Original Article:
Risky Sexual Behaviors and Prevalence of Chlamydia trachomatis Antibodies among Students in a Tertiary Institution

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Abstract: Chlamydia infection is a common sexually transmitted infection in humans caused by Chlamydia trachomatis. This infection occurs frequently in sexually active adolescent and young adults. This study determined the prevalence of Chlamydia trachomatis antibodies among students involved in risky sexual behavior in a tertiary institution. A total of 92 students consisting of 46 males and 46 females between ages 16 and 25 years who were involved in risky sexual behaviors were investigated. Gamma immunoglobulin (IgG) and Mu immunoglobulin (IgM) antibodies to Chlamydia trachomatis were assayed in the serum of the students using enzyme linked immunosorbent assay. Of the total students, 71.9% had multiple sex partners while 28.3% had single sex partners. The overall prevalence of Chlamydia trachomatis IgG and IgM antibodies were 56.5% and 40.2% respectively. Prevalence of Chlamydia trachomatis IgG and IgM, though more in ages 16-20, was not statistically significant (p>0.05) over higher ages. No significant difference was recorded in the prevalence of Chlamydia trachomatis antibodies among gender. A very significant difference (p<0.05) was recorded among students involved in multiple sex partnership in relation to those having single sex partners. Risk of Chlamydia trachomatis was high among sexually active students, especially among students involved in multiple sex partnership behavior. In view of the subtle nature of Chlamydia trachomatis infection and the long term deleterious effects it may produce, it is pertinent to campaign against risky sexual activities, especially among students in higher institutions, to reduce the rate of infection and safeguard their future.

Key Words: Risky sexual behavior, Chlamydia trachomatis, Antibodies, Tertiary institution

Introduction: Sexually transmitted infections (STI) are a set of infections transmitted primarily by sexual contact with an infected person. These infections are said to be generally reported in sexually active adolescents and young adults of 17-19 years old (1,2). Chlamydia is widespread in nature and is responsible for a number of diseases involving ocular, genitourinary and respiratory diseases in man (3). Complications such as still birth, ectopic pregnancy, infertility and ophthalmic neonatorum are said to be more in women and infants (4). Most infected women are however said to be asymptomatic and therefore often fail to seek medical treatment on time (5). Approximately 80% of women and 50% of men infected with Chlamydia trachomatis are said to be asymptomatic and the condition is responsible for most preventable cause of pelvic inflammatory disease in young women (6). Pelvic inflammatory disease may lead to ectopic pregnancy, tubal factor infertility and chronic pelvic pain (7). Ectopic pregnancy is regarded as a major public health problem and its incidence has been on the increase worldwide (8). Furthermore, Chlamydia trachomatis infection, if not noticed on time, produces deleterious effects such as preterm labor, premature rupture of the membranes, low birth weight, neonatal death and postpartum endometritis as complications later in life (9).
Chlamydia trachomatis infection in men often presents as nongonococcal urethritis, resulting in dysuria and a discharge from the penis. Untreated chlamydial infection in men can spread to the epididymis, cause prostatitis, proctitis, acute proctocolitis, and Reiter’s syndrome (10). Male infertility, chronic prostatitis, and urethral strictures are further possible complications of the infection. Infections take place after direct contact with the skin or mucous membranes of an infected sexual partner during vaginal, anal, or oral sex (11). Age, sex preference, number of sex partners, socioeconomic
status are among factors affecting the transmission of the pathogen(11). Young people indulge in sex for pleasure rather than for procreation. Risky sexual behaviors among them therefore include unprotected vaginal sex, oral and anal sex, group sex, and multiple sex partnership (12).

Many different groups of people have been investigated for the prevalence of Chlamydia trachomatis. Some of such groups are: women attending antenatal clinic in Nigeria (13,14), asymptomatic individuals in Nigerians (15), men and women (16), students and their non-student counterparts (17) and random study among tertiary institutions of learning (18). Records relating risky sexual behavior with prevalence of Chlamydia trachomatis antibodies in any higher institutions in Nigeria are scanty. The discovery of the prevalence rate of Chlamydia trachomatis antibodies among students in tertiary institutions involved in risky sexual behavior will help in campaign against risk of Chlamydia trachomatis infection among this group of people. This study aimed to determine the prevalence of Chlamydia trachomatis antibodies among students involved in risky sexual behavior in a tertiary institution in Nigeria. The prevalence of IgG antibody to Chlamydia trachomatis among students was determined. IgM antibody to the pathogen was determined to know the prevalence of current infection among the study group. The relationship between gender and prevalence of the antibodies was evaluated.

**Materials and Methods**

**Study area**

This study was carried out among students in a higher institution in Nigeria. **Sample size**

The sample size was determined using a mathematical formula (19), using the prevalence of 6.0% (18) of Chlamydia trachomatis, confidence level of 95 and desired precision of 0.05. The sample size of 92 was used in this study.

**Ethical approval**

Ethical approval for the study was obtained from the Ethical Committee of College of Medicine and Health Sciences, Afe Babalola University, Ado-Ekiti. The procedures are in line with Helsinki Declaration of 1975, as revised in 2000. The study was done according to the approved protocol. Only blood samples were required from the consented students; no other form of treatment was meted to the students investigated.

**Informed consent**

The informed participants were pre-informed about the importance of this research and their involvement. The consent of each participant was sort for and obtained.

**Inclusion criteria**

Students involved in unprotected vaginal sex, multiple sex partnership (one student having more than one sex partner), group sex, oral and anal sex were included in the study.

**Exclusion criteria**

Students not involved in sex or students that use any other protection apart from condom were excluded from the study.

**Sample collection**

A semi structured questionnaire was used to obtain information on the respondents’ demographic data and sexual behaviors. Blood was collected aseptically from consenting individuals by venipuncture, allowed to clot and the serum was separated by centrifugation at 3000 revolution per minute (rpm) for 10 minutes at room temperature into screw-capped containers, stored at -20°C, until ready for analysis (20).

**Sample analysis**

The serum samples were analyzed using ELISA technique for identification of antibodies to Chlamydia trachomatis. **Chlamydia trachomatis IgG ELISA test**

**Principle:** This kit uses capture ELISA principle to detect Chlamydia trachomatis IgG. Purified Chlamydia trachomatis antigen is pre-coated on the microplate, the enzyme-labeled anti-Chlamydia trachomatis IgG complex will combine with IgG in human serum/plasma (21). The manufacturer’s test protocol was strictly followed in carrying out the test. The test was incubated at 37°C for 20 minutes in Marvotech Incubator (China). At the end of the incubation the test was washed with 1: 40 dilution of wash solution (using distilled water) 5 times in a Marvotech Plate Washer (China) and patted to dry. The conjugate was added and the test was incubated at 37°C for 20 minutes. Fifty microliter (50µl) of stop solution was added to each well (excluding the blank hole) and mixed gently by shaking. The optical density of the ELIZA test was measured at 450nm wavelength using Marvotech Plate Reader (China).

**Interpretation of result**

The cut-off value for the individual tests was determined by multiplying the mean optical density (O.D) value of negative control by 3. O.D value ≥ cut-off O.D was taken as positive. Thus, the mean negative control O.D ≤ 0.1 and mean positive control O.D ≥ 0.8, was used to validate the test. Specimens giving an O.D equal to or greater than the cut-off value are considered reactive, which indicates that Chlamydia trachomatis IgG has been detected. Specimens giving O.D values less than the cut-off value were taken as non-reactive, which indicates that no Chlamydia trachomatis IgG has been detected.

**Chlamydia trachomatis IgM ELISA test**

**Test principle:** The kit uses a double-antibody sandwich enzyme-linked immunosorbent one-step process to analyze the existence or not of Chlamydia trachomatis-IgM in the samples (21). The manufacture’s instruction was followed in the ELISA assay.

The test was incubated for 60 minutes at 37°C in Marotech Incubator (China). Marvotech Washer (China) was programmed to wash each well five times by filling each well with 400µl of 1: 20 dilution of wash solution. After washing, chromogen solution A (50µl) and chromogen B (50µl) were added to each well, mixed and incubated for 15 minutes at 37°C protect from light. Fifty microliter (50µl) of stop solution was added to each well. The optical density (OD) of the test was read at 450nm using Marvotech Plate Reader (China).

**Calculation of result**

Test validity was determined by the positive control well giving O.D ≥ 1.00 while the average O.D of negative control well was ≤ 0.15. Cut-off value (CO) for determining the positivity of each test was taken as the O.D of negative control well plus 0.15. Specimen O.D values greater than the cut-off value were regarded as negative while specimen O.Ds ≥ the cut off value were regarded as positive, indicating current infection.

**Results**

Of the 92 students investigated, the total number of students involved in multiple sex partnership or involved in group sex was 66 (71.7%) while 26 (28.3%) had single sex partners. The overall prevalence of Chlamydia IgG and IgM were 56.5% (52) and 43.5% (40) respectively. Table 1 shows the age range of the students against IgG and IgM. The age of the students involved in multiple sex partnership or involved in group sex was 66 (71.7%) while 26 (28.3%) had single sex partners. The overall prevalence of Chlamydia IgG and IgM were 56.5% (52) and 43.5% (40) respectively. Table 1 shows the age range of the students against IgG and IgM. The age of the students had no significant (IgG, p=0.714, IgM, p=0.251) effect on the prevalence of infection. Though it was slightly higher among students in the age group between 16-20, this difference was not statistically significant (p=0.05).

<table>
<thead>
<tr>
<th>Age ranges</th>
<th>IgG</th>
<th>IgM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Negative</td>
<td>Positive</td>
</tr>
<tr>
<td>16-20</td>
<td>20</td>
<td>28</td>
</tr>
<tr>
<td>21-25</td>
<td>20</td>
<td>24</td>
</tr>
</tbody>
</table>

X² = 0.134
p-value = 0.714

NB: p>0.05, Not significant

Table 2 shows the relationship between students having multiple sex partners or involved in group sex and those with single sex partners in relation to Chlamydia infectivity. The rate of infection was very significantly higher (IgG p value = 0.000, IgM p value = 0.000) among students involved in multiple sex partnership in relation to those with single sex partners.

<table>
<thead>
<tr>
<th>Sex partnership</th>
<th>IgG</th>
<th>IgM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Negative(%)</td>
<td>Positive(%)</td>
</tr>
<tr>
<td></td>
<td>Negative(%)</td>
<td>Positive(%)</td>
</tr>
<tr>
<td>Multiple sex partner</td>
<td>14 (22.2)</td>
<td>52 (78.8)</td>
</tr>
<tr>
<td></td>
<td>29 (43.9)</td>
<td>37 (56.1)</td>
</tr>
<tr>
<td>Single sex partner</td>
<td>26 (100)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td></td>
<td>26 (100)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>X²</td>
<td>47.115</td>
<td>24.381</td>
</tr>
<tr>
<td>p-value</td>
<td>0.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Table 3 shows the prevalence of IgG and IgM in relation to gender. There was no significant difference in the rate of infection among both sexes (IgG p-value = 0.674, p-value = 0.832).

<table>
<thead>
<tr>
<th>Gender</th>
<th>IgG</th>
<th>IgM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Negative(%)</td>
<td>Positive(%)</td>
</tr>
<tr>
<td></td>
<td>Negative(%)</td>
<td>Positive(%)</td>
</tr>
<tr>
<td>Male</td>
<td>21 (45.7)</td>
<td>25 (54.3)</td>
</tr>
<tr>
<td></td>
<td>28 (60.9)</td>
<td>18 (39.1)</td>
</tr>
<tr>
<td>Female</td>
<td>19 (41.3)</td>
<td>27 (58.7)</td>
</tr>
<tr>
<td></td>
<td>27 (58.7)</td>
<td>19 (41.3)</td>
</tr>
<tr>
<td>X²</td>
<td>0.177</td>
<td>0.045</td>
</tr>
<tr>
<td>p-value</td>
<td>0.674</td>
<td>0.832</td>
</tr>
</tbody>
</table>

Discussion:
Risky sexual behavior is a strong risk factor among students in higher institutions. Records are scanty on the prevalence of Chlamydia infection among students having risky sexual behavior in tertiary institutions. However, random sampling of students, irrespective of sexual behaviors in other institutions, records Chlamydia trachomatis prevalence of 0.2% in Uganda (22) and 1.8% in Ethiopia (23). Also, in Anambra State, South East, Nigeria, random sampling among tertiary school students was 6.0% (18) irrespective of their sexual activity. In Ethiopia the prevalence rate for chlamydial infection of the cervix was 5.9% and also a prevalence rate of 13.3% was noted among women attending antenatal clinic in Benin City, Nigeria (13,14).

The result from this study (IgG, 56.5% and IgM, 43.5%, IgM) was higher than recorded values by previous researchers because the study focused on students involved in risky sexual activities. Students are not allowed to go out of the university in the institution under study except for cogent reasons. This may be a contributory factor to the prevalence of the organism in the institution because any sexually transmissible organism in such system may spread rapidly among students involved in sex. The prevalence of IgM (43.5%) in this study is quite alarming as this revealed the percentage of the subject having sex. Studies have shown that the pattern of sexual behaviors and practices among adolescents lean towards risky sexual behaviors (24).

In this work, Chlamydia trachomatis prevalence seemed to be higher in students in the age range of 16-20 years (though not significant). This is in agreement with previous report that Chlamydia is most often detected in sexually active 17-19 year olds (25). At ages over 20 years, prevalence tended to be lesser. This is further affirmed by many studies from developed countries; prevalence declining with increasing age (25,27,18). New student intakes in most universities are in ages 15-17 years. Such students having just left the parental monitoring gain freedom to explore sexual life. In this age bracket most people want to have sex due to peer group influence, curiosity and experimentation as well as financial reasons with little or no knowledge of the consequences of unprotected sexual intercourse, group sex or multiple sex partnership. Only after some unpleasant experiences some tend to withdraw from sexual activities. Thus at older ages prevalence of the pathogen become reduced. Certainly, Chlamydia trachomatis infection can be characterized as an adolescent infection (2).

Positivity was slightly higher among females than males, though not statistically significant in this study. This pattern of having more female being positive is in agreement with most reviewed studies (16,18,27). Chlamydia trachomatis affects both sexes but because females, being at the receiving end during sex, tend to have higher risk of infection. Students having multiple sex partners were found to be significantly associated with increased risk of Chlamydia trachomatis infection. This risky sexual behavior and the preponderance of Chlamydia trachomatis infection is consistent with the findings of other researchers (16,27). Risky sexual behaviors will lead to increased transmission among students practicing multiple sex partnership. Higher prevalence of sexually transmitted infections among individuals with high risk sexual behaviors has been reported in several studies (13,15,17).

Prevention and control of STDs, especially among the youth, is not given precedence for most countries (12). Ignorance of the problems of STDs and their complications, competitive demand on limited resources to control other equally vital health challenges and the reluctance of public health policy makers to combat diseases associated with sexual behavior are among factors identified to be responsible for the neglect of prevention and control of STDs among the youth (12).

Conclusion:
The overall prevalence of Chlamydia trachomatis antibodies reported in this study was 56.5% and 43.5% in IgG and IgM respectively among students involved in risky sexual behavior in a tertiary institution. Multiple sex partnership increases the chances of infection. Chlamydia trachomatis infection was neither gender biased nor selective in the present study. Health and sex education particularly safe sex practices should be introduced to tertiary institution students in Nigeria. The tertiary institution curriculum could be targeted as an avenue to disseminate information to the students. Other avenues for information dissemination such as enlightenment symposia, and electronic media, to campaign against risky sexual activities in campuses could be harnessed. The social media is an important source of information to young people and the adolescents nowadays. This could be harnessed to disseminate information that discourages risky sexual behaviors and offer guide to making right and constructive decisions towards a healthy future.

Conflict of interest: Not declared.

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References:


