication of *C. albicans*.

Germ-Tube Test

Small inoculum of suspected *Candida* cultures was inoculated into 0.5 ml of human serum in a test tube and was incubated at 37°C for 3 hours. After incubation, a loop-full of culture was placed on a glass slide, overlaid with a cover-slip and was then examined microscopically for the presence or absence of germ-tubes. Formation of germ tubes was seen as long tube like projections extending from the yeast cells with no constriction or septa at the point of attachment to the yeast cells. This is a confirmatory test for the identification of *Candida albicans* (Alembanch *et al.*, 2014).

Statistical Analysis

Data on socio-demography, risk factors and

symptoms of *Candida albicans* and *Trichomonas vaginalis* among the women were subjected to statistical analysis by chi-square and odd ratio of 95% confidence interval using IBM SPSS version 23.

RESULTS

Out of 100 high vaginal swabs (HVS) examined, the overall prevalence of *Candida albicans* was 38 (38.0%), while the overall prevalence for *Trichomonas vaginalis* was 2 (2.0%) as shown in Figure 1. Table 1 shows the prevalence of *C. albicans* and *T. vaginalis* in relation to age groups.

The highest prevalence of *C. albicans* was found in 36-40 years (57.1%) age groups, while the lowest prevalence of *C. albicans* was recorded in 31-35 years (22.2%) age groups. *Trichomonas vaginalis* was only observed in the 26-30 years (4.3%) and 31-35 years (11.1%) age groups.

Table 2 shows the prevalence of *C. albicans* and *Trichomonas vaginalis* based on socio-demographic factors. Single women had highest prevalence of *C. albicans* (39.6%) than married women (36.5%), while for *T. vaginalis*, married women had (3.8%) and no occurrence was recorded for single women.

Those with secondary level of education had highest prevalence of *C. albicans* (54.5%) than those with primary education (50.0%) and tertiary education (38.9%), *Trichomonas vaginalis* was only observed among women with secondary level of education with prevalence of (4.5%). In relation to occupation, the highest prevalence of *C. Albicans* was recorded among students (47.8%), than employed women with (25.0%) and unemployed with (30.0%). Prevalence of *T. vaginalis* was observed among unemployed female patients (4.0%) and no record on students and employed female patients for *T. vaginalis*.

Table 3 shows the risk-factors associated with *Candida albicans* and *Trichomonas vaginalis* infections.

Prevalence of Candida albicans

In relation to pregnancy status, it was observed that non-pregnant women had the higher prevalence of *C. albicans* (39.1%), while pregnant women had the lower prevalence of (25.0%). Prevalence of *T. vaginalis* was observed among non-pregnant with (2.2%) and no prevalence was recorded among the pregnant women. In relation to multiple sex partners, *C. Albicans* prevalence was 46.7% and *T. Vaginalis* was 2.2%.

Table 4 shows prevalence of the infections in relation to signs and symptoms. Patients with vaginal discharges had *C. albicans* prevalence of 40.0%, and of 3.1% *T. vaginalis*. Patients with vaginal itching had *C. albicans* prevalence of 38.8% and 3.0% *T. vaginalis*. Patients with dysuria had *C. Albicans* prevalence of 39.7% and 2.7% *T. vaginalis*. Patients with dyspareunia had *C. Albicans* prevalence of 6.4% and 18.2% *T. vaginalis*.

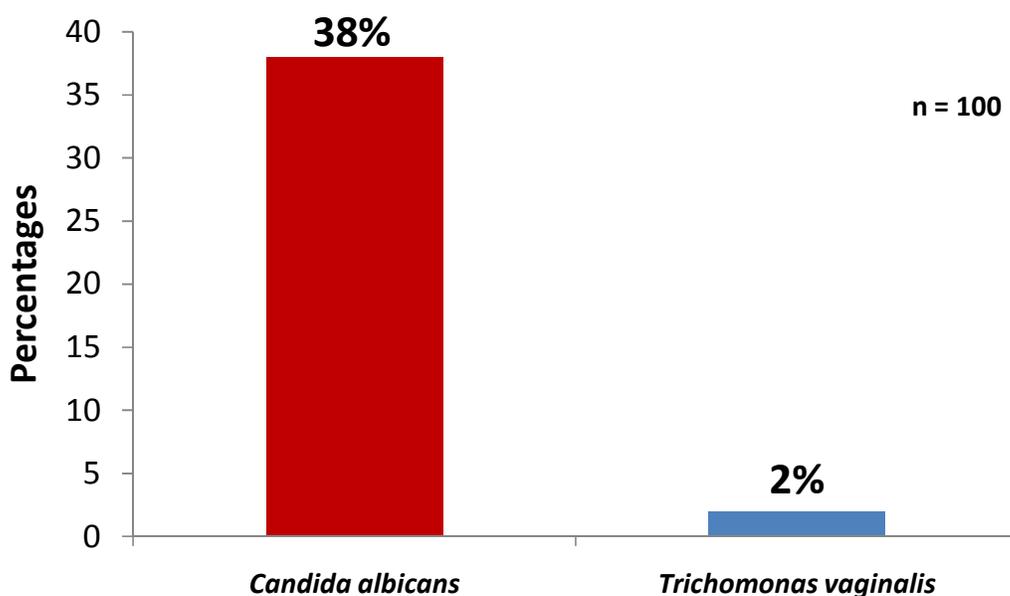


Figure 1: Prevalence of *Candida albicans* and *Trichomonas vaginalis*

Key: n = Number of Sample Collected

Table 1: Prevalence of *C. albicans* and *T. vaginalis* in Relation to Age

Age-Group (Years)	n	<i>C. albicans</i> (%)	χ^2	P-value	<i>T. vaginalis</i> (%)	χ^2	P-value
16-20	20	9(45.0)	4.115	0.533	0(0.0)	5.846	0.321
21-25	39	16(41.0)			0(0.0)		
26-30	23	6(26.1)			1(4.3)		
31-35	9	2(22.2)			1(11.1)		
36-40	7	4(57.1)			0(0.0)		
41-45	2	1(50.0)			0(0.0)		

Key: n = Number of Sample

Table 2: Prevalence of *Candida albicans* and *Trichomonas vaginalis* Based on Socio-Demographic Factors

Socio-Demographic Factor	Category	n	<i>C. albicans</i> (%)	χ^2	P-value	<i>T. vaginalis</i> (%)	χ^2	P-value
Marital Status	Married	52	19(36.5)	0.098	0.754	2(3.8)	1.884	0.170
	Single	48	19(39.6)			0(0.0)		
	No response	21	8(38.1)			1(4.8)		
Educational status	Informal	19	3(15.8)	6.669	0.154	0(0.0)	2.708	0.608
	Primary	2	1(50.0)			0(0.0)		
	Secondary	22	12(54.5)			1(4.5)		
Occupation	Tertiary	36	14(38.9)	3.530	0.171	0(0.0)	2.041	0.360
	Employed	4	1(25.0)			0(0.0)		
	Student	46	22(47.8)			0(0.0)		
	Unemployed	50	15(30.0)			2(4.0)		
	No Response	21	8(38.1)			1(4.8)		

Key: n = Number of Sample

Table 3: Prevalence of *C. albicans* and *T. vaginalis* Infections based on risk factors

Risk factor	n	<i>C. albicans</i> (%)	χ^2	P-value	<i>T. vaginalis</i> (%)	χ^2	p-value
Multiple Sex Partners							
No Response	55	17(30.9)	2.608	0.016	1(1.8)	0.021	0.886
None	45	21(46.7)			1(2.2)		
Pregnancy							
No	92	36(39.1)	0.624	0.430	2(2.2)	0.177	0.674
Yes	8	2(25.0)			0(0.0)		

Key: n = Number of Sample

Table 4: Prevalence of *C. albicans* and *T. vaginalis* based on symptoms

Symptoms	Category	n	<i>C.albicans</i> (%)	χ^2	P-value	<i>T. vaginalis</i> (%)	χ^2	P-value
Vaginal discharges	No	35	12(34.3)	0.315	0.574	0(0.0)	1.099	0.295
	Yes	65	26(40.0)			2(3.1)		
Vaginal itching	No	33	12(36.4)	0.056	0.831	0(0.0)	1.005	0.316
	Yes	67	26(38.8)			2(3.0)		
Dysuria	No	27	9(33.3)	0.342	0.559	0(0.0)	0.755	0.385
	Yes	73	29(39.7)			2(2.7)		
Dyspareunia	No	89	34(38.2)	0.014	0.906	0(0.0)	16.512	0.000
	Yes	11	4(36.4)			2(18.2)		

Key: n = Number of Sample

DISCUSSION

From the results, 38% prevalence of Vulvovaginal candidiasis (VVC) and 2% of trichomoniasis were obtained. The prevalence patterns were similar to the ones reported by Olowe *et al.* (2014), in Southwestern Nigeria where prevalence of vulvovaginal candidiasis was 36%, while that of trichomoniasis was 2%. However, our vulvovaginal candidiasis prevalence was higher than 10% reported in Abakaliki, South-Eastern Nigeria by Alo *et al.* (2012), and this may be due to variation in study time. The prevalence of trichomoniasis was lower than vulvovaginal candidiasis and seems to have declined when compared with earlier reports (Taylor *et al.*, 2013). The low prevalence of trichomoniasis in this research could be due to self-medication of trichomoniasis, high socioeconomic status of the women sampled or improved personal hygiene. This agrees with report of Okonko *et al.* (2012), who reported 1.5% prevalence of *T. vaginalis* in Ibadan; and Adeoye and Akande (2007), who also reported 0.6% prevalence in Lagos. Trichomoniasis is a disease mainly in women, where it may be asymptomatic (Uneke *et al.*, 2005); this may suggest its lower prevalence. The low prevalence of trichomoniasis in our study may also be attributed to the test method used. A study by Asmah, concluded wet mount method had very low sensitivity in detecting trichomoniasis using (PCR) as the gold standard (Asmah, 2018). The higher index of infection by *Candida albicans* in our study was in consistent with the ones reported in other studies that have determined it to be the principal cause of vaginitis in Europe (Kent, 1991). The prevalence has also been reported to be higher in specific regions, such as in the Mining Triangle of Brazil (Abad and Lima, 2001).

It was also observed that all the age groups had high prevalence of candidiasis. The age group 36-40 years had the highest prevalence (57.1%), followed by age group 41-45 (50.0%), while age group 16-20 had 45.0%.

This is not surprising as the distribution by age corresponds with the age in which most females ovulate; ovulation is very common in females not younger than 16 years or older than 45; and it is one of the risk factors associated with candidiasis. During this period, the ovary produces adequate amount of estrogen, which favours *Candida* growth by maintaining the acidic pH in the vagina and enhancing the yeast adherence to vaginal epithelial cells (Adetunde *et al.*, 2011). Poor vaginal hygiene practices may also accounted for high prevalence of candidiasis in our study population. The age groups 26-30 and 31-35 years had 4.3% and 11.1% prevalence of trichomoniasis respectively, while it was not detected in other age groups. This may be as a result of the fact that female age groups 26-30 and 31-35 years are more sexually active than other age groups. However there was no significant association between the age and the vaginal infections with p -value >0.05 . The infections rate may also be attributed wearing of tight fitted clothes without air spaces and use of broad spectrum antibiotic which are the predisposing factors for candida and trichomonas infection (Ahmad *et al.*, 2016).

It was found that 36.5% of the married women were infected with *Candida* (candidiasis), and 3.8% of the married women were infected with trichomoniasis, this presupposed that sexual activities have some effect on candidiasis and trichomoniasis. This presumption agreed with report by (Tanko and Mukhtar, 2009). Pregnancy does not appear to affect prevalence of candidiasis in this research, because the highest prevalence rate of candidiasis 39.1% and trichomoniasis 2.2% was found among non-pregnant women. However there was no significant association between the pregnancy status and the vaginal infections with p -value >0.05 . This could be due to improvement in the hygiene of the pregnant women, or visitation to ante-natal clinics regularly.

However, this contradicts report by Zira and Machido (2009), who reported a higher prevalence of candidiasis among pregnant women attending General Hospital Birnin Kudu, and report of Omorodion (2018), with higher prevalence of trichomoniasis among pregnant women in Zaria.

High prevalence of *Candida albicans* was found among students 47.8% compared to unemployed 30.0% and employed 25.0% female patients and high prevalence of trichomoniasis was found among unemployed 4.0%. This could be attributed to student and unemployed women's involvement in sexual activities, unprotected sex, multiple sex partners and other predisposing factors. This suggestion agreed with report of Okonko *et al.*(2012), who reported that sexually transmitted diseases are more prevalent among sexually active women. *Candida albicans* was found to be the most frequent cause of candidiasis in this research (38%). This is due to the ability of *Candida albicans* to adhere to vaginal epithelial cells readily. This agrees with report of Zira and Machido (2009).

Vaginal discharges, vaginal itching and dysuria were not found to be associated with vulvovaginal candidiasis and trichomoniasis in this study. Though, there was high prevalence of vulvovaginal candidiasis among patients with vaginal discharges, vaginal itching and dysuria symptoms, but they were not associated with the infections. However there was significant association between dyspareunia and trichomoniasis (18.2%) in this study with p -value <0.05. This agrees with report of Ijeoma *et al.* (2018).

CONCLUSION

It was observed that (38%) of the 100 female patients sampled were positive for vulvovaginal candidiasis and (2%) were positive for trichomoniasis. There was higher prevalence of vulvovaginal candidiasis among the studied population than trichomoniasis. Prevalence of vulvovaginal

candidiasis was high among all the age groups. Age group 36-40 years had the highest prevalence (57.1%), followed by age group 41-45 (50.0%), while age group 16-20 had 45.0%. Single women had 39.6% prevalence of vulvovaginal candidiasis and 0.0% of trichomoniasis, while married women had 36.5% prevalence of vulvovaginal candidiasis and 3.8% of trichomoniasis. Those with secondary educational status had 54.5% prevalence of vulvovaginal candidiasis and 4.5% of trichomoniasis. Women with primary educational status had 50.0% prevalence of vulvovaginal candidiasis and 0.0% of trichomoniasis. Students had 47.8% prevalence of vulvovaginal candidiasis and 0.0% of trichomoniasis. Women with no multiple sex partners had 46.7% prevalence of vulvovaginal candidiasis and 2.2% of trichomoniasis. Out of the 92 non-pregnant women sampled, 39.1% were positive for vulvovaginal candidiasis, while, 2.2% were positive for trichomoniasis. There was significant association between women with dyspareunia and trichomoniasis in this study and they have infection rate of 18.2%. Other symptoms were not found to be associated with the infections in this study.

RECOMMENDATION

There is a need to educate women on sexually transmitted diseases (STDs), personal hygiene because they predispose women to *T. vaginalis* and *C. albicans* infections respectively. Laboratory staff should analyze samples immediately after collection, especially when trichomoniasis is suspected. Newer and effective drugs for STDs should be produced and sold at subsidised prices.

ACKNOWLEDGEMENT

Our profound gratitude goes to the Management of Jama'a Hospital, Samaru, Zaria-Nigeria, for the ethical approval given to carry out this research.

Prevalence of Candida albicans

Also, we acknowledge the technical assistance and support rendered by staff of

the Hospital during the collection of samples for this study.

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