Prevalence of Chlamydial Infection and Frequency of Risk Behaviours for STDs and HIV Infection among Adolescents in Public Juvenile Facilities in the Province of Quebec

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Incarcerated adolescents have been identified as an especially high-risk group for STDs and HIV infection.1-5 Among sexually active female teenagers in different detention centres, 14% to 35% were found to be infected with Chlamydia trachomatis whereas prevalence rates range from 7% to 13% among incarcerated sexually active male adolescents.6-9 Risk factors found to be associated with the occurrence of STDs are multiple sexual partners, inconsistent or no condom use, a history of recent STD treatment and the amount of alcohol consumed per week.4,7,8 However, some surveys have failed to find an association between chlamydial infection and any of the usual STD risk factors such as age, race, number of sexual partners or condom use.3

The objectives of the present study were to determine the prevalence of genital chlamydial infection in adolescents admitted into public juvenile facilities in the province of Quebec and to assess the frequency of risk behaviours for STDs and HIV infection in order to better plan medical services and health education programs aimed at this population.

METHODS

Study population

The study population consisted of adolescents admitted into public juvenile facilities in the province of Quebec. Each year, approximately 5,000 adolescents between 12 and 18 years of age are admitted into these facilities.10 Approximately 66% of males and 87% of females are admitted under the Youth Protection Law (physical or sexual assault victims, runaways, drug abusers, or participants in prostitution). Nearly 12% of both males and females are admitted under the Health and Social Services Law because their safety and development are in jeopardy (physical or sexual assault victims, runaways, drug abusers, or participants in prostitution). Finally, 22% of males and 1% of females are admitted under the Young Offenders Law because of delinquency or antisocial behaviour. All juvenile facilities provide services for protection in an open setting, and some of them also admit young offenders in detention.

Overall, 12 of 40 public juvenile facilities were asked to collaborate. In Quebec
City, all five juvenile facilities participated in this study. In the Montreal region, the five juvenile facilities admitting the most adolescents agreed to collaborate. Finally, two other facilities located in important cities elsewhere in the province were also invited to participate.

Subjects were eligible if they were between 14 and 18 years of age and were admitted into the centre for at least 30 days. Those who left before that time were excluded because routine medical examinations were not performed. Subjects admitted to the facility on multiple occasions during the course of the study were eligible only at their first visit.

**Data collection**

Data were collected between June 1991 and December 1992. The medical history was taken and specimen collection performed by nurses working at the health service facility of each setting. Before the study they were trained by one of the investigators in order to ensure uniformity in data and specimen collection procedures. Standard care for other health problems was carried out as usual.

After written consent and under nurses’ supervision, participants completed an anonymous self-administered questionnaire providing demographic information and data on sexual behaviour, and on alcohol and drug consumption. Test-retest reliability conducted on items readministered to 15 incarcerated adolescents after 2 weeks was high (r ranged from 0.5 to 1.0 for most questions).

**Laboratory procedures**

If they were sexually active and not undergoing antimicrobial therapy for the preceding month, subjects were asked to be screened for *C. trachomatis*. An endocervical swab was taken in females. A urethral specimen was collected from the males, and then 15 cc to 30 cc of first catch urine was obtained from them. All the specimens were kept refrigerated for a maximum of 24 hours and sent on ice by courier to the Laboratoire de santé publique du Québec, where laboratory tests were performed. An ELISA test with blocking assay for confirmation (Chlamydiazyme, Abbott Laboratories, Chicago, IL) was used for diagnosis according to the manufacturer’s instructions. Male subjects who refused to have a urethral swab collected were still included in the study, and testing was then done only on urine specimens.

**Ethical considerations**

This study was approved by the Ethics Committee of Hôpital du Saint-Sacrement, Quebec. Subjects were assured complete anonymity of all information. The questionnaires were identified with code numbers, and only the research team had access to these data. Test results were reported to the researchers by the nurse of the centre’s health service using the code numbers. Subjects with positive test results were seen by health care providers for treatment and follow-up according to public health guidelines.

**Statistical analysis**

Statistical analysis was done using SAS software (SAS Institute Inc., Cary, NC). Chi-square or Fisher’s exact test was used for the comparison of proportions, and the Mantel-Haenszel chi-square was used on stratified categories. Student’s *t* test was used to compare means. The prevalence of chlamydial infection and its 95% confidence interval (95% CI) were calculated.

**RESULTS**

**Study population**

During the data collection period, 808 adolescents (396 males and 412 females) were eligible for the study. Of these, 731 (91%) were reported to be sexually active and were invited to be screened for *C. trachomatis*. Characteristics of the sample are displayed in Table I. Males accounted for 49% of the study population. Among reasons for admission to the juvenile facilities, problems with parents were the most frequent in females, and violent behaviour was the most frequent in males (Table I).

**High-risk behaviours**

Information on sexual behaviour was available for 300 of the 361 sexually active males (83%) and 346 of the 370 sexually active females (93%).Table I: Characteristics of Study Population by Gender

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Male (n=361)</th>
<th>Female (n=370)</th>
<th>p Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>11.8</td>
<td>30.0</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>20.8</td>
<td>29.4</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>27.0</td>
<td>25.4</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>34.5</td>
<td>14.9</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>5.9</td>
<td>0.3</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Born in Canada</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>35.1</td>
<td>70.5</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Has ever been on the street for at least two weeks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(street youth)</td>
<td>40.5</td>
<td>33.6</td>
<td>0.07</td>
</tr>
<tr>
<td>Reason for admission into centres (not mutually</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>exclusive)</td>
<td>35.1</td>
<td>70.5</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>- Problems with parents</td>
<td>33.4</td>
<td>39.9</td>
<td>0.09</td>
</tr>
<tr>
<td>- Problems with drugs</td>
<td>69.5</td>
<td>23.1</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>- Violent behaviour†</td>
<td>21.8</td>
<td>43.6</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>- Sexual assault victim</td>
<td>0.7</td>
<td>17.1</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>- Sexual assault victim</td>
<td>0.3</td>
<td>6.9</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Alcohol or drug consumption</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>96.7</td>
<td>94.2</td>
<td>0.09</td>
</tr>
<tr>
<td>Intrapenous drug use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10.7</td>
<td>15.9</td>
<td>0.05</td>
</tr>
</tbody>
</table>

* The p values are based on the comparison between males and females using chi-square or Fisher’s exact test.
† Includes one or many of the following offences: theft, burglary, vandalism, physical or sexual assaults.
active females (94%) (Table II). In the previous six months, female teenagers were twice as likely as male teenagers to report commercial sexual partners (Table II) and used condoms less often than males, particularly with non steady (53.8% vs 72.0%, \( p < 0.01 \)) and commercial partners (48.1% vs 87.0%, \( p=0.002 \)). In addition, 95% of sexually active adolescents were reported to be exclusively heterosexual. Only two males admitted to being exclusively homosexual, whereas 19 females and 15 males reported sexual partners of both sexes.

**Prevalence of chlamydial infection**

After informed consent, 453 of the 731 sexually active adolescents were screened for *C. trachomatis*. Excluding six females and three males who were being treated for chlamydial infection at the time of their admission, the participation rates for male and female adolescents were 59% (211/358) and 66% (242/364) respectively (\( p = 0.04 \)). We compared the subjects who agreed to be screened with those who refused with respect to some demographic variables and sexual behaviour. A significantly larger proportion of nonCanadian males agreed to be screened (24/32 [75%] vs 187/326 [57%], \( p = 0.05 \)), but they represented less than 10% of the study population. Among male teenagers, no difference was found between those agreeing to and those refusing screening, except for condom use. Indeed, 30% of those who accepted screening, as compared with 17% of those who refused (\( p = 0.02 \)), reported that they had never used condoms in the previous six months. Among female adolescents, 51% of those screened reported at least five lifetime sexual partners, as compared with 35% of those who refused screening (\( p = 0.05 \)). In the former group, consistent condom use was less frequently reported: 11% vs 26% (\( p < 0.01 \)).

*C. trachomatis* was detected in 23 (10%) of the 242 female teenagers and 3 (1%) of the 211 male teenagers tested. For male teenagers, testing was done on 75 paired urethral swab specimens and urine samples, on 134 urine samples only and on 2 urethral swab specimens only. For all 134 subjects who provided only a urine sample there was a negative result. We cannot assert that these were truly negative samples, but this was strongly suggested by the low absorbance values obtained (between 0.020 and 0.046 absorbance units). Among male teenagers testing positive, two had a positive result from urethral and urine specimens, and the other had a confirmed positive result from urethral specimen and a negative result from the urine sample.

Including the six female and three male teenagers who were under treatment for chlamydial infection at the time of their admission to the centre, the overall prevalence rate of chlamydial infection in the study population was 8% (35/462, 95% CI = 5.1-10.1). The prevalence was significantly higher in females (12%, 95% CI = 7.5-15.9) than in males (3%, 95% CI = 1.0-6.0) (\( p < 0.001 \)) but was independent of area of residence (Table III). In the uni-
variante analysis, chlamydial infection was significantly associated with multiple lifetime sexual partners but not with the other potential risk factors, such as type of sexual partners (steady, non steady or commercial) in the previous six months or the frequency of condom use. However, when we considered a composite variable formed by combining data on lifetime number of sexual partners and condom use, there was a significant increase in prevalence of chlamydial infection related to increased risk in sexual behaviour (Table IV).

**DISCUSSION**

This study shows that many adolescents admitted into public juvenile facilities in the province of Quebec, like those of other countries or regions,1,2,5,8 engage in activities that put them at high risk for STDs and HIV infection. The frequency of their at-risk behaviours was higher than that of students in the Canadian Youth and AIDS study11 but quite similar to that of students in the Canadian street youth.12

Although a large proportion of the young males reported at-risk behaviours, the prevalence of chlamydial infection in this population was surprisingly low (3%) as compared with that found in studies carried out among detained adolescents in the United States.6-9 In contrast to our study population, most of the US male adolescents in these studies were black.

Differences in sampling and testing techniques might be also responsible in part for this observation. Testing was done by an ELISA technique rather than culture6-8 or direct immunofluorescence,9 and most of the tests were carried out on urine specimens since only 37% of the screened males would provide a urethral sample. A non-invasive screening method like assay of urine specimen could be a good alternative to increase the participation rate in this population. However, when the population is asymptomatic, as were the young men in our study, most studies report a sensitivity for the ELISA technique of between 62% and 84% and a specificity near 100%.13,14

The use of polymerase chain reaction or ligase chain reaction assays on urine samples would probably have allowed detection of more infections in male teenagers.15-17 Unfortunately, these assays were not commercially available at the time the study was conducted.

The prevalence of chlamydial infection found in the female population was 12%. This might have been an overestimate, because girls who accepted screening were at higher risk, reporting more sexual partners and less use of condoms, than those who refused. However, testing was done only on cervical samples without the addition of a urethral specimen, which could have slightly increased the number of cases detected.18,19 This sampling was not performed because, according to the opinion of nurses working in the centres, providing a urethral specimen would have been unacceptable to these perturbed young women.

Chlamydial infection was much more prevalent in female than in male adolescents (12% vs 3%). This agrees with the age-specific incidence rates of notified cases to the health authorities of the province of Quebec20 and with the results of a study carried out recently in the USA.21 When compared with recent Canadian studies, the prevalence of chlamydial infection in this female population was lower than that observed in a small group of juvenile prostitutes in Alberta,22 similar to the one of street youth adolescents admitted to the same centre,23 and higher than the prevalence found in Quebec city in a group of pregnant teenagers.24

Except for gender and number of lifetime sexual partners, we found no significant association between chlamydial infection and other usual risk factors. Some explanations are possible for this observation. First, the frequency of risk behaviours for STDs was very high in the study population. In this context, it is more difficult to identify specific risk factors associated with chlamydial infection. Second, the reliability of the data on risk behaviours collected by means of the self-administered questionnaire is difficult to assess. Some subjects may be reluctant to claim risky activity, whereas others could find relevance in reporting them. Both tendencies could have an effect on the results and could mask possible associations. However, we believe that these possible biases were minimized because the questionnaire was anonymous and self-administered, and the answers were unknown to the staff or to peers.

The high prevalence of chlamydial infection found here supports the routine screening of all sexually active female teenagers admitted into public juvenile facilities in Quebec. For male teenagers, according to the Canadian guidelines,22 screening could be selective, taking into account sexual history and physical examination. Such a service may play an important role in STD control since it offers a rare opportunity for this potential core group of transmitters to not only be diagnosed and treated for STDs but also to be made aware of their vulnerability and therefore to be more alert to preventive messages. Finally, the high frequency of risk behaviours for STDs and HIV infection points to the importance of establishing specific prevention programs for this population.

**ACKNOWLEDGEMENTS**

We would like to thank the management and the employees of the participating juvenile facilities, particularly the nurses who collected the data.

<table>
<thead>
<tr>
<th>TABLE IV Chlamydial Infection and Sexual Behaviour*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>n</strong></td>
</tr>
<tr>
<td>One lifetime sexual partner</td>
</tr>
<tr>
<td>Two or more lifetime sexual partners and consistent condom use in the previous 6 months</td>
</tr>
<tr>
<td>Two or more lifetime sexual partners and non consistent condom use in the previous 6 months</td>
</tr>
</tbody>
</table>

* Data missing for 2 positive and 23 negative subjects. The 2 positive and 28 negative subjects reporting no sexual partner in previous 6 months were excluded.† p = 0.03, chi-square for trend
CHLAMYDIA TRACHOMATIS AND RISK BEHAVIOURS AMONG INCARCERATED ADOLESCENTS

REFERENCES


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$50.40, Order no. H0279

Now, for the first time, policy-makers and researchers can turn to one comprehensive source for accurate information about the health situation in the Caribbean. The countries and territories of the Caribbean area have a long tradition of collective action. This tradition was embodied in the formation of the Caribbean Community (CARICOM) in the early 1970s, and later was strengthened by the initiative known as Caribbean Cooperation in Health (CCH). In Health Conditions in the Caribbean, the Pan American Health Organization presents an overview of the challenges and conditions faced by health systems in the CARICOM member countries (the English-speaking Caribbean and Suriname).

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