

# Prevalence of Genital Chlamydia Trachomatis among Pregnant Women in a Northwestern Teaching Hospital, Nigeria

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## Research

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# Abstract

**Background:** *Chlamydia trachomatis* (Ct) is now being considered as an “obstetric pathogen” due to its potential in causing adverse pregnancy and perinatal outcomes. Consequent to being the commonest bacterial sexually transmitted infection, screening is recommended at the initial visit of antenatal care, but few countries have routine pregnancy screening and treatment programs. Prevalence assessment is a core component of the World Health Organisation sexually transmitted infection -surveillance programming which enables a country to monitor trends of this infection, for appropriate implementation of preventive measures.

**Aim:** To determine the prevalence of Ct infection among pregnant women, and to describe sociodemographic characteristics and reproductive profile of seropositive pregnant women attending the antenatal clinic of Ahmadu Bello University Teaching Hospital, Zaria.

**Methods:** Socio-demographic characteristics and risk factors were sought from 90 pregnant women using a proforma. Their sera were assayed for the presence of Ct immunoglobulin G (IgG) using ELISA. Data were analysed using SPSS version 21. Categorical variables were represented using frequency and percentages while associations between categorical variables were determined using Fisher’s exact test with  $p < 0.05$  considered significant.

**Results:** Prevalence of Ct infection was found to be 3.3% (3/90). The mean age of infected women was  $34.3 \pm 4.6$  years. All seropositive women were gainfully employed and had tertiary education. Mean parity was 3, the majority (2/3,66.7%) had no previous miscarriage and none had a history of prior stillbirth.

**Conclusion:** The prevalence of Ct in this study is low compared to the pooled prevalence for the West African sub-region. A broader community-based study using a nucleic acid amplification technique is suggested.

## Plain English Summary

*Chlamydia trachomatis* is the commonest bacterial organism that can cause sexually transmitted infection worldwide. Recently, this organism has been shown to result in negative pregnancy outcomes like miscarriage, premature births and infection in the new-born baby. This has led to the recommendation that pregnant women should be screened for this infection during pregnancy. However, only few countries practice this. Thus, knowing the burden of this infection among pregnant women will enable a country to monitor trends in the infection and institute appropriate preventive measure. So, this study aimed to know the percentage of pregnant women that are infected with this organism in a population of pregnant women in a northern Nigerian tertiary hospital. Blood samples of 90 pregnant women that agreed to participate in the study were obtained and the presence of antibody to this organism was assessed, which when present signifies a chlamydial infection. Only 3.3% of the pregnant women tested positive. The positive women had an average age of 34 years; all had tertiary education and were gainfully employed. The average number of deliveries was 3, majority had no history of

miscarriage and none had a history of stillbirth. We found a lower level of chlamydia infection among pregnant women in our study compared to that reported in West African sub-region and we recommend studying a larger number of women using methods that can detect this infection better than the antibody test used in this study.

## Introduction

Globally, sexually transmitted infections (STIs) are a major public health problem affecting the quality of life and causing serious morbidity. <sup>[1]</sup> *Chlamydia trachomatis* (Ct) is the most common bacterial STI worldwide. <sup>[2]</sup> Globally, the prevalence of Ct among pregnant women is similar or even higher than nonpregnant women as suggested by some studies, though limited data are available. <sup>[3]</sup> In sub-Saharan Africa, pooled prevalence rates range from 0-31.1%, with West Africa having a pooled prevalence of 6.1%. <sup>[3]</sup> Prevalence rates of 2%-13.2% have been reported among pregnant women in Nigeria. <sup>[4]-[7]</sup>

The infection is largely asymptomatic in women, which perpetuates an ongoing source of efficient disease transmission and also results in silent disease, which can result in adverse reproductive outcomes. <sup>[3]</sup> *Chlamydia trachomatis* is now being considered as an “obstetric pathogen” due to its potential in causing adverse pregnancy and perinatal outcomes. <sup>[8]</sup> Pregnant women are regarded as a special population because Ct infection in pregnancy is associated with additional morbidity. This is because intrauterine or perinatally transmitted Ct infection has grave consequences on the pregnant women, their partners, and their fetuses. <sup>[9]</sup> Studies have reported Ct infection to cause miscarriage, prelabour rupture of membranes, stillbirths, puerperal endometritis, preterm birth, low birth weight, neonatal conjunctivitis, and neonatal pneumonia. <sup>[3],[10]</sup>

Screening and treatment of STI in pregnancy represents an overlooked opportunity to improve the health of mothers and their babies. <sup>[3]</sup> Because Ct infection is associated with substantial morbidity and economic cost worldwide, this makes screening and treatment of Ct effective measures in reducing the burden of Ct. The Centre for Disease Control (CDC) recommends Ct screening at the initial visit of antenatal care in pregnant women aged less than 25 years or in those with risk factors. <sup>[11]</sup> However, despite Ct being the commonest treatable bacterial STI, few countries have routine pregnancy screening and treatment programs. <sup>[3]</sup> Nigeria, is yet to adopt Ct screening during antenatal care.

Prevalence assessment is a core component of the World Health Organisation Sexually Transmitted Infection-surveillance programme, which estimates the burden of an STI and enables a country to monitor trends of this infection and implementing preventive measures. <sup>[12]</sup> Presently, knowledge of Ct prevalence in pregnancy is scarce in most countries, and is largely responsible for lack of interventions to address this largely asymptomatic infection. <sup>[12]</sup> The determination of the prevalence of Ct in pregnancy will guide policymakers and/or hospital managers if to adopt proactive measures in the control of this infection in this special population. This study aimed to assess the prevalence of Ct infection among

pregnant women and to describe the sociodemographic characteristics and reproductive profile of seropositive pregnant women.

## Methodology

The study was conducted in the Antenatal clinic (ANC) of Ahmadu Bello University Teaching hospital (ABUTH), Zaria, Kaduna state. Ahmadu Bello University Teaching hospital, Zaria, is a tertiary hospital that has various specialist departments among which is the Obstetrics and Gynaecology department, which offers maternal health services including ANC and delivery to clients. The ANC is conducted on every weekday by a different Obstetric unit. Each pregnant woman is assigned a particular day to attend ANC. ANC attendees are not screened for Ct infection in ABUTH.

A cross-sectional study design was employed. The study population included all pregnant women attending the ANC clinic in the hospital during the period of study. Non-consenting pregnant women were excluded. The sample size was determined using the Cochran's formula for sample size determination for cross-sectional studies. The prevalence of pregnant women with Ct from a previous study was 13.2% was used.<sup>[7]</sup> With a 95% level of confidence, absolute precision of 5% and, a non-response rate of 10%, a sample size of 90 was obtained. Ninety pregnant women were consecutively sampled between January to March 2018. A structured proforma developed by the Authors was used to obtain the socio-demographic characteristics, reproductive profile and, to document the IgG result.

About 3 mls of venous blood was collected under aseptic technique from a peripheral vein and transferred into a plain bottle for assay of immunoglobulin G (IgG) to Ct. The blood was centrifuged at 4500 revolutions per minute to obtain serum. The sera were kept frozen at -70<sup>0</sup> C till all samples have been pooled. The IgG detection was done using *Chlamydia trachomatis* IgG ELISA catalogue No: IB19202 obtained from Immuno-Biological Laboratories (IBL-America), Minneapolis. The assay was carried out according to the manufacturer's instruction.<sup>[12]</sup> Data was analysed using SPSS version 21. Descriptive summary statistics such as frequency and percentage were used to represent categorical variables while mean and standard deviation were used to represent numeric variables Fishers-Exact test was used to test for associations between Ct status and other independent variables with P < 0.05 considered significant.

Permission to carry out this study was obtained from the Clinic management. Data collected from the study were anonymised and stored in a password protected computer which was only accessible to the Researchers to ensure data security. The three seropositive women were counselled on their results and given treatment with an oral stat dose of 1 g of Azithromycin.

## Results

A total of 90 pregnant women were studied. The mean age and standard deviation (SD) of the participants were 29.4 ± 6.8 years. The majority of the participants were parous with only 20% being

primigravidae. Their parity ranged between 0 to 8 with a median parity of 2. See Table 1.

Table 1  
Sociodemographic characteristics of study participants, in a study of the prevalence of Ct infection among pregnant women attending antenatal clinic in ABUTH, 2018

<b>Characteristic</b>	<b>Frequency n = 90</b>	<b>Percentage (%)</b>
<b>Age (years)</b>		
15–19	5	5.6
20–24	19	21.1
25–29	24	26.7
30–34	16	17.8
35–39	18	20.0
40–44	8	8.9
<b>Tribe</b>		
Hausa	61	67.8
Igbo	1	1.1
Yoruba	5	5.6
Others	23	24.7
<b>Marital status</b>		
Married	90	100
Single	0	0
<b>Religion</b>		
Islam	75	83.3
Christianity	15	16.7
<b>Occupation</b>		
Not gainfully employed	42	46.7
Gainfully employed	48	53.3
<b>Woman's education</b>		
Primary	15	16.7
Secondary	29	32.7
Tertiary	43	47.8
Quranic	3	3.3

The prevalence of Ct IgG seropositivity was 3.3% (3/90). All seropositive women were aged > 24 years with a mean age of  $34.3 \pm 4.6$  years. All seropositive women had tertiary education and all the seropositive women were gainfully employed. The socio-demographic characteristics are shown in Table 2.

All seropositive women were parous with a mean parity of 3. Two-third had no history of a previous miscarriage, and no seropositive woman has had a prior stillbirth. The reproductive profile of seropositive women did not differ from their counterparts ( $p > 0.05$ ). This is shown in Table 3.

Table 2  
Socio-demographic characteristics of pregnant women seropositive for Ct IgG

Characteristic	IgG Positive n = 3	IgG Negative n = 87	P-value
<b>Age (years)</b>			
15–19	0 (0.0)	5(6.3)	0.333
20–24	0(0.0)	19(23.8)	
25–29	1(33.3)	23(28.8)	
30–34	0(0.0)	13(16.3)	
35–39	2(66.7)	13(16.3)	
40–44	0(0.0)	7(8.8)	
<b>Tribe</b>			
Hausa	0(0.0)	61 (70.1)	0.03
Igbo	0(0.0)	1(1.1)	
Yoruba	0 (0.0)	5 (5.7)	
Others	3(100)	20 (23.0)	
<b>Marital status</b>			
Married	3(100)	87(100)	-
Single	0(0.0)	0(0.0)	
<b>Religion</b>			
Islam	2(66.7)	74(85.1)	0.02
Christianity	1(33.3)	13(14.9)	
<b>Occupation</b>			
Not gainfully employed	0(0.0)	45(51.7)	0.39
Gainfully employed	3(100)	42(48.3)	
<b>Woman's education</b>			
Primary	0(0.0)	15(17.2)	0.34
Secondary	0(0.0)	29(33.3)	
Tertiary	3 (100)	40(46.0)	
Quranic	0(10.0)	3(3.4)	



Table 3  
 Reproductive profile of women seropositive for Ct IgG, in a study  
 of the prevalence of Chlamydia trachomatis in pregnant women  
 in ABUTH, 2018

Parameter	IgG positive	IgG Negative	P-value
	n = 3	n = 87	
	No. (%)	No. (%)	
No. of live births			
0-1	1(33.3)	35(40.2)	0.64
≥ 2	2(66.7)	52(59.8)	
No. of miscarriages			
0	2(66.7)	53(60.9)	1.00
≥ 1	1(33.3)	34(39.1)	
Stillbirth			
0	3(100)	75(86.2)	1.00
≥ 1	0(0.0)	12(13.8)	

## Discussion

Prevalence of Ct widely varies from time to time, region to region, study population, study setting, and type of laboratory diagnosis method. <sup>[14]</sup> The prevalence of Ct among pregnant women found in this study is low when compared to results obtained by other authors. <sup>[5]-[7]</sup> This includes the findings from a meta-analysis in 2018 that reported a pooled prevalence of Ct in women of the reproductive age group in sub-Saharan Africa to be 7.8% and 7.6% in health facility studies. <sup>[14]</sup> This result is however higher than that obtained by Ankuma et al of 2% among a similar population using rapid chromatographic antigenic detection in cervical swabs, a study that was conducted in another part of Northern Nigeria. Some studies have reported no positive finding, as exemplified by Ghosh et al in India, in which they reported no positive case of Ct infection among 40 pregnant women using a similar ELISA technique. <sup>[15]</sup> Studies reporting a higher prevalence of Ct infection employed polymerase chain reaction (PCR) as the diagnostic technique which has been reported to be superior in Ct detection. <sup>[16]</sup> The ELISA test is more useful in seroepidemiological studies and also valuable in the diagnosis of Ct when the test for direct detection of the bacteria is negative or difficult to perform as in the upper genital infection. Though its major drawback is that it cannot distinguish current from past Ct infection. <sup>[17]</sup>

The prevalence of Ct obtained among pregnant women in this study is also lower than prevalence obtained among infertile women in the same setting and other climes. The variable higher prevalence of more than 50% has been reported among infertile women.<sup>[18]–[22]</sup> This supports the role of Ct in causing infertility. The additional adverse reproductive outcomes associated with Ct infection include miscarriage and stillbirths.<sup>[23], [24]</sup> However, from our study, seropositive pregnant women had similar parity and also reported similar miscarriage and stillbirth rates as seronegative women. This finding lends credence to the results of other workers that did not find Ct infection to be associated with miscarriage or stillbirth.<sup>[25]–[27]</sup>

Though some studies have shown young age ( $\leq 24$  years) to be significantly associated with Ct infection, all seropositive pregnant women in this study were found to be aged  $\geq 25$  years and are similar to findings of Huai et al.<sup>[11], [28], [29]</sup>

The association found between religion and Ct infection is likely because the study population was predominantly of the Islamic faith. We found no association between chlamydial infection and the level of education in our study. All seropositive women in our study were well educated, likely a reflection of the high educational level in the general study participants. The low prevalence rate of Ct infection found in pregnant women in this study may be explained by the findings of a study conducted in Northern Nigeria by Ige et al. They reported a higher prevalence of 26% women of reproductive age using polymerase chain reaction, but also found that women with a low level of education had over four-fold increased odds of having Ct infection.<sup>[30]</sup> Additionally, a report from a meta-analysis found a low educational level to nearly double the odds for Ct acquisition.<sup>[31]</sup>

## Conclusion and Recommendations

Our study found a low prevalence of Ct infection among pregnant women attending antenatal care. Seropositive pregnant women were well educated and gainfully employed. This study highlights the need for continued investigation into Ct infection in pregnancy preferably using the more advanced diagnostic techniques. These results provide a good basis for larger facility-based studies, as well as in the community; to institute programmes that could help to prevent and control this infection. Since chlamydia can be easily treated, such programme could help in lowering the transmission of chlamydia, which may help lower incidences of maternal disease, adverse pregnancy outcomes as well as neonatal disease.

## Abbreviations

ABUTH Ahmadu Bello University Teaching Hospital

ANC Antenatal clinic

CDC Centre for Disease Control

Ct Chlamydia trachomatis

ELISA Enzyme linked immunosorbent assay

Ig Immunoglobulin

mls Millilitre

PCR Polymerase chain reaction

SD Standard deviation

STI Sexually transmitted infection

WHO World Health Organisation

## **Declarations**

### **Ethics approval and consent to participate:**

Ethical approval was sought and obtained from the Health Research and Ethics Committee of Ahmadu Bello University Teaching Hospital, Zaria (ABUTHZ/HREC/B03/2017). Informed consent was obtained from all participants in the study after assuring them of confidentiality.

### **Consent for publication:**

Not applicable

### **Availability of data and material:**

Dataset from this study are available from the corresponding author on reasonable request.

### **Funding:**

The study was privately funded by the researchers.

### **Authors' contributions: Authors' contribution:**

All authors have significantly contributed to the production of this manuscript and have approved the manuscript for submission. ARM was involved in research conceptualisation, data collection, analysis and drafting of manuscript. AAG and AS were involved in conceptualisation, analysis and writing of

manuscript, SSI was involved in conceptualisation and manuscript writing, AAA was involved in conceptualisation, analysis of results and manuscript writing.

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## Competing interests:

The authors declare that they have no competing interests.

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