

## 1. Introduction

People who misuse licit or illicit substances have higher mortality rates (McGinnis et al., 1993; Unwin & Codde, 1999). There are several risk factors related, such as the substance toxicity itself, consumption severity, presence of comorbidity, demographic features and socioeconomic conditions (Li & Smialek, 1996). The type of substance used, as well as the administration route, is also associated with the observed *causa mortis* (Pereiro et al., 2003). In this manner, the new appearance of heroin and cocaine from the seventies until today has changed dramatically the patterns of mortality, with increasing incidence of suicide, overdose, car accidents and homicide, mainly among young users (Smith, 1994; Roberts et al, 1997). The habit of injecting and exchanging sex for drugs has contributed to the spread of AIDS and STD, which still are a public health concerning in several countries (Rodriguez et al., 2002).

Most research about substance abuse and mortality has been done on cigarette smokers, alcoholics or heroin addicts. Little is known about mortality in crack cocaine users. Since no studies have analyzed the mortality risk and the causes of death among crack users, the present study has attempted to produce some evidence with regard to this theme.

## **2. Methods**

### *2.1. Subjects*

In the present study 131 consecutive crack dependent patients, admitted to the detoxification ward of a public hospital with a city-wide catchment area in São Paulo, Brazil between 1992 and 1994, were followed-up 5 years later. By that time of the admission, all met DSM IV criteria for cocaine dependence. This was the second follow-up with the same group. Data from the first study was previously published elsewhere (Laranjeira et al., 2001).

### *2.2. Procedure*

Between 1998 and 1999 124 (94.6%) of the original cohort were located - mean follow-up 44.3 months. Semi-structured interviews were conducted by telephone with either the patient (21.5%) or a close family member (78.5%). Verbal consent was given and the project had been approved by the local ethics committee. Seven patients (5.4%) and their families could not be traced. Death certificates were verified from records held at the Municipal Offices. The hospital records of the patients were reviewed to collect demographic and socio-economical information of them by the time of the admission.

### *2.3. Data analysis*

The observed mortality rate had been calculated by the direct standardisation method, adjusted for age and sex, and compared with the population of São Paulo. The mortality ratio was also calculated. The probability of being alive after five years had been estimated by means of a survival analysis (Kaplan-Meyer). Potential predictors of mortality were identified using the patients' records and compared using the Cox's proportional hazards regression. These included: demographic data, level of schooling, drug use variables, criminal history, treatment history and pre-admission psychosocial assessment.

## **3. Results**

### *3.1. Demographic data*

The sample were predominantly young (mean age = 23,6 years SD=6,7), single (67%), white men (75%) of low educational attainment (56%) and high unemployment (69%) (**table 1**). More than half of them had been in other kind of treatment (56%). The mean age of the first crack cocaine experience was 22.6 years (from to years SD = ) and the great majority were using at least another drug at the admission. Half of them had been involved with criminal system.

### *3.2. Causa mortis*

Twenty-three patients (18.5%) had died: 3 were accidental (2 cocaine overdoses and 1 drowning), 7 due to infectious complications of intravenous drug use (6 of AIDS and 1 of hepatitis B) and 13 had been shot. Relatives reported that these latter deaths were related to turf fights, punishment levelled out by drug dealers for unpaid debts or police repression. Mean age at death was 27 years (range: 18 to 40).

### *3.3. Death rates*

Observed mortality rate, calculated by the direct standardisation method, adjusted for age and sex, was 24.92 per 1000. The expected all cause mortality rate in São Paulo, adjusted for age and sex, was 3.28 per 1000 inhabitants, giving an excess mortality rate of 21.64 per 1000 – a mortality ratio of 7.60.

### *3.4. Probability of been alive after five years*

Survival analysis showed that the probability of being alive 5 years post-treatment was 0.80 (95% CI = 0.77 to 0.84) (**Figure 1**). Seventeen variables were tested as predictors of mortality using Cox's proportional hazards regression. Three variables were identified as predictors of mortality: history of intravenous drug use (hazard risk = 3.28, 95% CI = 1.42 to 7.59,  $p = 0.005$ ), unemployment at index admission (hazard risk = 3.48, 95% CI = 1.03 to 11.80,  $p = 0.045$ ) and premature discharge from index admission (hazard risk = 2.21, 95% CI = 0.94 to 5.18,  $p = 0.068$ ).

#### **4. Discussion**

Follow-up studies of crack/cocaine users are rare and do not have mortality as their main focus (Brain et al., 1998), consequently it is difficult to make comparisons. The nearest comparable group is opiate addicts for whom more data are available. These follow-up studies usually report death rates from 6 to 22 deaths per 1000 inhabitants, mainly due overdose (Quaglio et al., 2001; Ghodse et al., 1998; Fugeldtad; 1997).

Homicide was the main cause of death in our study. Although the background homicide rate is higher in young Brazilian men, the age adjusted homicide ratio for our sample was 7.74, suggesting that crack use substantially increased the risk of a violent death. In the USA, which has similar gun laws to Brazil, it has been argued that violence surrounding emerging crack markets led to an increase in the homicide rate (Blumstein et al., 2000).

A limitation of our study is that patients came from just one hospital, albeit one that admitted patients from all parts of São Paulo City and one of just 2 hospitals with specialist detoxification units at the time the study began. This limits the generalisability of the results.

This is the first study of mortality in crack users and draws attention to the alarmingly high death rate, in particular from homicide. Regression analysis has

identified 3 risk factors, which could inform future treatment policies: (i) enable patients to stay in treatment longer, (ii) more effective harm reduction interventions for injectors and (iii) social reintegration. However, tighter gun controls would probably have a far greater impact on mortality for both crack users and the general population.

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