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Prevalence of STI Pathogens in HIV- Infected and Non-Infected Women: Implications for Acquisition and Transmission of Hiv in Nigeria

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Abstract: The prevalence of STI pathogens in HIV- infected and non infected women attending HIV and STI clinic of the Olabisi Onabanjo University Teaching Hospital (OOUTH), Sagamu, Ogun state, Nigeria was compared for possible implications in the acquisition and transmission of HIV. The study involved the collection of urine and vagina swabs using sterile universal bottles and Evapon swab sticks respectively from 100 females of which 34 were HIV-positive and 66 HIV- negative. The samples were screened at the Babcock University Microbiology Laboratory for the presence of *Trichomonas vaginalis*, *Candida albicans*, pus cells and bacterial vaginosis. Twelve percent of HIV-positive patients were infected with *T. vaginalis*, 77% with *C. albicans*, 68% with bacterial vaginosis and 35% with pus cells (indicates the presence of cervical infections). Only 2% of the HIV-negative patients were infected with *T. vaginalis* 20% with *C. albicans,* 40% with bacterial vaginosis and 5% with pus cells. The statistical analysis showed a significant difference in the infection rates between HIV infected and non- infected patients ($p<0.05$). Since STIs are not only associated with their own morbidity, but also facilitate sexual transmission and infectivity of HIV, there is therefore the need for aggressive prevention, testing and treatment of STIs in order to reduce acquisition and transmission of HIV.

Keywords: *Bacterial vaginosis*, *Candida albicans*, HIV, infected and non-infected, pus cells, *Trichomonas vaginalis*

INTRODUCTION

Sexually Transmitted Infections (STIs) are worldwide public health problem. Most of these infections affect the reproductive system causing Reproductive Tract Infections (RTIs) (Tortora *et al*., 2001). They are most often transmitted by direct contact during sexual activities that prevent the pathogen from exposure to the hostile conditions in the inanimate environment. The implicated organisms in the transmission of STIs belong to the group of bacteria, viruses, yeast and protozoa (Tortora *et al*., 2001; Prescott *et al*., 2002). *Candida albicans* and *Trichomonas vaginalis* are few opportunistic members that could grow abnormally when the vagina ecosystem or the urethra in male has a distorted environmental balance (Mckane and Kandel, 1996). Increase in the vaginal pH could also lead to Reproductive Tract Infections (RTIs) and bacterial vaginosis. Studies have proved that some infections or co-infections have the chance of increasing the risk of HIV transmission. STIs associated with hepatitis B and C, genital warts and herpes, *T. vaginalis* infections of *Chlamydia trachomatis, Nessieria gonorrhoeae* and even candidiasis enhance the acquisition and transmission of HIV (Njoku *et al*., 2000; Tortora *et al*., 2001; Sturm, 2002; Stenger, 2004).

Other factors which contribute to the risk of HIV transmission include sex during menses, sex with a partner with rapid progression of immunodeficiency, traumatic sex and presence of systematic disease conditions that lead to inflammation of the vaginal epithelium or cervix such as ulcerative disease, infection with *Gonorrhoeae*, *Chlamydia* or *Trichomonas* exposes HIV-susceptible cells, primarily monocytes and lymphocytes to infected fluid during intercourse (Juba, 1999; Sturm, 2002; Stenger, 2004). In addition, the presence of cervical ectopy in adolescents, or in women on exogenous estrogens including oral contraceptives, HIV susceptible cells, sub mucosal Langerhan's, can exposed this group to HIV infected semen during intercourse (Juba, 1999).

Male to female sexual transmission of HIV infection is more efficient than female to male sexual transmission, this is so because there is a higher viral inocula in the male ejaculate, which has cell-free and cellular HIV and semen dwells in the vagina which has a larger surface area for 2 to 3 days, providing a long period of time for

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the virus to penetrate barriers and find appropriate receptors in the sub-mucosa (Juba, 1999; Stenger, 2004). The presence of herpes, hepatitis B and C, genital warts facilitate the acquisition and transmission of HIV in women during sexual intercourse while gonorrhea, Chlamydia, syphilis, chancroid, untreated Candida and Trichomonas infections causes ulceration of the mucosa membrane of vagina, creating a direct entrance for the HIV into the bloodstream (Wald and Link, 2002). Bacterial vaginosis, which is the common cause of abnormal vaginal discharge in women of childbearing age is characterized by an overgrowth of anaerobic organisms leading to the replacement of Lactobacilli and an increase in vaginal pH from less than 4.5 to as high as 7.0. Bacterial vaginosis increases incidence of vaginal cuff cellulites and abscess formation, which also enhances the risk of acquiring and transmitting HIV (DTB, 1998; CEG, 2001). The high prevalence of untreated STI has been a major factor facilitating the spread of HIV-1 in Africa; with the synergistic infection between HIV-1 transmission and genital herpes (Corbett *et al*., 2002). Three recent studies in rural Tanzania have shown that acquisition of Herpes Simplex Virus-2 (HSV-2) increased the risk of HIV-1 acquisition (Corey *et al*., 2004). Recurrent of *Candida albicans* infections are the most common initial symptom of HIV infection in women and at the same time one of the most common complications experienced (Common GYN Conditions, 2004). The present study compared the level of occurrence of STIs between the HIV infected and non-infected patients with the aim to enhance HIV prevention and public health awareness.

MATERIALS AND METHODS

Study area: The study was conducted from January to April 2007 through recruiting volunteered HIV infected and non-infected women attending Olabisi Onabanjo University Teaching Hospital (OOUTH), Babcock University and Kolmop Diagnostic Centre in Ogun state, Nigeria.

Sample collection and analysis: Urine samples were collected from a total of 34 HIV patients and 66 non-HIV patients using sterile universal bottles, which specifically allowed for a single usage. The swabs were deep into normal saline, which serve as a transport medium to avoid desiccation. Direct microscopy and wet preparation for direct microscopy were made from the urine and vagina swabs respectively for the detection of yeast cells, clue cells, with bacteria, pus cells and *Trichomonas vaginalis*. Enzyme Link Immunosorbent Assay (ELISA) was used to test for HIV following the principle of antigen-antibody reactions.

The yeast cells have a budding characteristics, the *Trichomonas vaginalis* has a jerky movement and stains blue with Leishman's stain. Further studies were done to certify the result; the yeast cells were cultured using Sabouraud Dextrose Agar (SDA) prepared as 13.0g in 500ml of deionized water and sterilized under a pressure of 1bs/sq. inch at 121ºC for 15 min. The swabs and urine samples were cultured in agar between 24 to 48 days at 25 and 30ºC (Delost, 1997).

The urine samples were centrifuged at 36000 rpm for 15 min, while the sediments placed on clean slides were viewed with 40_X power lens of the microscope for the presence of pus cells, clue cells, *T. vaginalis* and yeast cells. The pHs of the samples contained in the normal saline with pH of 7.0 was taken using the pH meter and the difference became the pH of the samples. Bacterial vaginosis was examined using an Amsel criterion, which includes the fulfillment of three of the following four criteria;

- Presence of abnormal vagina discharge (thin, white, homogenous discharge)
- Elevated vaginal pH (>4.5)
- Positive amine odor test (on adding 10% potassium hydroxide)
- The presence of clue cells coated with bacilli on vaginal Gram smear

Nugent system or criteria using a scoring system from 0 to 10 based on the number of lactobacilli, gram-negative to gram-variable bacilli, and gram-negative curved bacilli (DTB, 1998; CEG, 2001; Myziuk *et al*., 2003). The scorings were defined as;

- Grade 1:(Normal) Lactobacillus morphotypes predominate and this had scores between 0 and 3
- Grade 2 (intermediate) mixed flora with some lactobacilli present, but Gardnerella and or Mobiluncus morphotypes are also present and this had scores between 4 and 6
- Grade 3 (Bacterial vaginosis) no lactobacillus, morphotypes of Gardnerella and or Mobiluncus predominate and this had scores between 7 and 10

Statistical analysis: The data obtained from samples were analyzed using percentages and Chi-Square. Results were accepted to be significant at $p<0.05$.

RESULTS

The study showed that 26(76%) of the 34 HIV positive patients had *C. albicans* infection which occurred in large number compared to other STI pathogens while 13 (19.69%) of the 66 non infected respondents had

Table 1: The occurrence of STI pathogens in HIV infected and non-Infected patients.

Organisms	HIV positive (n = 34)	HIV negative (n = 66)	Total (n = 100)
T. vaginalis	4 (11.79%)	1(1.52%)	5 (5%)
Candida albicans	26 (76.47%)	13 (19.69%)	39 (39%)
Pus cells	12 (35.29%)	3 (4.55%)	15 (15%)
Bacterial vaginosis	23 (67.65%)	26 (39.39%)	49 (49%)
Total	65 (52.31%)	43 (65.15%)	108

Table 2: Age distribution of STI pathogen among seropositive and seronegative patients.

	Seropositive (n = 34)				Seronegative (n = 66)			
Age range	*T. vaginalis*	*C. albicans*	Pus cells	Bacterial vaginosis	*T. vaginalis*	*C. albicans*	Pus cells	Bacterial vaginosis
< 20	0(0.00%)	2(5.88%)	2(5.88%)	2(5.88%)	0(0.00%)	2(3.03%)	1(1.52%)	11(16.67%)
21-30	2(5.88%)	4(11.76%)	2(5.88%)	3(8.82%)	1(1.52%)	7(10.61%)	0(0.00%)	7(10.61%)
31-40	2(5.88%)	11(32.35%)	6(17.65%)	12(35.29%)	0(0.00%)	2(3.03%)	1(1.52%)	3(4.55%)
41-50	0(0.00%)	5(14.71%)	2(5.88%)	5(14.71%)	0(0.00%)	0(0.00%)	0(0.00%)	0(0.00%)
>50	0(0.00%)	2(5.88%)	0(0.00%)	1(2.94%)	0(0.00%)	0(0.00%)	0(0.00%)	0(0.00%)
Total	4(11.76%)	24(70.59%)	12(35.29%)	23(67.65%)	1(1.52%)	11(16.67%)	2(3.03%)	21(31.82%)

C. albicans infection (Table 1). There was no significant difference in the occurrence of *C. albicans* between the two groups ($\chi^2 = 3.841$, df = 1, $p>0.05$).

However, 4 (11.8%) of the 34 HIV infected patients had the protozoa, *T. vaginalis* as against 1.5% recorded for non-HIV patience (Table1), but no statistical difference ($\chi^2 = 3.841$, df = 1, $p>0.05$).

Of the 34 HIV patients, 23 (67.65%) showed the presence of bacterial vaginosis while 26 (39.39%) of the 66 seronegative patients had the infection (Table 1), and no significant difference was observed ($\chi^2 = 3.841$, df = 1, $p>0.05$).

In HIV patients, 12/34 (35.29%) had pus cells while 3/66 (4.55%) non HIV patients showed the presence of pus cells, (Table 1), again this showed no significant difference ($\chi^2 = 3.841$, df = 1, $p>0.05$). The presence of pus cells is an indication of cervical infections, which could be *Nessieria gonorrhoeae* and or *Chlamydia trachomatis* infections.

In all, *C.albicans* occurred in largest number (96.4%) compared to other STI pathogens.

The age distribution of the pathogenic organisms of STI showed that the respondents between age 31 and 40 had the highest occurrence 37/100 (37%) (Table 2).

DISCUSSION

Results from this study showed that HIV especially type 1 is more prevalence and it occurs more in women than in men in the study population (Report from the patients' case file). Previous reports showed that this is in agreement with the findings of Stenger (2004), which stated that ejaculation from infected men, contain cell-free and cellular HIV. It is also in agreement with Juba (1999) and Stenger (2004) who reported that semen dwell more in vagina (2 to 3 days) and the virus can easily overcome the barriers and penetrate to locate the receptors in the sub-mucosa since vagina provides a larger surface area for the virus.

Majority of the women were of the childbearing age, the HIV infection could be as a result of promiscuity which agrees with the report of Sample EPID 168 Commentary (1997) at the same time the presence of bacterial vaginosis was found in a large proportion among the HIV infected people which could also promote the acquisition and transmission of HIV as stated by DTB (1998) and CEG (2001) bacterial vaginosis among HIV patients amounts to 23 (67.65%) while non-HIV infected patients were 26 (39.39%) care should be taken and cross examination should be made to find out those with bacterial vaginosis and to administer adequate treatment to prevent them from acquiring HIV since bacterial vaginosis can increase the chance of acquiring HIV as discussed in DTB (1998) and CEG (2001).

Those HIV patients who had *T. vaginalis* [4 (11.76%)] also showed the presence of bacterial vaginosis, pus cells as well as candidiasis. These observations were similar to that of Njoku *et al.* (2000) who showed that the prevalence of *T. vaginalis* among females of sexually active age increases the risk of HIV-1 infection since it causes haemorrhage and ulceration through which HIV can enter. Pus cells characterized the presence of cervical infections which could be caused by *N. gonorrhoeae*, *C. trachomatis* which could result into complications like Pelvic Inflammatory Disease (PID) were more in HIV patients this agrees with the report found in Sample EPID 168 Commentary (1997) which stated that diseases like gonorrhea, syphilis, herpes simplex virus, and chancroid increase the risk factor of HIV transmission. Therefore, those patients that had suffered any of these infections and did not have a thorough treatment may have acquired HIV through sexual intercourse. *Candida albicans* infection occurred more in HIV patients because the HIV compromises with the immune system and as a result of infections that could increase the pH of the vagina occurred. This and the use of contraceptives like female condom could be responsible for the increase in the population of HIV

patients that had the infection [26 (76.47%)]. The use antibiotics also could increase the pH level as stated by Common GYN Conditions (2003) that recurrent infections of *Candida albicans* are the most common initial symptoms of HIV infection in women and one of the most common complications experienced. From the STI pathogens distribution by age (Table 2), it showed that the group of women that were heavily infected are those that are found between the age group of 21-30 and 31-40, these groups are the sexually active and childbearing group. This agrees partly with Njoku *et al*. (2000) which said that study on *T. vaginalis* which has it that female between the age of 26 and 35 years could be more sexually active and promiscuous since sexual intercourse is the major means of transmission.

This study showed that *C. albicans* was more prevalent in HIV infected patients while bacterial vaginosis was a common STI in both HIV infected and uninfected patients. The high occurrence of STIs in HIV infected people perhaps might have led to the high blown of HIV infection or epidemics. It is therefore advisable to have a random test for STIs and to treat the infected people as early as detected in order to reduce the rate of HIV transmission particularly via sexual intercourse. The presence of STIs accelerates HIV infection progression and this has implication for the adoption of new approaches by the health workers for early diagnosis and to intensify public health surveillance as well as planning control programmes.

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