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PREVALENCE OF CHLAMYDIA *TRACHOMATIS* INFECTION IN INFERTILE WOMEN ATTENDING FERTILITY CLINICS IN BENIN CITY, NIGERIA: A PUBLIC HEALTH CONCERN

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ABSTRACT

This study was carried out to deduce the prevalence of *Chlamydia* infection amongst infertile women attending fertility clinics in Benin City, Nigeria. Fifty infertile women with either primary or secondary infertility and with their ages ranging from 24 to 51 years were enrolled for this study. The serum of each patient was screened for *Chlamydia* antibodies with the enzyme- linked immune-sorbent assay (ELISA) and immunoglobulin G (IgG) index of 0.90 or less was reported as seronegative for IgG antibody, while IgG index of 1.00 or greater were positive for IgG antibody. Findings in the present study revealed that 24 % to 52 % of the patients that attend the fertility clinics in Benin City, Nigeria were most likely to be infected with *Chlamydia*; with the primary infertile patients accounting for 32 % of the cases and secondary infertile patients for
68 % of the cases. Prevalence of *Chlamydia* infection was also found to be quite high amongst women aged between 36 and 40 years old. Since lack of symptoms often makes the clinical diagnosis of *Chlamydia* infection somewhat difficult, thus increasing the prevalence of this disease; routine screening is recommended to enable early therapeutic interventions of positive cases.

KEY WORDS: Infertility; *Chlamydia* infection; Asymptomatic; Immunoglobulin; Enzyme linked immune-sorbent assay.

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INTRODUCTION

Chlamydia trachomatis, an obligate intracellular human pathogen, is one of four bacterial speciesin the genus *Chlamydia*. It is a Gram-negative bacterium. It can appear as either coccoid or rod-shaped (Paavonen *et al.,* 1999). *Chlamydia trachomatis* infection is the most prevalent sexually-transmitted bacterial infection worldwide (Paavonen *et al.,*1999). It is found only in humans and it is estimated that about one million individuals in the United States are infected with *Chlamydia*. According to the World Health Organization, more than 90 million *Chlamydia*infections are detected annually worldwide (Gerbase *et al.,* 1998). *Chlamydial* infections causemajor medical, social and economic problems. Untreated *chlamydial* infections can cause serious reproductive and other health problems with both short-term and long-term consequences (Emele*et al*., 2009). Like other sexually-transmitted infections, *chlamydial* infection is primarily awoman's healthcare issue since the manifestations and sequelae have more adverse effects onfemale reproductive health than on the male (Paavonen *et al.,*1999.).

Chlamydia species are obligate intracellular parasites (Brooks *et al.,* 2007; Korhonen *etal.,* 2012; Eschenbach *et al.,* 1984). Eighteen distinct serotypes of *C. trachomatis* have been currently identified. Serotypes D to K are known to cause sexually-transmitted genital infections and neonatal infections. Chlamydial infection begins by contact of infectious elementary

body[EB] with the apical epithelial surface of a target cell (Beatty *et al., 1994*). The specific interaction triggers a series of early events which helps to program the *Chlamydia* and also prime the host cell for productive infection. Proposed mechanisms of *Chlamydia* uptake are parasite-specific phagocytosis, receptor-mediated endocytosis and pinocytosis (Oakeshott*et al.,* 1992). Genital infection caused

by *C. trachomatis* is generally asymptomatic. Approximately 50 % of infected males and 80 % of infected females show no symptoms, but infection may cause a muco-purulent cervicitis in females and urethritis in males (Ingalis *et al.,*1995). Commonly unrecognized and often poorly or inadequately treated, *Chlamydia* infections can ascend the reproductive tract resulting in pelvic inflammatory disease (PID) and, consequently, lead tochronic pelvic pain, ectopic pregnancy, and infertility Chernesky, 2005.

Women with a *Chlamydia* infection (especially serotype G) are 6.5 times more likely to develop cervical cancer than those without infection (Anttila *et al.,* 2001). In women with recentor invasive *Chlamydia* infection, increased rates of preterm delivery, premature rupture ofmembranes, low birth weight, and still birth have been observed (McGregor and French, 1991). Infection with *C. trachomatis* is also implicated in post-abortal, post-Cesarean section, and postpartum maternal infections. *C. trachomatis* in the cervix may be transmitted to a neonate during vaginal delivery, resulting in conjunctivitis and during vaginal delivery, resulting in conjunctivitis and neonatal pneumonia. Chlamydia infection develops in 60 % of neonates born vaginally to infected mothers. Premarital sexual intercourse and intercourse with multiple partners have been shown to be significant risk factors for C. trachomatis as well as HIV infection (Hitchcock, 1999). C trachomatis infection can be transmitted through vaginal, anal, or oral sexual or all sexual intercourse and also vertically during childbirth. The greater the number of sexual partners, the greater the risk of infection (Williams et al., 2003). Young age and multiple sexual partners have been identified as risk

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factors for chlamydial infection (Williams et al., 2003). C. trachomatis infection is the major cause of mucopurulent cervicitis (MPC) and pelvic inflammatory disease (PID) in women (Rose et al., 2007; Ainbinder et al., 2007; Opaneye et al., 2003). Chlamydial MPC can lead to somecomplications which include ascending intraluminal spread of organisms from the cervix,producing PID, ascending infection during pregnancy resulting in premature rupture of themembrane, chorio-amnionitis, premature delivery, and puerperal and neonatal infections (McCormack., 1994; Beem et al., 1977; Martin et al., 1982). An increasing proportion of cases with chlamydial PID are atypical or silent (Hiltunen et al., 1998). Chlamydial PID is the most important preventable cause of infertility, including tubal factor infertility, and adversepregnancy outcome (Weström, 1994). Studies have demonstrated an association between serum antibodies (Ab) to C. trachomatis and tubal factor infertility or ectopic pregnancy (Cates et al.,1991). Some studies have revealed that the severity of tubal damage found in infertile women isdirectly related to serum antibody titer levels (Punnonen et al., 1979; Mol et al., 1997). Nucleicacid amplification tests (NAAT) is considered the tests of choice for diagnosing C. trachomatis infection (Puolakkainen et al., 1998; Black, 1997). Serological detection of antibodies to Chlamydia trachomatis constitutes a convenient and yet highly sensitive approach to thediagnosis of Chlamydial infections (Johnson et al., 2008). The micro-immunofluorescence (MIF) assay, which detects antibodies to Chlamydial elementary bodies, is also used for serodiagnosis of C. trachomatis. Anti-chlamydial IgG antibodies are used as markers for previous exposure to these microorganisms and the IgA antibodies serve as markers for existing mucosal infection. Infertility is an emerging health problem in many countries of the world including Nigeria. The increase appears to coincide with the growing role played by *C. trachomatis* as a sexually transmitted disease.

Fertility clinics in Benin City, Nigeria, experience nowadays, increase in infertile couples with increasing challenge to meet their health care needs. Since *Chlamydia* has been shown to affect fertility outcome, it became secondary infertility and within the age group of 36 to 40 years. Lack of symptoms often makes clinical diagnosis of *Chlamydia* infection somewhat difficult. Thus, routine screening is recommended to enable early imperative to evaluate the prevalence of Chlamydia trachomatis amongst infertile couples in this research, so as to suggest ways of improving careand treatment outcome. The findings from this study would be an added advantage for themanagement of infertile women.

MATERIALS AND METHODS

Sample collection and processing

The study population comprised of all infertile woman attending fertility clinic for the first time from January to March 2015, who consented to the screening process. In this study, a total of fifty women with primary and secondary infertility were investigated. Detailed clinical history of each patient was recorded. Five milliliter of blood

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was collected from each patient and serum was separated by centrifugation at 2,500 rpm for 15 minutes followed by subsequent screening for *Chlamydia*. The sera were tested for *Chlamydia* antibodies using ELISA IgG kits (Diagnostic Automation, Inc., California United States). One milliliter of the *Chlamydia* antiserum was added to 0.5 ml of patient serum (test), while 0.5 ml of patient serum was added to 1 ml of *Chlamydia* standard solution (standard) followed by incubation for 30 minutes at 37ºC and measurement with the spectrophotometer at a wavelength of 370 - 450 nm. The *Chlamydia* level (*Chl*) was subsequently deduced as follows: $chl = \frac{Test\ absorbance}{Standard\ absorbance} X\ 10.4$

Interpretation of results: IgG index of 0.90 or less were sero-negative for IgG antibody, while IgG index of 1.00 or greater were positive for IgG antibody.

RESULTS AND DISCUSSION

As indicated by the confidence interval (Table 1), 24 % to 52 % of the patients that attend the fertility clinics in Benin City, Nigeria were most likely to be infected with *Chlamydia*; with the primary infertile patients accounting for 32 % of the cases and secondary infertile patients for 68 % of the cases. The findings in the present study revealed a high prevalence of *Chlamydia* infection which agreed with the work of Sturm-Remirex et al., 2002.

Table 1 Prevalence of *Chlamydia* infections in infertile women attending fertility clinics in Benin City, Nigeria

Fertility clinics in Benin City, Nigeria								
Prevalence of *Chlamydia* infection			Patients with primary infertility			Patients with secondary infertility		
(N = 50)			(P=19)			(P=19)		
Mean	S. Error	95 % CI	Mean	S. Error	95 % CI	Mean	S. Error	95 % CI
(x 100 %)	(x 100 %)	(x 100 %)	(x 100 %)	(x 100 %)	(x 100 %)	(x 100 %)	(x 100 %)	(x 100 %)
0.38	0.07	24-0.25	0.32	0.11	09-0.55	0.68	0.11	0.45-0.91

N: the total numbers of infertile women from who blood samples were collected for screening. P: the total number of positive cases. S: standard. CI: confidence interval.

There was a wide variation in the prevalence of *C. trachomatis* which may be dependent on the age, marital status, clinical condition, sensitivities of the methods used, and various other factors (Buye *et al.,* 2001; Verkoyeen *et al.,* 2002). *C. trachomatis* infections have been shown to be asymptomatic with undetected or multiple infection in up to 70% women population who are at risk of developing asevere reproductive sequelaeinfection which agreed with the work of Sturm-Ramirex *et al.* (2002). including pelvic inflammatory disease and tubal infertility (Carey and Beagly, 2010), indicating that the infection was a silent epidemic. In most part of Nigeria, *C. trachomatis* are not routinely screened for, and hence relative information about frequencies ofthe organisms is scarce. There is need therefore for routine screening of women for *Chlamydia*and subsequent treatment to protect them from prolonged infection which could have effect on fertility due to tubal blockage. History of infertility and pelvic inflammatory disease, other sexually transmitted diseases and spontaneous abortion have been associated with the of infection with *C. trachomatis* (Geisler, 2006). The distribution of positive cases of *Chlamydia* infection amongst the different age groups, as presented in Table 2, ranged between 37 % in the 36 – 40 years age group and 5 % in the 25 – 30 years age group.

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Table 2 Distribution of positive cases among the different age groups of infertile women.

Age groups (Years)	Distribution of positive cases (P=19)		
	Mean (x 100 %)	S, Error (x 100 %)	95% CI (x 100 %)
25-30	0.05	0.05	0.00-0.16
31-35	0.21	0.10	0.01-0.41
36-40	0.37	0.11	0.13-061
41-45	0.16	0.09	0.00-0.34
>45	0.21	0.10	0.01-0.41

P: the total number of positive cases. S: standard error. CI: confidence interval.

From the results obtained in thisstudy, it can be seen that the prevalence of *Chlamydia* infection was quite high amongst women aged between 36 and 40 years old. This may indicate higher sexual activity and low or no use of barrier (condom) method of contraception in this age group (Alarape *et al.,* 1998). This presentfinding agreed with the views by Kotchick *et al.* (2001), that *C. trachomatis* can be transmittedthrough sexual intercourse. It can be deduced that the females must have contacted the infection through sex or contact with contaminated surfaces such as toilet seats (Parks *et al.*, 1997; Kotchick *et al*, 2001). Widespread utilization of more accurate tests like nucleic acid amplification fordetection of infected genital secretions in those attending the sexually transmitted infection or generalgynecological clinics for infertility are presently nonexistent in Nigeria and many developing countries, and their use should be encouraged since this is perhaps a better way of detecting and treating asymptomatic *C.* trachomatis, which is still highly prevalent in apparently healthy population, especially the more sexually active population. Measures such as the use of barrier method during sexual intercourse, limiting the number of sexual partners, public awareness, school involvement, and peer educators may help in reducing the disease prevalence.

CONCLUSION

A relatively high frequency of *Chlamydia* infections was observed in infertile patients in Nigeria, especially in patients with secondary infertility and within the age group of 36-40 years. Lack of symptoms often makes clinical diagnoses of chlamydia infection somewhat difficult. Thus routine screening is recommended to enable early therapeutic interventions.

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