

The Epidemiology of *Trichomonas vaginalis*, *Gardnerella vaginalis* and *Candida albicans* Co- Infections in Women Attending the Yaounde University Teaching Hospital

Dickson Shey Nsagha^{1,*}, Denis Zofou², Jules Clement Nguedia Assob³, Anna Longdoh Njunda³, Che Denis Nchang³, Neville MvoNgum³, Weledji Elroy Patrick⁴, NgoweNgowe Marcelin⁴

¹Department of Public Health and Hygiene, Faculty of Health Sciences, University of Buea

²Biotechnology Unit, Faculty of Science, University of Buea

³Department of Medical Laboratory Sciences, Faculty of Health Sciences, University of Buea

⁴Department of Surgery, Obstetrics and Gynaecology, Faculty of Health Sciences, University of Buea, Buea, Cameroon

*Corresponding author: nsaghads@hotmail.com, dsnsagha@gmail.com

Received May 03, 2014; Revised January 07, 2015; Accepted April 27, 2015

Abstract Background: Vulvovaginitis is one of the most common problems in health care delivery, and constitutes one of the main purpose that drive women for obstetrics and gynecological consultations in developing countries. **Purpose:** To determine the prevalence of *Gardnerellavaginitis*, *Candidaalbicans* and *Trichomonas vaginalis* co-infection among women and to investigate the contributions of some socioeconomic factors on these infections. **Methods:** A cross-sectional study was conducted from March to July 2013 on 249 women attending the University Teaching Hospital Center Yaoundé, Cameroon for gynecological, antenatal, and post natal reasons. The detection of *Gardnerella vaginalis*, *Candidaalbicans* and *Trichomonas vaginalis* was done microscopically using vaginal swabs. A structured questionnaires was used to collect participants` socioeconomic data. Data was analysed on SPSS. **Results:** 68.7% of the participants had genital infections including 41.0% for *Gardnerella vaginalis*, 26.5% for *Candidaalbicans*, and 1.2% for *Trichomonas vaginalis*. Non-pregnant women had statically higher prevalence than pregnant women ($P < 0.01$). Women between 26-40 years had the highest prevalence of each pathogen, although this was not statistically significant. Prevalence was found to be significantly higher with increasing education although women with secondary education were found to have significant values than those with post-secondary education ($P < 0.01$). **Conclusion:** The high prevalence of genital infections warrants the implementation of constant health education and sensitization especially among women of child bearing age who are at risk of preterm labor or birth and low birth weight. Epidemiological analytical studies are necessary in this environment to shade more light on risk factors and control strategies.

Keywords: *Gardnerella vaginalis*, *Candidaalbicans*, *Trichomonas vaginalis*, gynecology, socioeconomic

Cite This Article: Dickson Shey Nsagha, Denis Zofou, Jules Clement Nguedia Assob, Anna Longdoh Njunda, Che Denis Nchang, Neville MvoNgum, Weledji Elroy Patrick, and NgoweNgowe Marcelin, "The Epidemiology of *Trichomonas vaginalis*, *Gardnerella vaginalis* and *Candida albicans* Co- Infections in Women Attending the Yaounde University Teaching Hospital." *American Journal of Epidemiology and Infectious Disease*, vol. 3, no. 2 (2015): 28-31. doi: 10.12691/ajeid-3-2-2.

1. Background

Vulvovaginitis, characterized by vaginal discharge and/or vulvar itching, vagina irritation and vagina odour are the most frequent and common reasons for women visiting gynecologist or obstetrician. Bacterial vaginosis, candidiasis and trichomoniasis are responsible for about 90% of the cases of infectious origin [1] and have been linked to premature labour, preterm delivery, low birth weight, increase prenatal mortality as well as predisposing them to HIV/AIDs and cervical cancer [2,3].

Bacterial vaginosis is a synergistic infection caused by a complex alteration in the microbial flora of the vagina with an up to 1000 fold increase in *Gardnerella vaginalis*

and a decrease in lactobacilli. [4] It usually presents with no symptoms but could be accompanied by vaginal irritation, vaginal discharges and fish-like odour. [5,6] *Candida albicans* is the most commonly implicated fungi infection of the vagina and vulva characterized by severe itching, burning sensation, soreness, irritation and whitish-grey cottage cheese-like discharge often with a curd-like appearance. [7] The protozoa *Trichomonas vaginalis* a sexually transmitted parasite causing vulvovaginitis characterized by intense frothy yellow-greenish vaginal discharges, irritation and pain in the vulva, perineum and thighs, and dyspareunia and dysuria [8].

Worldwide, there have been varying prevalence of these pathogens, grossly due to differences in participants` characteristics and in sociodemographic/socioeconomic factors. In Cameroon, there have been a few previous

reports about the frequency of these health conditions. The prevalence of trichomoniasis has been reported to be 17.6% - 20%, [9,10] *Gardnerella vaginalis* has presented prevalence between 15.2% and 17.6%, [11,12] and *Trichomonas vaginalis* between 16.6% and 29%. [12,13] However, most of these results were peculiar to a certain group of participants such as sex workers, HIV/AIDS individuals and did not take into consideration sociodemographic and socioeconomic characteristics on the prevalence. Therefore, the objective of the present study was to determine the prevalence of *Gardnerella vaginalis*, *Candida albicans* and *Trichomonas vaginalis* among women attending the University Hospital Center, Yaounde and to investigate the contributions of some socioeconomic factors on the prevalence of these infections.

2. Materials and Methods

2.1. Study Design and Settings

A cross-sectional study was carried out at the University Teaching Hospital Center Yaoundé, Cameroon from March to July 2013. The participants comprised female patients who had been received by the gynecologists working at the University Hospital Center, Yaoundé. All the participants were 15 years and above and satisfied three basic inclusion criteria: were not on their menstrual period or were at least 3 days after the last menses, had not douched the morning of the test and had not urinated at least one hour before specimen collection. Vaginal swabs were collected through a sterile speculum using aseptic techniques with help of nurses and doctors.

2.2. Laboratory Identification of Microorganisms

Trichomonas vaginalis was identified by making wet mounts of vagina swabs and viewing for viable organism under x10 and x40 objectives of the light microscope. *G. vaginalis* was identified using two different methods; Whiff-amine test and Gram staining. Whiff-amine test was used to test for the production of a fishy ammoniacal smell and Gram staining was used for identification of bacterial vaginosis through vaginal flora typing. The vaginal flora were divided and labelled into four different types: Type I for slides which had only Gram positive bacilli indicating normal vaginal flora; Type II for slides which had Gram positive bacilli and few other bacteria; Type III for slides which had few Gram positive bacilli and many other bacteria indicating bacterial vaginosis and Type IV for slides which had no Gram positive indicating bacterial vaginosis. *Candida albicans* was identified through a step-wise process. Wet mounted slides were examined for budding yeast cells and pseudohyphae using the germ tube test. Gram staining was examined for the presence of yeast cells. For the positive slides, their corresponding swab sticks were cultured on Chloramphenicol-impregnated Sabouraud for further confirmation. Culture plates with white to cream colored, smooth, glabrous yeast-like in appearance were isolated and a confirmatory test was performed by transferring a few of the colonies into human serum which were subsequently viewed under the microscope for the identification of tube-like yeast cells.

2.3. Data Management and Analyses

Structured forms used in collecting data were checked each working day for completeness and correctness in filling by one of the main investigators. Data was keyed in on Microsoft excel and exported to SPSS (Statistical Package for Social Sciences). Statistical analyses were performed on SPSS version 17.0. Frequencies and percentages were used to present categorical variables while means and standard deviations or median and inter-quartile range were used to present numerical variables. Chi-square test was used for categorical variables while the independent student t-test was used to compare means for continuous variables for the evaluation of the differences and the significant level was set at $P < 0.05$.

2.4. Ethical and Administrative Clearances

All aspects of the study were conducted in accordance to the Declaration of Helsinki and conformed to international ethical standards. An ethical approval was obtained from the Institutional Review Board of the Faculty of Health Sciences, University of Buea while the administrative clearance was issued by the Director of University Hospital Center, Yaounde. Eligible females who fitted the inclusion criteria were free to participate in the study after been correctly educated on the benefits and risks of the study. The consent of all patients was sought and gained before data collection.

3. Results

A total of two hundred and forty nine patients visiting the University Teaching Hospital Center Yaoundé were included in the study. From speculum examinations, a total of 203 (81.5%) participants had abnormal discharge and 171 (68.7%) participants had confirmed infections. Table 1 shows the contribution of *Gardnerella vaginalis*, *Candida albicans* and *Trichomonas vaginalis* to the overall prevalence. *Gardnerella vaginalis* had the highest prevalence [102(41.0%)] while *Trichomonas vaginalis* had the least prevalence [3(1.2%)]. The prevalence of *Gardnerella vaginalis* and *Candida albicans* in conjunction with *Trichomonas vaginalis* among the infected participants was found to be 1.8% and 24.4% between *Gardnerella vaginalis* and *Candida albicans* respectively.

Table 1. Distribution of the various organisms according to prevalence

Organism	N0	No (N=249)
<i>Gardnerella vaginalis</i>	102	41.0
<i>Candida albicans</i>	66	26.5
<i>Trichomonas vaginalis</i>	3	1.2
Total	171	68.7

Sixty eight (27.3%) of the participants were pregnant. Among the pregnant women, 30 (44.11 %,) [n=68] were positive for vulvovaginitis while among the 181 non-pregnant participants 141 (78%, N= 181) had genital infections (Table 2). The prevalence of vaginal infections was statistically significantly different between pregnant and non-pregnant women ($P < 0.001$). However the prevalence of a particular organism was insignificantly associated with pregnancy status ($P > 0.05$).

Table 2. Prevalence of infections among pregnant and non-pregnant women

Status	<i>Gardnerella vaginalis</i> No (%)	<i>Candida albicans</i> (%) ^a	<i>Trichomonas vaginalis</i> No (%)	Total No(%)
Pregnant	18(17.6)	12(18.2)	0(0.0)	30(17.54)
Not pregnant	84(82.4)	54(81.8)	3(100.0)	141(82.46)
Total	102(59.65)	66(38.60)	3(1.75)	171(100)

The participants were aged from 15 to 56 years with a mean age of 28.7±7.7 years and a median age of 28 years. The ages were stratified into three categories; < 25 years, 25-40 years and > 40 years. Women between 26-40 years had the highest prevalence of each of the infections, but

this was not statistically significant ($P > 0.05$) (Table 3). 72 (42.11%, N=171) of the participants with genital infections were inpatients while 99 (57.89%, N=171) were outpatients and the prevalence of particular infections was insignificant with regards to admission status (Table 4).

Table 3. Prevalence of genital infections with respect to age groups

Age range	<i>Gardnerella vaginalis</i> No(%)	<i>Candidaalbicans</i> (%) ^a	<i>Trichomonas vaginalis</i> No(%)	Total No(%)
<25	39(38.2)	30(45.5)	0(0.0)	69(40.35)
26-40	63(61.8)	36(54.5)	3(100.0)	102(59.65)
>40	0(0.0)	0(0.0)	0(0.0)	0(0.00)
Total	102(59.65)	66(38.60)	3(1.75)	171(100)

Table 4. Prevalence of genital infections with respect to admission status

Admission status	<i>Gardnerella vaginalis</i> No (%)	<i>Candidaalbicans</i> (%) ^a	<i>Trichomonas vaginalis</i> No (%)	Total No(%)
Inpatient	42(41.2)	27(40.9)	3(100.0)	72(42.10)
Outpatient	60(58.8)	39(59.1)	0(0.0)	99(57.90)
Total	102(59.65)	66(38.60)	3(1.75)	171(100)

Married women had a higher prevalence (83, 48.5%, N= 171) of genital infections compared to the single women and widows. However, the acquisition of a particular genital infection with marital status was not significantly significant. With regards to level of

education, the results were divided into four categories; no formal education, primary education, secondary education and post-secondary education (Table 5). Participants with secondary education were found to have significant higher prevalence of infections than the others ($P < 0.01$).

Table 5. Prevalence of infections by level of education

Level of education	<i>Gardnerella vaginalis</i> No (%) ^a	<i>Candidaalbicans</i> (%) ^a	<i>Trichomonas vaginalis</i> No (%)	Total No(%)
No formal education	15 (14.7)	07 (10.6)	0(0.0)	22(12.90)
Primary	09 (8.8)	15 (22.7)	1 (33.3)	25(14.62)
Secondary	64 (62.8)	25 (37.9)	2 (66.3)	91(53.22)
Post secondary	14 (13.7)	19 (28.8)	0 (0.0)	33(19.30)
Total	102(59.65)	66(38.60)	3(1.75)	171(100)

4. Discussion

In the current study, the prevalence of specific confirmed infections was 68.7% which is higher than the 14.7% and 14.2% reported in Nigeria by Ojiyiet al [14] and Ngokere et al [15] respectively. However, the result is similar with that of Assobet al who reported a 50.90% prevalence of genital infectious among women in Buea, Cameroon [12]. *Gardnerella vaginalis* was common among the study participants with a prevalence of 41% which is higher than the 15.2% reported by Mbuet al [11] and 17.6% reported by Assob et al. [12] The prevalence of *Candida albicans* was 26.5% which is in conformity with the results of Njunda et al [13] and Assob and coworkers [12] in the same study country. However, Mbu and colleagues [11] have reported a higher prevalence (35.4%) of *Candida albicans* in Cameroon. A low prevalence (1.2%) was observe for *Trichomonas vaginalis* which is lower than the 10,6% reported by Mbu et al [11] and the

20% reported amongst sex workers. [10] These variations in prevalence are related to the differences in the type of techniques used in the isolation of the pathogens, differences in patients' characteristics, and the presence or absence of symptoms in the study participants.

Significantly the prevalence of genital infections was different between pregnant and non-pregnant women. The prevalence of genital infections was statistically higher (78% versus 44.11%) in non-pregnant women than in pregnant women. This could be an indication of an effective health education during prenatal clinics where the implications of these infections especially relating to preterm labour or birth and low birth weight were probably highlighted to the pregnant women.

Participant's age was not significantly associated with genital infections although higher incidences were found almost women aged between 26-40 years; an age range involved with a lot of procreation. This is in conformity with the results of Ojiye et al and Adinma et al. [14,16] A few cases were also observed in women who were > 40 years. This might be because women of such ages are

thought to be at end of their reproductive life and this is in agreement with results from Ojijee et al [14].

The prevalence of genital infections in the current study was not statistically affected by the admission status of the participants, as the results of the inpatients were not significant from that of the out patients. Married women had a higher prevalence of infections than single women and widows although the association was not significant ($P > 0.05$). This is not in concordance with the work of Ojijee et al who reported that married women were less prone to genital infections by virtue of their stable life style with one sexual partner. [14] However, the higher prevalence among married women could be but not exclusively attributable to sexual promiscuity of their husbands whom might serve as carriers of the infection.

The prevalence of genital infections was strongly associated with the level of education ($P < 0.01$). Prevalence was higher in educated women compared to those without education. Among the educated women, those with secondary education had significantly higher prevalence from those with primary or tertiary education. Educated women are usually richer and have more affluence in the society than their uneducated peers. To keep with this standard, many of them turn to indulge in the frequent usage of medicated soaps for douching in an attempt to keep their skin clean and healthy but which might be a strong contributing factor to the higher prevalence of genital infections.

5. Conclusion

The high prevalence of specific infections among women who are still of child bearing age is a call for more health education and sensitization among women as these infections have been shown to be linked to preterm labour or birth, premature rupture of membranes, endometritis and low birth weight. The association between genital infections and certain socioeconomic variables such as level of education in this study sets a platform for epidemiological cohort studies that may incorporate many sociodemographic and socioeconomic variables that might be useful for the development of risk scoring.

Competing Interests

The authors have no competing interests to declare.

Authors' Contributions

DSN, DZ, JCNA, ALN and NNM designed the study, oversaw data collection and supervised the work, participated in data analysis, drafted the manuscript and substantially revised it for academic content; CDN collected the data for the study, performed the analysis and drafted the manuscript; WEP and NMN drafted the

manuscript and substantially revised the manuscript for academic content. All authors read and approved the final copy of the manuscript.

Acknowledgements

We acknowledge the efforts of all the participants who gave their consent and participated in the study. We extend our sincere appreciations to the Director of the Yaounde University Teaching Hospital for permitting us use their facility. We thank all the nurses, doctors and laboratory staff of CHU Yaounde for their full cooperation in data collection.

References

- [1] Friedrich EG Jr. Vaginitis. *Am J ObstetGynecol* 1985; 152(3): 247-51.
- [2] Schwebke J R, Burgess D. Trichomoniasis. *ClinMicrobiol Rev* 2004; 17 (4):794-803.
- [3] Turovskiy Y, Sutyak N K, Chinkindas M L. The aetiology of bacterial vaginosis. *J ApplMicrobiol* 2011; 110(5):1105-28.
- [4] Sobel J D. Non trichomonal purulent vaginitis: clinical approach. *Curr Infect Dis Rep* 2000; 2(6):501-505.
- [5] Sobel JD. Bacterial vaginosis. *Br J ClinPract Suppl.* 1990 Sep; 71: 65-9.
- [6] Schwebke, J.R; Asymptomatic bacterial vaginosis. *Am J Obstet Gynecol.* 2000; 183(6): 1434-1439
- [7] Mackay MD. Gynecology. In: Tierney LM, McPhee SJ, Papadakis MA, editors. Current Medical Diagnosis & Treatment. Connecticut: Appleton & Lange; 1998:691-723.
- [8] Nanda N, Michel R G, Kurdgelashvili G, Wendel KA. Trichomoniasis and its treatment. *Expert Rev Anti Infect Ther* 2006; 4(1): 125-35.
- [9] Buve A, Weiss HA, Laga M, Van Dyck E, Musonda R. The epidemiology of trichomoniasis in women in four African cities. *Int J STD AIDS* 2001; 15 (4):S89-96.
- [10] Ryan KA, Zekeng L, Roddy RE, Weir SS. Prevalence and prediction of sexually transmitted diseases among sex workers in Cameroon. *Int J STD AIDS* 1998; 9(7):403-407.
- [11] Mbu ER, Kongnyuy EJ, Mbopi-Keou FX, Tonye RN, Nana PN, Leke RJ. Gynecological morbidity among HIV positive pregnant women in Cameroon. *Reprod Health.* 2008; 3(9): 5:3.
- [12] Assob NJC, Weledji EP, Njunda AL, Bolimo F, Asongalem EA, Kamga FHL, Achidi EA, Penlap BV, Ndumbe PM. Bacteriological and Mycological characterization of some pathogens of the urogenital tract in Buea Sub-Division (South West Region Cameroon) *Health Sci. Dis.* 2009;10 (3): 10-16.
- [13] Njunda AL, Nsagha DS, Assob JCN, Kamga HL, Teyim P. In vitro antifungal susceptibility patterns of *Candida albicans* from HIV and AIDS patients attending the Nylon Health District Hospital in Douala, Cameroon. *J Publ Health Afr* 2012; 3 (1):e2.
- [14] Ojiji ED, Okeudo C, Anolue F, Audu B, Nggada H. The prevalence and predictors of genital tract infections in cervical cytology specimens at a University Teaching Hospital. *Inter J GynecolObstet* 2012; 16(1).
- [15] Ngokere AA, Ofordile PM. Cytological evaluation of cervical smears in the university of Nigeria Teaching Hospital, Enugu and environs. A 5 years study. *Orient J Med.* 1996; 8:49-52.
- [16] Adinma JL, Okwoli RN, Agbai AO, Unnaeze NC. Gardnerella vaginalis vaginosis in Nigerian Igbo women. *Trop J ObstetGynaecol* 2000; 17: 21-23.