AIDS incidence and mortality in injecting drug users: the AjUDE-Brasil II Project

Incidência de AIDS e mortalidade em usuários de drogas injetáveis: Projeto AjUDE-Brasil II

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Abstract

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This paper presents AIDS incidence and mortality among injecting drug users (IDUs) reached by the AjUDE-Brasil II Project. From a cross-sectional survey, 478 IDUs were interviewed in three Brazilian cities: Porto Alegre, São José do Rio Preto, and Itajaí. The cohort was followed up in the Brazilian surveillance database for AIDS and mortality during 2000 and 2001. AIDS incidence was 1.1 cases per 100 person-years, and the mortality rate was 2.8 deaths per 100 person-years. AIDS cases only occurred in IDUs who reported ever having shared injecting equipment. Female gender (RR = 5.30), homelessness (RR = 6.16), and report of previous sexual relations with same-sex partners (RR = 6.21) were associated with AIDS. Deaths occurred only among males. Homelessness (RR = 3.00), lack of income (RR = 2.65), HIV seropositive status (RR = 4.52), and no history of incarceration (RR = 3.71) were also associated with death. These findings support evidence that gender and socioeconomic conditions are both determinants of morbidity and mortality in Brazilian IDUs.

Acquired Immunodeficiency Syndrome; Mortality; Intravenous Substance Abuse

Introduction

In Brazil, of the 362,363 AIDS cases reported to the Ministry of Health through the National Reportable Diseases System (SINAN) from 1980 to June 30, 2004, 16.4% were attributed to injecting drug use [1].

Despite the downward trend in the proportion of new AIDS cases associated with injecting drug use, this decrease has not been homogeneous in the country. In some cities or regions, especially in the South, injecting drug users (IDUs) constitute an important component of the epidemic. In the southernmost State capital city, Porto Alegre, HIV prevalence among IDUs has reached 65% [2,3].

For the year 2003, overall AIDS incidence in the Brazilian population was 18.4 cases per 100 thousand inhabitants. The epidemic is increasing more quickly in population groups with less schooling and lower socioeconomic status [4,5,6], and IDUs have been the group with the worst socioeconomic situation since the beginning of the epidemic [7].

The incidence of HIV infection among IDUs, estimated at 1 to 3 per 100 person-years in the United States in the early 1990s, also appears to have dropped to some 1.84 per 100 person-years in 1995-1998 [8,9]. The known risk factors for HIV infection and the development of AIDS in this group are frequency of injection, sharing of needles and syringes, cocaine injecting,

and sexual behaviors such as same-sex relations and sex with other IDUs [8].

In addition to representing an important risk group for HIV infection, IDUs are included in the portion of the population most exposed to increased mortality risk. Not only in Brazil, but elsewhere in the world, high mortality rates have been shown in this group, estimated at 3.3 deaths per 100 person-years in the United States in 1999-2000 [10] and 2.3 deaths per 100 person-years in Edinburgh, Scotland, in 1980-2001 [11].

The most relevant risk factors associated with death in IDUs are infectious diseases, especially AIDS and its markers such as high HIV viral load and decreased CD4 lymphocyte counts. Although the causes related to HIV disease currently constitute the principal cause of death in this population, there are other major causes of death, especially those related to overdose, pneumonia, and bacterial endocarditis, in addition to external causes such as suicide and homicide [10,11,12,13].

The current study aimed to estimate AIDS incidence and mortality among IDUs in the context of syringe-exchange programs (SEP) participating in the AjUDE-Brasil II Project, as well as to explore the principal determinants of these events.

Method

The AjUDE-Brasil II Project, a cross-sectional study conducted from May 2000 to February 2001, interviewed clients of SEP supported by the Drugs and AIDS Unit of the Programa Nacional de DST e AIDS, Ministry of Health (PN-DST/AIDS). This study aimed to characterize the socio-demographic, behavioral, and serological profiles of the accessed IDUs. Structured interviews were conducted by properly trained staff and/or outreach workers. Collected information included social, sexual, and drug-use behavior, characteristics of the healthcare utilization and drug-related treatment, and any criminal record. Blood samples were collected by finger stick on filter paper to determine the HIV seroprevalence, using the ELISA test performed by two independent methods. The use of ELISA as a serological test was justified by the high HIV seroprevalence in the IDUs population and consequently by the tests' high positive predictive value [14].

This prospective component study included three of the six Brazilian cities from the overall project: Porto Alegre in the State of Rio Grande do Sul, São José do Rio Preto in São Paulo, and Itajaí in Santa Catarina. These three cities

were chosen because they presented structured SEP at the time the research was done, and because their respective city health departments allowed access to the local surveillance systems.

The 478 individuals interviewed in these cities constituted a cohort, followed up during the years 2000 and 2001, aimed at estimating AIDS incidence and mortality. The information gathered in the survey's baseline was used for the exposure variables. Identification of AIDS cases and deaths was based on a list of IDUs interviewed at baseline in the AjUDE-Brasil II Project, containing full name, date of birth, and mother's initials, allowing an active search of these individuals in the databases of the National Reportable Diseases System for AIDS (SINAN-AIDS) and the Mortality Information System (SIM) at the regional level. Information on incarceration was collected from local prison records.

Based on identification of the interviewee in the data systems, data on AIDS diagnosis and/or death were recorded, along with the respective underlying cause. Incident AIDS cases (n = 6) were defined as all IDUs found in the SINAN-AIDS database from May 10, 2000, to December 31, 2001, and who had not been recorded with a date prior to the interview during the field study in the AjUDE-Brasil II Project. Six additional individuals recorded in the SINAN-AIDS database during this same period, but who had the same date of death recording in the SIM (recorded in SINAN-AIDS following death) were not tabulated as incident cases because they were considered cases of delayed reporting. Fifty-six AIDS cases showed date of diagnosis prior to the beginning of the study and were considered prevalent AIDS cases and were excluded, such that 422 individuals remained. Individuals not found in the SINAN-AIDS database were considered AIDS-free.

Deaths (n = 17) were defined as all IDUs found in the SIM from May 10, 2000, to December 31, 2001, out of the total of 478 individuals interviewed.

As for the variables analyzed: age was dichotomized using as the cutoff point the natural number closest to the median; married IDUs or those living with a companion were classified as living in a marital union, while single, divorced/separated, and widow(ers) were classified as living alone. Sexual risk was defined as any reported sexual relations without a condom in the previous six months, regardless of the type (homosexual or heterosexual). The remaining information was obtained from

direct responses by IDUs to the AjUDE-Brasil II Project questionnaire.

A descriptive analysis of the 478 study participants was performed initially using univariate analysis, by comparison of the incidence density rates between the exposed and unexposed groups, using the Poisson regression technique [15]. Estimation of the relative risk used the risk ratio (RR) and respective 95% confidence interval (95%CI). Associations were also investigated for the exposure variables using chi-square (χ^2) or Fisher's exact test, as appropriate [16]. Graphs using the Kaplan-Meier technique were produced to visualize the survival trend of IDUs between the field testing and the AIDS diagnosis [17]. Epidemiologically relevant exposure factors or those with a p-value of ≤ 0.20 were selected for multivariate analysis using the Cox proportional model, aimed at producing a model adjusted for confounding variables [18]. Due to the model's limitations, variables with null incidence in one of the exposure categories were not included in this stage of the analysis.

The research complied with the guidelines and technical standards as defined by Ruling 196/96, and was approved by the Institutional Review Board of the Universidade Federal de Minas Gerais, case review ETIC 168/99.

Results

Of the 478 participating IDUs, 52.9% were from Porto Alegre, 26.8% from São José do Rio Preto, and the remaining 20.3% from Itajaí. Mean age was 30.0 ± 8.7 years. Median schooling was five years (5th grade of primary school).

Table 1 shows the descriptive analysis of the IDUs. Most of the sample consisted of male IDUs, living alone. The majority of the IDUs reported having some source of income, although many were unemployed.

More than half of the IDUs reported not having sought drug-related or health treatment in the previous six months, and only one-fourth had used SEP services. Half were HIV-positive according to the field testing. Most had started using drugs after the age of 14, and by 18 years approximately half were already using injecting drugs. More than half of the IDUs were already sharing needles and syringes in some way.

Sexual initiation had occurred around 14 years of age, and some one-third reported any lifetime same-sex relations (35.2% of the males and 14.7% of the females). The vast majority had a history of police arrest, and nearly half had served prison time, with a median of a month and a half.

Table 1

Selected characteristics of 478 injecting drug users participating in a prospective component study of the AjUDE-Brasil II Project, 2000-2001.

Characteristics	n	%
Demographic		
Male gender	376	78.7
Lives alone	305	63.8
Age < 30 years	248	51.9
Skin color white	266	55.8
Can read	417	87.2
No source of income*	59	12.8
Unemployed*	384	82.2
Homeless*	122	25.7
Health conditions		
HCV-positive	294	61.5
HIV-positive	235	49.2
Drug-related treatment*	84	17.7
Health treatment*	190	40.3
Currently in treatment for HIV/AIDS*	75	16.1
HIV test (lifetime)	272	56.9
Lifetime use of harm reduction project services	124	25.9
Drug behavior		
Age at initiation of drug use < 14 years	189	39.5
Age at initiation of injecting drug use < 18 years	235	49.2
Injecting drug use*	364	76.2
Frequency of injection (> 3 times a day)*	37	7.7
Lifetime sharing of injecting equipment (passive)	259	55.5
Lifetime sharing of injecting equipment (active)	285	60.8
Use of alcoholic beverages*	428	89.7
Smoking*	405	84.7
Marijuana*	398	83.3
Sniffed cocaine*	336	70.6
Crack*	221	46.5
Sexual behavior		
Age at sexual debut < 14 years	199	41.6
Any lifetime same-sex sexual relations	264	55.7
Sexual risk: unprotected sex*	90	19.4
Report of genital lesions or discharge*	143	30.1
Lifetime social behavior		
Police arrest	370	80.2
Convicted or served time	209	45.7
Drug-related assault and aggression	218	47.7

Unknown information varied from 1 (0.2%) to 45 (9.4%).
* Information refers to previous six months.

Mean follow-up time for analysis of AIDS incidence was 1.29 years (15.5 months). The AIDS incidence density for the entire group of IDUs was 1.10 cases per 100 person-years (n = 6), with 1.07 in Porto Alegre (n = 3), 1.42 in São José do Rio Preto (n = 2), and 0.81 in Itajaí (n = 1). There was no statistical difference between these rates in the three cities (p = 0.680). Considering only HIV-positive individuals according to the ELISA test, the incidence was 2.54 per 100 person-years.

For mortality, the follow-up time was 1.28 years (15.4 months). The mortality rate was 2.77 deaths per 100 person-years. The rates by city were 1.16 per 100 person-years in São José do Rio Preto (n = 2) and 1.56 (n = 2) in Itajaí, while Porto Alegre showed the highest mortality at 4.16 (n = 13), with a different statistical behavior from the other two cities (p = 0.047). The most common underlying cause of death was HIV disease (66.7%, n = 10), followed by aggression (20%, n = 3), septicemia (6.7%, n = 1), and pneumonia (6.7%, n = 1). Death from pneumonia occurred in one individual with an AIDS diagnosis according to the SINAN-AIDS database. Two deaths in São José do Rio Preto were classified as due to undefined conditions, but one of these was located with an AIDS diagnosis in the SINAN-AIDS database.

One individual had an AIDS diagnosis and died after the interview, while the death occurred three and a half months after the AIDS diagnosis recorded in the SINAN-AIDS. Another 12 IDUs who died were also found in the SINAN records: six had the same date for diagnosis and death, while six presented a date of diagnosis prior to the survey, with the death occurring some two years after recording of the AIDS diagnosis (mean 1.98 years, median 2.11 years).

Univariate analysis

a) AIDS incidence

Table 2 shows the main results. Of the six new AIDS cases, two were women, and although this was not statistically significant, they showed twice the risk of developing AIDS as compared to men. Homeless individuals had six times the risk of developing the syndrome. The influence of one's living place on survival of IDUs with AIDS can be seen in Figure 1, showing a statistically lower survival function for homelessness (log-rank = 5.75; p = 0.016).

All of the six new AIDS cases had previous HIV-positive serology and reported ever having shared needles and/or syringes. Individuals who sought health treatment were associated with a higher risk of developing AIDS as compared to those who did not seek health treatment. There was no significant difference in the risk of developing AIDS, when comparing those who sought or failed to seek drug-related treatment. All of the AIDS cases reported previous use of SEP services, although this was not statistically significant.

As for sexual exposure, individuals reporting any lifetime same-sex relations, all of whom were male, showed a fivefold risk of developing AIDS as compared to those denying such exposure. Paradoxically, those who reported adequate condom use showed a six-fold risk of having an AIDS diagnosis. Likewise, individuals who reported not having used cocaine in the previous six months showed a greater risk of AIDS diagnosis as compared to those reporting use of this drug during the same period. Although the association was not significant (p = 0.561), the RR point estimate indicated a more than fivefold risk in the group of individuals who self-identified as non-cocaine users (RR = 5.26; 95%CI = 0.96-33.33).

In order to elucidate these findings, a parallel analysis of some exposure variables was performed in the prevalent cases found in the SINAN-AIDS database. Of the 56 prevalent cases, 16.2% of those reporting condom use in all their sexual relations already had an AIDS diagnosis in the SINAN-AIDS, as compared to 8.3% in the group reporting irregular condom use (p = 0.008). Likewise, in the group that had not used cocaine in the six months prior to the interview, 16.4% already had an AIDS diagnosis in SINAN-AIDS, as compared to 9.8% in the group who reported cocaine use (p = 0.04). In addition, the group that attended SEP services had 15% of its IDUs with an AIDS diagnosis in the SINAN-AIDS, while only 2.4% of those not attending SEP services were found in the SINAN-AIDS (p < 0.001).

b) Mortality

All of the 17 deaths occurred in males who reported not having sought drug-related treatment in the previous six months (Table 3). Other demographic characteristics associated with death were: not living in a marital relationship, not having any source of income in the previous six months, and homelessness in the previous six months. Figure 1 shows a comparative survival curve for IDUs, stratified by homelessness. Statistically distinct probabilities are observed for this event as compared to the group with a living place (log-rank = 4.29, p = 0.04).
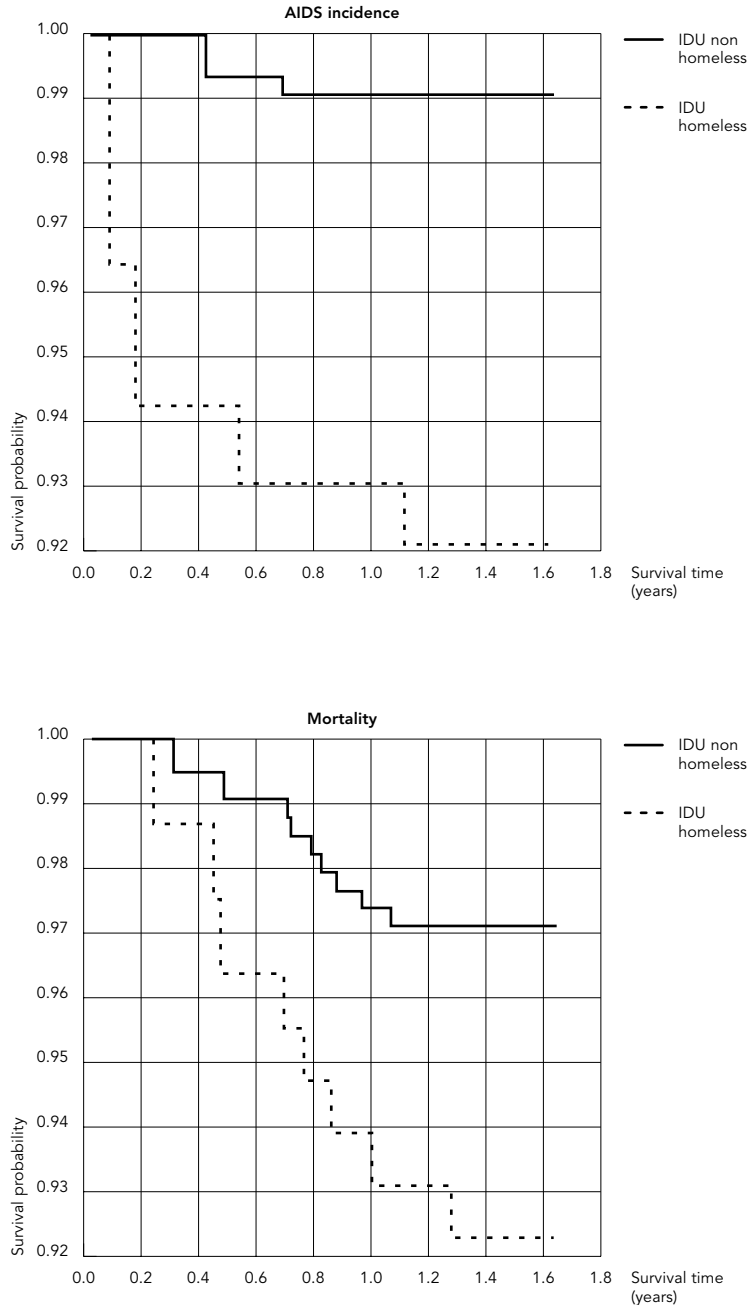
Table 2

AIDS incidence according to selected characteristics of 422 injecting drug users participating in prospective component study of the AjUDE-Brasil II Project, 2000-2001.

	n	Rate*	p	RR	95%CI
Gender					
Male	4	0.92		1.00	
Female	2	1.87	0.410	2.04	0.37-7.82
Age (years)					
< 30	3	1.00		1.00	
≥ 30	3	1.22	0.808	1.22	0.25-6.04
Skin color					
White	3	0.98		1.00	
Non-white	3	1.27	0.753	1.30	0.26-6.25
Marital status					
Married	1	0.51		1.00	
Single	5	1.44	0.346	2.80	0.32-24.02
Source of income					
Yes	5	1.10		1.00	
No	1	1.56	0.754	1.41	0.16-12.06
Living place					
Yes	2	0.49		1.00	
No	4	2.96	0.039	5.99	1.09-32.70
HIV					
Negative	0	0.00		–	
Positive	6	2.54	0.006	–	–
Health treatment					
Yes	5	2.54	0.049	8.33	1.01-71.43
No	1	0.30		1.00	
Drug-related treatment					
Yes	1	1.09		1.00	
No	5	1.12	0.981	1.03	0.12-8.79
Ever used syringe-exchange program services					
Yes	6	1.52	0.189	–	–
No	0	0.00		–	
Sexual risk					
Absent	5	2.21	0.078	6.71	0.78-57.47
Present	1	0.32		1.00	
Same-sex sexual relations					
No	2	0.56		1.00	
Yes	4	2.47	0.075	4.68	0.86-25.54
Ever served time in prison					
No	2	0.68		1.00	
Yes	4	1.77	0.267	2.61	0.48-14.26

* Rate calculated by Poisson regression.

Figure 1

Probability of AIDS and death among IDUs participating in the AjUDE-Brasil II
Project, 2000-2001, using the Kaplan-Meier method stratified by living condition.

HIV-positive individuals showed increased risk of death. Prior AIDS diagnosis in the SINAN-AIDS database was an important predictor of death. Individuals with the syndrome showed a 20-fold risk of dying.

As for criminal records, in the univariate analysis the absence of previous incarceration or conviction did not significantly increase the risk of dying. However, analyzing only males, the RR increased to 2.04 (p = 0.158). In order to better understand this characteristic, we investigated the association between AIDS recorded in the SINAN-AIDS and reported history of conviction. The proportion of AIDS cases doubled when comparing IDUs without criminal records (8.1%) to those with criminal records (16.7%) (p = 0.004). As for frequency of arrests, among males reporting only one arrest, 14.8% were recorded with AIDS in the SINAN-AIDS. Among male IDUs with more than one arrest, the proportion was significantly higher (28.6%; p = 0.089).

Multivariate analysis

Table 4 shows the results of this analysis for the two target events.

New AIDS cases occurred independently with increased probability among IDUs who reported homelessness in the six months prior to the interview, in female IDUs, and in those with any lifetime report of same-sex sexual relations.

A model was investigated that included the six AIDS cases with a simultaneous report of death, classified here as delayed reporting. The results generated a model that was very similar to the multivariate model for mortality and is described below.

In relation to mortality analysis, considering that all the deaths occurred in males, we opted to use the 376 male IDUs to comprise this stage of the analysis. The types of exposure that were markers for socioeconomic status and that remained in the model after adjusting and were statistically significant were homelessness and lack of income, increasing the risk of death by some threefold. Positive HIV serology increased the risk of death fivefold, while time served in some penal institution decreased the risk of death. IDUs who reported never having been incarcerated showed a fourfold greater risk of dying as compared to those with a history of conviction.

Analysis of the Martingale and Deviance residues [18] were performed for all the multivariate models, showing good adequacy and adjustment in the final models.

Table 3

Mortality rates according to selected characteristics of 478 injecting drug users participating in the prospective component project of the AjUDE-Brasil II Project, 2000-2001.

	N	Rate*	p	RR	95%IC
Gender					
Male	17	3.52	0.030	–	
Female	0	0.00		–	–
Age (years)					
< 30	8	2.56		1.00	
≥ 30	9	3.00	0.746	1.17	0.45-3.03
Skin color					
White	10	2.85	0.903	1.06	0.40-2.79
Non-white	7	2.68		1.00	
Marital status					
Married	2	0.92		1.00	
Single	15	3.83	0.058	4.16	0.95-18.21
Source of income					
Yes	11	2.15		1.00	
No	5	6.56	0.039	3.05	1.06-8.77
Living place					
Yes	9	1.99		1.00	
No	8	5.08	0.054	2.55	0.98-6.60
HIV					
Negative	3	0.98		1.00	
Positive	14	4.57	0.016	4.65	1.34-16.19
In AIDS database (SINAN)					
No	5	0.92		1.00	
Yes	12	17.74	<0.001	19.35	6.82-54.92
Drug-related treatment					
Yes	0	0.00		–	
No	17	3.41	0.052	–	–
Ever used syringe-exchange program services					
Yes	15	3.25	0.230	2.47	0.56-10.79
No	2	1.32		1.00	
Sexual risk					
Absent	10	3.70	0.238	1.79	0.68-4.70
Present	7	2.07		1.00	
Same-sex sexual relations					
No	13	4.24	0.316	1.79	0.58-5.48
Yes	4	2.37		1.00	
Ever served time in prison					
No	11	3.51	0.352	1.60	0.59-4.34
Yes	6	2.19		1.00	

* Mortality rate calculated by Poisson regression.

Table 4

AIDS incidence density ratio and adjusted mortality ratio using Cox regression method for injecting
drug users participating in the AjUDE-Brasil II Project, 2000-2001.

	Estimate	Risk Ratio	95%CI	p
AIDS incidence*				
Female gender	1.67	5.30	0.78-36.08	0.088
Homelessness	1.82	6.16	1.07-35.31	0.041
Same-sex sexual relations	1.82	6.21	0.95-40.62	0.057
Mortality				
Lack of income	0.97	2.65	0.98-7.17	0.055
Homelessness	1.09	3.00	1.01-8.73	0.047
Positive HIV serology	1.51	4.52	1.26-16.21	0.021
Lack of incarceration (lifetime)	1.31	3.71	1.26-10.94	0.018

*Comparisons relating to the same categories as in the univariate analysis.

Discussion

In this study, Brazilian IDUs showed AIDS inci-
dence and death rates greater than 1% and 2%
per year, respectively. AIDS risk was associated
with sharing of needles and/or syringes, female
gender, same-sex sexual relations, and precari-
ous living conditions, as marked here by home-
lessness in the previous six months. Death,
which occurred only among males and with
higher risk among those with an HIV/AIDS di-
agnosis, was also associated with precarious
living conditions and possible lost opportuni-
ties for diagnosis and treatment, as marked
here by the absence of time served in a penal
institution.

The few Brazilian and international studies
on this issue show rate estimates similar to
those found here. There is a similarity between
the AIDS incidence estimate and the HIV infec-
tion rates of 1 to 3 cases per 100 person-years
found currently in the United States [9]. In addi-
tion, comparing the mortality estimates with
contemporary international studies, one notes
some similarity in the rates, varying from 2.8 to
3.3 per 100 person-years, despite the method-
ological differences between the studies [10,11].

The finding that women showed increased
AIDS risk appears consistent with the epidem-
ic's overall profile in Brazil, currently with 18.8
AIDS cases per 100 thousand inhabitants. Con-
trary to the situation described for men, in
whom the epidemic shows signs of stabiliza-
tion, among women, with 14 new cases per 100
thousand, the figures show an upward annual
trend. These data appear to confirm the hypoth-
esis that women are becoming more vulnera-
ble to AIDS in Brazil [1,19]. For female IDUs, this
appears to be a typically Brazilian phenomenon,
since international studies point to lower risk
of progression to AIDS among women IDUs [20].
Absence of deaths in female IDUs in the cur-
rent study could reflect the peculiar dynamic
of the HIV/AIDS epidemic, which is more ma-
ture among males (the predominant gender in
the early days of the epidemic among IDUs)
and who would thus tend to show an increased
risk of death.

The importance of socioeconomic indica-
tors can be observed in IDUs morbidity and
mortality. Major risk factors were homeless-
ness and lack of income, associated with both
AIDS and death. This agrees with international
studies showing a fivefold mortality risk in IDUs
with no source of income [21]. These data appear
to confirm the pauperization of the HIV/AIDS
epidemic and its negative outcomes in Brazil [4]
and also prove this population group's vulnera-
bility and the importance of maintaining IDUs
as targets in the main prevention programs.

Corroborating the above is the confirmation
that sharing of needles and/or syringes is one
of the principal risk factors for AIDS, reinforc-
ing the importance of preventive measures, es-
pecially in the less privileged segments of this
population group, in order to inhibit injecting
practices with contaminated equipment.

Probable evidence of the above is the asso-
ciation between use of SEP services and in-
creased AIDS incidence. In the current study,
as well as in international research such as that
of Bruneau et al. [22], this association suggests
that SEP in the respective cities are accessing a
segment of IDUs in precarious living and health

conditions, the majority of whom are HIV-positive and who come to treatment services late, when they already present the initial symptoms of the disease [23]. While some might question whether SEP are meeting the role of primary prevention and health promotion, that is, before HIV infection, these data do suggest that SEP are satisfactorily meeting their role in secondary and tertiary prevention.

Still, the underlying cause in the majority of deaths was HIV infection and AIDS. That is, HIV/AIDS is confirmed as cause of death in a young segment of the Brazilian population, although external causes cannot be overlooked [10,24].

Two findings in this study are intriguing: 100% of the deaths occurred in individuals who reported not having sought drug-related treatment, and there was a lower risk of death among those who reported having served time in a penal institution. One hypothesis is that these data point to direct or indirect participation by health care services for vulnerable groups, whether at the primary or specialized level, for example in prisons, suggesting that IDUs who are more exposed to such services have a higher probability of both diagnosis (as evidenced in this study by the higher proportion of AIDS cases recorded in the SINAN-AIDS database among IDUs who reported having served time in prison) and treatment, consequently showing decreased odds of death, principally related to HIV/AIDS.

This hypothesis is consisted with the work by Havens et al. [25], whose IDUs cohort study showed an association between the search for psychiatric treatment and decreased mortality. Mental health services or those provided by prisons and which focus on overcoming the dichotomy between treatment and prevention [26] could function as possible markers for the reduction in mortality, due to increased access to HIV/AIDS diagnosis and treatment.

The current study has limitations. One of them is the small number of events collected in the short follow-up period, possibly jeopardizing the relative risk estimates, which failed to reach significance due to lack of statistical power. We thus classified some statistical associations as significant when the p values were either borderline or slightly above 0.05. The IDUs would have to be followed up for a longer period of time in order to accumulate more cases and better elucidate the risk factors for morbidity and mortality in this group.

The incidence and mortality rates found here may be lower than expected, due to underreporting in the surveillance systems (for example, 42.7% in the SINAN-AIDS database in the city of Rio de Janeiro) [27]. Corroborating this possibility, in the current study six AIDS cases among IDUs were entered into the SINAN-AIDS database at the time of death, thus suggesting a reporting delay of some 50%. The AIDS incidence rates may therefore be twice what were actually shown here.

It is also conceivable that there was an underestimation of deaths (in the SIM) due to delayed reporting, given that classification problems are common, as described in studies in Rio de Janeiro and Belo Horizonte [27,28]. In addition, underestimation could occur due to high co-morbidity and mortality from competing causes in this IDUs group [29,30].

Another important limitation of this study is the presence of a prevalence bias. To analyze AIDS incidence, some exposure variables that represent classic risk factors for AIDS behave as protective factors. We hypothesize that individuals with symptoms prior to their AIDS diagnosis could reverse their risk behavior. This could explain the threefold risk of AIDS among those reporting some type of medical treatment in the previous six months, as compared to those without treatment. The lower use of sniffed cocaine in the incident AIDS group could also indicate that individuals with the syndrome decrease their drug use as the disease progresses.

The same bias would also appear to explain the increased AIDS risk among individuals reporting adequate condom use. Since they are aware of their serological status or display symptoms of the disease, they probably report more frequent condom use.

Further research is necessary to confirm the determinants of morbidity and mortality that were shown by the current study in IDUs. Despite this study's limitations, we highlight the importance of AIDS in the life and death of injecting drug users and can expect that the IDUs studied here are living in precarious living and health conditions, with considerable vulnerability to HIV/AIDS.

Measures taken in the future to improve the control of the HIV/AIDS epidemic in this group should include both specific prevention strategies for IDUs and better access to diagnosis and treatment, with a strong emphasis on SEP as one of the most effective mechanisms for accessing this difficult-to-reach group.

Resumo

Este estudo apresenta a incidência de AIDS e a morta-lidade em usuários de drogas injetáveis (UDIs) partic-ipantes do Projeto AjUDE-Brasil II. *Uma coorte de 478 indivíduos entrevistados nas cidades de Porto Alegre – Rio Grande do Sul –, São José do Rio Preto – São Paulo – e Itajaí – Santa Catarina – foi acompanhada nos sis-temas de vigilância brasileiros entre 2000 e 2001. En-controu-se incidência de AIDS de 1,1 caso por 100 pes-soas/ano e taxa de mortalidade de 2,8 óbitos por 100 pessoas/ano. Casos de AIDS ocorreram somente em UDI que relataram compartilhar seringas. Sexo femi-nino (RR = 5,30), relato de ausência de local para morar (RR = 6,16) e de relações sexuais com pessoas do mesmo sexo (RR = 6,21) estiveram associados à ocor-rência de AIDS. Relato de ausência de local para mo-rar (RR = 3,00) e de fonte de renda (RR = 2,65), ser HIV soropositivo (RR = 4,52) e nunca ter sido encarcerado (RR = 3,71) se associaram aos óbitos, que ocorreram somente em homens. Esses achados parecem confir-mar que diferenças de gênero e condições econômicas são determinantes para a morbi-mortalidade de UDIs brasileiros.*

Síndrome de Imunodeficiência Adquirida; Mortali-dade; Uso Indevido de Drogas Parenterais

Contributors

M. N. Cardoso was responsible for the literature, structuring of the database for data analysis, and drafting of the article. W. T. Caiaffa conducted litera-ture searches, data analysis, and participated in draft-ing the article, especially in relation to discussion of the findings. S. A. Mingoti conducted literature search-es (principally on scientific methodology), data analy-sis (supervision of the statistical techniques used in the article), and drafting of the sections on presenta-tion and interpretation of the results.

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