International Journal of Gynecology and Obstetrics xxx (2016) xxx–xxx

Contents lists available at ScienceDirect

International Journal of Gynecology and Obstetrics

journal homepage: www.elsevier.com/locate/ijgo

www.figo.org

CLINICAL ARTICLE

# The value of chlamydial antibody level for predicting tubal blockage among women undergoing hysterosalpingography in Lagos, Nigeria

Olalekan Olaleye [a], Joseph A. Olamijulo [b,*]

[a] Department of Obstetrics and Gynecology, Lagoon Hospitals, Lagos, Nigeria
[b] Department of Obstetrics and Gynecology, College of Medicine, University of Lagos, Lagos, Nigeria

ARTICLE INFO

*Article history:*
Received 2 August 2015
Received in revised form 26 November 2015
Accepted 29 March 2016

*Keywords:*
Chlamydial antibody
*Chlamydia trachomatis*
Hysterosalpingography
Pelvic inflammatory disease
Sexually transmitted infection
Tubal blockage
Tubal infertility

ABSTRACT

*Objective:* To determine the prevalence of *Chlamydia trachomatis* infection among Nigerian women undergoing hysterosalpingography (HSG) and to identify any correlation between chlamydial antibody levels and a diagnosis of tubal disease. *Methods:* A prospective cross-sectional study was conducted from January 1 to June 30, 2013, among women scheduled to undergo HSG in the radiology department of Lagos University Teaching Hospital, Nigeria. Endocervical swabs and serum samples were collected to assess the levels of chlamydial antigen and antibody, respectively. *Results:* Among 150 participants, 83 (55.3%) had bilateral tubal patency and 67 (44.7%) had tubal disease. Overall, 53 (35.3%) women had positive test results for chlamydial antibodies; however, none of the participants tested positive for chlamydial antigen. Women with tubal disease were more likely to test positive for chlamydial antibodies (n = 44 [65.7%]) than were those whose test results were negative (n = 9 [10.8%]; $P < 0.001$). The sensitivity and specificity of chlamydial antibody testing to predict tubal disease diagnosed by HSG were 66% and 89%, respectively. *Conclusion:* The presence of chlamydial antibodies was quantitatively related to the likelihood of HSG-diagnosed tubal disease.



## 1. Introduction

Hysterosalpingography (HSG) has an important role in evaluations of the female genital tract. This technique uses contrast media and radiologic techniques to visualize the uterine cavities and fallopian tubes. Although laparoscopy with hydrotubation is considered the gold standard for assessing tubal patency, HSG has the advantages of being less invasive and cheaper; furthermore, HSG exhibits a high negative predictive value and remains the most frequently used test for tubal patency in Nigeria [1,2].

Tubal infertility resulting from upper-genital-tract infection still predominates in Sub-Saharan Africa [3]. *Chlamydia trachomatis* is the most frequent sexually transmitted infection globally [4]; therefore, this microorganism represents an important etiological agent in tubal infertility. Up to 80% of all cases of female tubal infertility are asymptomatic [5] and so remain untreated, thereby constituting a large reservoir of infection. Prevalence rates of chlamydia infection of 3%–5% have been reported among asymptomatic women in England [6] and the USA [7]; however, the prevalence within the general population of Nigeria is approximately 10% [8]. An association between tubal infertility and infection with *C. trachomatis* has previously been demonstrated [9,10]. Given the contribution of chlamydial infection to pelvic inflammatory disease (a precursor to tubal disease), research has been conducted to assess the sensitivity of chlamydial antibody titer for predicting tubal patency. For example, a meta-analysis found that the predictive value of chlamydial antibody testing was comparable to HSG in screening for this condition [11]. Furthermore, Lim et al. [2] have questioned the continued role of HSG in the evaluation of female infertility.

At present, HSG is recommended as the primary screening tool for tubal patency among low-risk patients because it is both reliable and more cost-effective than is laparoscopy [12]. Consequently, use of the laparoscopy and dye patency test is reserved for women with identifiable risks, as well as for those with either abnormal or inconclusive HSG results [12]. However, the use of HSG is not without risk, including pelvic infection from dissemination of an asymptomatic genital infection such as *C. trachomatis* [13]. The risk of infection is highest among patients with tubal disease, possibly owing to reactivation of quiescent bacteria that had persisted in the upper genital tract following past infection [13]. Strategies to minimize this risk include routine screening or treatment for *C. trachomatis* when procedures such as HSG or laparoscopy and hydrotubation are performed [12,14]. Defining the risk in a given population will help to refine which strategy to adopt. Therefore, it is vital to investigate the association between infection with *C. trachomatis* and the possible risk of resultant ascending infection after HSG.

The aims of the present study were to evaluate the prevalence of *C. trachomatis* infection among women undergoing HSG at a center in Nigeria and to assess any correlation between the presence of chlamydial antibodies and HSG findings.

* Corresponding author at: Department of Obstetrics and Gynecology, College of Medicine, University of Lagos, Idi-Araba, Lagos, Nigeria. Tel.: +234 8063964966.
*E-mail address:* ayolamijulo@hotmail.com (J.A. Olamijulo).

http://dx.doi.org/10.1016/j.ijgo.2015.12.009
0020-7292/

## 2. Materials and methods

A prospective cross-sectional study was conducted from January 1 to June 30, 2013, among patients scheduled to undergo HSG at Lagos University Teaching Hospital, a tertiary health facility in Lagos, Nigeria. Ethical approval was obtained from the Lagos University Teaching Hospital Research and Ethics Committee before the study began. All participants provided written consent.

Participants were recruited using a simple random sampling method. Patients who had undergone pelvic surgery or laparotomy were excluded. Information about age, parity, and indication for HSG were collected. A 5-mL venous blood sample was obtained from each patient. An endocervical swab was carefully collected before HSG cannulation using standardized procedures.

Samples were analyzed in a central research laboratory at the College of Medicine, University of Lagos, Nigeria. Serum levels of chlamydial antibodies (immunoglobulin G) were measured using a commercially available kit (Dia.Pro Diagnostic Bioprobes, Milan, Italy). The optical density (OD)—a measure proportional to the antibody concentration in the sample—was evaluated at 450 nm. The cutoff OD for a positive test result (0.3) was determined using calibrators provided with the kit. Samples were considered positive for the presence of chlamydial antibodies when the OD exceeded this cutoff.

Detection of genus-specific antigen (lipopolysaccharide) in the endocervical sample was performed using the DIASPOT Chlamydia kit (Bresta Perkasa, Jawa Barat, Indonesia). This kit has a quoted specificity of 99% and a sensitivity of 90%.

Data collation and analysis were conducted using SPSS version 20.0 (IBM, Armonk, NY, USA). The association between HSG-diagnosed tubal disease and serum levels of chlamydial antibody was determined using the $\chi^2$ test. A $P$ value below 0.05 was considered statistically significant.

## 3. Results

In all, 142 (94.7%) of the 150 participants had been diagnosed with infertility. Characteristics of the present study cohort are shown in Table 1. The women were aged 22–43 years, with a mean age of 34.3 ± 2.1 years. The majority of the women (n = 99 [66.0%]) were nulliparous. The main HSG findings were bilateral tubal patency (n = 83 [55.3%]) and features suggestive of tubal disease (n = 67 [44.7%]). Unilateral proximal tubal blockage was the most frequent abnormal HSG finding (n = 28 [18.7%]).

Overall, 53 (35.3%) of the women tested positive for the presence of chlamydial antibodies; however, none of the participants tested positive for chlamydial antigen. As shown in Table 2, chlamydial seropositivity was not associated with either age or parity. By contrast, a relationship was detected between HSG findings and the presence of chlamydial antibodies. The difference in seropositivity between women with tubal disease (n = 44 [65.7%]) and those without tubal disease (n = 9 [10.8%]) was statistically significant ($\chi^2 = 44.8$; $P < 0.001$).

Using HSG as the diagnostic criterion for tubal disease, the sensitivity and specificity of chlamydial seropositivity for predicting this condition were 66% and 89%, respectively. The positive predictive value was 83% and the negative predictive value was 76%.

Fig. 1 shows the distribution of women with tubal disease in relation to the level of chlamydial antibodies. The proportion of patients with tubal disease progressively increased with increasing antibody levels. At an OD of 0.30–0.49, 2 (50%) patients had tubal disease, whereas all five patients with OD values greater than or equal to 1.5 had tubal disease. Increasing the cutoff value for chlamydial seropositivity increased the specificity of the test at the expense of sensitivity (Fig. 2).

## 4. Discussion

The present study found that women with tubal disease diagnosed by HSG displayed a greater prevalence of chlamydial antibody seropositivity than did women without tubal disease.

The high prevalence of tubal disease (44.7%) recorded in the present study was comparable to the rates found in other Nigerian studies [15,16]. Unilateral proximal tubal occlusion was the most frequent tubal pathology detected in the present study. The correlation between the presence of chlamydial antibodies and HSG-diagnosed tubal disease reported in the present study was in agreement with other research [17,18], emphasizing the effect of past infection with *C. trachomatis* on the development of tubal disease. Not surprisingly, increasing parity was associated with decreasing antibody prevalence: seropositive women were more likely than seronegative women to have tubal disease and consequently low parity.

The sensitivity of chlamydial antibody levels for predicting HSG-diagnosed tubal disease was 66% in the present study. This value was lower than the sensitivity reported in other studies [10,19], possibly reflecting increased contributions of other infective conditions in the present study population (e.g. gonorrhea, postabortion infections, and puerperal sepsis). Nevertheless, with a specificity of 89% and a positive predictive value of 83%, the findings of the present study indicated a possible role for measurement of chlamydial antibodies, either as a screening tool for tubal assessment or to complement HSG. Akande et al. [19] found that women with positive titers of chlamydial antibodies were more likely to have pelvic adhesions than tubal occlusion, suggesting that serology testing can be used to augment HSG findings.

**Table 1**
Characteristics of the women who underwent hysterosalpingography (n = 150).

| Characteristic | No. (%) |
|---|---|
| Age, y | |
| <25 | 4 (2.7) |
| 25–29 | 36 (24.0) |
| 30–34 | 59 (39.3) |
| 35–39 | 46 (30.7) |
| ≥40 | 5 (3.3) |
| Parity | |
| 0 | 99 (66.0) |
| 1 | 39 (26.0) |
| 2 | 9 (6.0) |
| >2 | 3 (2.0) |
| Tubal findings | |
| Bilaterally patent tubes | 83 (55.3) |
| Unilateral proximal tubal blockage | 28 (18.7) |
| Bilateral proximal tubal blockage | 9 (6.0) |
| Unilateral hydrosalpinx | 15 (10.0) |
| Bilateral hydrosalpinx | 5 (3.3) |
| Proximal tubal blockage with contralateral hydrosalpinx | 3 (2.0) |
| Unilateral loculation of contrast | 4 (2.7) |
| Others | 3 (2.0) |

**Table 2**
Distribution of chlamydial antibody among the women who underwent hysterosalpingography (n = 150).[a]

| Characteristic | Chlamydial antibody test result | | $\chi^2$ ($P$ value) |
|---|---|---|---|
| | Positive (n = 53) | Negative (n = 97) | |
| Age, y | | | 1.736 (0.792) |
| <25 | 2 (50.0) | 2 (50.0) | |
| 25–29 | 15 (41.7) | 21 (58.3) | |
| 30–34 | 20 (33.9) | 39 (66.1) | |
| 35–39 | 15 (32.6) | 31 (67.4) | |
| ≥40 | 1 (20.0) | 4 (80.0) | |
| Parity | | | 2.733 (0.532) |
| 0 | 38 (38.4) | 61 (61.6) | |
| 1 | 13 (33.3) | 26 (66.7) | |
| 2 | 2 (22.2) | 7 (77.8) | |
| >2 | 0 | 3 (100.0) | |
| Tubal disease | | | 44.8 (<0.001) |
| Present | 44 (65.7) | 23 (34.3) | |
| Absent | 9 (10.8) | 74 (89.2) | |

[a] Values given as number (percentage) unless indicated otherwise.



Please cite this article as: Olaleye O, Olamijulo JA, The value of chlamydial antibody level for predicting tubal blockage among women undergoing hysterosalpingography in Lagos, Nigeri..., Int J Gynecol Obstet (2016), http://dx.doi.org/10.1016/j.ijgo.2015.12.009