A Community-Wide Outbreak of Hepatitis A: Risk Factors for Infection Among Homosexual and Bisexual Men

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PURPOSE: To assess risk factors for hepatitis A infection among homosexual and bisexual men during a community-wide outbreak of hepatitis A in New York City.

PATIENTS AND METHODS: Twenty-five homosexual and bisexual men, 20 to 49 years of age with hepatitis A identified from health department surveillance data (cases) were compared with 42 homosexual and bisexual men of similar age distribution who were seronegative for hepatitis A virus and identified from private physician offices (controls). Odds ratios (OR) were determined for acute hepatitis A infection according to demographics, numbers of sexual partners, frequency of specific sexual behaviors, and self-reported human immunodeficiency virus status.

RESULTS: Cases had more anonymous sex partners (0 to 1 partner versus >1 partner) than controls during the 6 weeks before illness onset (OR = 4.4, 95% confidence interval [CI] 1.4 to 14.4). Cases were more likely than controls to have engaged in group sex (OR = 3.8, 95% CI 1.1 to 12.6). Among specific sexual behaviors examined, oral-anal intercourse (oral role) and digital-rectal intercourse (digital role) with anonymous sex partners were more commonly reported by cases than controls (OR = 9.7, 95% CI 1.2 to 78.7 and OR = 2.6, 95% CI 1.0 to 7.4, respectively). Multivariate analysis showed that >1 anonymous sex partner, group sex, oral-anal intercourse, and digital-rectal intercourse were associated with illness in models controlling for duration of sexual activity. Because these variables were highly correlated, independent risk could not be evaluated in a single model.

CONCLUSIONS: Hepatitis A infection among homosexual and bisexual men is associated with oral-anal and digital-rectal intercourse, as well as with increasing numbers of anonymous sex partners and group sex. These findings reinforce the importance of developing educational activities for homosexual and bisexual men that focus on risk reduction for hepatitis A as well as other sexually transmitted diseases spread via the fecal-oral route.

During 1991, the New York City Department of Health (NYCDOH) noted a 5-fold increase in acute hepatitis A cases among men 20 to 49 years of age who lived in Manhattan. A preliminary survey indicated that the outbreak was occurring among homosexual and bisexual men.[1] Similar outbreaks among homosexual men were simultaneously described in several United States, Canadian, European, and Australian cities.[1,2]

Although there have been previous reports of hepatitis A outbreaks among homosexual men,[3-5] and serostudies that suggest homosexual men are more likely than heterosexual men to have had prior exposure to hepatitis A,[6-9] few investigators have examined specific risk factors for hepatitis A in this population. Studies from the late 1970s and early 1980s suggested that hepatitis A transmission was associated with oral-anal intercourse[6] and an increased number of different sexual partners.[8] In the decade since these studies were completed, numerous changes in sexual behaviors have occurred among homosexual and bisexual men, primarily due to the human immunodeficiency virus (HIV) epidemic. We conducted a case-control study to examine current risk factors for transmission of hepatitis A among homosexual and bisexual men in Manhattan—particularly to determine whether hepatitis A infection was associated with risky sexual behavior among homosexual men, including behaviors associated with HIV transmission.

PATIENTS AND METHODS

Hepatitis A is a reportable disease in New York City (NYC), with both physicians and laboratories reporting. Information was reviewed from the NYCDOH Communicable Disease database for all Manhattan men with hepatitis A during 1991.

Cases

A case was defined as a homosexual or bisexual man, 20 to 49 years of age, residing in Manhattan, who
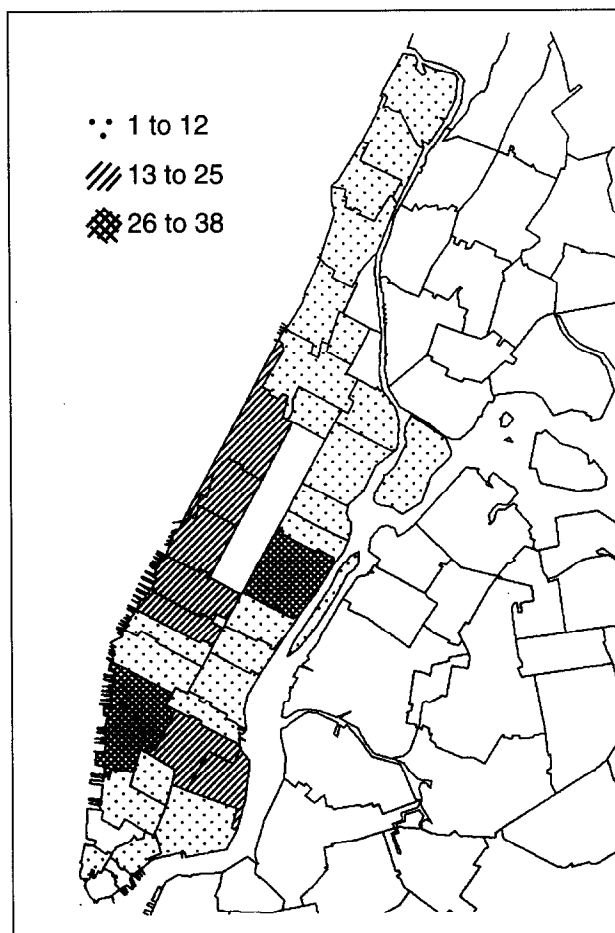
Figure. Map illustrates the number of hepatitis A cases by residence ZIP code in Manhattan in 1991.

had a positive antihepatitis A virus (anti-HAV) immunoglobulin M (IgM) serology reported to the NY-CDOH. To enhance recall of sexual behaviors, cases were restricted to those men with a positive serology between May and December 1991 (the study period).

Information regarding sexual behaviors is not available on standard communicable disease report forms; therefore, an initial telephone interview was conducted for all cases during the study period. Demographic and hepatitis risk factor data and information to identify men who had sex with men (homosexual or bisexual) were obtained.

Controls

Surveillance data showed that 85% of 1991 hepatitis A cases were diagnosed in private medical offices or outpatient clinics. Therefore, we enrolled controls from three private physician practices, one each from the upper east, upper west, and lower regions of Manhattan—areas with large numbers of reported cases (**Figure**). Homosexual and bisexual men 20 to 49 years of age who resided in Manhattan and attended any of the three practices for a routine office visit were invited to participate by a physician or nurse-practitioner. Following informed consent, one 10-mL blood sample was obtained from each control. Blood samples were tested for both anti-HAV IgM antibody and anti-HAV immunoglobulin G (IgG) antibody using an enzyme-linked immunosorbent assay at the NYCDOH laboratory. Controls were eligible for enrollment only if tests for both anti-HAV IgM and anti-HAV IgG antibody were negative.

Study Design

A standard questionnaire was administered by personal or telephone interview to cases and controls. Cases and controls were matched by date of illness onset for cases (ie, illness onset dates for cases were randomly assigned as reference dates to controls in order to minimize recall bias about their sexual activity during the potential exposure period). For example, if the case had an illness onset of May 15, 1991, a control was assigned a reference date of May 15 and information on risk factors engaged in during the 6 weeks before May 15 were collected from case and matched control. Henceforth, the onset date for cases and the reference date for controls will be referred to as time 0. Information regarding the number of anonymous and known sex partners, participation in various sexual behaviors, and the places where cases and controls engaged in sexual activity during the 6 weeks before time 0 was obtained. The 6-week period was chosen to include activities during the usual incubation period for hepatitis A. Self-reported HIV status was also collected.

Univariate analysis was done using Epi-Info 5.0.[10] The matched results are presented. For continuous variables, the P value was obtained from a single variable, conditional logistic regression model (statistical analysis system [SAS]), to account for the matched design.

Variables highly associated with illness (odds ratio [OR] >2.5), including oral-anal intercourse with an anonymous partner, digital-rectal intercourse with an anonymous partner, group sex, and number of anonymous partners (categorized as 0 to 1 versus >1 partner), as well as the duration of sexual activity were further assessed in a multivariable analysis (SAS) using conditional logistic regression to account for the matched study design.

RESULTS

An initial interview was completed for 79 (44%) of the 180 Manhattan men 20 to 49 years of age reported to the NYCDOH with hepatitis A during the study period. Of the 79 initially interviewed men, 17 were heterosexual and 62 (78%) were homosexual or bisexual and thus met the case definition. Among the 101 persons not interviewed, 94 could not be reached because of incorrect or missing phone numbers or fail-

TABLE I

Characteristics of Cases and Controls

Characteristic	Cases (n = 25)	Controls (n = 42)	P Value*
Median age (y)	31	33	0.52
Non-Hispanic white (%)	92	93	0.76
Education (median y)	16	16	1.00
Median years in New York City	8	12	0.06
Median years of sexual activity	9	14	0.09

*P value is from single-value, conditional logistic regression model.

TABLE II

Proportion of Cases and Controls Who Participated in Selected Behaviors During the 6 Weeks Before Time 0

Behavior	Cases (n = 25) No.	%	Controls (n = 42) No.	%	OR*	95% CI†
Use of inhaled nitrites	4	16	3	7	3.2	0.5 to 19.5
Group sex	8	32	4	10	3.8	1.1 to 12.6
Receptive anal intercourse	8	32	15	36	0.9	0.3 to 2.6
Insertive anal intercourse	12	48	22	52	0.9	0.3 to 2.8
Oral-anal intercourse (oral role)	16	64	12	29	4.8	1.4 to 16.6
Digital-rectal intercourse (digital role)	16	64	21	50	1.5	0.6 to 3.7
Oral-penile contact	20	80	32	76	1.2	0.4 to 3.9

*Odds ratio calculated from matched analysis.
†Confidence interval calculated from matched analysis.

ure to return 3 or more calls from health department personnel and 7 persons refused interview.

Cases resided in 24 (63%) of 38 Manhattan ZIP codes. The median age of the 62 cases was 30 years; 53 (85%) were non-Hispanic white males. Forty-two (68%) of 62 cases had no identified hepatitis A risk factor, such as consumption of raw shellfish or foreign travel.

Case-Control Study

Among 62 cases, follow-up questionnaires were completed for 25 (40%). Nineteen refused further interview or failed to keep interview appointments, and 18 could not be reached by telephone after initial contact.

Sixty-six blood samples were obtained from potential controls; 16 (24%) were positive for anti-HAV IgG antibody and none were positive for anti-HAV IgM antibody. Among the 50 hepatitis A susceptible controls, 42 were interviewed. Four were excluded, 3 because they did not live in Manhattan during the study period and 1 who was older than 49 years of age; 4 could not be reached for interview.

Cases and controls were similar with regard to age, race/ethnicity, and years of formal education (**Table I**). Cases had resided in NYC for fewer years than controls and reported fewer years of sexual activity than controls, although neither comparison was statistically significant.

Four of 25 cases reported contact with a sexual partner with recognized hepatitis A infection during the 6 weeks before time 0; no controls reported such contact. Other common hepatitis A risk factors, such as travel to endemic areas, consumption of raw shellfish, and daycare employment or contacts were similar between cases and controls. Both cases and controls reported eating a median of 30 restaurant meals during the 6 weeks before time 0; however, there was no evidence of case clustering by specific restaurant.

Cases had a greater total number of sex partners than controls during the 6 weeks before time 0 (median 4 [range 0 to 22] versus median 1 [range 0 to 70]). Cases also reported more anonymous sex partners

during the 6 weeks before time 0 than controls (median 3 [range 0 to 20] versus median 1 [range 0 to 55]). The proportion of cases reporting >1 anonymous sex partner during the 6 weeks before time 0 was greater than for controls (68% versus 31%, OR = 4.4, 95% confidence interval [CI] 1.4 to 14.4).

Self-reported sexual behaviors of cases and controls during the 6 weeks before time 0 showed that cases were more likely than controls to engage in group sex and oral-anal intercourse (oral role) (**Table II**). However, during the period of interest, cases were no more likely than controls to engage in receptive anal intercourse or insertive anal intercourse.

Although digital-rectal intercourse (digital role) was similar between cases and controls when reporting for all sex partners (Table II), cases more commonly reported digital-rectal intercourse with anonymous sex partners than controls (**Table III**). Cases were also more likely than controls to engage in oral-anal intercourse with an anonymous partner during the 6-week period.

Cases and controls engaged in sexual activity at various sites (**Table IV**). Thirty-six percent of cases versus 12% of controls had sexual activity at sex clubs, homosexual bookstores, adult movie theaters, bathhouses, or the back rooms of bars (OR = 4.7). No single site was associated with case status.

Using multivariate analysis and controlling for the total duration of sexual activity (OR = 0.91, 95% CI 0.83 to 0.99), oral-anal intercourse (oral role) remained significant (OR = 17.5, 95% CI 2.0 to 152.2). In addition, digital-rectal intercourse (digital role), group sex, and having more than one anonymous sex partner were each statistically significant in separate

TABLE III

Proportion of Cases and Controls Who Participated With Anonymous Sex Partners in Selected Behaviors During the 6 Weeks Before Time 0

Behavior	Cases (n = 25)		Controls (n = 42)		OR*	95% CI†
	No.	%	No.	%		
Receptive anal intercourse	4	16	6	14	1.2	0.3 to 5.0
Insertive anal intercourse	7	28	10	24	1.5	0.4 to 5.1
Oral-anal intercourse (oral role)	9	36	3	7	9.7	1.2 to 78.7
Digital-rectal intercourse (digital role)	11	44	8	19	2.6	1.0 to 7.4
Oral-penile contact	14	56	17	40	2.4	0.7 to 8.7

*Odds ratio calculated from matched analysis.
†Confidence interval calculated from matched analysis.

models that controlled for the duration of sexual activity. Because oral-anal intercourse, digital-rectal intercourse, group sex, and having more than 1 anonymous sex partner were highly correlated, it was not possible to evaluate the independent risk of these variables in a single model.

Approximately two thirds of cases and controls (cases 67% versus controls 77%) reported using condoms 100% of the time when engaging in insertive anal intercourse during the 6 weeks before time 0. Fewer cases and controls reported 100% condom use by partners during receptive anal intercourse (cases 50% versus controls 67%). Only 1 case and 1 control reported using a glove when having digital-rectal intercourse, and no case or control reported any barrier use during oral-anal intercourse.

Four (20%) of 20 cases and 8 (20%) of 40 controls reported being HIV-seropositive. HIV testing

was performed an average of 10 months before interview for cases and 12 months before interview for controls.

DISCUSSION

A number of sexual behaviors associated with acute hepatitis A infection were identified among homosexual and bisexual men in NYC. Oral-anal intercourse, digital-rectal intercourse, more than 1 anonymous sex partner, and having group sex during the 6-week incubation period were all associated with acute infection. The high correlation of these factors suggests that men with acute hepatitis A were engaging in a number of behaviors that put them at risk for hepatitis A as well as other sexually transmitted diseases spread via the fecal-oral route.

Given that more than 60% of cases had oral-anal intercourse during the hepatitis A incubation period, it may be tempting to suggest that a return to oral-anal intercourse, an activity that is often perceived as "less risky" for HIV transmission, resulted in the Manhattan hepatitis A outbreak. However, it is not possible to conclude from this investigation that oral-anal contact among cases was a "new" activity, a return to an "old" activity, or the continuation of an ongoing sexual practice. Despite evidence that HIV seroconversion rates among homosexual and bisexual men continue to decline[11] and reports of major reductions in unprotected insertive and receptive anal intercourse among homosexual men,[11-15] some investigators have found little change in oral sex practices over time.[12]

Assessment of sexual behaviors associated with HIV transmission among study participants yielded mixed findings. Cases were not more likely than controls to report receptive or insertive anal intercourse. However, many cases had large numbers of anonymous sex partners and frequent group sex encounters and participated in sexual activity at sites traditionally associated with risky sex behaviors, such as

TABLE IV

Proportion of Cases and Controls Reporting Sexual Activity at Selected Sites During the 6 Weeks Before Time 0

Site	Cases (n = 25)		Controls (n = 42)		OR*	95% CI†	P Value
	No.	%	No.	%			
Sex club	3	12	1	2	ND	0.9‡	0.22§
Bookstore	4	16	1	2	7.0	0.8 to 64.6	0.16
Movie theater	4	16	3	7	3.3	0.5 to 19.5	0.39
Bathhouse	2	8	0	0	ND	0.7‡	0.33§
Back room of bar	2	8	0	0	ND	0.5‡	.50§
Any of above	9	36	5	12	4.7	1.2 to 18.5	0.06

*Odds ratio calculated from matched analysis.
†Confidence interval calculated from matched analysis.
‡Confidence interval calculated from mid-P corrected.
§Exact P value.
ND = not defined.

sex clubs or bathhouses. Additionally, half of partners of cases used condoms less than 100% of the time during anal intercourse, and no cases reported any barrier use during oral-anal contact. All of these findings raise concerns about adherence to safer sex practices and suggest that at least some case patients were involved in activities that are associated with HIV transmission.

Potential limitations of the investigation include a lack of representativeness of study participants and introduction of selection bias. Cases and controls were well-educated, white homosexual and bisexual men living in Manhattan and may not be similar to other groups of homosexual men. In addition, we interviewed only a relatively small proportion of men reported with acute hepatitis A during the study period. While demographic similarities between the study participants and the uninterviewed group (data not presented) suggest that there were no major differences, the possibility of selection bias cannot be eliminated. Potential bias in our control selection must also be considered. Controls were attending private physician offices mainly for routine care and thus may represent a group who are more concerned for their general health than cases, who sought care for HAV-associated illness.

This investigation enabled the NYCDOH to target homosexual and bisexual men, through their health care providers and the gay media, for health education messages that stressed potential modes of HAV transmission, particularly oral-anal and digital-rectal intercourse. Health education messages recommended abstinence from oral-anal contact and thorough handwashing immediately following any digital-rectal intercourse. Comparison of 1991 hepatitis A cases among Manhattan men 20 to 49 years of age, with similar 1992 and 1993 data showed a persistent 45% decline in reported cases. The reasons for this decline cannot be determined from available data.

The risks associated with oral-anal and digital-rectal intercourse need to be reinforced in health education programs targeting homosexual men. Early involvement of physicians and clinics providing health care for homosexual men during hepatitis A outbreaks may limit spread via better health education for patients. Timely administration of immunoglobulin to appropriate sexual and household contacts can

also be enhanced. Advances in inactivated hepatitis A vaccine[16] and its recent license in the United States may result in primary prevention strategies to further diminish the hepatitis A risk in this community.

ACKNOWLEDGMENT

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