Seroprevalence of *Chlamydia trachomatis* Among HIV Patients Attending Faith Alive Hospital, Jos, Plateau State

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ABSTRACT

Infection caused by *Chlamydia trachomatis*, is the most common curable bacterial sexually transmitted disease. *Chlamydia trachomatis* (CT) has been given the status of a global pathogen by the World Health Organization (2006) and yet no routine screening of CT is carried out in Nigerian hospitals and this has called for more needed researches in Nigeria. Growing evidence indicates that active chlamydial infection is an important risk factor facilitating sexual transmission of HIV infection. So far, very little information has been documented on the co-infectivity of *Chlamydia trachomatis and HIV* in Jos, Plateau State.

CT infection and HIV infection have interrelationship independent of the sexually transmissible risk factors. Therefore, this study was carried out to determine the prevalence of genital *Chlamydia trachomatis* and Human Immunodeficiency Virus among women attending Plateau State Specialist Hospital, Jos. The result of this study shows that the HIV epidemic has disproportionately affected people living in economically-deprived areas, establishes a clear synergy between HIV, Chlamydia and other bacterial Sexual Transmitted Infections resulting from their mutual heterosexual transmission modes, and underscores the high risk of the multiple infections to individuals and the community as the infected, but untreated women (in their sexually active age), constitute a reservoir of the infections for continuous transmission to the entire community. Impacts of this epidemiological synergy, which range from increased potential of further dissemination of HIV and faster progression to the active disease, AIDS, additionally predispose the infected individuals who are mostly young people in their reproductive and economically most productive age to societal ills including ostracization and stigmatization.

(Keywords: sexually transmitted infections, HIV, Chlamydia, Jos, Nigeria, risk factors, coinfection)

INTRODUCTION

Chlamydial infection is caused by *Chlamydia trachomatis*, a coccoid bacillus closely related to Gram negative bacteria (Mawak, et al., 2011). Chlamydial infection is the most common curable bacterial sexually transmitted disease (CDC, 2006, WHO, 2011). However, the diagnosis of gonococcal and chlamydial infections can be difficult, especially among women, as approximately 70-80% of cases exhibit non-specific symptoms (Land,et al., 2009; Rours,et al., 2011).

The incidence of chlamydial infections in women has increased dramatically from 79 to 467 per 100,000 between 1987 and 2003 (Sexually transmitted disease surveillance, 2003). According to the World Health Organization (WHO, 2011), 101 million chlamydial infections are detected annually worldwide. In the U.S. the Centre for Disease Control and Prevention (CDC) estimates that 2.8 million people are infected each year (CDC, 2006). Approximately 4 million cases reported each year in the USA alone with paucity of information about the pathogen in Nigeria and other sub Saharan Africa (Wilson, et al., 2000). The highest prevalence in the USA is in people <25 year of age (Wilson, et al., 2000).

In 2003, (Ngandjigo, et al., 2003) screened 1277 Cameroonian students and found over 44% positive to molecular screening. CT has recently been given the status of a global pathogen by the (WHO, 2006) and yet no routine screening of CT is carried out in Nigerian hospitals and this has

called for more needed researches in Nigeria. Information about relative frequency of CT in Nigeria is sparse. However, some studies have implicated Chlamydia trachomatis as a major cause of infections in Africa.

Chlamydia trachomatis (CT) has been given the status of a global pathogen by the (WHO, 2006) and yet no routine screening of CT is carried out in Nigerian hospitals and this has called for more needed researches in Nigeria. Chlamydia trachomatis poses a serious public health problem not only as a result of its asymptomatic infections but also due to its ability to change the epitome of its major antigen (Manju, et al., 2011).

A major problem with CT infection is its ability to remain latent for a very long time (Nelson and Helfand, et al., 2001) and then comes with very serious sequelae if left untreated. Such sequelae can include pelvic inflammatory diseases (PID), cervicitis, salpingitis, endometritis and infertility (Bennett and Garrett, 2001).

Growing evidence indicates that active chlamydial infection is an important risk factor facilitating sexual transmission of HIV infection. So far, very little information has been documented on the co-infectivity of *Chlamydia trachomatis and HIV* in Jos, Plateau State. The increasing cases of CT associated co-infection with HIV among the local populace in Jos, therefore necessitates this study. The general health impact and paucity of data on this deadly disease and its association with heterosexual transmission of HIV infection in Jos, Nigeria, has resulted in an upsurge of interest in the prevalence of the disease and the associated complications and/or adverse outcomes.

Growing evidence indicates that active CT infection is an important risk factor facilitating sexual transmission of HIV infection, and several observed high rates of CT assumes significance in view of risk of HIV transmission and spread.

Further observation indicated that HIV positivity significantly correlated to CT infection; the combined epidemiology of these infections may partly be due to the fact that STDs including HIV and CT have common sexual/behavioral risk factors including premarital sex and multiple partnership, therefore, it may be appropriate to conclude that all sexual/behavioral factors could potentially interplay for the acquisition of these infections (Brunham, et al., 1996).

CT infection and HIV infection have interrelationship independent of the sexually transmissible risk factors. These include: the invasive intracellular pathogenesis of CT which can cause substantial damage to the genital epithelial layer thereby facilitating HIV infection; immunological changes due to HIV infection which may favor CT infection and the interrelationship between the two infections and mutually associated transmission pattern (Debattista, et al., 2002). Therefore, this study was carried out to determine the prevalence of genital *Chlamydia trachomatis* and Human Immunodeficiency Virus among women attending Plateau State Specialist Hospital, Jos.

MATERIALS AND METHODS

Study Area

The Study area was carried out at Plateau State Specialist Hospital, Jos, Plateau State. It is situated in the northern savannah vegetation. It has an area of 291 km^2 with a population of 429,300 at the 2006 census. The climate is near equivalent to that found in Europe or America. It lies on latitude 5.9 north and longitude 8.5 west. It has the minimum temperature of 17^OC. The maximum mean temperature is 27.2^OC.

Study Population

The study included only women attending Plateau State Specialist Hospital, Plateau State. The minimum sample size for the study was calculated as described by (Downs *et al*., 2011):

$$N = \frac{Z^2 P (1 - P)}{d^2}$$

Where; N = minimum sample size
Z = constant mean deviation (1.96)
P = reported prevalence = 5.0% (0.05)
1 = constant
d^2 = allowable error = 5% (0.05)

$$N = \frac{1.962 \times 0.05 \times (1 - 0.05)}{0.0025}$$

$$= \frac{3.8416 \times 0.05 \times 0.95}{0.0025}$$

$$= \frac{0.182476}{0.0025}$$

= 72.99

≈ 73 samples + 10% attrition (7) = 83 samples.

Therefore, the minimum sample size for the study was 80 samples. This was a three (3) months study of eighty (80) female volunteers (symptomatic and asymptomatic), aged ≥14 years investigated at the hospital.

Study Design

A Cross-Sectional Study was carried out.

Ethical Consideration

Ethical approval was obtained from the Ethical Committee of the Plateau State Specialist Hospital, Jos, Plateau State.

Questionnaire and Oral Interviews

Appropriately structured and vetted questionnaires was administered to participant's intent of study explained to them.

Details of the questionnaire included the following: socio-demographic details, sexual behavior, history of chlamydial infection and allied predisposing factors, and urogenital symptoms including cases of pelvic inflammatory disease (PID), infertility and abortion.

Inclusion and Exclusion Criteria

The inclusion criteria were women ≥14 years old and had been sexually active during the last year. The exclusion criterion was women who had received antibiotics two (2) weeks before the interview.

Sample Collection Techniques

Blood Sample Collection for Human Immunodeficiency Virus Screening: Five (5) ml of blood sample was collected from each participant by venepuncture and stored in venoject vacutainers and allowed to clot. The sera were separated by spinning the blood in a centrifuge at 3000 rpm and stored at -20^{o}C until use.

Swabs Sample Collection: Endocervical swabs of the subjects were aseptically collected using sterile plastic-shaft Dacron swabs.

Screening for Human Immunodeficiency Virus

Screening for HIV antibodies was carried out on patients' sera samples according to Manufacturers' instructions following pre-test counseling and informed consent, using the in vitro test. Post HIV counseling will be given to all HIV positive participants with assurance and maintenance of confidentiality.

Screening for *Chlamydia trachomatis* Antigen

Rapid Screening Test for *C. trachomatis* was carried out using the Chlamydia Rapid Test Device – Swab, a qualitative, lateral flow immunoassay for the detection of Chlamydia antigen from swab samples.

Test Procedure/Principle: This is an antibody-antigen reaction in which antibody specific to the Chlamydia antigen was coated on the test line region of the test device. The extracted antigen solution was reacted with the Chlamydia antibody solidly coated onto particles; the mixture would migrate and subsequent reaction with the Chlamydia antibody on the membrane, generating a colored line in the test-line region.

Test Interpretation: Colored line in the test-line region indicated a positive result; absence of such color showed a negative reaction. However, colored lines in the control-line region authenticated the experiment and indicated adequacy of specimen addition as well as accuracy of experiment.

Statistical Analysis

Data collected was checked for completeness and consistency and then evaluated. Pearson Chi–Square was then used to test differences between symptoms, risk factors and prevalence rate (differences between proportions). Statistical significance was accepted at P≤0.05 (95% Confidence Level).

RESULTS

Prevalence of *Chlamydia trachomatis* and Human Immunodeficiency Virus (HIV) coinfection among women attending Plateau State Specialist Hospital, Jos, is presented in Table 1. Out of a total of 100 samples, prevalence of 2(4.5%) women were positive for both *C. trachomatis* and HIV. The prevalence of *C. trachomatis* was higher in HIV seropositive women as compared to HIV seronegative women.

Table 1: Prevalence of *Chlamydia trachomatis* and Human Immunodeficiency Virus coinfection among women attending Plateau State Specialist Hospital, Jos.

		CT status		Total
		No. positive (%)	No. negative (%)	
HIV status	Positive	2 (4.5)	42 (95.5)	44
	Negative	0 (0.0)	56 (100.0)	56
		2 (2.0)	98 (98.0)	100

Table 2 shows the risk factors, sociodemographic and behavioral characteristics of the participants. The age profile of the entire participants is also shown here. In both the HIV seropositive study group and the HIV seronegative control group, the age group of 31-40 was the predominant age group. It had the highest number of participants and the highest prevalence of *C. trachomatis* and HIV coinfection which was 2 (4.5%).

For the occupational status, prevalence of 1 (3.7%) among students and 1 (2.9%) among the business women was discovered. The percentage coinfection of married women was 1 (2.2%), while those not married was 1 (2.8%). For educational status, percentage prevalence of 1 (3.4%) among those with secondary level of education and 1 (2.3%) among those with tertiary level of education was also discovered.

Table 2: Risk factors, Demographic and behavioral characteristics of the 100 participating women attendees at Plateau State Specialist Hospital, Jos, Plateau State.

Parameter	No. of Sample	CT No. Positive (%)	HIV No. Positive (%)
Age Group (years)			
14 – 20	5	0 (0.0)	1 (20.0)
21 – 25	13	0 (0.0)	3 (23.1)
26 – 30	23	0 (0.0)	6 (26.1)
31 – 40	37	2 (5.4)	19 (51.4)
≥ 41	22	0 (0.0)	15 (68.2)
Total	100	2 (2.0)	44 (44.0)
χ^2		3.475	12.506
p-value		0.482	0.014*
Occupation			
Student	27	1 (3.7)	3 (11.1)
House wife	25	0 (0.0)	12 (48.0)
Civil servant	13	0 (0.0)	7 (53.8)
Business	34	1 (2.9)	22 (64.7)
Total	100	2 (2.0)	44 (44.0)
χ^2		1.316	18.396
p-value		0.725	< 0.001**
Marital Status			
Married	46	1 (2.2)	17 (37.0)
Single	36	1 (2.8)	13 (36.1)
Divorced	6	0 (0.0)	5 (83.3)
Widower/widow	12	0 (0.0)	9 (75.0)
Total	100	2 (2.0)	44 (44.0)
χ^2		0.486	10.283
p-value		0.922	0.016*
Educational Status			
Primary	19	0 (0.0)	1 (100.0)
Secondary	29	1 (3.4)	10 (55.6)
Tertiary	44	1 (2.3)	16 (55.23)
No formal education	8	0 (0.0)	16 (36.4)
Total	100	2 (2.0)	44 (44.0)
χ^2		0.878	7.980
p-value		0.928	0.092
Sexually Active			
Yes	85	2 (2.4)	36 (42.4)
No	15	0 (0.0)	8 (53.3)
Total	100	2 (2.0)	44 (44.0)
χ^2		0.035	0.624
p-value		0.852	0.430
Sex Partners			
Single	81	2 (2.5)	36 (44.4)
Multiple	4	0 (0.0)	3 (75.0)
Total	85	2 (2.4)	39 (45.9)
χ^2		0.479	0.037
p-value		0.787	0.982
Protected sex			
0	11	0 (0.0)	4 (36.4)
Yes	32	1 (3.1)	18 (56.3)
No	57	1 (1.8)	22 (38.6)
Total	100	2 (2.0)	44 (44.0)
χ^2		0.449	2.885
p-value		0.799	0.236

** = statistically significant association exists at $p \leq 0.01$

* = statistically significant association exists at $p \leq 0.05$

Among those with history of sexual contact, the sexually active showed the highest coinfection rate, with the prevalence of 2 (2.4%). Also, women with single sex partners showed a high coinfection rate, with the prevalence of 2 (2.5%). While 15 women decline giving information. The percentage prevalence of women regularly having protected sex by using condoms was 1 (3.1%), 1 (1.8%) do not use condoms. While 11 women use it but not frequently.

There was no significant association between the age group, sociodemographic factors, risk factors and *C. trachomatis*. There was significant association between the age group, occupational status, marital status and HIV infection.

DISCUSSION, CONCLUSION AND RECOMMENDATION

Discussion

C. trachomatis (CT) infection was apparent in the study; with a very low prevalence rate of 2% in the population. The reported prevalence rate of *C. trachomatis* in this study is in consonance with previously reported prevalence of 13.3% in Benin City (Isibor, *et al*., 2005). However, a higher prevalence of 41% has been reported in South-Western Nigeria (Okoror, *et al*., 2007).

The observed prevalence of CT infection in the current study could be intrinsically linked to its mutual relationship and/or co-infectivity with Human Immunodeficiency Virus. Local inflammation of the genital tract caused by *C. trachomatis* promotes HIV shedding, thereby increasing HIV infectiousness (Ho, *et al*., 1995). Moreover, one plausible reason for the decreased prevalence observed in the study could be partly due to the increased awareness of coinfection of CT and HIV among female patients. Since knowledge of coinfection of CT and HIV had been registered to reduce the risk factors associated with the infection (Jorn, *et al.,* 2008).

A mutual and/or synergistic interaction was therefore not observed in the co-infectivity of both infections as in CT infection which facilitates the transmission of HIV. This finding is in consonance with the lower prevalence rates of 10% in Ibadan and 9% in Maiduguri, respectively (Sanders, *et al*., 1994; Darougar, *et al*., 1982).

The lower prevalence rates could represent its endemicity and subsequent silent horizontal and vertical transfer between sex partners as well as under-diagnosis of cases. Since CT is often asymptomatic and is found in latent infections, it is therefore, frequently unreported for diagnosis. However, the women who are at risk in the study location are still not being screened—reflecting, in part, the lack of awareness in the area by appropriate authorities and the limited resources available to support these screenings. In developed countries, access to diagnosis and treatment procedures, low or improved sexual risk lifestyles, and increased knowledge of sexually transmitted infections lowers prevalence of CT.

Based on age, CT infection is predominantly a disease of adolescent girls and young women. The study underscores the prevalence of CT among adults, who have been shown not to be consistently associated with increased risk of chlamydial infection in the population. However, in this study, age-based analysis of the prevalence of CT infection showed no significant relationship, however, age is thus not considered a significant risk factor for CT. According to the research, the incidence of CT infection in women decreases substantially after 30 years of age, likely because the target cell for CT (i.e., the columnar epithelial cell, which is present on the ectocervix of young women [cervical ectopy]) is replaced by squamous epithelium through the process of squamous metaplasia that occurs with age.

Marital and socioeconomic status may not be sturdily linked; however, the responses indicated the preponderance of CT among single and married people only within 31-40 age brackets. This is representing the most vulnerable and sexually active age bracket. The observed trend of events in the surveyed area is attributable to socioeconomic levels, chiefly student 1 (3.7%), business 1 (2.9%) as well as Secondary 1 (3.4%) and Tertiary 1 (2.3%) educational status.

Prevalence of CT and HIV coinfection associated with risk factors among those with history of sexual contact, the sexual active show the highest coinfection rate. Also, women with single sex partners showed a high coinfection rate.

Other findings contradicted that socioeconomically disadvantaged women had a significantly higher prevalence due to poverty

and/or economic hardship and associated sexual promiscuity and multiple sex partnering (Dibua, 2010). This view however, contradicted by other reports which showed preponderance of CT among married rather than single people (Mawak, *et al*., 2011).

Sexual activities predisposing to sexually transmitted infections and especially, HIV/AIDS and CT are therefore unconsciously and unwittingly indulged in. The implication therefore, is that, the probability of getting infected with CT has a direct relationship with the age of commencement of sexual intercourse; in other words, predisposing to CT is a function of age of onset of sexual activity. The most plausible explanation, therefore, is that; the earlier the age of onset of sexual activity, the greater the chances of acquisition of CT. This finding is in agreement with reports of coworkers.

CONCLUSION

The result of this study shows that the HIV epidemic has disproportionately affected people living in economically-deprived areas, establishes a clear synergy between HIV, Chlamydia and other bacterial Sexual Transmitted Infections resulting from their mutual heterosexual transmission modes, and underscores the high risk of the multiple infections to individuals and the community as the infected, but untreated women (in their sexually active age), constitute a reservoir of the infections for continuous transmission to the entire community. Impacts of this epidemiological synergy, which range from increased potential of further dissemination of HIV and faster progression to the active disease, AIDS, additionally predispose the infected individuals who are mostly young people in their reproductive and economically most productive age to societal ills including ostracization and stigmatization.

RECOMMENDATION

1. The study therefore suggests comprehensive HIV prevention strategy directed to the most vulnerable group; the young people and young adults at the grassroots.

2. Health professionals should be aware of the risks and complications of Sexual Transmitted Infections, as itis difficult to control these infections and they can negatively affect the quality of life among women with HIV.

3. So therefore, Policy makers and HIV program managers should emphasize health education programs for clinicians and the local people on the prevalence of, and sequel of Human Immunodeficiency Virus/*Chlamydia trachomatis* and other Sexually Transmitted Infections (STIs), improve access to efficient STI clinical services, promote early diagnosis and establish epidemiologic surveillance systems for proper monitoring, management of infected persons and treatment.

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