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Original Research Article

Correlates of genital *Chlamydial trachomatis* infection in a cohort of infertile women in Ibadan, Nigeria

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ABSTRACT

Background: Genital *Chlamydial trachomatis* infection, though often asymptomatic, is an established indirect causative agent of female infertility via its activities on the tubal physiology. Many risk factors are postulated for its acquisition and the main thrust of this study was to establish the organisms' correlates among infertile women attending gynaecologic clinic in Ibadan.

Methods: A systematic sampling technique was used on each selected day to recruit women who met the inclusion criteria into the study using a sampling frame of 2. Interviewer-administered questionnaires were used to obtain attributes considered as risk factors for acquiring genital *Chlamydia trachomatis* infection from 150 consenting infertile women between January and November 2015. These attributes included sexual history, social status, alcohol intake and past history of sexually transmitted infections (STIs). Blood samples and endocervical swabs were subsequently taken for detection of *C. trachomatis* infection using polymerase chain reaction (PCR). Data analysis was done using SPSS version 20.0.

Results: The mean age of the respondents was 34.1 ± 5.6 years and 7.30% were positive for *C. trachomatis*. *Chlamydia trachomatis* infection was significantly associated with past history of gonorrhoea, history of multiple sexual partners, husband that has other sexual partners and lifetime sexual partners greater than one.

Conclusions: The prevalence of asymptomatic *C. trachomatis* among infertile women indicated the pathogen as a potential aetiologic agent of female infertility and supported the asymptomatic nature of the infection. The risk factors found to be associated with the organisms' infection lend out further support to the sexual transmissibility of *C. trachomatis*.

Keywords: Asymptomatic, *C. trachomatis*, Genital, Infertility, PCR, STIs

INTRODUCTION

Chlamydia trachomatis is among the most common sexually transmitted bacterial organisms, worldwide.¹ It is the causative agent for several diseases including

trachoma, urogenital infections, Chlamydia conjunctivitis, infant pneumonia, and lymphogranuloma venereum.²

Two third of cases of Chlamydial infections worldwide occurred in the developing countries and the incidence of

the infection has continued to rise every year in both industrialized and developing countries.¹

Infertility is a worldwide problem affecting more than 15-20% of married couples and commonly caused, in most developing countries, by tubal damage in women.³ Pelvic infections from sexually transmitted organisms especially *C. trachomatis* have remained the commonest cause of tubal occlusion.^{3,4} Genital *C. trachomatis* infections in women are usually asymptomatic or present with less severe symptoms than other sexually transmitted diseases thus allowing the infection go unnoticed till secondary or tertiary symptoms develop with far reaching consequences such as infertility.^{2,5} A study in Ibadan found the prevalence of Chlamydia cervicitis to be 17.6% among women undergoing hysterosalpingography for infertility evaluation while several studies have proven that *C. trachomatis* infections rates are higher among infertile than fertile women.^{3,5-15}

Patients with positive Chlamydia assay are 1.7 times at risk of infertility compared with patients with negative assay.⁵ A study reported that *Chlamydia trachomatis* IgG was significantly higher among patients presenting with infertility than those that did not.¹⁶ A study also reported that both past and current Chlamydial infections are strongly statistically significant in women with secondary infertility while another study reported a prevalence of 28.1% among women presenting with infertility in a clinic.^{13,17}

In developing countries, the prevalence of lower genital tract chlamydial infection in sexually active women is reported to be 26%.¹⁸ Fifteen million new cases of *C. trachomatis* occur in Africa while 45 million new cases are reported in Southern Asia every year.¹⁹ In Nigeria, the prevalence of *C. trachomatis* was 18.2% in Lagos, 17.6% in Ibadan and 22% in Calabar among women undergoing evaluation for infertility.^{6,8,14} Other studies in Nigeria among other populations have reported varied prevalence of Chlamydia infections which ranged from 6.7% to 60% in Lagos, Zaria, Benin, Enugu, Port-Harcourt and Kano.^{4,9,20-26}

Numerous risk factors and sexual behaviour have been associated with acquisition of genital Chlamydia infection. Studies done on the prevalence and risk factors for genital Chlamydia infection found that the main risk factors for *C. trachomatis* infection are age, irregular sexual relationships and change of sexual partners, failure to use (or erratic use) of barrier contraception during intercourse, and insufficient knowledge about sexual life and care for one's sexual health.^{27,28}

Another study in Germany found that genital Chlamydia infection was associated with alcoholism, high use of marijuana and cigarettes, lower social status, oral contraceptive use and pregnancy.²⁹ In another study, additional risk factors reported included duration of marriage, partners living away from each other, age (40%

of adolescent women are currently infected), educational level, unprotected sex with an infected partner and multiple sexual partners.³⁰ A systematic review and meta-analysis done in Australia found a trend of higher Chlamydia prevalence in younger populations.³¹ In Nigeria, risk factors found to be associated with *Chlamydia trachomatis* infection include multiple sexual partners, irregular contraceptive usage and past history of sexually transmitted infections.³²

The objective of this study was to determine the risk factors predisposing to acquisition of genital *Chlamydia trachomatis* infection among women presenting with infertility in University College Hospital, Ibadan.

METHODS

This was a descriptive cross-sectional study in which women presenting with infertility and asymptomatic for *Chlamydia trachomatis* infection at the Gynaecology clinic of the University College Hospital were recruited. Questionnaires were administered between January and November 2015 to obtain respondent's attributes considered as risk factors for acquiring genital *Chlamydia trachomatis* infection. These attributes include sexual history, social status, alcohol intake and past history of sexually transmitted infections (STIs).

Blood samples and endocervical swabs were subsequently taken from the consenting infertile women. Only women who presented with infertility at the gynaecology clinic of the UCH, Ibadan, Nigeria and consented to the study were included while those who presented with infertility but have symptoms suggestive of genital *Chlamydia trachomatis* infection such as dysuria, abnormal vaginal discharge, abnormal menstrual bleeding, post-coital bleeding and lower abdominal pain were excluded. In addition, women who used antibiotics in the preceding 6 weeks and those who refuse to consent were excluded from the study.

Sampling technique

A simple random sampling using balloting technique was used to select one day out of the three clinic days for the study weekly. A systematic sampling technique was used on the selected day to recruit women who met the inclusion criteria into the study. Using a sampling interval of 2 for weekly patient selection, the first patient is recruited by ballot and thereafter every alternate patient was selected until the desired sample, which were 10 for each clinic day was met.

Data management

Data collected was subjected to descriptive and inferential statistical analysis using the SPSS version 20.0 software. In addition, means and standard deviation were derived for quantitative variables, while qualitative variables were summarized as proportions. Chi square

test was used to assess association between qualitative variables. P values ≤ 0.05 was considered statistically significant.

Variables of interest were past history of infection with *Neisseria gonorrhoea* or any other sexually transmitted diseases (STD), use of condom with a sexual partner and past history of multiple sexual partners.

RESULTS

It was a cross-sectional hospital based study that involved 150 consenting women presenting with infertility at the gynaecology clinic of the UCH, Ibadan. Their mean age was 34.1 ± 5.6 years.

Majority, 89 (59.3%), were self-employed and almost three-quarters, 108 (72%) earn above the national minimum wage.

Table 1: Socio-demographic characteristics of the respondents.

Socio-demographic characteristics	Frequency	Percentage
Age groups (in years)		
20-29	29	19.3
30-39	96	64.0
≥ 40	25	16.7
Religion		
Christianity	92	61.3
Islam	58	38.7
Marital status		
Single	11	7.3
Married	136	90.7
Divorced	3	2.0
Family setting		
Monogamy	129	86.0
Polygamy	21	14.0
Education		
Primary uncompleted	2	1.3
Primary completed	8	5.3
Secondary uncompleted	7	4.7
Secondary completed	44	29.3
Post-secondary	27	18.0
Tertiary	62	41.4
Income (in naira)		
<18,000	42	28.0
$\geq 18,000$	108	72.0
Employment		
Self-employed	89	59.3
Employed by government/private	46	30.7
Unemployed	10	6.7
Housewife	1	0.7
Student	2	1.3
Others	2	1.3

The other socio-demographic characteristics are illustrated in the Table 1. In addition, 116 (77.3%) were HIV negative and only 5 (3.3%) take alcohol (Table 2).

Table 2: Gynaecological history and sexual behaviour of respondents.

Variables	Frequency	Percentage
Type of infertility		
Primary	61	40.7
Secondary	89	59.3
Previous history of abortion		
Yes	56	37.3
No	94	62.7
Use condom with sexual partner		
Yes	27	18.0
No	123	82.0
New sex partner in the last 3 months		
Yes	8	5.3
No	142	94.7
Long distance driver husband		
Yes	15	10.0
No	135	90.0
Alcohol intake		
Yes	5	3.3
No	145	96.7
Number of Sex partners presently		
1	147	98.0
2 or more	3	2.0
Number of lifetime sexual partners		
1	76	50.7
> 1	74	49.3
Husband has other sexual partners		
Certainly yes	21	14.0
Certainly no	71	47.3
Not sure	58	38.7
History of Multiple sex partner		
Yes	65	43.3
No	85	56.7
HIV status		
Positive	8	5.3
Negative	116	77.3
Unknown	26	17.3

The prevalence of *Chlamydia trachomatis*, using PCR, was 7.30%. Among the respondents, *Chlamydia trachomatis* infection was significantly associated with past history of gonorrhoea, history of multiple sexual partners, husband that has other sexual partners and lifetime sexual partners greater than one, (Tables 3).

The logistic regression analysis showed that respondents who had past history of gonorrhoea were 8.37 times more likely to have genital *Chlamydia trachomatis* infection than those that did not have the infection.

History of multiple sexual partners was strongly associated with genital *C. trachomatis* infection, (Tables 3 and 4).

Table 3: Factors associated with chlamydia trachomatis infection in the respondents.

Variable	Chlamydia infection		df	X ²	p-value
	Yes (%)	No (%)			
Grouped Age (in years)					
20 – 29	2 (6.9)	27 (93.1)	2	0.025	0.988
30 – 39	7 (7.3)	89 (92.7)			
≥ 40	2 (8.0)	23 (92.0)			
Past history of Gonorrhoea					
Yes	9 (17.3)	43 (82.7)	1	8.494	0.0036
No	2 (2.0)	96 (98.0)			
History of Multiple sex partner					
Yes	9 (13.8)	56 (86.2)	1	7.2	0.007
No	2 (2.4)	83 (97.6)			
HIV Status					
Positive	1 (12.5)	7 (87.5)	2	0.352	0.839
Negative	8 (6.9)	108 (93.1)			
Unknown	2 (7.7)	24 (92.3)			
Husband has other sex partners					
Certainly yes	9 (42.9)	12 (57.1)	2	45.4	<0.001
Certainly no	1 (1.4)	70 (98.6)			
Not sure	1 (1.7)	57 (98.3)			
Lifetime sexual partners					
One	2 (2.6)	74 (97.4)	1	5.0	0.025
> One	9 (12.2)	65 (87.8)			

P value is set at <0.05.

Table 4: Logistic regression analysis.

Variables	Odds Ratio	95% Confidence Interval	p-value
Past history of Gonorrhoea			
Yes	8.37	1.60-81.75	0.002
No (R)			
Don't know	0.00	0.00-27.84	0.528
History of Multiple sex partner			
Yes	6.67	1.30-64.95	0.007
No (R)			
Husband has other sex partners			
Certainly yes	52.5	4.09-226.61	<0.0001
Certainly no (R)			
Not sure	1.23	0.02-97.76	0.885
Lifetime sexual partners			
One (R)	5.12	0.98-35.72	0.025
> One			

P value is set at <0.05.

DISCUSSION

Genital *Chlamydia trachomatis* is known to be a cause of female infertility although often unrecognized because of its asymptomatic nature. This study was done to determine the correlates of asymptomatic genital *C. trachomatis* infection among infertile women. Using PCR, prevalence rate was 7.30% thus highlighting the asymptomatic nature of *Chlamydia trachomatis*.^{2,5} This prevalence rate is also similar to rates obtained in studies

from Argentina, Sudan and Iran from where prevalence of 7.27%, 10.5% and 12.4% were reported respectively but higher than 1.6% reported in Ghana.^{3,7,33,34} These different prevalent rates might be due to socio-cultural differences and practices across these countries.

In Nigeria, there is paucity of data on the prevalence of asymptomatic genital *Chlamydia trachomatis* infection among infertile women based on PCR. In a study conducted by Otoikhian et al, the prevalence of *Chlamydia trachomatis* among asymptomatic adolescents in Nigeria in which PCR was used as a diagnostic method was found to be 52.63%.²⁶ This prevalence was much higher than what we obtained in the present study. The reason for this difference might be due to the different study populations that participated in their studies. It has been established that the prevalence of *Chlamydia trachomatis* infection is higher among adolescents.¹

Past history of *Neisseria gonorrhoeae* or other STIs, multiple sexual partners, husband that had other sex partners and lifetime sex partner >1 remained strongly associated risk factors for *C. trachomatis* infection. Several studies have previously demonstrated positive correlation between multiple sexual partners and increased risk for *Chlamydia trachomatis* infection.^{2,3,28,32,35} Asymptomatic men have been found to have large reservoir of *Chlamydia trachomatis* which could potentially and repeatedly, re-infect their partners.³⁶ The strong association with husbands who had other sex partners found in this study however suggested that

transmission may require repeated exposure to an infected partner, which would be facilitated by the longer-term partnerships that are characteristic of individuals who cohabit.

The lack of association between *C. trachomatis* and the non-use of condom in this study is similar to an earlier systematic review by Navarro et al but in contrast with a previous research which reported a positive relationship.^{37,38} This lack of association might be because the respondents, being infertile women were unlikely to be on any form of contraception. The association between *Chlamydia trachomatis* and past history of *Neisseria gonorrhoea* or other STIs in this study is similar to that of other studies although Tukur *et al* did not find any of such association between *C. trachomatis* infection and past history of STI.^{20,32,39-41} The association corroborated the fact that previous STIs, especially gonorrhoea, increase the risk for chlamydia infection.⁸ The risk of infertility thus increases with each successive episode of infection.^{10,42}

In summary, the prevalence of asymptomatic *C. trachomatis* among infertile women indicated the pathogen as a potential aetiologic agent of female infertility and supported the asymptomatic nature of the infection. The risk factors found to be associated with the organism infection lend out further support to the sexual transmissibility of *C. trachomatis*. Understanding the risk factors will enable targeted efforts at their prevention in order to reduce the burden of infertility in Nigeria. There should be preventive programme strategies such as education on risky sexual behaviours among women of reproductive age group or sexually active individuals.

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