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HIV Seroprevalence Rates Among Homicide Victims in New York City: 1991–1993*

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ABSTRACT: This study assessed HIV seroprevalence in homicide victims killed in New York City in 1991–1993, using data from the Office of Chief Medical Examiner. Among 5852 homicide victims there were 344 (5.9%) victims who were HIV positive. Females were just as likely as males to be HIV positive. For females, the highest rates were in the 25–34 year (11.7%) and 35–44 year (12.6%) age categories. For males the highest rates were in the 35–44 year (13.7%) and 45–54 year (11.5%) age categories. Other than there being no HIV positive Asian victims, there were no differences in HIV rates among racial/ethnic groups. The highest rates of HIV infection for homicide victims were among those using both opiates and cocaine (males: 23.0%; females: 27.3%). Women, not men, using cocaine alone had a high HIV positive rate (18.4%). Victims not using these drugs had rates of HIV around 2%. The authors believe that the high risk of HIV among homicide victims, may be due to the use of cocaine and associated risky use of needles and risky sex practices.

KEYWORDS: forensic science, HIV, homicide, cocaine, methadone, opiates, substance abuse, violence, trauma

Drug abuse is a major public health problem that is linked to two others: violence and AIDS. The pharmacologic effects of some drugs such as cocaine produce violence through irritability, paranoid thinking, and excitation (1–5). Furthermore, violence can result from the enterprise of drug-dealing when dealers attempt to control sales territory, or when drug users rob others to obtain money for drugs (6,7). High rates of homicide among the young and the non-white population appear to be due to, in part, their disproportionate cocaine use (8–10). Women who use drugs are often victimized by husbands or boyfriends (11–13).

Drug use is also associated with HIV infection. Studies of intravenous drug users have found that 20 to 30% are HIV positive (14–16). Studies of accidental drug overdose fatalities, usually involving intravenous drug use, have found higher HIV seroprevalence rates, from 30 to 37% (17–18).

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Here we explore HIV infection and drug use in a population who is not identified as drug users but who may have a high level of drug use: homicide victims. In addition, study of homicide victims allows us to view HIV infection in a population which may come to emergency departments before eventual death. We evaluated: 1) the HIV seroprevalence rates among homicide victims and 2) whether the use of cocaine, opiates, or methadone by homicide victims at the time of death was associated with elevated HIV seroprevalence.

Methods

All deaths (N = 6218) in New York City in 1991–1993 that were certified as homicides by the medical examiner were eligible for the study. The rate of autopsy for homicides was 99.8%. Data concerning demographics, the type of setting where the injury took place, HIV test results, and toxicology were obtained from the files of the medical examiner.

Plasma and serum samples were obtained for 5879 (94.5%) of homicide cases and were screened for HIV at the New York City Department of Health Laboratory. Initial screening is done in replicate by ELISA (Recombigen [env and gag HIV-E1A]) with confirmation by Western Blot. HIV testing was inconclusive in 28 (0.4%). Cases not tested for HIV and those whose tests were inconclusive were excluded, leaving 5852 cases for analysis in this study.

Autopsy samples are tested for the most commonly abused drugs. When available, urine initially is screened by homogeneous enzyme immunoassay for opiates, benzoylecgonine, and other drugs. A specimen is considered positive for opiates and benzoylecgonine if the concentration is =/>0.3 mg/L. When urine is unavailable, initial screening is performed on blood using radioimmunoassay, and positive findings are substantiated by radioimmunoassay of another tissue. All positive findings are confirmed by gas chromatography/mass spectrometry. In this study "cocaine" refers to the presence of cocaine or its metabolite benzoylecgonine.

Some victims survive their injury long enough to have metabolized cocaine and opiates prior to their death. In these instances negative postmortem toxicological findings would underestimate the presence of cocaine and opiates in victims at the time of the injury. Therefore, the survival interval, defined as the period from injury to death, was calculated for each case. In our analyses of toxicology data, we required a survival time of less than 48 h because prior use of significant amounts of drugs would still be detected (19,20).

Chi-square tests were used to compare seroprevalence across groups based on demographic characteristics and toxicologic analyses. All statistical tests were conducted with two tailed alpha levels of 0.05.

Results

Among 5852 homicide victims there were 344 (5.9%) victims who were HIV positive. The rates of HIV compared across characteristics of homicide victims stratified by gender are presented in Table1. African-Americans, Latinos, and men made up the bulk of total number of homicide victims. There was no statistically significant difference in HIV positive rates between male homicide victims (5.7%) and female victims (7.2%) ($x^2 = 3.09$, df = 1, $p = .08$). For males, significantly higher HIV positive rates were found in the age groups 35–44 years of age (13.7%) and 45–54 years (11.5%) ($x^2 = 197.83$, df = 5, $p < .001$). For females, significantly higher HIV positive rates were found in somewhat younger groups, namely 25–34 years of age (11.7%) and 35–44 years (12.6%) ($x^2 = 30.75$, df = 5, $p < .001$). There were no HIV positive homicide victims in the Asian/other category. When victims in the Asian/other category were excluded from chi-square analyses, there were no statistically significant differences in seroprevalence rates across racial/ethnic groups for males ($x^2 = 0.05$, df = 2, $p = .97$) or females ($x^2 = 2.23$, df = 2, $p = .33$). Male homicide victims who were killed in private residences had a somewhat higher rate of HIV seroprevalence (7.7%) than did male homicide victims killed in other settings ($x^2 = 17.14$, df = 2, $p < .001$). Female homicide victims who were killed on the streets, in automobiles, and other outdoor settings outside buildings had a higher rate of HIV seroprevalence (10.8%) than female homicide victims killed in residences and other buildings ($x^2 = 6.88$, df = 2, $p = .03$).

TABLE 1—*Presence of HIV positive rates among homicide victims by gender by age, race, and place of homicide.*

Characteristics	Males HIV Positive* Total Number	Males HIV Positive* Row %	Females HIV Positive* Total Number	Females HIV Positive* Row %
All Victims	5051	5.7	801	7.2
Age, year†				
<14	108	2.8	67	0
15–24	1796	1.2	174	4.6
25–34	1692	5.8	266	11.7
35–44	830	13.7	143	12.6
45–54	375	11.5	53	1.9
>55	250	2.4	98	0
Race‡				
White	446	5.8	119	4.2
African-American	2490	5.8	417	7.9
Latino	1920	6.0	239	8.4
Asian/Other	195	0	26	0
Place of Homicide§				
Private Residence	1163	7.7	462	6.3
Other Building	1004	3.7	92	3.3
Outside	2748	5.4	213	10.8

*Represents gender-specific HIV positive rate (row %) for each respective group.

†Males: $x^2 = 197.83$, df = 5, $p < .001$; females: $x^2 = 30.75$, df = 5, $p < .001$.

‡Males: $x^2 = 0.05$, df = 2, $p = .97$; females: $x^2 = 2.23$, df = 2, $p = .33$ (Asian/other excluded from the analysis).

§Males: $x^2 = 17.14$, df = 2, $p < .001$; females: $x^2 = 6.88$, df = 2, $p = .03$.

The rest of the analysis concerning toxicology used victims who died within 48 h after injury. There were 415 (7.8%) victims who survived longer than 48 h after injury and they were excluded from the analyses of HIV seroprevalence by toxicology. Those excluded for the analyses of HIV seroprevalence by toxicology were more likely to be older than 35 years of age (11.8% excluded) ($x^2 = 104.89$, df = 5, $p < .001$), HIV positive (10.2% excluded) ($x^2 = 16.29$, df = 1, $p < .001$) and killed by a means other than a firearm (15.9% excluded) ($x^2 = 99.75$, df = 1, $p < .001$). There was no difference between those who were excluded and those who were included in regard to gender ($x^2 = .09$, df = 1, $p = .76$).

The presence of drugs in homicide victims was determined by toxicology. The most frequently found drug was cocaine or its metabolites. Cocaine was present without opiates or methadone in 930 (22.4%) male homicide victims and 103 (21.2%) female victims. Cocaine was found with opiates in 189 (4.6%) male and 19 (3.9%) female victims. The next most frequent combination was that of cocaine, opiates, and methadone (males: 1.7% and females: 1.8%). Cocaine with methadone was found in 25 male (0.6%) and 5 female (1.0%) victims. Opiates alone was found in 78 (1.9%) male and 5 (1.0%) female victims while methadone alone was found in 23 (0.6%) male and 3 (0.6%) female victims.

Analyses of HIV seroprevalence by type of drug found on toxicology used four drug categories: opiate and/or methadone without cocaine, opiate and/or methadone with cocaine, cocaine without opiate or methadone and none of these. These were notable differences in HIV seroprevalence across these toxicology groups. Table 2 presents the analyses of HIV and toxicology separately for males and females. For males (23.0%) and females (27.3%) the highest HIV positive rates were among victims who were positive for opiate and/or methadone with cocaine. Female victims with cocaine without opiate or methadone also had a high HIV positive rate (18.4%) while male victims in that drug category had a lower HIV positive rate (7.1%). Males with opiate and/or methadone without cocaine had an HIV positive rate of 9.3% while female victims in that drug category had no HIV positive victims, although regardless of HIV status there was a small number of females who had used opiates prior to their death (male: $x^2 = 244.08$, df = 3, $p < .001$); female: $x^2 = 56.83$, df = 3, $p < .001$).

TABLE 2—*HIV positive rates among homicide victims by gender and presence of drugs at the time of death.**

Toxicology Results	Males† Number	Males† % HIV Positive	Females† Number	Females† % HIV Positive
Opiate and/or methadone without cocaine	118	9.3	8	0.0
Opiate and/or methadone with cocaine	283	23.0	33	27.3
Cocaine without opiate or methadone	930	7.1	103	18.4
None of the above	2812	2.4	343	1.7
	4143	5.0	487	7.0

*These analyses contain victims those who died 48 h or less after injury.

†Males: $x^2 = 244.08$, df = 3, $p < .001$; females: $x^2 = 56.83$, df = 3, $p < .001$.

Discussion

This is the first study to examine HIV infection in a non-drug treatment population and a population not identified as drug overdoses. This study found that overall 6% of homicide victims in New York City in the early 1990s were HIV positive. The HIV positive rate for homicide victims not using opiates, cocaine, or methadone was around 2%. This is within the estimate of 1.4% to 2.4% for HIV seroprevalence in New York City for the early 1990s. (21) However, in our study the range of HIV positive rates for homicide victims who were using an opiate and/or methadone with cocaine was 23% for males and 27% for female victims. Women using cocaine alone had an HIV positive rate of only 18% while men using cocaine alone had an HIV positive rate 7%. The true HIV positive rates in the analyses of toxicology may be slightly higher than we report since 415 cases (7.8%) excluded from these analyses were more likely to be HIV positive than those included in the analyses.

The use of cocaine was associated with an elevated risk of HIV infection. There are two possible reasons for this: cocaine can increase risky use of needles as well as risky sexual behaviors. In interviews of drug users, those who used cocaine are more likely than those not using cocaine to report more frequent needle use, and more sharing and less cleaning of needles (22–24). Cocaine users report risky sexual behaviors than do other drug users (12,24,25). This includes unprotected sex, sex with many partners, and, particularly for women, sex for drugs or money to buy drugs. In addition, cocaine users are more likely to have mouth sores from smoking crack and breaks, or abrasions of the skin in genital areas from prolonged sexual activity due to decreased male orgasm associated with cocaine (12). Last, if cocaine is used intravenously, it must be injected frequency due to it's short half-life. This increases the risk of exposure to HIV. These risky sexual practices and portals for HIV infection increase the risk of HIV infection.

There is conflicting evidence as to whether men and women differ in terms of the problems they have with cocaine use. There are some who have not found differences in the frequency of problems associated with cocaine use between men and women (26). After reviewing 16 epidemiologic studies which examined drug use, sexual behavior and sexually transmitted diseases, Marx et al. stated "gender differences for certain risk behaviors remain unexplained and require further inquiry (27)." Our findings show that female homicide victims who were using cocaine alone have higher rates of HIV infection than male homicide victims using cocaine alone. Although we do not have systematic data, anecdotal evidence and the literature make us believe that unprotected sex with many partners associated with cocaine use place women at a greater risk of HIV infection than men because of their receptive role in the sexual practices.

The high rate of HIV infection among homicide victims has clinical implications. The main message to forensic pathologists and other professionals is that, care must be exercised in autopsies, and handing specimens from homicide victims particularly where drug abuse is evident. In addition, homicide victims represent persons who sustain serious injuries and may be brought to emergency departments. As such the HIV seroprevalence of homicide victims may be a proxy for the true HIV prevalence of victims of intentional trauma who present to emergency departments. Our study, unlike other studies of emergency department patients which use waste blood, has nearly complete, uniform testing for HIV infection. Universal Precautions are recommended as a way of protecting staff from exposure to blood (28). Yet universal precautions are usually ignored in emergency departments (29,30). Our data suggest that there must be research on how to increase compliance with universal precautions and the development of new barrier technology.

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