International Journal of Bioscience and Biochemistry
www.biosciencejournal.net
Online ISSN: 2664-6544; Print ISSN: 2664-6536
Received: 03-11-2019; Accepted: 04-12-2019; Published: 09-01-2020
Volume 2; Issue 1; 2020; Page No. 10-15

Genital *Chlamydia trachomatis* infection among pregnant women in Jos north, Jos, Nigeria: A hospital-based cross-sectional study

Ocheme Julius Okojokwu[1*], Innocent Ajegba Onaji[2], Bashiru Shafa Abubakar[3], Maryam Bisola Adebayo[4], Nanman Ladul Mwankat[5], Ibrahim Abubakar Yusuf[6], Francis Ofuowoicho Ukah[7], Entonu Elijah Entonu[8], Murna Ahmed Ali[9], Amos Obaje Ogaji[10], Joseph Aje Anejo-Okopi[11]

[1, 5, 7-11] Department of Microbiology, Faculty of Natural Sciences, University of Jos, Plateau State, Nigeria
[2] Department of Pharmaceutical Microbiology, Faculty of Pharmaceutical Sciences, University of Jos, Plateau State, Nigeria
[3] Department of Zoology, Faculty of Natural and Applied Sciences, Nasarawa State University, Keffi, Nasarawa State, Nigeria
[4] Department of Microbiology, Faculty of Life Sciences, Ahmadu Bello University, Zaria, Nigeria

Abstract
Background: Chlamydia, infection caused by *Chalmydia trachomatis*, is recognized as one of the most prevalent curable sexually transmitted infections. Chlamydial infections during pregnancy have been considered as significant factors in the causation of poor pregnancy outcome and complications like ectopic pregnancy, low weight birth, still birth etc.
Objectives: The study was undertaken to determine the prevalence and risk factors associated with *Chlamydia trachomatis* infection among pregnant women accessing antenatal care in Jos, Plateau State, Nigeria.
Methods: A total of 200 endocervical swabs were collected from consenting pregnant women who were attending antenatal clinic in Faith Alive Foundation Hospital, Jos, Nigeria. Structured questionnaire was used to obtain data on socio-demography and risk factors. The samples were analysed using lateral flow immunoassay – Rapid Test Device (Swab/Urine) (International Ltd. China).
Results: Chlamydia prevalence of 48.5% was established in the current study. The age group 24 – 28 years had the highest prevalence of 67.1% while the least prevalence (23.5%) was recorded among women older than 43 years. This variation of chlamydia prevalence was significantly associated with age group ($\chi^2 = 16.541$; $p = 0.001$). demographics such as marital status and educational status were not associated ($p > 0.05$) with chlamydia but in addition to age, occupation of the women was significantly associated ($\chi^2 = 44.490$; $p = 0.001$) with the infection. Unskilled women had the highest chlamydia prevalence (74.7%) as opposed to 20% recorded in skilled women and 47.1% among the semi-skilled women. Risk factors like HIV status was significantly associated ($\chi^2 = 27.205$; $p = 0.001$) with chlamydia. HIV positive women had chlamydia prevalence of 83.7% compared with 38.9% in their HIV negative counterparts.
Conclusion: The study demonstrated chlamydia prevalence of 48.5% in this study. Age group, history of STI, use of IUD, history of abortion among others were identified as risk factors associated with the infection.

Keywords: chlamydia, sexually transmitted infection, pregnant women, pregnancy

Introduction

Genital *Chlamydia* infection is globally recognized as one of the most prevalent curable Sexually Transmitted Infection [1] with over 92 million cases reported annually [2]. High prevalence has being reported in developing and under developed regions of the world [3]. It is caused by a small, obligate, intracellular gram-negative bacterium called *Chlamydia trachomatis* [4].

Chlamydia trachomatis infection can remain latent for a very long time [5]. As up to 80% of women shows mild or are asymptomatic to most of *C. trachomatis* genital tract infections, hence making detection and diagnosis difficult [6]. This poses a serious threat which can lead to very sequelae if left untreated. Such sequelae can include pelvic inflammatory diseases (PID), chronic pelvic pain, cervicitis, salpingitis, and pregnancy associated complications such as; ectopic pregnancy Infertility, abortions, postpartum endometritis, ectopic pregnancy, preterm labor, premature rupture of membrane, and poor neonatal outcome [7, 8].

Neonatal inclusion conjunctivitis and pneumonia within the first three months of life many also be a problem due to exposure of the fetus to *Chlamydia trachomatis* during delivery [3]. Despite the evidences, screening for *Chlamydia trachomatis* infection is not part of the routine antenatal care in the developing world including Nigeria. Though this infection is predominantly found in females, very serious infection has been established in males. Such infections include urethritis, epididymitis, proctitis reactive arthritis and related cases of low sperm count and sperm deterioration [5]. Dean [9] documented that about 50% of males are asymptomatic.

Co-infection has also been established with reported case of 61% prevalence rate of *Chlamydia* and HIV co-infection as well as 13.5% rate of Chlamydia/gonorrhoea co-infection among gynaecologic patients in South- Eastern Nigeria [10]. Recent studies have also indicated the emergence of antibiotic resistance in *Chlamydia* which is feared to create severe problems in the treatment of the disease [11].

With the progressive increase of the incidence of *Chlamydial* infections in women, this work was aimed to determine the prevalence and risk factors associated with *Chlamydia*

trachomatis infection in pregnant women attending antenatal clinic in Faith Alive Foundation Jos.

Material and Methods

Study Area

The study was conducted in Jos North Local Government Area of Plateau State, Nigeria located between latitude 9º55'42.56" N and longitude 8º53'31.63" E, among women attending antenatal care at Faith Alive Foundation Jos, Plateau State Nigeria.

Ethical Approval

The study was granted ethical approval by the ethical committees of Faith Alive Foundation Jos, Plateau State. Consent of the study participants were also sought before they were included in the study.

Data Collection

Structured questionnaire was used to obtained demographic details and other relevant information such as number of sex partner, use of contraceptives, past STDs, educational status, knowledge about the *C. trachomatis* infection, etc from the participants.

Exclusion criteria

Pregnant women who have taken antibiotics or applied local vaginal antiseptics during the previous three (3) weeks were excluded from this study.

Sample Collection and Processing

Sample collection

Endocervical swabs were collected with the assistance of the medical personnel. Cusco vaginal speculum was inserted into the vagina for the visualization of the cervix. A swab stick was inserted through the speculum into the endocervical canal and rotated. This permitted acquisition of columnar or cuboidal epithelial cells which are the main reservoir of *Chlamydia* organism. It was withdrawn without contamination from exocervical or vaginal cells. The swabs were transported promptly to the laboratory and processed within 30 minutes of collection.

Sample analysis

Collected samples were analyzed using *Chlamydia* Rapid Test Device -Swab/Urine (Interchemical Ltd. China). The *Chlamydia* Rapid Test Device (Swab/Urine) is a qualitative, lateral flow immunoassay for the detection of *Chlamydia* antigen from female cervical swab, male urethral swab and male urine specimens. In this test, antibody specific to the *Chlamydia* antigen is coated on the test line region of the test. During testing, the extracted antigen solution reacts with an antibody to *Chlamydia* that is coated onto particles. The mixture migrates up to react with the antibody to *Chlamydia* on the membrane and generates a coloured line in the test line region. The presence of this coloured line in the test line region indicates a positive result, while its absence indicates a negative result. To serve as a procedural control, a coloured line will always appear in the control line region indicating that proper volume of specimen has been added and membrane wicking has occurred (*Chlamydia* Antigen Rapid test). The test procedure was conducted according to the manufacturer's instruction manual described by Sanders [12].

Statistical Analysis of the Results

Data obtained from this study were analyzed using statistical package for social science (SPSS) version 23 (IBM SPSS Inc, USA). Analysis of association with *Chlamydia* infection was performed on potential risk factors using the Pearson Chi-Square. Statistical significance was accepted at p-value of < 0.001.

Results

Out of 200 samples that were tested for *Chlamydia trachomatis*, 97 (48.5%) were found to be positive (Table 1). The prevalence of *C. trachomatis* in relation to age is showed that the age group 24-28 (69.1%) had the highest number of infections followed by age group 19-23 (60.0%). The age group < 19, 29-33, 34-38, 39-43 and > 43 had a prevalence of 33.3%, 32.5%, 28.0%, 23.5% and 16.7% respectively. This was statistically significant ($\chi 2$ = 16.541; p-value = 0.001).

Married women had the highest prevalence 96(48.7%) than in single 1(33.3%) (Table 2) but this was not statistically significant ($\chi 2$ = 1.338; p-value = 0.512). Table 3 showed the prevalence of genital *C. trachomatis* in relation to occupation. Unskilled women were found to have the highest prevalence with 59(74.7%), while skilled and semi-skilled had 14(20%), and 24(47.1%) respectively. This difference was statistically different ($\chi 2$ = 44.490; p-value = 0.001). Women who had informal education had the highest prevalence of *C. trachomatis* of 64.5%, primary 56.1%, secondary 48.5% and tertiary 35.5% (Table 4). The difference was however not statistically significant ($\chi 2$ = 1.011; p-value = 0.799).

Table 5 showed the prevalence of *Chlamydial* infection in relation to HIV status, which was found to be statistically significant with prevalence of 83.7% in HIV positive women and 38.9% in HIV negative women ($\chi 2$ = 27.205; p-value = 0.001). The most common reported symptoms among the participants who tested positive for *Chlamydia trachomatis* were abnormal vaginal discharge (74.6%), lower abdominal pain (70.1%), burning sensation (73.3%), and pain during intercourse (71.4%). There was however proportion of asymptomatic participants who tested positive for *C. trachomatis*. 35.3% of those who tested positive for *C. trachomatis* did not report any abnormal vaginal discharge, 37.6% had no lower abdominal pain, 44.1% had no burning sensation, and 44.7% had no pain during intercourse (Table 6).

Women who had history of sexually transmitted infection, still birth, miscarriage and abortion, and use of intrauterine device were associated with 69.1%, 53.3%, 75.0%, 69.2% and 59.5% respectively (Table 7). Prevalence with relation to marriage type was statistically significant as higher prevalence was recorded with polygamous marriage (71.7%), 38.0% in monogamous marriage and 66.7% in none (Table 8).

Table 1: Prevalence of *Chlamydia trachomatis* infection in relation to age

Age group (Years)	Number examined	Number positive (%)	χ^2	p-value
<19	6	2 (33.3%)	16.541	0.001**
19-23	38	23 (60.0%)		

24-28	68	47 (69.1%)		
29-33	40	13 (32.5%)		
34-38	25	7 (28.0%)		
39-43	17	4 (23.5%)		
>43	6	1 (16.7%)		
Total	200	97 (48.5%)		

** = Statistically significant at $p \leq 0.001$ * = Statistically significant at $p \leq 0.005$

Table 2: Prevalence of *C. trachomatis* in relation to marital status

Marital status	Number examined	Number positive (%)	χ^2	p-value
Married	197	96 (48.7)	1.338	0.512*
Single	3	1 (33.3)		
Total	200	97 (48.5)		

** = Statistically significant at $p \leq 0.001$ * = Statistically significant at $p \leq 0.005$

Table 3: Prevalence of *C. trachomatis* infection in relation to occupation

Occupation	Number examined	Number positive (%)	χ^2	p-value
Skilled	70	14 (20.0)	44.490	<0.001**
Unskilled	79	59 (74.7)		
Semi-skilled	51	24 (47.1)		
Total	200	97 (48.5)		

** = Statistically significant at $p \leq 0.001$ * = Statistically significant at $p \leq 0.005$

Table 4: Prevalence of *C. trachomatis* in relation to educational level

Educational level	No. examined	No. positive (%)	χ^2	p-value
Informal	31	20 (64.5)	8.337	0. 799
Primary	41	23 (56.1)		
Secondary	66	32 (48.5)		
Tertiary	62	22 (35.5)		
Total	200	97 (48.5)		

** = Statistically significant at $p \leq 0.001$ * = Statistically significant at $p \leq 0.005$

Table 5: Prevalence of *C. trachomatis* infection in relation to HIV status

HIV status	Number examined	Number positive (%)	χ^2	p-value
Positive	43	36 (83.7)	27.205	<0.001**
Negative	157	61 (38.9)		
Total	200	97 (48.5)		

** = Statistically significant at $p \leq 0.001$ * = Statistically significant at $p \leq 0.005$

Table 6: Prevalence of *C. trachomatis* in relation to symptoms

Symptom	Number examined	Number positive (%)	χ^2	p-value
Vaginal discharge	67	50 (74.6)	27.535	<0.001**
Burning sensation	30	22 (73.3)	8.714	0.003**
Lower abdominal pain	67	47 (70.1)	18.906	<0.001**
Pain during intercourse	28	20 (71.4)	6.853	0.009**

** = Statistically significant at $p \leq 0.001$ * = Statistically significant at $p \leq 0.005$

Table 7: Prevalence of *C. trachomatis* in relation to other health factors

Factor	Number examined	Number positive (%)
History of still birth	15	8 (53.3)
History of abortion	26	18 (69.2)
History of miscarriage	28	21 (75.0)
History of STDs	68	47 (69.1)
Use of IUD	37	22 (59.5)

Table 8: prevalence of *C. trachomatis* in relation to marriage type

Type of marriage	Number examined	Number positive (%)	χ^2	p-value
Monogamy	137	52 (38.0)	19.386	<0.001**
Polygamy	60	43 (71.7)		
None	3	2 (66.7)		
Total	200	97 (48.5)		

** = Statistically significant at $p \leq 0.001$ * = Statistically significant at $p \leq 0.005$

Discussion

A prevalence of 48.5% out of the 200 samples examined was found in this study. This is slightly lower with some reported prevalence; 56.1% among gynaecologic clinic attendees in Jos13, 51% among pregnant and non-pregnant women and their spouses at the College of Medicine of the University of Lagos14. High prevalence as such could be as a result the asymptomatic cases in most women [15] and lack of routine check in antenatal clinics. Lower prevalence of 40.1% has been reported in South-Eastern part of Nigeria16, 31.0% and 26% in Zaria by Koledade *et al*. [17] and Ige *et al*. [6] respectively while 13.3% was reported in Benin City [18]. In contrast with these recent studies, much lower prevalence of 9% was reported in Maiduguri and 10% in Ibadan [14, 19]. This could be a pointer to its endemic nature and an increase in the spread of the infection.

Very low prevalence of genital C. trachomatis infection is recorded in developed countries. A Prevalence of 4.7% among 18-26 years was found in the USA20, a ranged of 1.7-17% in asymptomatic women in Europe [21] and among indigenous and urban young adults a prevalence of 7.5% and 5.6% were found respectively in Australia [22, 23]. These differences in prevalence reported in the various research could be associated with social, cultural and environmental factors, reduced sexual risk-behaviour, increased awareness on Chlamydia infection, the sample size, the test method used, level of hygiene of the infected women and easy access to laboratory, diagnoses and treatment among others in developed countries.

Amongst the studied age group [24-28] had the highest prevalence of 69.1% which is slightly higher than in the age group [19-23] (60.0%). This is in sync with work carried out by Inyang-Etoh *et al*. [24], Oloyede *et al*. [25] and Mawak *et al*. [13] where C. trachomatis highest prevalence was observed between the age of 18 and 28 years. This age group falls within the sexually active and adolescent age which could be the reason for higher prevalence in the group [16]. Contrary to the work carried out by Odusolu *et al*. [26], which showed that subjects aged [30-34] years had the highest positivity rate (36.0%) for C. trachomatis antibody.

The least prevalence according to this study was among age group > 43 this is in line with the findings of STDs Surveillance Report [27] that the age bracket of [14-39] years accounted for over 95% of Chlamydial cases in the United States. Studies have also shown that the incidence of Chlamydial infection in women decreases substantially after 30 years of age, likely because the target cells for Chlamydia trachomatis (i.e. the columnar epithelial cell, which is present on the ectocervix of younger women) is replaced with squamous epithelium through the process of squamous metaplasia that occurs with age [28].

In relation to marital status, married women had highest prevalence (48.7%) than single (33.3%). This is in consonance with the reported work of Inyang-Etoh *et al*. [24], Oloyede *et al*. [25] and Mawak *et al*. [13]. Polygamous marriages had the highest prevalence of 71.7% than in monogamous (38.0%). This could be as a result of the number of sexual partners and since men have been known to have large reservoir of Chlamydial infection and could repeatedly re-infect their partners even without knowing [29]. This is also in agreement with work done by Ige *et al*. [6]. Previous report has showed statistically association between numbers of sexual partners with C. trachomatis infection [30].

Prevalence of Chlamydial infection is significantly associated with HIV status with 83.7% in HIV positive and 38.9% in HIV negative participants and studies have shown the association between the two infections (Chlamydia and HIV) such that the presence of one facilitates that of the other. Genital Chlamydial infection has been linked to an increasing risk for acquisition of HIV infection [31, 32, 33, 34] while on the other hand, immunosuppression due to HIV may lead to more severe Chlamydial disease condition like PID in those who are infected with Chlamydia trachomatis [35].

The distribution of Chlamydia across occupation categorised into skilled, unskilled and semi-skilled, showed that unskilled women had the highest prevalence rate. This might be explained by the fact that women with unskilled occupation who are mainly traders have more tendency of having multiple partners since they have more opportunity of meeting several and different kinds of people and lack the knowledge of how to protect themselves from sexual health risks than those of the skilled and semi-skilled category. The prevalence of Chlamydial infection in relation to educational level showed that women with informal education had the highest prevalence of 64.5%. This could be as a result of lack of education and low status, and are not able to negotiate condom use to protect themselves against HIV and other sexual transmitted diseases.

This study also showed that women who had urogenital symptoms which include; abnormal vaginal discharge, burning sensation, lower abdominal pain and pain during intercourse were associated with chlamydial infection with vaginal discharge and lower abdominal pain significantly associated with $p< 0.001$. This implies that the presence of these symptoms could be in line with the nature of the infection even though the infection is usually presented more asymptomatically as reported by several studies [36, 37, 38, 39] and this has been the biggest challenge in the control of the disease.

Conclusion

The prevalence of Chlamydia trachomatis was found to be 48.5%. The risk factors associated with the infection in this study were age group, history of sexually transmitted infection, use of intrauterine device, history of abortion, HIV status, unskilled occupation, polygamous marriage and educational status. There is need for appropriate Chlamydia trachomatis screening services to be introduced in antenatal clinics in Nigeria.

References

1. Wariso KT, Odigie J, Eyaru S. Prevalence of Chlamydia trachomatis Infection among Female Undergraduates of the University of Port Harcourt Using Strand Displacement and Amplification [SDA] Technique. The Nigerian Health Journal. 2012; 12(2):35-38.
2. Mamuna Q, Muhammad KS. Prevalence of Chlamydia trachomatis among Asymptomatic Women. J Ayub Med Coll Abbottabad. 2013; 25:1-2.
3. Okunola TO, Olusegun AK, Oladipo AA. Prevalence of Antenatal Chlamydia trachomatis Infection in Ile-Ife, Nigeria. Infectious Diseases and Tropical Medicine Research Center, 2016, doi: 10.17795/iji-39391.
4. Ghosh M, Choudhuri S, Ray RG, Bhattacharya B, Bhattacharya S. Association of Genital Chlamydia trachomatis Infection with Female Infertility, Study in a

Tertiary Care Hospital in Eastern India. The Open Microbiology Journal. 2015; 9:110-116.
5. Okoror LE, Otoickian C, Eniolorunda T, Omoniyi FD. Prevalence and Risk of Chlamydia trachomatis in Symptomatic Patients Attending Clinics in South West Nigeria. Imed Publishing Journals. Archives of Clinical Microbiology. ISSN 1989-8436. 2014; 5(5):2. doi: 10.3823/285.
6. Ige OT, Ige SO, Olayinka AT. Prevalence of Chlamydia trachomatis Infection among Women of Reproductive Age Group in a Tertiary Hospital in Northern Nigeria. Annals of Tropical Pathology. 2018; 9:17-21. DOI: 10.4103/atp.atp_35_17.
7. Land JA, Van Bergen JE, Morré SA, Postma MJ. Epidemiology of Chlamydia trachomatis Infection in Women and the Cost Effectiveness of Screening. Human Reproductive Update. 2010; 16:189‑204.
8. Nandeibam Y, Laishram S, Lionel J. Prevalence of Chlamydia trachomatis in a Tertiary Center in South India. Journal of Med Soc. 2016; 30:31-35.
9. Dean D. Chlamydia trachomatis today: Treatment, Detection, Immunogenetics and the Need for a Greater Global Understanding of Chlamydial Disease Pathogenesis. Drugs Today. 2009; 45:25.
10. Dibua Uju ME, Ugonabo JAC, Oladepo D, Iroha IR, Odimegwu ND. Genital Chlamydia and HIV Co-infection: Adverse Pregnancy Outcomes. American Journal of Research Communication. 2013; 1(12):470-500.
11. Bhengraj AR, Srivastava P, Vardhan H, Yadav SS, Singh LC, Mittal A *et al*. Study on Survival of Chlamydia trachomatis in the Presence of Anti-chlamydial Drugs. American Journal of Infectious Diseases. 2012; 8(1):5-12.
12. Sanders JW, Hook EW, Welsh LE, Shepherd ME, Quinn TC. Evaluation of an enzyme immunoassay for detection of Chlamydia trachomatis in urine of asymptomatic men. Journal of Clinical Microbiology. 1994; 32:24-27.
13. Mawak JD, Dashe N, Agabi YA, Panshak BW. Prevalence of Genital Chlamydia trachomatis Infection among Gynecologic Clinic Attendees in Jos, Nigeria. Shiraz E-Medical Journal. 2011; 12(2):1-9.
14. Okoror LE, Omilabu SA, Fadojutimi J, Nsongkhai V. Seroepidemiological Survey of Chlamydia in Patients Attending Pre and Post Natal Clinic at the College of Medicine of the University of Lagos, Nigeria. In: Book of Abstract of the 24th annual conference of the Nigerian Society for Microbiology, 2000.
15. Ikeme LE, Ezegwui HU, Ikeako LC, Agbata I, Agbata E. Prevalence of Chlamydia trachomatis in Student and Nonstudent Population in Enugu, Nigeria. Nigerian Journal of Clinical Practice. 2011; 14(2):1-5.
16. Okoror LE, Agbonlahor DE, Esumeh FI, Umolu PI. Prevalence of Chlamydia in Patients Attending Gynaecological Clinics in South Eastern Nigeria. African Health Science. 2007; 7(1):18-24.
17. Sedlecki K, Markovic M, Rajic G. Risk factors for Chlamydia infections of the genital organs in adolescent-females. Srp Arh Celok Lek. 2001; 129(7-8):169-174.
18. Koledade A, Adesiyun A, Oguntayo A, Olayinka A, Randawa A, Samaila M. Prevalence of Chlamydia trachomatis Infection among Women Attending Gynaecological Clinic for Infertility in Zaria, Nigeria. The Internet Journal of Gynecology and Obstetrics, 2014, 19(1).
19. Isibor JO, Ugbomoiko D, Nwobu GO, Ekundayo AO, Enweani IB, Okogun GRA. Detection of Chlamydia Antigen in Cervical Specimens from Antenatal Clinic Attendees in Benin City, Nigeria. African Journal of Clinical and Experimental Microbiology. 2005; 6(3):208-211.
20. Darougar S, Forsey T, Osoba AO, Dines RJ, Adelusi B, Coker GO. Chlamydial Genital Infection in Ibadan, Nigeria. A Sero-epidemiological Survey. Br J Vener Dis. 1982; 58:366-369.
21. Miller EK. Diagnosis and treatment of Chlamydia trachomatis infection. American Family Physician. 2006; 73:1411-1416.
22. Wilson JS, Honey E, Templeton A, Paavonen J, Mårdh PA, Stary A. Stray- Pedersen B for the EU Biomed Concerted Action Group. A Systematic Review of the Prevalence of Chlamydia trachomatis among European Women. Human Reproduction Update. 2002; 8(4):385-394.
23. Vajdic CM, Middleton M, Bowden FJ, Fairley CK, Kaldor JM. The prevalence of genital Chlamydia trachomatis in Australia 1997-2004: a systematic review. Sex Health. 2005; 2(3):169-83.
24. Bandea CI, Debattista J, Joseph K, Igietseme J, Timms P, Black CM. Chlamydia trachomatis Serovars among Strains Isolated from Members of Rural Indigenous Communities and Urban Populations in Australia. Journal of Clinical Microbiology. 2008; 46(1):355-356.
25. Inyang-Etoh PC, Ogban GI, Inyang-Etoh EC, Useh MF, Etuk SJ. Prevalence of Chlamydia trachomatis Infection among Women Attending Infertility Clinics in Calabar, Nigeria. Nigeria Journal Health Biomedical Sciences, 2009, 8.
26. Oloyede OAO, Fakoya TA, Oloyede AA, Alayom AM. Prevalence and Awareness about Chamydial Infection in Women undergoing infertility evaluation in Lagos, Nigeria. Int J Health Res. 2009; 2(2):157.
27. Odusolu PO, Edet EE, Emechebe CI, Agan TU, Okpe AE, Etuk SJ. Prevalence of Chlamydia trachomatis Immunoglobulin G Antibody in Infertile Women in Calabar. African Journal of Medical Health Sciences. 2016; 15:74-83.
28. Centers for Disease Control and Prevention (CDC). Sexually Transmitted Disease Surveillance, 2004. Atlanta, GA: U.S. Department of Health and Human Services, CDC, National Centre for HIV, STD, and TB Prevention, 2005.
29. Jacobson DL, Womack SD, Peralta L, Zenilman JM, Feroli K, Maehr J *et al*. Concordance of human papillomavirus in the cervix and urine among inner city adolescents. The Paediatric Infectious Diseases Journal. 2000; 19(8):722-728.
30. Sule OAO, Fakoya TA, Odusoga OA, Olatunji AO, Olusanya O. Asymptomatic endocervical infection of infertile women in Sagamu, Nigeria. The Nigerian Medical Practitioner. 1997; 34(3/4):51-55.
31. Verhoeven V, Avonts D, Meheus A, Goossens H, Ieven M, Chapelle S *et al*. Chlamydial infection: an accurate model for opportunistic screening in general practice. Sex Transm Infect. 2003; 79:313-317.
32. Laga M, Manoka A, Kivuvu M, Malele B, Tuliza M, Nzila N *et al*. Non-ulcerative sexually transmitted diseases as risk

factors for HIV-1 transmission in women: results from a cohort study. AIDS. 1993; 7:95-102.
33. Stamm WE. Chlamydia trachomatis infections: progress and problems. Journal of Infectious Diseases. 1999; 179(2):380-383.
34. Joyee AC, Thyagarajan SP, Riddy EV, Venkatesan C, Ganapathy M. Chlamydia infection in patients: its relation to HIV infection. Indian Journal of Medical Microbiology. 2005; 23:37-40.
35. Thomas K, Simmus I. Chlamydia trachomatis in subfertile women undergoing uterine instrumentation. How can we help in avoidance of iatrogenic pelvic inflammatory disease. Human Reproduction. 2002; 17:1431-1436.
36. Farley TA, Cohen DA, Elkins W. Asymptomatic sexually transmitted diseases: the case for screening. Preventive Medicine. 2003; 36:502-509.
37. Wiesenfeld HC, Sweet RL, Ness RB, Krohn MA, Amortegui AJ, Hillier SL. Comparison of acute and subclinical pelvic inflammatory disease. Sexually Transmitted Diseases. 2005; 32:400-405.
38. Geisler WM. Duration of Untreated, Uncomplicated Chlamydia trachomatis Genital Infection and Factors Associated with Chlamydia Resolution: A Review of Human Studies. The Journal of Infectious Diseases. 2010; 201(2):104-113.
39. Detels R, Green AM, Klausner JD, Katzenstein D, Gaydos C, Handsfield HH *et al*. The Incidence and Correlates of Symptomatic and Asymptomatic Chlamydia trachomatis and Neisseria gonorrhoeae Infections in Selected Populations in Five Countries. Sexually Transmitted Disease. 2011; 38(6):503-509.