

## Chlamydial Infection Prevalence in Human Immunodeficiency Virus Patients

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### Abstract

**Objective:** To determine the prevalence of chlamydial infection in male urethra and female cervix of HIV-positive patients based on PCR assay in Teratai Clinic, Dr. Hasan Sadikin General Hospital Bandung.

**Methods:** A cross sectional observational study with consecutive sampling method, which was conducted in Teratai Clinic during the month of July 2012. All participants underwent history taking, physical examination, and PCR assay for *C. trachomatis*. Swab samples were obtained from male urethra and female endocervix.

**Results:** Eighty one HIV-positive patients, consisted of 48 males and 33 females were included in this study. The PCR examination for *C. trachomatis* was positive in 14 of 81 subjects (17.3%), with 10 (20.8%) urethral chlamydial infection in 48 males and four (12.1%) cervical chlamydial infection in 33 females.

**Conclusions:** The study concluded that the prevalence of chlamydial infection in male urethra and female cervix of HIV-positive patients were 20.8% and 12.1%, respectively. Identifying chlamydial infection based on PCR testing should be considered for routine screening test in HIV-positive patients.

**Keywords:** *Chlamydia trachomatis*, HIV, prevalence, PCR

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### Introduction

Worldwide, *Chlamydia trachomatis* is one of the most common etiologies for sexually transmitted infection.<sup>1</sup> In 2009, 92 million new cases of chlamydial infection were reported by World Health Organization, including 43 million cases in South and South-East Asia.<sup>2</sup> Most of chlamydial infections are asymptomatic (70% in female and 20–30% in male),<sup>3</sup> making it difficult to diagnose clinically.<sup>1</sup> Nowadays, polymerase chain reaction (PCR) method has been approved by the Food and Drug Administration (FDA) as the new gold standard for the diagnosis of chlamydial infection.<sup>4</sup> In comparison with culture, the PCR method has higher sensitivity in detecting chlamydial infection (90.4% vs 70.8%) which makes it the best method for screening.<sup>5</sup>

Acquired immunodeficiency syndrome (AIDS) caused by human immunodeficiency virus (HIV) has become a great public health concern.<sup>6</sup> In 2009, the United Nations joint program on HIV/AIDS (UNAIDS) estimated 33.3 million cases of HIV infection with 4.1 million cases in South and South East Asia.<sup>7</sup> Until September 2012, Indonesian Ministry of Health reported 92,251 cases of HIV infections with most of them (50.8%) are heterosexually transmitted.<sup>8</sup>

The available epidemiological data showed that there is “epidemiological synergy” between sexually transmitted infections (STI) and HIV transmission.<sup>9</sup> HIV transmission will increase 10 fold in STI and HIV co-infected patient<sup>10</sup> and HIV-positive patient has higher risk of being infected with other STIs. High risk sexual behaviors and drug abuse are the two main factors causing STI and HIV co-infection.<sup>11</sup> Both ulcerated and non-ulcerated STIs may increase the risk of acquiring and transmitting HIV.<sup>12</sup> Ulcerated STIs increase the risk of acquiring HIV 5 to 10 folds, while non-ulcerated STIs increase the risk 2 to 5 folds.<sup>13</sup>

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Although the impact of non-ulcerated STIs is smaller than ulcerated STIs, non-ulcerated STIs are more commonly found and, therefore, could also increase the HIV epidemic.<sup>14</sup>

In 2008, it was reported in a study that the prevalence of STI in HIV patients in Washington was 8% with 19.4% of them were infected by *C. trachomatis*.<sup>15</sup> Meanwhile, in India, the prevalence of chlamydial infection in HIV patients in 2011 was 7%.<sup>16</sup>

Sexually transmitted infections among HIV-positive patients usually suggest high risk sexual behaviors and HIV transmission to uninfected population.<sup>17</sup> High-risk sexual behavior seems to be continually practiced among HIV-positive population.<sup>12</sup> To decrease associated morbidity and prevent the secondary spread of HIV and STIs, prevention efforts should focus on HIV-positive patients who continue to be engaged in high-risk sexual practices.

Corrections of high-risk behavior and STI management could decrease the risk of HIV transmission as it is reported that viral shedding in HIV-positive patients decreased significantly after the STIs were treated.<sup>18-20</sup> A study on STI intervention with syndromic management in several populations in Mwanza has shown a successful reduction of HIV incidence by 38%.<sup>21</sup>

Until currently, there has been no study conducted on the prevalence of chlamydial infection in HIV-positive patients in Indonesia. Therefore, this study will be the first one that aims to determine the prevalence of chlamydial infection in male urethra and female cervix of HIV-positive patients in Indonesia.

## Methods

### Study population

This study was conducted at Teratai Clinic in Dr. Hasan Sadikin General Hospital, Bandung during the month of July 2012. Sexually active HIV-positive patients attending Teratai Clinic were offered to participate in this study. Eighty one HIV-positive participants (48 males and 33 females) were enrolled after written informed consent was obtained. Women having her menstrual period were excluded from the study.

The HIV serostatus of the study population was determined and confirmed before this study according to the National Guideline for HIV/AIDS. Comprehensive data on characteristics and sexual history of the patients were collected through history taking and medical records. History taking, clinical examination, and specimen collections were conducted in Teratai Clinic, while the specimen processing was conducted

in Biology Molecular Laboratory, Microbiology Department of Health Research Unit, Faculty of Medicine, Universitas Padjadjaran.

The study was approved by the Ethical Committee of Faculty of Medicine, Universitas Padjadjaran-Dr. Hasan Sadikin General Hospital Bandung.

### Specimen collection method

Urethral swab of male patients and endocervical swab of female patients were collected using specimen collection kit (Roche) and transported to the laboratory in Chlamydia transport tubes (Roche), on the day of collection. At the laboratory, urethral and endocervical swab specimens for PCR assay were prepared immediately according to the instruction, frozen at -20 °C, and analyzed within 14 days of sampling.

### Specimen processing method

The Roche Amplicor PCR Assay was used (the PCR was accomplished with thermocycler). After the amplification, the amplified nucleotide sequences were detected by an enzyme immunoassay and the optical density at wave length 450 nm was measured using a spectrophotometer. A positive result was defined as a reading above 0.5 while the result was considered equivocal when the reading is between 0.2 to 0.5. A negative result was assigned for a reading below 0.2. Statistical analysis was performed using SPSS 17.0

## Results

During the study, 81 HIV-positive participants were screened for chlamydial infection. Among the 81 patients tested, 14 chlamydial infections were identified with 10 in male urethra and 4 in cervix. The prevalence of chlamydial infection in this study was 17.4%. Meanwhile, the prevalence of urethral chlamydial infection in male was 20.8% and cervical chlamydial infection in female was 12.1%.

A list of the 81 HIV-positive participants in this study is presented in Table 1. Male participants comprised 59.3% of the total participants and 69.1% participants were in 25–35 years old group. Half of the participants were high-school graduates, 43.2% were self employed, and 55.6% were married.

Most of participants who were infected with Chlamydia was in the age group of 25–35 years old, with 17.9% of them were Chlamydia positive (Table 2). *C. trachomatis* was detected in 20.8% males and 12.1% females. Both single and divorced groups were infected with *C. trachomatis* as many as 27.8%. This number is

much higher compared to only 8.9% of married group that were infected by *C. trachomatis*.

**Table 1 Baseline Characteristics of Participants**

Variable	n	%
<b>Age (yrs.)</b>		
<25	5	6
25–35	56	69
>35	20	25
<b>Sex</b>		
Male	48	59
Female	33	41
<b>Education</b>		
No education	0	0
Elementary school	4	5
Junior High school	4	5
Senior High school	41	51
College/university	32	40
<b>Occupation</b>		
Self employed	35	43
Civil servant	1	1
Working class	20	25
Commercial sex worker	1	1
Student	1	1
Not working	23	28
<b>Marital status</b>		
Single	18	22
Married	45	56
Divorced	18	22

Table 3 shows that 17.9% participants with the age of sexual debut of less than 20 years old were infected with Chlamydia. This percentage is not significantly different from that of the participants with the age of sexual debut of more than 20 years old. There were 33.3% participants with 6 or more lifetime sexual partners were Chlamydia positive, which is higher when it is compared to only 14.3% participants with 1 lifetime sexual partners. Condom use behavior was also asked to the participants. Almost half of the participants included in the study admitted that they always use condom. Despite this statement, there were still 17.5% of the participants who were infected with Chlamydia. This means that we have to consider the participants' statement regarding condom use

more carefully to understand the real condom use behavior.

**Table 2 Characteristics of Participants with Positive *C. trachomatis***

Variable	C. trachomatis		Total n
	(+)	(-)	
<b>Age (yrs.)</b>			
<25	1	4	5
25–35	10	46	56
>35	3	17	20
<b>Sex</b>			
Male	10	38	48
Female	4	29	33
<b>Marital status</b>			
Single	5	13	18
Married	4	41	45
Divorced	5	13	18

## Discussion

The overall prevalence of chlamydial infection in this study was 17.3%, which was higher than any of the previous studies. This is probably due to the fact that STI screening is not routinely performed for HIV-positive patients in Teratai Clinic. Since most of chlamydial infections are asymptomatic, most patients did not receive appropriate treatment and this could result in persistent chlamydial infection.

Several studies on prevalence of chlamydial infection using nucleic acid amplification test in HIV-positive patients have been conducted with varied results. A literature review of 37 clinical studies reported that chlamydia was the most common STI identified in HIV-positive patients, with 5% median prevalence, ranging from 3 to 10,9%.<sup>22</sup>

An evaluation on sexually active Inuit women living in remote villages in Alaska found that 114 (23%) of 493 women had cervical infection with *C. trachomatis*.<sup>23</sup> As shown in this study, it has been repeatedly demonstrated that in sexually active populations in which little diagnostic testing and/or specific treatment is used, the prevalence of infection may reach surprisingly high levels. This reflects the asymptomatic nature of chlamydial infection and the ability of the infection, when untreated, to persist for months or years.<sup>23</sup>

Phipps reported that the prevalence of asymptomatic chlamydial infection in HIV-

positive patients was 8.3%,<sup>24</sup> whereas Iwuji reported that the prevalence of chlamydial infection was 2.7% in asymptomatic patients and 19% in symptomatic patients.<sup>25</sup>

The prevalence of urethral chlamydial infections in male participants in this study was 20.8%. The prevalence was higher than previous studies. Several authors reported varying result of *C. trachomatis* prevalence in HIV-positive men. The prevalence of chlamydial infection in HIV-positive men was 7% in India<sup>16</sup> and America,<sup>15</sup> 9% in England,<sup>25</sup> and 6% in US army.<sup>26</sup>

In this study the prevalence was higher in men than women. This is probably due to the fact that most of the patients who came to Teratai Clinic are male, and compared to women, men have higher tendencies to engage in high risk sexual behavior. The risk for chlamydial infection was twice higher in men than women.<sup>26</sup> This is probably due to higher risk sexual practices in men. Twenty nine point two percent of men admitted having more than 15 sexual partners, compared to 11.4% in women.<sup>27</sup>

A research in 11 cities in Indonesia showed that 33% of men had sex with female sex worker in the previous year and 20% with non-marital female partners. This study also showed consistent condom use was low in both sex workers (17%) and other non-marital partners (13%).<sup>28</sup> The prevalence of cervical chlamydial infections in female participants in this study was 12.1%.

Previous studies have reported different results of chlamydial prevalence in HIV-positive women.<sup>18,29,30</sup> The cervical chlamydial infection prevalence in women with HIV in 12 European countries was 11.8%.<sup>29</sup> Research in Thailand found that the prevalence of chlamydial infection was 9.7% in HIV-positive woman.<sup>30</sup> In an American study, it was reported that the prevalence of chlamydial infection was 3.6% in HIV-positive women.<sup>18</sup>

Chlamydial infection in HIV-positive patients were found as more common in female, but not statistically significant<sup>12</sup> which was affirmed by another study showing a correlation between female sex and chlamydial infection in HIV-positive patients.<sup>31</sup> Women have twice the risk of infected with *C. trachomatis* than men. This is probably because women are anatomically more vulnerable to STIs. Anatomic considerations make the transmission of STIs to women during sexual intercourse a biologically "more efficient" process. During intercourse, semen tends to pool in the vaginal vault causing prolonged contact with cervix epithelium. Another factor is cervical ectopy, which is commonly found in prepubertal women caused by hormonal changes.<sup>27</sup>

Norms regarding appropriate sexual behavior are usually more restrictive for women than for men in most societies. These norms not only limit women's sexual freedom but also restrict their access to information about sexuality. In addition, lack of economic independence may prevent women from leaving a relationship that puts them at risk for acquiring STIs. In many countries, wives have little control over marital sexuality and women's ability to negotiate safer sexual practices, particularly condom use, is practically none.<sup>32</sup>

In this study, the average age of participants infected with *C. trachomatis* was 33.6 (34) years old, with a range of 23 to 71 years old. Most participants were in the age of 25–35 years old.

Most authors confirmed young age as a risk factor for chlamydial infection.<sup>11,18,31</sup> Young age was significantly related to the risk for acquiring STI in HIV-positive patients.<sup>11</sup> While another studies showed that an age of <35 years old with HIV positive were at risk of being infected with chlamydia.<sup>18,31</sup> One study stated that the prevalence of chlamydial infection in <25, 25–35, and >35 years old were 6.3%, 4.8%, 1.9%, consecutively.<sup>18</sup>

Several factors that contributed to young age as a risk factor for acquiring chlamydial infection include higher number of sexual partners<sup>15</sup> and less concerns about the risk of contracting HIV which lead to inadequate use of protective measures despite knowledge of HIV-positive status.<sup>26</sup> Onen reported that recent sexual activities decreased with increasing age which may be due to a number of factors, including partner availability, relationship satisfactory, social isolation, bereavement plus perceived ageism, and stigmatization. The presence of physical and medical illness can also impact sexual function and was a factor independently and negatively associated with recent sexual activity.<sup>15</sup> Contrary to other studies, Iwuji found that age is not related with chlamydial infections in HIV-positive men.<sup>25</sup>

Most authors discovered that chlamydial infection is related with sexual behavior. It is also reported that high risk sexual behavior increased the risk for acquiring chlamydial infection significantly.<sup>33</sup>

Contrary to other studies, Lee found no significant relation between sexual behavior and STI incident in HIV-positive patients.<sup>11</sup> This is probably due to bias. Many studies that observed sexual behavior frequently gave inaccurate result, because of recall and social desirability bias.<sup>34</sup>

Sexual histories discussed in this study are age of sexual debut, number of sexual partners,

**Table 3 Sexual History of Participants with Positive *C. trachomatis***

Variable	<i>C. trachomatis</i>		Total n
	(+)	(-)	
<b>Age of sexual debut (yrs.)</b>			
<20	7	32	39
≥20	7	35	42
<b>Number of sexual partner in the last month</b>			
0 person	6	21	27
1 person	6	42	48
≥2 persons	2	4	6
<b>Number of sexual partner in the last 3 months</b>			
0 person	4	16	20
1 person	7	39	46
≥2 persons	3	12	15
<b>Number of lifetime sexual partner</b>			
1 person	3	18	21
2–5 persons	4	35	39
≥6 persons	7	14	21
<b>Condom use</b>			
Never	4	16	20
Seldom	3	18	21
Always	7	33	40

condom use, and STI history. In this study, the average age of sexual debut in chlamydial infected participants is 19 years old, with 7 of 14 participants infected with *C. trachomatis* having sexual debut at the age of <20 years old. This result is in accordance with the results from a study by Ghosh who found the risk for acquiring chlamydial infection in HIV-positive patients increased in patients with age of sexual debut <20 years old.<sup>16</sup>

Young sexual debut, particularly in men is correlated with increased number of sexual partners, while in women this correlates with early marriage and sexual coercion. Sexual coercion is related to big age difference, infrequent condom use, and high STI risk.<sup>32</sup> In this study, 6/27 of participants claimed not having sexual intercourse in the last month and 4/20 in the last three months infected with *C. trachomatis*.

Fifty percent of homosexual and 22% women who admitted not having sexual intercourse in the last three months were infected with STI.<sup>34</sup> This may be due to several reasons, including

recall and social desirability bias in reporting<sup>34</sup> and persistent chlamydial infection transmitted through sexual encounters >3 months before.<sup>15</sup> Most of chlamydial infections are asymptomatic. Therefore, if routine screening was not done, most of infections would not be treated and could persist months or even years.<sup>23</sup> Most of chlamydial infected participants in this study had ≥6 lifetime sexual partners.

Several authors found that the number of sexual partners correlated with chlamydial infection.<sup>35,36</sup> Findings show that increased number of sexual partners would increase the risk for acquiring chlamydial infection<sup>35</sup> and ≥6 sexual partners would increase the risk for acquiring chlamydial infection 13.5 times in women and 5.3 times in men.<sup>36</sup>

Most of participants in this study claimed always using condom in every sexual intercourse. Seventeen point five percent (7/40) of the participants who claimed that they always use condom were infected by *C. trachomatis*. Several authors reported conflicting results about condom use in chlamydial infection.<sup>11,34</sup> One

study found no correlation between condom use and incident of chlamydial infection<sup>11</sup> while another study found that 20% of patients who always use condom were infected with STI.<sup>34</sup> Most patients infected with Chlamydia claimed that they always use condom in the previous week.<sup>35</sup> This finding may be influenced by several factors, including recall and reporting bias, inconsistent and inappropriate condom use,<sup>33</sup> or latent chlamydial infection.<sup>23</sup>

Contrary to other studies discussed above, van Benthem found that inconsistent condom use with casual sex partners increased the risk for acquiring chlamydial infection in HIV-positive patients. HIV-positive women who used condoms

in less than 50% of their sexual contacts with casual partners had almost eight-fold higher risk and those who used condoms in 50–99% of the contacts had two-fold higher risk than women who did not have a casual partner.<sup>29</sup>

Based on the discussion in this paper, It is concluded that the prevalence of chlamydial infection in male urethra and female cervix of HIV-positive patients in Teratai Clinic, Dr. Hasan Sadikin General Hospital Bandung were 20.8% and 12.1%, consecutively, based on the PCR results. Identifying chlamydial infection using PCR assay should be considered for routine screening test in HIV-positive patients.

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