

Chlamydia Trachomatis Prevalence In Ghana – A Study At A Municipal District In Western Ghana

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ABSTRACT: The paper seeks to determine the prevalence of chlamydia trachomatis infection in Tarkwa-Nsuaem Municipality and explore the relationship between age, gender, symptoms and diagnosis. A laboratory screening test for chlamydia trachomatis was employed with patients aged between 3 and 50 years. The swab specimens were collected randomly from Patients who were attending a normal routine checkup and were diagnosed of chlamydia-related symptoms. The sample size is comprised of 186 individuals, 17 years and older who were screened for Chlamydia in two hospitals, the Government Hospital in Tarkwa and the Ghana Manganese Company Hospital at Nsuta in the Western Region of Ghana. Among the 186, 17 were diagnosed with a sexually-transmitted infection (STI) other than Chlamydia, and 2 were children younger than 15 years. Of the remaining 167 patients, 127 (76.0%) were women and 40(24.0%) were men. The samples were collected from February 2011 to August 2011. The most common symptoms among the women were vaginal discharge (54.3%), followed by vulva vaginitis (23.6%); while among the men, urethral discharge accounted for 52.5% and burning sensation accounted for 37.5%. The prevalence rate for Chlamydia was 20.4%. Prevalence rates were not significantly different for men and women, across symptoms or age groups. However, among the women presenting vaginal discharge, the women with a negative diagnosis were significantly older with an average age of 31.8 years and standard deviation (SD) 6.6 years, whereas women with a positive diagnosis had an average age of 25.6 years and SD = 4.8 years. Among men presenting urethral discharge, the men with a negative diagnosis were older (Mean = 31years, SD = 4.7 years) than those with a positive diagnosis (Mean = 24years, SD =7.2 years). The study found a positive relationship between symptoms and age and between symptoms and positive diagnoses of Chlamydia among young adults in Tarkwa-Nsuaem Municipality.

Keywords: Chlamydia Trachomatis, Chlamydia Infection,

1 INTRODUCTION

Chlamydia, one of the most common sexually-transmitted diseases, is caused by the bacterium *Chlamydia trachomatis* (Centers for Disease Control and Prevention (CDC), 1998; World Health Organization (WHO), 2001). *C. trachomatis* is a bacterium that is transmitted from person to person through sexual contact with the vagina, penis, mouth or anus, and in infants, through passage of the birth canal of an infected mother (CDC, 1995). In addition to being widespread, chlamydia is an important public health concern because the infection is largely asymptomatic and, hence, it is often untreated for long periods. According to WHO (2001), 70-75% of women who are infected do not show any symptoms. In a study in Uganda, Orroth et al. (2003) estimated that only 11% of infected males and 6% of infected females develop symptoms. Left untreated, the infection can have serious long-term health consequences, especially for women. The most widespread disease caused by *C. trachomatis* is trachoma (WHO, 2001a). Between six and eight million people are blind because of trachoma in developing countries (Resnikoff, 2004). Blindness from trachoma is two to three times more common in women than in men. Repeated and untreated infection often results in irreversible blindness due to scarring of the front of the eye. Scarring occurs when the eyelid turns inward and the eyelashes scratch the cornea (WHO, 2001).

The disease usually begins in childhood and spreads through personal contact or with flies that have had contact with the eyes and nose of an infected person. Areas with poor sanitation are particularly vulnerable. According to the CDC's Chlamydia Fact Sheet (2002), *C. trachomatis* can cause inflammation and irritation of the cervix (cervicitis) and the urethra (urethritis) as evidenced by vaginal discharge, painful and frequent urination and bleeding. Untreated cervicitis can spread infection to the uterus, ovaries and fallopian tubes resulting in pelvic inflammatory disease (PID), infertility due to blocked or damaged fallopian tubes, ectopic pregnancy, and chronic pelvic pain (Paavonen, 2002). Babies born to infected mothers often develop chlamydial eye infection soon after birth and are susceptible to pneumonia (WHO, 2005). In men, *C. trachomatis* can cause urethritis with abnormal discharge as a common symptom (Pepin et al., 2001). Other outcomes include swelling of the prostate gland (prostatitis) and the epididymis, infertility and reactive arthritis (Wagenlehner et al., 2006). According to the WHO (2001), reactive arthritis is characterized by inflammation of the joints, accompanied by urethritis and inflammation of the eyes (conjunctivitis). Veznik et al., (2004) found that factors that may lead to infertility, such as slower sperm motility and speed and lower density and volume, were present in ejaculates that tested positive for chlamydia.

1.1 Prevalence

In 2008, the number of cases of chlamydia infection was 100.4 million worldwide and 9.1 million in Africa (WHO, 2008). Prevalence for chlamydia among women in Africa was 3.9% and 2.4% for men. The Africa region had the fourth highest prevalence among the six world regions. Chlamydia had higher prevalence compared to *Neisseria gonorrhoeae*, and syphilis, but was a distant second to *Trichomonas vaginalis* (WHO, 2005). In Ghana, prevalence among non-sex workers residing in Kumasi and who are engaged in high-risk sexual behaviours was 4.8% in women and 3.0% in men (Qpoku et al., 2010) and 3% among women attending an obstetric-gynecological clinic (Apea-Kubi et al., 2004). Similarly, a study in Accra reported a prevalence rate of 4.9% among

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postpartum women and patients of a gynecological clinic (Bentsi et al., 1985). In another urban area, a study in Kumasi by Siemer et al. (2008) reported an infection rate of 2.4% among infertile women and 1.6% among healthy patients of a gynecological and obstetrics clinic. Among female sex workers in Accra, the prevalence rate was 10.1% (Deceuninck, et al., 2000). Higher rates were observed in other African countries, especially in some rural areas. A study in Pretoria, South Africa, among 200 women seeking termination of pregnancy found that 10% were diagnosed with Chlamydia and another 3% had chlamydia and another STI (DeJongh et al., 2010). A study of rural women in South Africa reported that 11% of 696 women who presented with vaginal discharge at a sexually-transmitted disease clinic were diagnosed with Chlamydia (Moodley, et al., 2002). Chlamydia prevalence among women in Mwanza, a rural area in Tanzania, was about 13% (Orroth et al., 2003). However, among randomly selected women in a rural area in Malawi, the infection rate was much lower at 6.9% for men and 5.1% for women (Paz-Soldan et al., 2012). Higher prevalence is often expected from samples of sex workers. However, a review of 47 independent studies in South Africa revealed no significant difference between sex workers and women who attended an STI clinic and women who attended a prenatal or family planning clinic (Johnson et al., 2005). A study in Benin reported an infection rate of 4.8% among sex workers in Benin (Lowndes et al., 2007), 12% in Cameroon (Ryan et al., 1998), and 16.4% among sex workers in KwaZulu-Natal, South Africa (Ramjee et al., 1998). Between 1993 and 1999, the chlamydia infection rate ranged from 13.1% in 1993 to 5.1% in 1999 among Ghanaian sex workers in Cotonou, Benin (Alary et al. 2002).

1.2 Risk Factors

Women and young people have been found to have higher rates than other groups. According to WHO (2011), the worldwide prevalence of women (3.5%) is almost twice that of men (2.2%). A study of women in four countries in Southern and Western Africa revealed that younger age, multiple sex partners, receipt of gifts or money in exchange for sex, use of hormonal contraceptives and practice of anal sex were risk factors for chlamydia (Kapiga et al., 2009; Ventaktesh, 2011). Studies have shown that age of participants, use of contraceptive, marital status, infertility and symptoms are significant determinants of Chlamydia infection with a larger part of the infections seen in the younger age group, 18–25 years (Opoku, . 2006). There is relatively less information about chlamydia as one of the STIs in developing countries, including Ghana. Thus, there is a need to extend the knowledge of *Chlamydia trachomatis* infection to less-privileged districts in Ghana, as well as including men in the screening process. Including gender as a risk factor is important because research has shown that, compared to women, men are less likely to seek health advice and treatment and are less likely to disclose their infection to their partners (Leichliter et al., 2011). To address this important deficit, this study examined the relative effects of gender, age and symptoms in acquiring chlamydia infection.

1.3 The Study

This study was conducted to determine the prevalence of *C. trachomatis* infection in the rural municipality in Southwest Ghana. The study explored the relationship between age,

gender, symptoms and diagnosis. The specific hypotheses were:

H1: Younger patients are more likely to be diagnosed positively than older patients.

H2: Women are more likely to be diagnosed positively than male patients.

H3: Vaginal discharge and urethral discharge are more likely to lead to a diagnosis of chlamydia compared to other symptoms.

H4: Interaction effects among age, gender and symptoms are associated with chlamydia.

The findings of this study are to inform members of the population who are most at risk of acquiring a chlamydia infection about the symptoms that are most likely to indicate infection. This information will help promote preventive measures that minimize the spread of chlamydia infection in many districts and municipalities in Ghana.

2 MATERIALS AND METHODS

2.1 Sample

The sample is comprised of 186 individuals, 17 years and older who were screened for chlamydia. Patients who were screened were having a routine check and were diagnosed with chlamydia-related symptoms in two hospitals in the municipal district. . Among the 186, 17 were diagnosed with a sexually-transmitted infection (STI) other than Chlamydia, and 2 were children younger than 15 years.

2.2 Measures

The dependent variable was a diagnosis of chlamydia. Patients who tested positive for chlamydia during the screening were coded '1' and those who tested negative were coded '0' in data analysis. The independent variables were age and gender of patient and symptoms presented. Males were coded '1' and females were coded '0'. The symptoms for men were urethral discharge, burning sensation, and lesion on the penis. The symptoms for women were vaginal discharge, vulva vaginitis, pelvic inflammatory disease (PID) and candidiasis. The symptoms were coded '1' for yes and '0' for no.

2.3 Data Analysis Procedures

Analyses of variance and post-hoc tests, independent t-tests, and chi-square tests were used to determine if gender, age and symptoms significantly determined a positive diagnosis. Logistic regression was used to estimate the relative importance of factors that differentiated respondents with a positive diagnosis of chlamydia from those who did not.

3 RESULTS

3.1 Demographic Characteristics and Health Status

Of the remaining 167 patients who also participated in the screening test, 40 (24.0%) were men and 127 (76.0%) were women. The average age of patients was 30.7(SD = 6.7) years. The average age of the men was 31.7 (SD =7.2) and the average age of the women was 30.3 (SD = 6.5) years.

3.2 Symptoms

The most common symptoms reported among the women were vaginal discharge (54.3%), vulva vaginitis (23.6%), pelvic inflammatory disease (PID) (13.4%) and candidiasis (8.7%). The most common symptoms for the men were urethral discharge (52.5%), burning sensation (37.5%), and sore on penis (10.0%).

Table 1: Number of Patients Screened and Diagnosed with Chlamydia by Gender and Symptom

Symptoms	Symptom No. (%)	Negative Diagnoses No. (%)	Positive Diagnoses No. (%)
Men			
Urethral Discharge	21 (52.5%)	17(42.5)	4 (10.0)
Burning Sensation	15 (37.5%)	11(27.5)	4(10.0)
Sore on Penis	4 (10.0%)	3(7.5)	1(2.5)
Total	40 (100%)	31(77.5)	9(22.5)
Women			
Vaginal Discharge	69 (54.3%)	52(41.0)	17(13.4)
Pelvic Inflammatory Disease (PID)	17 (13.4%)	14(11.0)	3(2.4)
Vulva vaginitis	30 (23.6%)	26(20.5)	4(3.1)
Candidiasis	11 (8.7%)	10(7.9)	1(0.8)
Total	127	102(80.3)	25(19.7)

3.3 Symptoms and Age

A comparison of the average age of women presenting with the symptoms showed no significant difference. However, among the men, a post-test (Bonferroni) with one-way ANOVA showed the average age of men presenting with a lesion on the penis ($M = 40.3$, $SD 9.5$) was significantly higher than the average age of men with urethral discharge ($M = 29.8$, $SD = 5.8$, $p = 0.02$).

3.4 Positive Diagnosis and Gender

As shown in Table 1, the percentage of women diagnosed with chlamydia was 19.7% and the percentage of men was 22.5%. There was no significant difference between diagnosis and gender ($p = 0.618$).

3.5 Positive Diagnosis and Symptoms

The number of patients diagnosed positive for chlamydia was 34 (20.4%); the remaining 133 (79.6%) were negative. Chi-square tests were conducted to determine whether infection rates across symptoms were significantly different. The results show that the infection rates were not significantly different for symptoms of men ($p = 0.86$) and women ($p = 0.53$). Chi-square tests were also conducted to determine whether the proportion of infected and non-infected individuals was significantly different for each symptom. With the exception of vaginal discharge ($p = 0.017$), the results show that the proportions were not significantly different. With regard to vaginal discharge, the risk ratio for getting a negative diagnosis is 1.23 (95% CI 1.03, 1.48) and for a positive diagnosis is 0.41 (95% CI 0.19, 0.88). The former risk ratio indicates that the women who did not have vaginal discharge were 1.23 times more likely not to be diagnosed with

chlamydia. The latter risk ratio indicates that the women who did not have vaginal discharge are 0.41 less likely to have a diagnosis of chlamydia. The odds ratio was 3.02 (95% CI 1.19, 7.71).

3.6 Positive Diagnosis and Age

There was no significant difference in age between those who received a positive or negative diagnosis in separate analyses for men and women. The relationship between a positive diagnosis and age was investigated further in two ways. First, one-way ANOVA with post-hoc tests was conducted to determine whether there was a significant difference in age across symptoms among those who received a positive diagnosis. In this analysis, candidiasis and lesion on penis were removed from the analyses because there was only one case of each. The tests show significant differences in age among infected women. The post-hoc results show that women who presented with PID were significantly older than those who presented with vaginal discharge ($p = 0.016$). Among infected men, a trend suggests that those with symptoms of burning sensation were older than those with urethral discharge ($p = 0.06$). Second, t-tests were used to determine whether, within each symptom, there was a significant difference in age between those who received a positive or negative diagnosis. The results were significant for two symptoms, vaginal discharge and urethral discharge. Among the women presenting with vaginal discharge, the average age of those women with a negative diagnosis was 31.8 ($SD = 6.6$) years, whereas the average age of those with positive diagnosis was 25.6 ($SD = 4.8$ years, $p = 0.001$). Among men presenting with urethral discharge, the average age of men with a negative diagnosis was 31.1($SD = 4.7$) years, whereas the average age of men with a positive diagnosis was 24 ($SD = 7.2$ years, $p = 0.023$) (see Table 2).

Table 2: Average Age of Respondents Screened and Diagnosed with Chlamydia Infection

Symptom	Patients Screened			Patients with Positive Diagnosis			
	Number of cases	Mean Age	Standard Deviation	Positive Diagnosis	Mean Age	Standard Deviation	Prevalence rate (%)
Men							
Urethral Discharge	21	29.8	5.8	4	24.0	7.2	19.0*
Burning Sensation	15	32.1	6.9	4	34.5	5.5	26.7
Lesion on Penis	4	40.3	9.5	1	50.0	0.0	25
Total	40	31.7	7.2	9	29.3	8.2	22.5
Women							
Vaginal Discharge	69	30.0	6.4	17	25.6	4.8	24.6*
Pelvic Inflammatory Disease (PID)	17	30.4	7.2	3	37.3	10.7	17.6
Vulva vaginitis	30	30.5	6.8	4	33.0	10.2	13.3
Candidiasis	11	32.0	5.8	1	30.0	0.0	9.1
Total	127	30.3	6.5	25	28.4	7.8	19.7
Grand Total	167			34			20.4

3.7 Interaction Effects

Logistic regression was used to determine the relative importance of main and interaction effects on a diagnosis of chlamydia. The interaction effects examined were age and symptoms that showed significant differences in the previous analyses. The variables were age, two of the symptoms - vaginal discharge, and PID – and interaction variables between age and each of the two symptoms. Only vaginal discharge and its interaction term were significant in this initial model. A model with only these two variables was significant ($p < 0.001$). The pseudo R^2 (Nagelkerke) was 0.21, the odds ratio of vaginal discharge was 7.46 ($p = 0.001$) and that of its interaction term was 0.82 ($p = 0.005$). The odds ratio of vaginal discharge indicates that likelihood of a positive diagnosis is seven and a half times greater when a woman has vaginal discharge compared to when she has not. The odds ratio of the interaction term indicates that women with vaginal discharge, who are older, are about 20% less likely to receive a positive diagnosis than younger women with a vaginal discharge (see Figure 1). Figure 1 shows that as age increases the probability of being diagnosed positive with chlamydia decreases. This means that patients who are 25 years and below presenting with vaginal discharge are more likely to be diagnosed with chlamydia infection than older patients with vaginal discharge.

4 DISCUSSION

The study demonstrated, using limited data from screening tests in two hospitals in a Western municipal district of Ghana, that there is a relationship between age, gender, symptoms and positive diagnosis of chlamydia. The prevalence rate for men and women were 22.5% and 19.7% respectively. Both rates were much higher compared with infection rates reported in the four studies of women in urban areas mentioned earlier (Qpoku et al., 2010); Appea-Kubi et al. (2004); Bentsi et al., (1985); Siemer et al., 2008) and in a study of female sex workers in Accra (Deceuninck, et al., 2000). The higher rates in the study area, compared to that of Ghana and other West African urban areas may be partly due to the wider availability

of antibiotics and over-the-counter medications in urban areas compared to rural areas to. In a study by Adu-Sarkodie (1997), many of the respondents reported that they had taken antibiotics without a prescription prior to presenting at a clinic when they suspected they had an STI. Another explanation for the difference in rates may be due to differences in the sampling procedures and levels of sensitivity of the diagnostic tests used (Orroth et al., 2003).

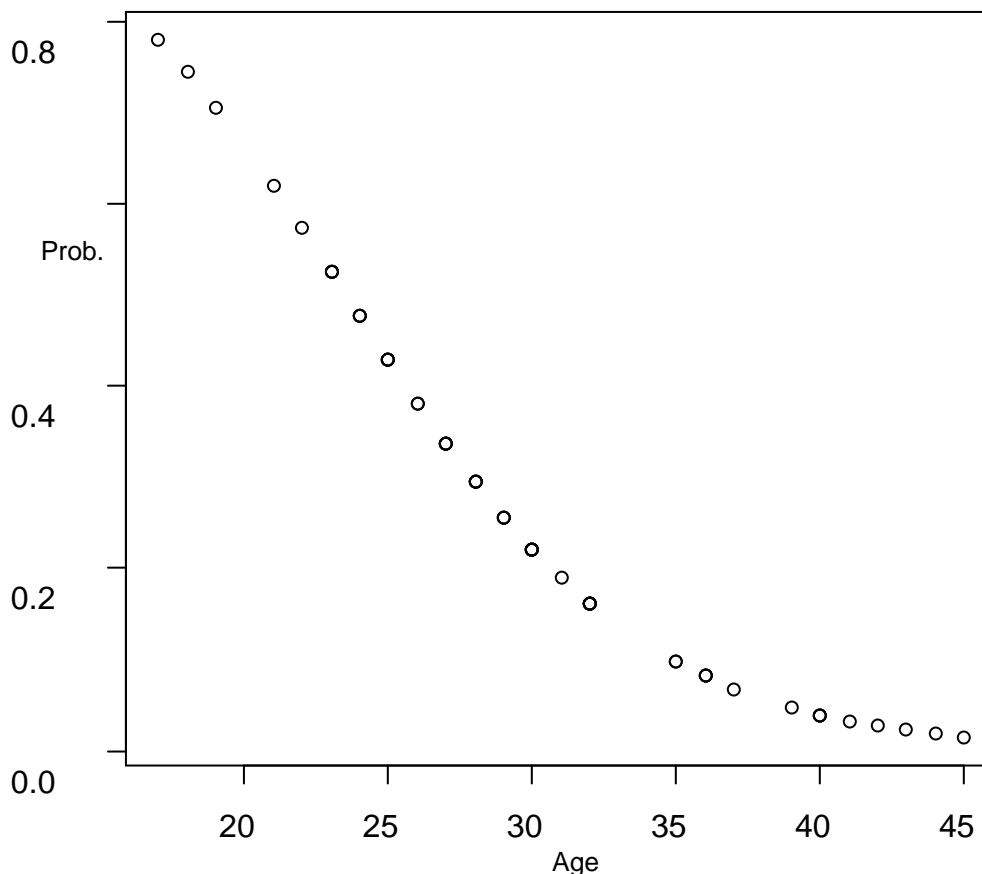


Fig.1 Age and Positive Diagnosis of Vaginal Discharge

The most common symptoms reported were vaginal discharge in women and urethral discharge and a burning sensation in men. The rates presented here were 24.6%, 19.0% and 26.7% respectively. The 24.6% is slightly lower than 27.2% presented by Opoku et al.,(2010) regarding the rates of vaginal discharge among high risk young women in Kumasi. Consistent with this study, Mhlongo et al. (2010) found that vaginal and urethral discharge were the most common symptoms and that chlamydia was one of the main causes of these symptoms. Among the symptoms, vaginal discharge was the only symptom predictive of positive diagnosis, partially supporting H3. The proportions of infected and non-infected individuals within each of the other symptoms were not significantly different. The infection rate of patients reporting vaginal discharge in this study was 23%. This rate is much higher than the infection rate of 1.5% among those presenting vaginal discharge among Ghanaian women who are not sex workers (Pepin et al., 2004). A study in South Africa reported an infection rate of 14.7% among patients of a clinic and health care centre seeking treatment for vaginal discharge in Cape Town and Johannesburg (Mhlongo et al., 2010). Urethral discharge did not significantly predict a positive diagnosis of Chlamydia among men in the sample. This may be due to the small sample size (4 out of 21, 19% had positive diagnosis). A study of men in West African nations by Pepin et al., (2001) found that among men complaining of urethral discharge, 13.4% were positively diagnosed with chlamydia whereas from a study of men in South Africa with urethral infection, 4.9% were diagnosed with chlamydia (Lewis et al., 2012). A study of

men complaining of urethral discharge in Cape Town and Johannesburg in South Africa reported that 18.3% had chlamydia (Mhlongo et al., 2010). Age was an important factor in identifying who is at risk for chlamydia, supporting H1 and partially H4. Research has shown that age is the most important risk factor for both men and women (Rowhani-Rahbar, et al., 2011). There was a significant difference in age with regard to symptoms suggesting that risks vary with age. Women who had PID and a positive diagnosis were older than infected women who presented with vaginal discharge. This confirms previous studies that chlamydia infection falls with increasing age (Opoku et al., 2010; Masese et al., 2013). Among infected men, those who had burning sensation symptoms were older than those with urethral discharge symptoms. The findings also show that young people are more at risk than older people for a diagnosis of chlamydia if they present with vaginal or urethral discharge. This is supported by Beydoun, et al., (2010) who studied the gender and age disparities in chlamydia prevalence in US, and Satterwhite, et al., (2008) in their study of American men.

5 LIMITATIONS

The small sample size makes it difficult to judge the tests for assessing chlamydia. Scarcity, unavailability and high cost of reagents for chlamydia screening tests in most clinics and hospitals in Ghana make STI facilities inaccessible by patients. Inability of patients to report for follow-up after treatment makes management of chlamydia infection very difficult.

6 CONCLUSION

Analyses performed on diagnoses and age and between diagnoses and gender showed no significant difference. However, other results showed some positive relationship between symptoms and age and between symptoms and positive diagnoses. The study also showed that urethral discharge, burning sensation, vaginal discharge and pelvic inflammatory disease were significant determinants of chlamydia infection especially among young adults in the municipality.

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