Crack-cocaine: a five-year follow-up study of treated patients.

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Abstract

Objectives: To follow-up a group of 131 crack-cocaine users and examine drug use, treatment experience, employment status, involvement in crime and mortality at 2 and 5 years.

Methods: Consecutive crack dependent patients who were admitted to a detoxification unit in Sao Paulo between 1992 and 1994 were re-interviewed on two occasions: 1995-1996 and 1998-1999.

Results: At 5 years post-treatment information was obtained on 124 (95%) of the original cohort. 39.7% (n=52) of patients reported having been abstinent from cocaine for at least the last year and 21.4% (n=28) had been using. Of those subjects not using cocaine at 2 years, 19 (62%) were still abstinent at 5 years. Twenty-three (17.6%) patients had died by the 5 years follow-up with homicide, due to firearms or other weapons, being the commonest cause (n=13). The annual adjusted mortality rate for the sample was of 24.92 deaths per 1000 individuals, the excess mortality rate was of 21.64 deaths per 1000 individuals and the standardized mortality ratio (SMR) was 7.60. A history of injecting drug use, unemployment at the time of the index admission and administrative discharge at index admission were factors that contributed to the risk of dying over the next five years.

Conclusions: There was a progressive movement towards abstinence over the follow-up period and there was evidence that once abstinence had been achieved it was maintained. On the other hand, the mortality rate was extremely high and was higher among those who were still using crack at 2 years.

Key words: crack cocaine, cocaine-related disorders, follow-up studies, mortality

Introduction

Crack/cocaine use is a growing problem worldwide[1,2]. In Brazil, crack or cocaine powder are the most commonly used drug of misuse among patients presenting to drug treatment services[3]. National data show that the proportion of cocaine users who are using crack rather than cocaine powder has been increasing since the early 1990s[3,4]. Among treatment populations, although most cocaine users begin by snorting cocaine powder, over time more than two-thirds change their preferred route of administration to smoking crack[5].

Crack/cocaine use has been extensively studied, but there are remarkably few long-term follow-up studies of this population[6-11] and we know very little about their long-term outcomes. Brain et al.[6] followed up a group of 50 crack users over a 2-year period. Their sample had been obtained using snowball sampling from an initial group of patients in contact with a treatment agency in the North of England. Outcomes measured in this study were on-going crack use, employment status and involvement in crime. Falck et al.[7] used the SF36 health survey form to study the medical outcomes of a sample of 436 not-in-treatment crack users from Dayton, Ohio. The authors concluded that the instrument did not adequately capture the type of health complications that cocaine use causes. Gossop et al.[8] followed up a sub-group of 496 crack users from the National Treatment Outcome Research Study (NTORS) over a period of 4 to 5 years. Of this sample 169 had been using crack prior to treatment entry. Of this sub-group the rate of crack use had fallen to 35% at one year but at 2 and 4/5 years it had risen slightly to 37% and then 44%, respectively. This study also investigated factors predictive of using crack at the 4/5-year follow-up interval.

There have been no follow-up studies of crack users in Brazil and from the international data we have searched no study has specifically addressed mortality among this population. The aim of the present study was to follow-up a group of crack-cocaine users and to examine a range of outcome measures, including: drug

use, treatment experience, employment status, involvement in crime and mortality. A survival analysis of this sample has already been published[12] and the present paper focuses more on the other outcome measures as well as giving additional information on the causes of death.

Materials and methods

Setting

The Detoxification Inpatient Unit of Taipas General Hospital has fifteen beds and runs a structured residential treatment program. It is a public hospital, admitting patients from the whole of Sao Paulo City. During the study period, it was the only specialized public inpatient service for drug and alcohol detoxification in the municipal district. Patients on the program received psychiatric services, individual and group psychotherapy and occupational therapy from a multidisciplinary team. The program normally lasted 15 days but longer admissions were possible if the patient was receiving treatment for a comorbid psychiatric condition or if residential aftercare arrangements were being made. Other general psychiatric hospitals admitted individuals with a diagnosis of drug or alcohol dependence but only for non-specialist treatment.

Subjects

Successive inpatients admitted to the unit were included in the sample if they met the International Classification of the Diseases (ICD-10) criteria for crack dependence. The diagnosis was established through a clinical interview by one of the seven psychiatrists working at the service during the study period. The first patient was admitted to the unit in May 1992. From this point onwards, all subsequent admissions of crack dependent patients were included in the sample up until December 1994. All admissions were identified from the central register of admissions. From this the diagnosis and patient identification were obtained. These were used to locate the patients' case-notes, from which information was extracted pertaining to the initial admission to hospital. Information was collected

using a standardised proforma and all records were scrutinised by the first author (MR). There were 131 patients in the initial sample.

In general, patients were young, single men of low educational attainment who were predominantly unemployed. The demographic details of the sample are outlined in **Table 1**. The mean age of first crack use was 22.6 years (SD = 6.93, range = 12 to 42 years). Two-thirds of patients had used crack for the first time before age 18. Almost all of them had used others substances before crack (99.2%). Among these, cocaine powder was the most common (83.2%), followed by marijuana (68.1%). Only 2 people had ever used heroin. Almost one-third of subjects had ever injected drugs prior to the index admission.

Follow-up

The follow-up study was approved by the local research ethics committee of the Federal University of Sao Paulo. Before initiating the follow-up interview, the patients were asked to give verbal consent (when contacted by telephone) or written consent (when interviewed personally) to take part in the study. None of the located patients or their family members refused to answer the questionary.

The first follow-up took place between 1995 and 1996 – on average 2 years after the index admission[13]. Because the inpatient unit operated a waiting list, patients had to give a contact telephone number so that they could be called when a bed became available. This number was used to contact the patient or family member at follow-up. Where patients could not be contacted by telephone, a registered letter was sent to their last known address asking them to telephone a named individual at the unit. A search was made at the Sao Paulo Municipal Records Office for death certificates of all patients for whom no current information was available and also for those who we were told had died.

The second follow-up took place between 1998 and 1999. The same procedures were used, although some additional strategies were employed to locate patients. Patients who could not be reached by the initial contact telephone number and who did not reply to the second registered letter, sent to their last known address, were visited at home and interviewed (n=17). A further 31 domiciliary visits were made where a neighbour was able to give a new telephone contact for the patient. We also searched the online Sao Paulo telephone directory for the names of patients who were no longer contactable via their original telephone number or address (n=5). We searched the central electronic register of all inmates in the Brazilian penal system (n=9). Using these additional strategies the number of subjects who could not be localised fell from 28 in 1995/6 to 7 in 1998/99.

At the first follow-up interviews were conducted by two doctors and one psychologist and at the second follow-up by a doctor and an occupational therapist. At the second follow-up most interviews took place over the telephone (n=88) either with the patient or a close family member. Seventeen interviews took place at the patient's house. Patients who were in prison were not interviewed.

Statistical analysis

A descriptive analysis was used to summarise the profile of patients studied. The t-test was used to compare the means between groups where data followed a normal or near-normal distribution. Categorical data were analysed using the X^2 test. Parametric but highly skewed data were analysed using the Mann-Whitney U test.

The crude mortality rate was obtained by dividing the number of observed deaths by the total number of individuals in the sample. The mean annual mortality rate was calculated by dividing the crude mortality rate by the number of years of follow-up. These values were expressed as number of deaths per 1000 individuals. This value was then adjusted for sex and age, by applying age and sex rates in the sample to the age and sex distribution of Sao Paulo City (direct method)[14], in order

to eliminate differences in observed rates that result from those differences in both population compositions. The age and sex distribution for the inhabitants of Sao Paulo City and their expected mortality rates were obtained from the records of the State of Sao Paulo Analysis of Data Systems Foundation (SEADE). The excess mortality rate was calculated as the difference between the observed and the expected mortality rates. The standardized mortality ratio (SMR) was defined as the ratio of the observed mortality rate to the expected morality rate. Survival analysis was undertaken using the Kaplan-Meier method.

Stratified survival curves were compared using the 'log-rank' method. Cox's proportional hazard model was used to study factors related to death at follow-up. The analyses were performed using the SPSS program (Statistical Package for Social Scientists) for Windows, version 8.0.1.

Results

Subjects located and missing at the 5-year follow-up

Of the original sample of 131 patients admitted to the detoxification unit with crack dependence, we obtained information on 124 (94.6%) at 5 years. Among the seven not located, 3 had been interviewed during the first follow-up and 4 had not been located at either follow-up point. Thirteen patients (9.9%) were confirmed dead at the first follow-up and these families were not contacted again. Four subjects (3.1%) were detained in the Brazilian Penitentiary System, but were not interviewed.

Detoxication history and treatment after discharge from the detoxification unit

The majority of the patients (74.7%) completed the detoxification program of the hospital. More than 80% (n=105) of patients had a planned discharge. Only 12 (9.2%) patients received an administrative discharge for breaching the unit's rules and a further 12 (9.2%) self-discharged before completing the two-week program.

Almost one quarter of patients (n=29, 22.3%) were subsequently re-admitted for a further detoxification. Among these patients, more then half sought a further episode of inpatient treatment in the first two years. A third inpatient detoxification took place for just 5 of these patients.

Among the patients (n=80) whose pattern of cocaine use was known at 5 years, one fifth (n=16) were involved in some kind of treatment: 7 of the abstinent patients (13.4%) and 9 of the users (32.1%). During the five years after discharge, 38 patients (47.5%) had sought further treatment. Of these, 23 belonged to the currently abstinent group (60.5%) and 15 to the using group (39.5%). Fourteen subjects chose outpatient services (36.8%), 19 residential services (50%) and 5 had been to both (13.2%). There were no significant differences between the kinds of treatment chosen by the two groups.

Abstinence and drug use post- discharge

At the first follow-up, of the 103 patients located 22.1% (n=29) reported being abstinent from cocaine for a year or more, 38.2% (n=50) had used cocaine in the last year. No information was available on 29.8% (n=39) and 9.9% (n=13) had died. At the 5-year follow-up, 39.7% (n=52) reported having been abstinent from cocaine for least the last year and 21.4% (n=28) had been using. No information was available on 21.3% (n=28) and 17.6% (n=23) had died.

There were considerable changes in the patterns of consumption between the two follow-up points (**Table 2**, **Figure 1**). The biggest change was from "using" at 2 years to "abstinent" at 5 years. Most of the death that occurred between the 2 and 5-year follow-ups were among clients who were using at 2 years.

Of those subjects not using cocaine at 2 years, 19 (62%) reported still being abstinent at 5 years.

Work and study

At the 5-year follow-up, the majority of individuals had been working for more than one year in the same job (**Table 3**). Cocaine abstainers were more likely to be formally employed and were less likely to report absences from work in the last year.

In spite of the overall low level of educational attainment, only 11 of the 80 patients (n=11) had studied in the year prior to the interview (13.7%). Of these, most had studied at high school (n=9), although one had gone to technical college and one to Law School.

Imprisonment

From records obtained from the Brazilian Penitentiary System at the 5-year follow-up, 16 (12.2%) of the original 131 subjects were in prison. The offences committed in by these individuals were robbery (n=13) and drug trafficking (n=3). At the 2-year follow-up, 9 patients had been incarcerated (6.8%). None of the 5 patients who had been in prison at 2 years could be located at 5 years and may still have been in prison.

During the five years since discharge from the inpatient unit, 13 patients (16.3%) had some kind of involvement with the police. There was no difference between abstainers and users in relation to their involvement with the police over the preceding 5 years.

HIV

In relation to the HIV, at the 5-year follow-up 13 (10.8%) patients stated that they had tested positive for HIV, 74 (61.7%) declared themselves as HIV negative and 33 (27.5%) had never been tested in life.

Mortality

Demography and *causa mortis*

Twenty-three (17.6%) patients died between the discharge from hospital and the second follow-up at 5 years. The medium age of death was of 27.1 years (SD=6.6; range = 18 – 40 years). Almost half of subjects died before they had reached 25 years of age. The majority of deaths had external causes, with homicides, due to firearms or other weapons, being the most common. AIDS was the next most common cause of death (n=6). All the patients dying of AIDS had injected drugs during their lifetime. In **Table 4** all demographic details and causes of death are summarized.

Mortality rates

The *annual crude mortality rate* of the sample was of 35.1 deaths per 1000 individuals. Among the men, there were 22 deaths out of 115 subjects, giving a mortality rate of 38.3 deaths per 1000. For women there was 1 death out of 16 subjects, giving a mortality rate of 12.5 deaths per 1000. The *annual adjusted mortality rate* for the sample (adjusted for sex and age using the direct method and in reference to the population structure of Sao Paulo City) was of 24.9 deaths per 1000 individuals. The expected mortality rate for the population of the City of Sao Paulo was of 3.3 deaths per 1000 inhabitants. Therefore the *excess mortality rate* was of 21.6 deaths per 1000 individuals and the *standardized mortality ratio* (SMR) was 7.6.

Multivariate Survival Curves

In an analysis using Cox's proportional hazards model, we investigated variables that had been recorded at the time of the index admission to see if they contributed to the risk of subjects dying over the next five years (Table 5)

Three variables were retained in the final model: (i) history of injecting drug use (hazard ratio = 3.8, 95% CI =1.4 – 7.6, p=0.005), (ii) unemployment at the time of

the index admission (hazard ratio = 3.5, 95% CI = 1.0 – 11.8, p=0.045) and (iii) administrative discharge at index admission (hazard ratio = 2.2, 95% CI = 0.9 – 5.2, p=0.068).

Discussion

In this 5-year follow-up study, we have successfully located 94.6% of the original cohort of 131 crack dependent patients who had been admitted to an inpatient detoxification unit between 1992 and 1994. There was a progressive movement towards abstinence from crack-cocaine use over the follow-up period with just over a fifth of the sample reportedly not using crack-cocaine at 2 years, increasing to two-fifths at 5 years. There was evidence that once abstinence had been achieved, it was maintained – so that the majority of individuals who had not used crack-cocaine at the 2-year follow-up were still abstinent at 5 years. Most subjects had returned to work but the non-users were more likely to be employed in the formal jobs market. The most worrying finding was the high level of mortality. Nearly 18% of the sample were dead 5 years post-treatment, with homicide and HIV being the commonest causes. Most of the deaths that occurred between the first and second follow-up were among subjects who reported that they were still using crack-cocaine at 2 years.

Pattern of crack-cocaine consumption – a trend towards abstinence?

At the two follow-up points, progressively more of our subjects reported that they had not used crack-cocaine in the last year. Falck et al.[7] followed-up 439 not-in-treatment crack users who had no criminal histories and who had stable accommodation and found that the proportion of patients who had been using crack more than once a day, was 50% lower at 2 years. Brain et al.[6] in a 6-month follow-up study, observed an oscillation in crack use both in relation to frequency and quantity of use. However, 25% of the sample had stopped using crack, although only 10% were not using any other psychoactive substance.

Follow-up studies looking at crack users post-treatment, show significant reductions in drug use. Siegal et al.[9] followed up 229 crack users over 6, 12 and 18 months after leaving a residential rehabilitation unit. Of the 112 subjects (48.9%) who reported abstinence at 18 month, 71 subjects (63.4%) had not used crack since the first follow-up. Gossop et al[8] observed a large decrease in cocaine use in a group of heroin addicts one year after treatment discharge, which was sustained during the 5-year follow-up period.

No study has yet convincingly identified the pre-treatment factors that predict long-term abstinence from crack. Although several authors have suggested that severity of dependence, employment, criminal justice involvement and comorbid alcohol dependence are important[8,10,11,15,16]. One treatment factor has been identified as being a good prognostic indicator: duration of retention in treatment[9-11,15]. Some authors have argued that when duration of time spent in treatment is taken into account the predictive effect of pre-treatment variables, such as severity of dependence and psycho-social factors disappears[9,15].

Improvement in employment levels

At the time of the index admission, only 38 subjects (30.6%) were employed. However, at both the first and second follow-up levels of employment progressively increased, reaching 70.9% at 5 years. Sánchez-Carbonell et al.[17] found similar levels of employment in an eleven-year follow-up study of heroin users.

Interestingly there were no statistically significant differences in the overall levels of employment between subject who reported that they had not used crack-cocaine in the last year and those who had. However, the abstinent group, were more like to report being employed in the formal jobs' market and were less likely to report having taken days off in the last year. A positive relationship between abstinence from crack and better social functioning has been found by other authors[7,9]. Goldstein et al.[18] also found that patients on methadone maintenance were more likely to find formal employment compared with an out-of-treatment sample, who

were more likely to report informal work or describe themselves as self-employed. The Brazilian economy was growing during the 1990s, job opportunities were greater and the minimum wage had been raised. Blumstein et al.[19] cite improvements in the United States economy and increased levels of employment during the 1990s, as contributing factors to the observed decline in mortality from crack-cocaine use, despite an increase in levels of consumption.

High mortality rate

The mortality rate in this sample of young, predominantly male crack-cocaine users was extremely high (24.9 per 1000 individuals) - almost eight times that of the population from which they came. The medium age at death was 27 years and two-thirds of individuals had died before age 30. Although homicide is the commonest cause of death among young men in Sao Paulo, the age adjusted homicide rate for our sample was 7.74, suggesting that crack use significantly increases the risk of dying a violent death[12].

Most studies that have examined mortality among drug users have been with heroin users[17,20-24] or include subjects using a broad range of substances[25-28]. These studies report standardized mortality rates between 10 and 30 deaths per 1000 inhabitants. The mortality rate in our study is at the lower end of this range but our sample of crack users is much younger than most of the heroin users and the causes of death quite different. Heroin users tend to die from overdose or complications of infections with blood-borne viruses. Our sample primarily died of homicide (56,5%). Among follow-up studies of heroin users, mortality from homicide rarely exceeds 5%, with the exception of Goldstein et al.[18] who studied a population of male, Hispanic heroin users from New Mexico.

In Los Angeles, Budd[29] studied the first 114 post-mortems of subjects whose toxicology results were positive for cocaine. Twenty-nine percent died of an overdose but 61% had suffered a violent death, with firearms or other weapons being responsible for 68% of these deaths. The author was not able to

differentiate those violent deaths that had been caused by accident, suicide or homicide.

Limitations of the study

The present study used a sample of crack-cocaine users from a single service, albeit one providing a service for the entire city, so the findings cannot be generalized to other cities in Brazil or other countries around the world. However, there are so few follow-up studies of crack-cocaine users, that this study acts as a basis on which future studies can be compared. We relied on interviews that were usually undertaken by telephone and often with a close family member rather than the patient. This could have compromised the reliability of the information collected. However, the outcomes that we measured were quite broad and ones that family members are likely to have known about (death, cocaine use, employment). The most important outcome (death) was verified in official records.

Future

The present study leaves many questions unanswered, in particular a fuller understanding of the pre-, during- and post-treatment factors that may predict abstinence form crack use and social integration. We are currently planning a 10-year follow-up of this sample. It is intended that more objective measures of outcome will be utilised in this subsequent study, including drug testing to confirm abstinence and more direct confirmation of employment status. Mortality will also be tested again.

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Table 1. Sociodemographic details of 131 crack dependent patients at the time of admission to a detoxification unit between 1992- 94.

Variables*	N	%
Gender: (n=131)		
male	116	88.5
female	15	11.5
Age [years]: (n=131)		
10 – 14	3	2.3
15 – 19	35	26.7
20 – 24	48	36.6
25 – 29	20	15.3
30 – 34	12	9.2
35 – 40	8	6.1
40 – 45	5	3.8
Race: (n=130)		
white	97	74.6
black	33	25.4
Civil status: (n=130)		
single	87	66.9
married	35	26.9
divorced	8	6.2
Schooling: (n=102)		
less than 8 years	57	55.9
8 years or more	45	44.1
Employed/studying (n =124)		
Yes	38	30.6
No	86	69.4
Committed an offence (n=123)		
Yes	61	49.6
No	62	50.6
Imprisoned (n=123)		
Yes	26	21.1
No	97	78.9

* Missing data for some variables are due to the absence of this information in the case-notes.

Table 2. **Changes in the pattern of crack consumption between the follow-up studies.**

2-year follow-up (1995 - 1996)	5-year follow-up (1998 - 1999)				
	Abstinent	**User**	**Unknown**[*]	**Dead**	**Total**
Abstinent	18	6	4	1	29
User	23	14	7	6	50
Unknown*	11	8	17	3	39
Dead	-	-	-	13	13
Total	52	28	28	23	131

(*) includes patients not located at follow-up or in prison.

Table 3. Characteristics related to work between the abstinent and users patients (n=80) of the study.

	5-year follow-up				
	Abstinent		**Using**		
	N	**%**	**N**	**%**	**P**
Worked during last 12 months					
Yes	40	76.9	16	59.3	0.10
No	12	23.1	11	40.7	
Duration of employment					
Up to 3 months	06	15	02	12.5	0.81
More than 3 months	34	65	14	85.7	
Type of job					
Formally registered	20	50	3	18.7	0.03
Informal job	20	50	13	81.3	
Absenteeism					
Yes	3	7.5	6	37.5	0.00
No	37	92.5	10	62.5	
Changed job in the past 12 months					
Yes	8	20	5	31.3	0.49
No	32	80	11	68.8	

(*) information about one patient from the user group could not be traced.

Table 4: Demography and *causa mortis* of the 23 patients who died during the follow-up.

	N	%
Gender		
Male	22	95,7
Female	01	4,3
Race		
white	16	69,6
black	07	30,4
Civil status		
single	15	65,2
married	06	26,0
divorced	02	8,7
Age of death		
15 - 20	05	21,8
21 - 25	06	26,1
26 - 30	06	26,1
31 - 35	03	13,0
36 - 40	03	13,0
Causa mortis		
External causes		
homicide	13	56,5
overdose	02	8,7
drowning	01	4,3
natural causes		
AIDS	06	26,1
hepatite B	01	4,3

Variable	Survival chance after 5 years	Confidence interval (95%)	Significance level (p)
Demography			
Gender			
Male	0.79	0.75 – 0.83	0.21
Female	0.92	0.85 – 0.99	
Race			
White	0.83	0.79 – 0.87	0.36
Black	0.74	0.65 – 0.82	
Civil status			
Single or divorced	0.82	0.78 – 0.86	0.75
Married	0.81	0.74 – 0.88	
Schooling			
$\leq$ 5 years	0.63	0.45 – 0.80	0.13
> 5 years	0.81	0.77 – 0.85	
$\leq$ 8 years	0.79	0.74 – 0.84	0.70
> 8 years	0.80	0.71 – 0.86	
Work			
Employed at admittance	0.92	0.87 – 0.96	**0.047**
Unemployed at admittance	0.74	0.69 – 0.80	
Crack cocaine consumption			
	0.81	0.73 – 0.87	0.81
Age at first episode of use	0.79	0.74 – 0.84	
< 18 years old			
$\geq$ 18 years old			
Life use of injected drugs	0.63	0.54 – 0.71	**0.004**
Yes	0.86	0.83 – 0.90	
No			
Family history of alcohol and drug consumption	0.80	0.75 – 0.86	0.52
Yes	0.77	0.71 – 0.83	
No			
Previous treatments before detoxification	0.71	0.64 – 0.78	**0.07**
Yes	0.87	0.82 – 0.92	
No			
Type of discharge	0.84	0.80 – 0.88	**0.09**
Only planned discharge	0.69	0.61 – 0.78	
Administrative or self-discharge			
Crime			
Any offense against the law before detoxification			
Yes	0.83	0.78 – 0.88	0.31
No	0.74	0.67 – 0.81	
Imprisonment before detoxification			
Yes	0.83	0.76 – 0.91	0.54
No	0.78	0.74 – 0.83	

Table 5. Stratified survival curves according with the variables related to the demography, consumption and criminality of the 126 subjects by the period of detoxification at Taipas General Hospital (1992 – 1994).
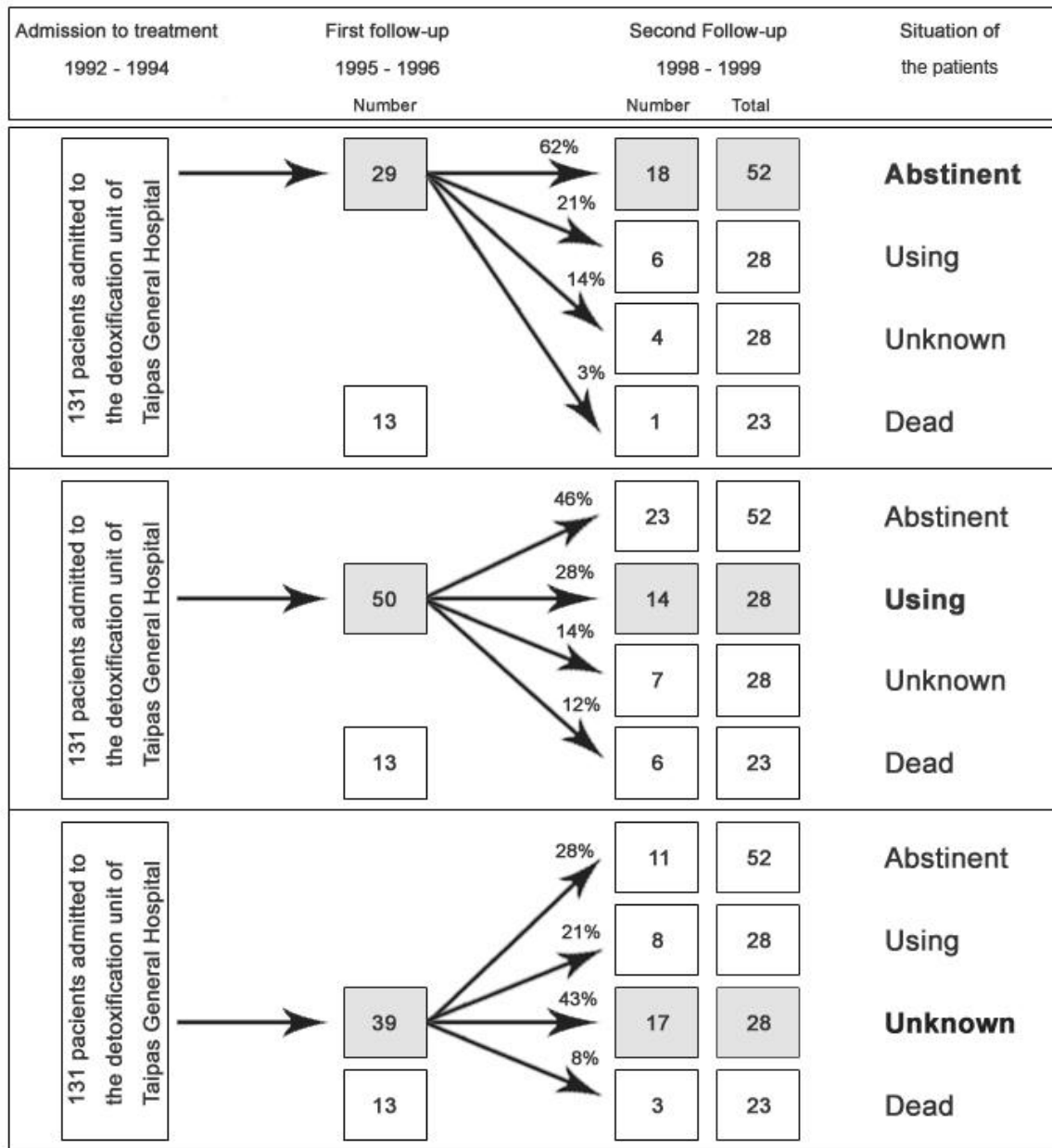
Figure 1. Primary outcomes at 2 and 5 years of a sample of 131 crack users admitted to an inpatient detoxifcation unit, between 1992 – 1994.