Crack Cocaine User's Protective Factors for Relapse

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Abstract

Background: Although available treatments may reduce the severity of crack cocaine use-related problems, a significant percentage of users resume drug abuse within a relatively short time after treatment. This relapse process is the return to the condition of pre-treatment drug consumption conditions. Crack cocaine users appear to be particularly prone to this dynamic, making relapse one of the biggest challenges for treating crack cocaine dependents. However, in the midst of this disheartening setting regarding the high relapse potential, a negligible part of the population of users remains in abstinence, not following this pattern of relapse, although they belong to contexts similar to relapsing users. This study aimed to identify the main characteristics of crack cocaine users, which protect them from relapse in the first six months after treatment.

Methods: This is a study with 700 participants recruited through treatment institutions. Initially, data were analyzed descriptively and the existence of associations was verified by Chi-Square test or Fisher's exact test. The Student t-test for independent samples was employed to compare the means between two groups. Logistic regressions were used to simultaneously evaluate the effects of demographic characteristics, history of use of crack cocaine on the occurrence of non-relapse.

Results: The results of this work returned the following crack cocaine user's main protective factors for relapse: being single but with a steady partner, or being separated or divorced, Catholic, not living in the streets or "Cracolândia", not developing binge, withdrawal, dependence, abstinence (more than ten days) and drug late onset.

Conclusion: Among these factors, not being abstinent is a protective factor for relapse that deserves attention, considering that the conventional treatment options available in Brazil consider abstinence as the only possible outcome.

Background

Crack cocaine was introduced in Brazil in the early 1990s [1], when the first drug seizure was made by police in São Paulo [2]. Its consumption has been on the rise since then, with a prevalence of 0.4% in 2001 [3] and almost double in 2005, 0.7% [4]. According to the National Survey on Crack Cocaine Use in Brazil by FIOCRUZ, the prevalence of regular use of crack cocaine or similar in Brazilian capitals is about 0.81%, corresponding to 35% of consumers of illicit drugs, excluding marijuana [5]. Although consumption has increased over time, crack cocaine is still not among the most consumed drugs in Brazil [6]. However, it is the illicit drug that leads most to hospitalizations and demand for treatment, with a significant financial burden on the Brazilian Government [7, 8]. Also, Brazil is cited as one of the largest crack cocaine markets in the world [9]. This is compounded by the high rates of morbidity and mortality associated with crack cocaine use, due to problems such as violence, addiction, infectious diseases and especially sexually transmitted diseases [10, 11, 12].

Treatments have been provided by the public and private crack cocaine user care network in an attempt to decrease or eliminate crack use, but its effectiveness has been disputed [13]. However, the negative short-term consequences of crack cocaine have become a matter of great concern for society and a massive challenge for the Brazilian Government [13, 14].

Although available treatments may reduce the severity of crack cocaine use-related problems, a significant percentage of users resume drug abuse within a relatively short time after treatment [15}. This relapse process, as defined by Marllat and Gordon [16], is the return to the condition of pre-treatment drug consumption conditions. Crack cocaine users appear to be particularly prone to this dynamic [17, 18], making relapse one of the biggest challenges for treating crack cocaine dependents [19].

Some studies show that the crack cocaine user's course is marked by a recurrent cycle of abstinence and relapse to the initial dysfunctional pattern [20, 21]. In the first six months after treatment, relapse can reach a rate of 80% [22] or even 90% [15]. In a study with adolescent crack cocaine users in abstinence after treatment in the Brazilian city of Porto Alegre, the authors confirmed these high relapse rates in this population: 69.9% in the first month and 86.4% in the third month [18].

Several reasons are attributed to the onset of relapse: negative feelings, craving, problems with romantic or family relationships and others [23, 24, 25, 26]. However, in the midst of this disheartening setting regarding the high relapse potential, a negligible part of the population of users does not follow this pattern of relapse, although they belong to contexts similar to relapsing users.

This study aimed to identify the main characteristics of crack cocaine users, which protect them from relapse in the first six months after treatment.

Methods

This is a study carried out in the cities of São Paulo and Recife with 700 crack cocaine users who were treated at the Alcohol and Drugs Psychosocial Care Center (CAPS AD), in Therapeutic Communities and medical clinics.

Criteria for inclusion in the sample

Subjects over 18 years of age, both genders, who had sought treatment services primarily due to crack cocaine use, who already knew what relapse is. This last criterion was necessary for the researchers to be sure that participants would be able to identify this event if it recurred. We recruited subjects who had completed treatment 3–6 months earlier. This criterion was defined based on literature data showing that the highest rate of relapse occurs between the first three to six months after treatment.

Recruitment of participants

Potential participants were identified with the help of professionals from the treatment sites. These subjects were approached by such professionals and were invited to participate in the research. Loss (subject not found) and refusal to participate corresponded to 6% of the total number of individuals contacted. The sample consisted of N = 700 participants, an estimated number that warranted a high probability of finding participants who had not relapsed in that period.

Instrument used

questionnaire, with 46 multiple-choice questions (sociodemographic data, drug use history, reasons for relapse, treatments, dependence), was developed specifically for this study. Interviews were performed with the help of the researcher and held in a place indicated by the participant with a duration of about one hour, distributed by treatment services, as shown in Table 1.

Table 1
Distribution of interviews by type of service (São Paulo and Recife)

SERVICES	NUMBER OF LOCATIONS	INTERVIEWS
Clinics	19	138
CAPs AD	35	290
Therapeutic community	31	272
Total	85	700

Data collection was completed in approximately one year. The questions relating to the socioeconomic data were evaluated using the *Brazilian Economic Classification Criteria 2008* scale, published by the ABEP [27]. This scale mainly considers the consumer goods possessed by the family and classifies repondents into classes A1, A2, B1, B2, C, D, and E (A1 is the category with greatest ownership, whereas E delineates a lack of ownership and includes the homeless). The criteria for dependency, as defined by the DSM-V [28], were also incorporated into the questionnaire

Data analysis

Initially, data were analyzed descriptively. Absolute and relative frequencies were shown for the categorical variables and summary measures (mean, quartiles, minimum/maximum and standard deviation) for the numerical variables.

The existence of associations between two categorical variables was verified using the Chi-square test, or in cases of small samples, Fisher's exact test. When differences were observed in the distributions, the standardized adjusted residual was used to identify the local differences – boxes with absolute values above 1.96 indicate evidence of (local) associations between the categories related to these boxes.

The comparison of means between two groups was performed using Student's t-test for independent samples. One of the assumptions of the Student's t-test is data normality, which was verified using the Kolmogorov-Smirnov test. The non-parametric Mann-Whitney test was used alternately in case of violation of this assumption.

Logistic regressions were used to simultaneously evaluate the effects of the demographic characteristics and crack cocaine use history on the occurrence of non-relapse. In this study, we adopted a hierarchical model that allowed us to structure the investigation of risk factors (of a demographic nature, history of crack cocaine use and treatment) and facilitate interpretation. The predictive variable selected were those associated with relapse in the descriptive analysis at 10% due to a large number of variables compared to the sample size. Demographic characteristics were considered as Level 1 predictive variables of the hierarchical model. Then,

history of crack cocaine use and treatment features were set as Level 2 and Level 3, respectively. After inclusion of each set of predictive variables of a given level, the selection of these variables for the following model was performed by excluding non-significant ones, one at a time (as backward selection). Furthermore, the Hosmer and Lemeshow test assessed the goodness-of-fit of the final model.

Sensitivity and specificity were calculated through the ROC curve that allowed the definition of a cut-off point in the probabilities of non-relapse estimated from the adjusted regression model. A significance level of 5% was used for all statistical tests. SPSS 20.0 was the statistical software used for the analysis.

Results

Sample characteristics

Consisting of a larger percentage of men (87.4%) (Table 2), with a mean age of 34 years (Table 3), with complete or incomplete primary school (57.4%), Evangelical/Protestant (41.4%), distributed predominantly in classes D and E (38.8%), unemployed (35.8%), with own subsistence from odd jobs or help from relatives (72.2%), living in a house or apartment (own or rented) (65.2%), single and with no steady relationship (46.2%), not living with crack cocaine users (79.4%) (Table 2), with an average of 1.6 children (SD = 1.5 children) (Table 3). Only 7.1% of the sample did not relapse after the last treatment (Table 2).

Table 2
Distribution of users by sociodemographic characteristics by status (relapse, without relapse)

	Total		Relapse		Without relapse		p
		%	N	%	N	%	
Gender	**700**	**100%**	**650**	**92.9%**	**50**	**7.1%**	0.448
Male	612	87%	570	93.1%	42	6.9%	
Female	88	13%	80	90.9%	8	9.1%	
Schooling	**700**	**100%**	**650**	**92.9%**	**50**	**7.1%**	0.166[a]
No education	9	1.6%	9	100.0%	0	0.0%	
Primary school	402	57.4%	376	93.5%	26	6.5%	
Complete secondary school or incomplete higher education	245	35%	227	92.6%	18	7.0%	
Complete higher education	44	6%	38	86.4%	6	13.6%	
Skin color	**659**	**100%**	**611**	**92.7%**	**48**	**7.3%**	0.866
White	331	50.2%	307	92.7%	24	7.3%	
Black	136	20.7%	128	94.1%	8	5.9%	
Brown	170	25.8%	156	91.8%	14	8.2%	
Yellow	22	3.3%	20	90.9%	2	9.1%	
Religion	**696**	**100%**	**646**	**92.8%**	**50**	**7.2%**	0.009
Catholic	172	24.7%	152	88.4%	20	11.6%	
Evangelical/protestant	290	41.7%	278	95.9%	12	4.1%	
Other	103	14.8%	92	89.3%	11	10.7%	
None	131	18.8%	124	94.7%	7	5.3%	
Socioeconomic classification	**700**	**100%**	**650**	**92.9%**	**50**	**7.1%**	0.005[a]
A1	3	0.43%	3	100.0%	0	0.0%	
A2	26	3.7%	22	84.6%	4	15.4%	
B1	55	7.8%	53	96.4%	2	3.6%	
B2	99	14.1%	91	91.9%	8	8.1%	

p - Descriptive level of the Chi-Square test or Fisher's exact test ([a]).

	Total		Relapse		Without relapse		p
		%	N	%	N	%	
C1	134	19.1%	122	91.0%	12	9.0%	
C2	111	15.8%	98	88.3%	13	11.7%	
D	88	12.6%	80	90.9%	8	9.1%	
E	184	26.2%	181	98.4%	3	1.6%	
Occupation	**698**	**100%**	**648**	**92.8%**	**50**	**7.2%**	0.477
Unemployed and job seeker	139	19.9%	128	92.1%	11	7.9%	
Unemployed and not seeking a job	251	35.9%	238	94.8%	13	5.2%	
Formal work	129	18.6%	116	89.9%	13	10.1%	
Informal work	144	20.6%	135	93.8%	9	6.3%	
Only studying	11	1.6%	10	90.9%	1	9.1%	
Retired	24	3.4%	21	87.5%	3	12.5%	
Main source of income	**682**	**100%**	**633**	**92.8%**	**49**	**7.2%**	0.614[a]
Employed or Odd Jobs	299	43.8%	278	93.0%	21	7.0%	
Government benefits	102	14.9%	91	89.2%	11	10.8%	
Illegal activities	10	1.5%	10	100.0%	0	0.0%	
Sex worker	6	0.9%	6	100.0%	0	0.0%	
Help (friends, relatives, other)	265	38.9%	248	92.3%	17	7.7%	
Housing type	**698**	**100%**	**648**	**92.8%**	**50**	**7.2%**	0.040[a]
Downtown crack cocaine-land (cracolandia)	7	0.9%	7	100.0%	0	0.0%	
Family house/apartment	323	46.3%	300	92.9%	23	7.1%	
User's house/apartment	134	19.2%	117	87.3%	17	12.7%	
House/apartment of others	43	6.2%	38	88.4%	5	11.6%	
Hotel/Boarding house	11	1.6%	10	90.9%	1	9.1%	
Shelter/hostel	78	11.2%	76	97.4%	2	2.6%	
Abandoned street or places	55	7.9%	54	98.2%	1	1.8%	

p - Descriptive level of the Chi-Square test or Fisher's exact test ([a]).

	p						
	Total		Relapse		Without relapse		
		%	N	%	N	%	
Other	47	6.7%	46	97.9%	1	2.1%	
Marital status	**698**	**100%**	**648**	**92.8%**	**50**	**7.2%**	0.036
Single, no steady relationship	324	46.4%	309	95.4%	15	4.6%	
Single, with a steady relationship	107	15.3%	96	89.7%	11	10.3%	
Married / Common-law marriage	155	22.2%	143	92.3%	12	7.7%	
Separated / divorced	99	14.1%	90	90.9%	9	9.1%	
Widower	13	2.0%	10	76.9%	3	23.1%	
Lives with someone using crack cocaine	**687**	**100%**	**647**	**92.8%**	**50**	**7.2%**	0.255
No	556	80.9%	513	92.3%	43	7.7%	
Yes	141	19.1%	134	95.0%	7	5.0%	

p - Descriptive level of the Chi-Square test or Fisher's exact test ([a]).

According to Table 2, there was an association between relapse only with religion (p = 0.009), economic classification (p = 0.005), housing type (p = 0.040) and love relationship (p = 0.036). A higher percentage of non-relapse is observed in Catholics, C2 economy class individuals, individuals living in a house/apartment that is rented or belongs to someone and widowers compared to subjects without these conditions.

According to Table 3, there were no differences in mean age and number of children by status.

Table 3
Summary measures of age and number of children by status

	Mean	Standard Deviation	Minimum	Maximum	1st Quartile	Median	3rd Quartile	N	p
Age (years)	**34.0**	**9.1**	**16.0**	**62.0**	**28.0**	**32.0**	**40.0**	**700**	0.708
Relapse	33.9	9.2	16.0	62.0	28.0	32.0	40.0	650	
Without relapse	34.4	7.8	18.0	56.0	29.0	33.5	39.0	50	
Number of children	**1.6**	**1.5**	**0.0**	**8.0**	**1.0**	**1.0**	**2.0**	**542**	0.564
Relapse	1.6	1.5	0.0	8.0	1.0	1.0	2.0	504	
Without relapse	1.5	1.8	0.0	7.0	0.0	1.0	3.0	38	

p - descriptive level of the Student t-test.

According to Table 4, there was an association between relapse and binge (p < 0.001), last time on a crack cocaine craving rampage (used crack cocaine several days and nights in a row) (p < 0.001), dependence (p = 0.010), abstinence (more than 10 days) at some point in life (p < 0.001) and reason for non-use at some point in life (p < 0.001). Thus, higher rates of non-relapse were observed in patients who never practiced binge with crack cocaine, who were never on a crack cocaine craving rampage, without dependence and among those who were never in abstinence for more than 10 days.

Table 4
Distribution of users by relapse, according to crack cocaine use history

	Status						p
	Relapse		Without relapse		Total		
	N	%	N	%	N	%	
Mean frequency of crack cocaine use when seeking treatment	**644**	**92.9%**	**49**	**7.1%**	**693**	**100.0%**	0.067[a]
Daily	472	94.6%	27	5.4%	499	100.0%	
3−6 days/week	90	88.2%	12	11.8%	102	100.0%	
1−2 days/week	51	87.9%	7	12.1%	58	100.0%	
3−4 times/month	12	92.3%	1	7.7%	13	100.0%	
Twice a month	4	80.0%	1	20.0%	5	100.0%	
Once a month	6	100.0%	0	0.0%	6	100.0%	
Less than once a month	9	90.0%	1	10.0%	10	100.0%	
Performed crack cocaine binge	**647**	**92.8%**	**50**	**7.2%**	**697**	**100.0%**	< 0.001
No	117	83.0%	24	17.0%	141	100.0%	
Yes	530	95.3%	26	4.7%	556	100.0%	
Last time you were on a crack cocaine craving rampage	**645**	**92.8%**	**50**	**7.2%**	**695**	**100.0%**	< 0.001
Never	92	81.4%	21	18.6%	113	100.0%	
This week	27	96.4%	1	3.6%	28	100.0%	
Less than a month ago, but more than a week	61	96.8%	2	3.2%	63	100.0%	
More than a month ago, but less than a year	358	94.7%	20	5.3%	378	100.0%	
More than a year ago	107	94.7%	6	5.3%	113	100.0%	
Classification of dependence	**650**	**92.9%**	**50**	**7.1%**	**700**	**100.0%**	0.010[a]
No	9	69.2%	4	30.8%	13	100.0%	
Yes	641	93.3%	46	6.7%	687	100.0%	

p - Descriptive level of the Chi-Square test or Fisher's exact test ([a]).

	Status						p
	Relapse		Without relapse		Total		
	N	%	N	%	N	%	
Have you ever stopped using crack cocaine for more than 10 days, since you started to use it	650	100.0%	50	100.0%	700	100.0%	< 0.001
No	7	1.1%	11	22.0%	18	2.6%	
Yes	643	98.9%	39	78.0%	682	97.4%	
Main reason for not using crack cocaine in this period	642	92.8%	50	7.2%	692	100.0%	< 0.001[a]
Never stopped using	7	38.9%	11	61.1%	18	100.0%	
Family reasons	171	90.5%	18	9.5%	189	100.0%	
Physical reasons	164	97.0%	5	3.0%	169	100.0%	
Financial reasons	16	72.7%	6	27.3%	22	100.0%	
Social reasons	61	93.8%	4	6.2%	65	100.0%	
Moral reasons	34	97.1%	1	2.9%	35	100.0%	
Other	189	97.4%	5	2.6%	194	100.0%	

p - Descriptive level of the Chi-Square test or Fisher's exact test ([a]).

In Table 5, the logistic regression models were adjusted for non-relapse. The exponentiated coefficients are interpreted as Odds Ratio (OR). In this study, the probability was the quotient between the probability of a patient not relapsing and the probability of relapse. Initially, the following predictive variables were considered: Level 1 model: socio-demographic variables; Level 2: use history-related variables; Level 3: variables related to treatment and association with other drugs. Some levels of the variables were aggregated due to the small number of cases and to facilitate interpretation of the results. All these predictive variables were associated with the participant's condition (relapse) at 10% in the descriptive analysis.

Table 5
Logistic regression results for non-relapse

	Model 1		Model 2		Model 3	
	OR (95%CI)	p	OR (95%CI)	P	OR (95%CI)	p
Religion (ref.= Evangelical)						
Catholic	3.67 (1.71–7.86)	0.001	2.30 (0.99–5.37)	0.053	2,79 (1,11 – 7,02)	0,029
Other	3.41 (1.42–8.21)	0.006	2.66 (1.03–6.84)	0.043	3,77 (1,3–10,92)	0,015
None	1.55 (0.58–4.10)	0.379	1.42 (0.50–4.00)	0.508	1,15 (0,36 – 3,62)	0,814
Housing type (ref.=Family home / apartment)						
User's or other's home / apartment/Hotel/Boarding house	1.78 (0.95–3.33)	0.071	1.86 (0.93–3.72)	0.081	3,13 (1,43 – 6,88)	0,004
Other[1]	0.26 (0.09–0.79)	0.017	0.30 (0.09–0.94)	0.039	0,41 (0,12 – 1,40)	0,157
Marital status (ref.=Single, without steady relationship)						
Single, with a steady relationship	2.29 (1.00–5.28)	0.051	2.54 (1.00–6.44)	0.050	3,01 (1,08–8,35)	0,034
Married / Common-law marriage	1.46 (0.65–3.28)	0.356	1.51 (0.61–3.74)	0.376	1,92 (0,71 – 5,16)	0,196
Separated / divorced / widower	2.85 (1.25–6.48)	0.013	2.67 (1.07–6.69)	0.036	2,79 (1,03–7,52)	0,043
Did not perform crack cocaine binge			2.26 (1.09–4.69)	0.028	-	-
Did not become dependent			5.11 (1.24–20.98)	0.024	6,05 (1,28–28,62)	0,023

[1] Downtown "Cracolandia", shelter/hostel, abandoned street or places and other. OR − Odds Ratio.

	Model 1	Model 2		Model 3	
Has never been abstinent for more than 10 days since onset of crack cocaine use		16.03 (4.82– 53.35)	< 0.001	5,11 (1,52 – 17,20)	0,008
Age at first crack cocaine stone use (years)		1.041 (1.004– 1.079)	0.029	1,043 (1,002 – 1,086)	0,037
N	692	684		684	
Hosmer and Lemeshow goodness-of-fit test	0.412	0.496		0.471	

[1] Downtown "Cracolandia", shelter/hostel, abandoned street or places and other. OR – Odds Ratio.

The Hosmer and Lemeshow test pointed to a good model fit (p = 0.471)

After inclusion of each set of predictive variables of a given level, the selection of these variables for the next model was performed excluding non-significant ones, one at a time. The following remained in the final model (model 3): Catholic faith (p = 0.029) and other (p = 0.015), housing type – house/apartment of the user or belonging to others / hotel / boarding house (p = 0.004), romantic relationship – single, with steady relationship (p = 0.034) and separated/divorced/widowed (p = 0.043), dependence (p = 0.023), abstinence (less than 10 days) (p = 0.008).

The result of the logistic regression for non-relapse is commented as follows:

Religion: Catholic patients were 2.8 times (OR = 2.79, 95%, CI: 1.11–7.02, P = .029) more likely of non-relapse than evangelicals. This probability was 3.8 times (OR = 3.77, 95%, CI: 1.3-10.92, P = .015) for those with other religions, with no difference in probability between those with no religion and Evangelicals (reference category).

Housing type: Crack cocaine users residing in a home or apartment of their own or of others / hotel / boarding house are 3.1 times (OR = 3,13, 95%, CI: 1.43–6.88, P = .004) more unlikely to fall in relapse than those who reside at the family's home (reference category), with no difference in likelihood between those residing in the family's home and those residing in the downtown "Caracolandia", shelter/hostel, street or abandoned places and other.

Marital status: Single patients with a steady relationship or separated/divorced/ widowed were more likely of non-relapse than single with no steady relationship (OR = 3.01, 95%, CI: 1.08–8.35, P = .034 and OR = 2.79, 1.03–7.52, P = .043 respectively). No differences in the probability were found between the married/common-law marriage and the unmarried singles.

Dependence: Non-dependent patients were 6.1 times (OR = 6.05, 95%, CI: 1,28–28,62, P = .0230 more likely of not falling in relapse than those without this condition.

Abstinence: Patients who never stopped using crack cocaine for more than 10 dias were 5.1 more likely of not falling in relapse than those who have been in abstinence at some point in their life.

Age of onset of first crack cocaine stone use: A 4.3% increased probability of non-relapse is found with each 1-year increase on the age of onset (late onset).

Discussion

A relevant finding of this work is the continued use of crack cocaine with short time interruptions (less than 10 days) as a protective factor for relapse i.e., long-term abstinence is a predisposing condition for the crack cocaine user's relapse. This conjures an important reflection when we evaluate that almost all official drug user treatment programs currently available in Brazil admit abstinence as the only plausible goal. No pattern of consumption is tolerated and abstinence emerges as the condition, medium, and purpose of treatment [29].

Again, concerning the results, the study points the user who did not binge and develop dependence as protective factors. The pattern of binge, dependence and abstinence share the possibility of the developing craving, a factor closely associated with relapse to consumption [25]. Many authors argue that craving is the main reason for relapse [30, 31]. *Binge* is the pattern of intense, continuous and repetitive crack cocaine consumption, which is defined as "using as much crack cocaine as you can, until you run out of crack cocaine or are unable to use any more" [32, 33]. These irregular cycles of repeated crack cocaine doses, typical of drug dependence caused by craving, are followed by sharp consumption shutdowns, which are associated with withdrawal signs and symptoms, forcing the user back to crack cocaine use [25].

Before this crack use pattern, it is not difficult to suggest that those crack cocaine users who developed drug dependence and consequently the binge pattern of consumption caused by the crack cocaine craving characteristic will be more likely to relapse to consumption when undergoing treatments in which total abstinence is required as a "cure" of dependence. After intense periods of uncontrolled consumption (binge), maintaining total drug abstinence is supposedly a tremendous effort by a crack cocaine user, so much so that Marlatt [34] labels it as a high-demand approach. The author also adds that drug abstinence can be associated with relapse and is a barrier to access and continuity of treatment.

Possibly, controlled use of the drug, which would facilitate user's reintegration into society, with a family, job, friends, and so forth could be a more effective strategy to repress relapse in the case of crack cocaine. In a study of the characterization of the culture of crack cocaine use in São Paulo, Oliveira and Nappo [35] identified the controlled pattern of crack cocaine use, which was based on harm reduction strategies, comprised the non-daily drug use and was commonly reconciled with pre-existing social activities (regarding family, school and work activities), protecting the user from marginalization. According to these authors, users maintained this controlled consumption from the internal protective factors they developed from their own beliefs and values.

Another element pointed out by this research that deserves attention is marital status as an essential condition of interference in relapse to crack cocaine use. Single participants with a steady relationship or separated/divorced were more likely to show non-relapse than single without a steady relationship. Several authors have shown the protective role of the family for drug use [36, 37]. Sau et al. [38] confirm this assertion

through the results of their research with crack cocaine users, in which a smaller number of cases of relapse occurred among those who were not alone, that is, they counted on the support of a partner or the family. However, the result obtained in this study does not follow this pattern, or at least seems contradictory at first, when it reveals that separated/divorced users are also more likely to not relapse. One possible explanation for this would be the existence of disharmony in the relationship which led to separation or divorce. Some authors state that 75% of relapses occur, among other causes, due to interpersonal problems and lack of family and social support [39, 40]. These causes show that the family does not always have a beneficial or protective role vis-à-vis drug use. Marchi et al. [41] concluded that families of crack cocaine users are poorly bonded, with broken ties of affection among their members. Disharmony, disagreements, intra-family violence are factors that can trigger a relapse.

Continuing the analysis of variables that have shown to be significant though the logistic regression model, users living in places like home or apartment are less likely to relapse (3.1 times) than those who live in the 'Cracolandia' or the streets. (Table 5)

Authors such as Halpern et al. [8] affirm that there is an association between homeless people and the use of illegal substances, mainly crack cocaine, as well as with diseases such as HIV, hepatitis and tuberculosis. The result becomes more evident when one analyzes the characteristics of the Brazilian "Cracolandia" and its dynamics. It is a place that covers four city downtown blocks, with about 500 residents. It receives daily close to 2,000 visitors seeking drugs, especially crack cocaine. It is controlled by organized crime gangs, which operate in trafficking and activities related to the use of drugs, among them crack cocaine. Lack of more effective policing, poverty, unemployment and moral destruction in this place allow users to use crack cocaine on the streets, where many begin to dwell [13, 42]. The presence of the drug, the visibility of consumption and the lack of drug use censorship would hardly be a safe setting to prevent crack cocaine use relapse. On the contrary, this place facilitates its consumption [30]. Besides this widespread social vulnerability is the fact that the "Cracolandia", because of the full visibility of crack cocaine use, can awaken the environmental clues associated with the drug (seeing someone using the drug, contact with the paraphernalia required for its consumption, such as a pipe, visiting the place where they used to consume the drug), which persist during withdrawal, contributing to relapse [43]. Bruehl et al. [44] and Chaves et al. [25] attribute to these environmental cues the potential of triggering a craving, which can lead to relapse. Another factor that can contribute to relapse in places like the street and the Cracolandia the actual violence. In their study with crack cocaine users, Yang et al. [45] confirmed that violence is a predictor of relapse.

Before these relapse-inducing factors, one can easily understand that home, in general, is a more protective environment against relapse. Religion also appears in the results of this research as an important protective factor for relapse, especially Catholicism. Participants of this study who declared themselves Catholics were 2.8 times more likely than non-Evangelicals and 3.8 times more likely than those with other religions to not relapse.

Brazil is the largest Catholic country in the world [46] and with about 95% of the Brazilian population with high religious involvement [47]. These data show the importance of religion in Brazilian life, especially the Catholic, the most professed in the country. Religion has been evidenced with a positive association with mental health [48, 49, 50]. Sanchez et al. [51] have shown the relevant protective role played by the Catholic religion

regarding drug use, stressing the role of prayer as conversations with God that act as strong anxiolytic and a means of controlling craving. They also found that confession and the consequent forgiveness of own wrongdoings provide users with conditions for a new start and increase self-esteem, reinforcing their distancing from the drug. In a study to evaluate patients consuming psychotropic drugs, Shirama and Miasso [52] concluded that there was a relationship of higher consumption of these drugs among non-Catholics. These data may explain greater protection of the Catholic faith against crack cocaine use relapse.

Late onset of drug consumption appears to be a protective factor for relapse. This study points out that a 4.3% increased probability of non-relapse is found with each 1-year increase to the age of onset of drug use. This result may be related to the fact that drug use by young people (17 years of age or younger) is associated with the development of psychosocial problems in various areas of life such as behavioral patterns, psychiatric disorders, family system, relationships with friends, work and leisure [53]. Rioux et al. [54] showed that adolescents (under 15 years of age) who started drug use were at higher risk of developing disorders due to this consumption at 28 years of age, as well as indirect effects such as delinquency and affiliation to deviant groups of friends. According to these authors, the symptoms caused by the abuse of any drug arising in adulthood are reduced by 31% for each year of delayed drug use onset in youth. In summary, the severity of the symptoms that appear in an adult drug user is related to the age of onset of drug use, that is, the sooner this drug starts, the higher the complications, including relapse.

The results of this work confirm crack cocaine user's tendency to relapse to drug use in the first months of withdrawal, as described in the literature [15, 18]. Of the 700 crack cocaine users participating in this study, only 7.1% did not relapse. Several characteristics of the sample coincide with the Brazilian crack cocaine user's pattern found in the National Survey on Crack Cocaine Use developed by the FIOCRUZ [5] reinforcing the results presented.

Conclusion

According to the results of this work, the user's main protective factors for crack cocaine relapse are being single but with a steady relationship, or separated/divorced, Catholic, not living in the streets or Cracolandia, not developing binge, abstinence (more than ten days), dependence and late onset of drug use. Among the factors presented, not being in drug abstinence(more than ten days) is a protective factor for relapse that deserves attention, considering that the conventional treatment options available in Brazil consider abstinence as the only possible outcome.

Study limitations

Data were not collected from the patient's records, but from answers provided by the participants themselves, which may have generated some inconsistency. On the other hand, the sample of users, while robust (N = 700) was not recruited by the researchers, but by the professionals of treatment-providing institutions, which may have influenced randomness.

Abbreviations

ABEP

Brazilian Association of Research Companies

CAPS AD

Alcohol and Drugs Psychosocial Care Center

CEBRID

Brazilian Center on Psychotropic Drugs Information

Declarations

Ethics approval and consent to participate

The study protocol was approved by the Ethical Review Committee of the UNIFESP (Universidade Federal de São Paulo) (CAEE nº 2451.0.000162-11) and Ethics Council in Research from São Paulo city (CEP/SMS nº 039/12. Oral informed consent was obtained from each participant at the beginning of the initial interview and anonymity of participants was maintained (participants were illegal drug users and oral informed consent was obtained from all of them to protect their anonymity. Both ethics committees agreed with this strategy).

Consent for publication

Not applicable

Availability of data and materials

All data generated or analyzed during this study are included in this published article

Competing interests

The authors have declared that no competing interests exist

Authors' contributions

Conceptualization, funding acquisition, supervision, project administration – SAN; Data curation, formal analysis, investigation – RCRA and JIC; methodology- SAN, RCRA, JIC; wrote the paper – SAN, RCRA, JIC. All authors have read and approved the manuscript.

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