Risk factors leading to Cryptosporidium infection in men who have sex with men

M Hellard, J Hocking, J Willis, G Dore, C Fairley

Objectives: Cryptosporidiosis is a devastating illness in people with HIV/AIDS yet there have been no analytical epidemiological studies measuring risk factors leading to cryptosporidiosis in men who have sex with men (MSM). The objective of this study was to measure the risk factors for exposure to Cryptosporidium among MSM.

Methods: The study was a case-control design. It recruited MSM who had laboratory confirmed Cryptosporidium infection between 1997 and 2000. Participants answered a questionnaire about potential risk factors leading to exposure to Cryptosporidium.

Results: 10 cases and 24 controls were recruited. Men having more than one sexual partner in the past month were more likely to have had Cryptosporidium diarrhoea (p = 0.034, OR 6.67, CI [1.15 to 38.60]). Insertive anal sex (p = 0.059) and attending a sex venue one or more times (p = 0.059) also increased the odds of having cryptosporidiosis.

Conclusion: The study results suggest that sexual behaviour is a significant risk factor for cryptosporidial diarrhoea in MSM. The results will be used to inform risk groups about behaviours that may put them at increased risk of cryptosporidial diarrhoea.

Cryptosporidium was first identified in 1907 but cases of disease in humans were not described until 1976.1 During the late 1970s and early 1980s further cases were recognised in immunocompromised patients, in particular in AIDS patients. By the early 1990s Cryptosporidium was recognised as an important cause of community gastroenteritis caused by outbreaks associated with drinking water2 or swimming pools,3 and animal exposure.4 In the general community cryptosporidial diarrhoea is usually a self limiting disease in AIDS. By the early 1990s Cryptosporidium was recognised in immunocompromised patients, in particular in AIDS patients. By the early 1990s Cryptosporidium was recognised as an important cause of community gastroenteritis caused by outbreaks associated with drinking water2 or swimming pools,3 and animal exposure.4

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Cryptosporidiosis can be a devastating illness in people with HIV/AIDS because it can cause severe diarrhoea that lasts for weeks and has a significant impact on patients’ morbidity and mortality. In the absence of effective therapy or response to highly active antiretroviral therapy (HAART),5 preventing exposure to Cryptosporidium organisms offers an alternative approach. In Australia the primary risk factor for HIV infection is male to male sexual contact6 and it is this subgroup who are most at risk of contracting cryptosporidiosis.7 8 Sexual contact has been implicated as a possible risk factor but there have been no analytical epidemiological studies measuring risk factors leading to cryptosporidiosis in men who have sex with men (MSM).

We report the results of a case-control study that aimed to identify the risk factors for exposure to Cryptosporidium among MSM. If the risk factors can be identified this helps in advising people about how they can reduce their risk of contracting cryptosporidiosis, particularly MSM with HIV/AIDS.

Methods

The study was a case-control design. It recruited MSM in both Melbourne and Sydney who had laboratory confirmed Cryptosporidium infection between 1997 and 2000. Cases were identified through hospitals or general practices that had a large case load of HIV infected men. Cases were also identified through a larger community study of Cryptosporidium. When a case occurred at a practice known to have a high case load of MSM the general practitioner was contacted. If the patient met the study criteria (being an MSM and having a confirmed case of Cryptosporidium infection) they were invited to participate in the study. Up to three controls for each case were recruited from the same hospital or general practice that the case attended. They were the next known MSM seen at the practice after the case was identified who had the same HIV status.

Participants self completed a questionnaire that recorded HIV status, drinking water consumption, sexual behaviour, use of sex on premises venues, use of swimming pools, travel, if they were a carer for an HIV positive person, and exposure to children and animals in the month before the participant developing cryptosporidiosis. The cases were compared with MSM who did not have cryptosporidiosis.

Cryptosporidium is a notifiable disease in New South Wales, the state in which the city of Sydney is located. Cryptosporidium was not officially a notifiable disease in Victoria, the state in which the city of Melbourne is located, but for all practical purposes was being treated as such by the Department of Human Services. It is now officially a notifiable disease in Victoria. Testing for Cryptosporidium varied between the laboratories but generally a modified acid stain or an immunofluorescence assay was used.9 All analysis is based on an unmatched case-control study and was conducted using STATA version 7. Owing to the small number of cases no adjusted analysis was performed. Local institutional research and ethics committees approved the study. Study participants gave their written and informed consent.

Results

Ten cases and 24 controls were recruited between October 1998 and August 2000. Seven cases (70%) and 16 (66.66%) controls were HIV positive. The mean CD4 count was 320 ×10^6/L for cases and 336 for controls.

Men having more than one sexual partner in the past month were nearly seven times more likely to have had Cryptosporidium diarrhoea (p = 0.034, OR 6.67, CI [1.15 to 38.60]). The odds of cryptosporidiosis were increased among those who had insertive anal sex in the past month and among those who had been to a sex venue one or more times (p = 0.059 for each variable) (table 1). There was no...
significant association between drinking tap water (p = 0.71) or contact with pets (p = 0.46).

**DISCUSSION**

Our study results suggest that sexual behaviour is a significant risk factor for cryptosporidial diarrhoea in MSM. This is the first case-control study to report this direct association. Previous studies of people infected with HIV have suggested a relation between cryptosporidiosis and sexual activity in MSM compared with injecting drug users or other HIV subgroups but none looked at specific risk factors in MSM.2–6 Our study found that having more than one sexual partner in the past month increased the risk of cryptosporidial diarrhoea. The odds were also increased among those who had anal insertive sex and attended a sex venue in the past month but the limited power of the study made it difficult for variables to reach statistical significance. The number of case of initial AIDS defining cryptosporidiosis in Australia declined over a 3 year period following the introduction of HAART from 100 in 1993–5 to 40 in 1996–1998. There is also the concern that as patients develop resistance to antiretroviral therapy there may be an increase in opportunistic infections such as Cryptosporidium. For this reason it is important that we understand the major risk factors leading to Cryptosporidium infection and educate patients about how to avoid contracting this infection.

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**CONTRIBUTORS**

MH, development of the grant proposal and study methodology and protocol and recruitment of participants, managed the project and contributed to the writing of the manuscript; JW assisted in writing the study protocol and ethics submissions, recruited and interviewed study participants, performed data entry and contributed to the writing of the manuscript; GD, development of the study methodology, recruitment of the study participants and contributed to the writing of the manuscript; CF, development of the grant proposal and study methodology, recruitment of participants, and contributed to the writing of the manuscript.

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**Table 1 Crude odds ratio of associations between Cryptosporidium infection and risk behaviours in the previous month**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cases (%)</th>
<th>Controls (%)</th>
<th>Odds ratio</th>
<th>95% CI*</th>
<th>p Value</th>
</tr>
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<tbody>
<tr>
<td>Swimming</td>
<td>No 80</td>
<td>88</td>
<td>1.00</td>
<td></td>
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<tr>
<td></td>
<td>Yes 20</td>
<td>12</td>
<td>1.75</td>
<td>0.25 to 12.50</td>
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<tr>
<td>Sex with a man</td>
<td>No 20</td>
<td>29</td>
<td>1.00</td>
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<td></td>
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<tr>
<td></td>
<td>Yes 80</td>
<td>71</td>
<td>1.65</td>
<td>0.28 to 9.79</td>
<td>0.58</td>
</tr>
<tr>
<td>Number of male partners</td>
<td>&lt;1 20</td>
<td>63</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt;1 80</td>
<td>37</td>
<td>6.67</td>
<td>1.15 to 38.60</td>
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<tr>
<td>Anal sex</td>
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<td>54</td>
<td>1.00</td>
<td></td>
<td></td>
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<td></td>
<td>Yes 70</td>
<td>46</td>
<td>2.76</td>
<td>0.57 to 13.29</td>
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</tr>
<tr>
<td>Anal insertive sex</td>
<td>No 30</td>
<td>67</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes 70</td>
<td>33</td>
<td>4.67</td>
<td>0.95 to 23.04</td>
<td>0.059</td>
</tr>
<tr>
<td>Fingering partner</td>
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<td>67</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes 60</td>
<td>33</td>
<td>3.00</td>
<td>0.65 to 13.76</td>
<td>0.158</td>
</tr>
<tr>
<td>Anal receptive sex</td>
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<td>58</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes 40</td>
<td>42</td>
<td>0.93</td>
<td>0.21 to 4.20</td>
<td>0.928</td>
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<tr>
<td>Partner fingering</td>
<td>No 70</td>
<td>67</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes 30</td>
<td>33</td>
<td>1.86</td>
<td>0.17 to 4.23</td>
<td>0.850</td>
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<tr>
<td>Rimming</td>
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<tr>
<td></td>
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<td>35</td>
<td>2.00</td>
<td>0.45 to 8.98</td>
<td>0.366</td>
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<tr>
<td>Number times at sex venue</td>
<td>0 30</td>
<td>67</td>
<td>1.00</td>
<td></td>
<td>0.95 to 23.04</td>
</tr>
<tr>
<td></td>
<td>&gt;1 70</td>
<td>33</td>
<td>4.67</td>
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</table>

*CI = confidence interval.
REFERENCES


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