

Research Article

Risk Factors for Illicit Drug Disorders during Adolescence: An Analysis According To Substance of Preference

Camila Da Silva Barbosa¹, Camila Ribas Stefanello¹, Maicon Bonaldo Dias¹, Murilo Halberstadt Beskow¹, Émile Hirdes Krüger², Stephan Espinosa Meirelles², and Rafael Moreno Ferrode de Araújo^{3*}

¹UNIVATES, Brazil

²Department of Psychiatry, Hospital São José, Brazil

³Department of Psychology and Medicine, UNIVATES, Brazil

***Corresponding author**

Rafael Moreno F. de Araújo, Department of Psychology and Medicine, UNIVATES, Lajeado, Brazil, Email: rmpsiquiatria@gmail.com

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Abstract

Most of the available information about risk factors for specific illicit drug related disorders (cannabis, cocaine powder and crack cocaine) during adolescence comes from studies that analyze the use of illegal substances as a single group. This study evaluated several risk factors for illicit drug related disorders separately, in a clinical sample of Brazilian adolescents. Post-traumatic symptoms were strongly associated with crack use disorder, paternal neglect was moderately associated with cocaine use disorder, and maternal suicidal behaviour was moderately associated with cannabis use disorder. The risk factors for illicit drug-related disorder among adolescents were different according to the substance of preference.

INTRODUCTION

During adolescence, the youth goes through moments of biological, cognitive and social changes, being an important period for adopting new behaviors and attitudes [1]. These may influence the youth health, such as bad nutrition habits, sedentary lifestyle, and risky behaviours (unprotected sex, conduct problems and substance use) [2,3]. Thus, it becomes a crucial period in life to the onset of licit and illicit drug use, either through experimentation or occasional use, misuse or abuse [4]. Compared with adults, adolescents are hypersensitive to reward (limited reward assessment and heightened reactivity in anticipation of reward) and their neural activation differs even for small rewards in the absence of choice. These findings may have important implications for understanding adolescent risk-taking behavior [5,6]. Despite these inherent characteristics of this period, substance use contributes to enhancing poor judgment, impulsivity, impaired self-control and risk-taking that are features of behavioral disinhibition. Consequently, the combination of adolescence and substance use is a primary cause for accidental injuries (including those due to road traffic accidents), homicides and premature deaths [7]. It may also lead to reduced levels of life quality [8], health problems in later life and affect life expectancy. Therefore, drug use and harmful drinking among adolescents is a major concern in many countries, including Brazil [9].

The lifetime use of psychoactive substances among Brazilian adolescents occurs in the following frequencies: alcohol (60.5%), tobacco (16.9%) and other drugs (25.5%). Furthermore, about 5% are thought of as having started the experimentation of drugs before 10 years of age [10]. It appears that, even though selling psychotropic drugs to individuals under 18 years of age is prohibited by law, their use among Brazilian adolescents is common. Anyway, drug use is not initiated in 50% of the population until adolescence, so most addictions do not emerge until this period [11]. The use of substances before 18 years of age increases the chances of developing substances dependence in adulthood [12], most of them first experiment using licit substances such as cigarettes and alcohol, and afterwards some of them try marijuana use, and finally, a smaller number of adolescents uses others drugs [13]. Among Brazilian students, the prevalences of frequent (> 6 times a month) or heavy use (> 20 times a month) of illicit drugs are: 0.7% for marijuana, 0.4% for cocaine powder, and 0.1% for crack cocaine [10]. Crack use among Brazilian students is well below the percentage of the United States (2.6%) and Chile (1.4%) [12]. By using the Network Scale-up Method, it is estimated that 14% of Brazilian crack users are minors [14]. In children and adolescents on the streets, there has been a steady increase in crack consumption, reaching up to 26% of them [15]. Therefore, given this low frequency in general population and common premature withdrawal [16], it is difficult to conduct studies on this important cause of premature morbidity.

The prevalences of opportunity to use a drug and the actual use are similar [17]. However, most individuals that experience illicit drugs do not become addicted. Risk factors can increase a person's chances for drug abuse, whereas protective factors can reduce the risk. These factors can be characterized in five domains (individual, family, peer, school and community), despite their close inter-relationship. Early aggressive behaviour, lack of parental supervision, peer and parental substance abuse, drug availability, poverty, and depressive symptoms are risk factors for the experimentation of illicit drugs in youth [18]. On the other hand, the most often studied protective psychosocial factors are: familial environment and monitoring, religiosity, self-control, self-esteem, future perspective, academic competence, risk perception, anti-drug use policies, information about drugs, and strong neighbourhood attachment [10].

The research on risk factors for drug (licit and illicit) use in adolescence is extensive, mainly for alcohol and nicotine. However, in Brazilian samples, most previous studies about this topic have only analyzed the risk factors for experimentation (lifetime use) [15,19-22] and a few analyzed regular use [23]. Moreover, in general they analyzed the use of illegal substances as single group, so they did not analyze the risk factor for each substance [23-25]. Besides, the risk factors for illicit drug related disorders (frequent or heavy use) in adolescent samples have not been properly studied, mainly for crack cocaine. In fact, most of the available information about the theme is from studies involving adolescents living in high-income countries [26], or carried out with adult and mixed (adult and adolescent) samples [15,20]. We hypothesize that the risk factors for illicit drug related disorders are different in adolescents from those in adults, and may vary according to substance of preference. The main objective of this study is analyzing several risk factors for substance use disorders, involving three illicit drugs (cannabis, cocaine powder and crack cocaine), in a clinical sample of Brazilian adolescents.

METHODS

The data for this study were collected from health care registers at the Psychosocial Community Care Center for Children and Adolescents (CAPSi in Portuguese) in the city of Lajeado, Rio Grande do Sul, Brazil [27]. The CAPSi is a community health service accessible to all, within the Unified National Health System (SUS in Portuguese), which is the public health system in Brazil. For the children and adolescents who are seriously psychologically impaired, CAPSi is a day treatment facility designed to serve this specific population [28]. Lajeado was originally founded by German settlers. It has a population of 71,445 inhabitants, 99.6% of which lives in urban areas. Industrial activities account for 42% of its gross domestic product (IBGE, n.d.) [29]. In our study, the subjects' personal identification was replaced by a number to guarantee confidentiality to all individuals. This study was approved by the ethics committee of UNIVATES, and participant consent was not required.

Sample

All patients were clinically evaluated according to the operational criteria of the DSM-IV-TR by a multiprofessional team (psychologist, social worker, nurse and psychiatrist) [30].

The same psychiatrist (specialized in treating children and adolescents) had worked at this CAPSi throughout the study period. At this service, the admission evaluation was assessed by using a semi-structured interview including sociodemographic data, adverse childhood experiences, maternal pregnancy history, adverse academic outcomes, lifetime psychiatric symptoms, drug use pattern, family history of mental disorders, and previous drug addiction treatments and socio-educative treatments (secondary to criminal justice involvement). Interviews of parents and/or of adolescents themselves were conducted. Furthermore, toxicological tests of urine (for marijuana and cocaine) were used to assess illicit drug use.

Regarding case selection, all adolescent (12 to 17 years old) patients referred to this CAPSi from February 1st, 2013 to January 31st, 2014 were analyzed. According to Fulkerson et al, DSM-IV substance abuse and dependence criteria may be more optimally structured as a unidimensional construct rather than as bidimensional constructs for adolescents [31]. Therefore, cases were eligible when there had been use of illicit drugs (cannabis, cocaine or crack), in the past three months, at least weekly (WHO, n.d.). In order to simplify the analysis, cocaine powder and crack cocaine were named as "cocaine" and "crack", respectively [32]. At least one age-matched and sex-matched control was recruited per case. The controls were patients of the same CAPSi who had had a wide range of mental disorders except for illicit drugs use, at least weekly, throughout the study period. All patients who had no conclusive drug use, either due to diagnostic uncertainty or lack of data, were excluded.

Between February 1st, 2013 and January 31st, 2014, 36 controls and 32 cases were registered. Considering the substance of preference, ten cases were diagnosed as having cannabis use disorder, twelve as cocaine use disorder, and ten as crack use disorder. No subject had an inconclusive drug use pattern, therefore all subjects were included in the analysis. The mean age of the subjects was similar between diagnosis groups (control = 14.9 +/- 1.18; cannabis = 15.0 +/- 1.24; cocaine = 15.41 +/- 1.44; crack = 15.8 +/- 1.31; $P = 0.268$, ANOVA), and no gender difference was found (% male; control = 91.7; cannabis = 90.0; cocaine = 91.7; crack = 90.0; $P = 0.997$, $df=3$, Pearson Chi-Square).

Measures

Psychiatric symptoms : According to the Diagnostic and Statistical Manual of Mental Disorders-IV-TR (DSM-IV-TR), only symptoms that persist for more than 4 weeks after the cessation of acute intoxication or withdrawal should be considered as manifestations of an independent non-substance-induced mental disorder or of a Substance-Induced Persistent Disorder (DSM-IV-TR) [33]. In addition to that, among Brazilian adolescents, withdrawal of treatment frequently occurs in the first month [16]. Thus, we chose to assess only lifetime psychiatric symptoms, instead of closed psychiatric diagnosis.

Lifetime psychiatric symptoms were assessed by using adaptations of some key questions of the Development and Well-Being Assessment (DAWBA) [34]. The DAWBA uses a combination of closed and open questions about child and youth psychiatric symptoms and their impact. Its special feature is the fact that it is applied by lay interviewers and revised by experienced clinicians

who subsequently review the answers before assigning diagnosis according to DSM-IV-TR criteria.

These subsequent questions were used to assess these symptoms: "Thinking about his/her school work and about his/her ability to reason things out (e.g. reading, writing and mathematics) during the first school years, was s/he behind for his/her age?" for learning difficulties; "Over the last 4 weeks, have you "relived" any traumatic event or situation that happened to you with vivid memories (flashbacks)?" for post-traumatic stress symptomatology; "Over the last 4 weeks, has there been a period when you have been really miserable nearly every day?" for depressive mood; "Over the last 4 weeks, has there been a period when you have been really irritable nearly every day?" for irritability; "During childhood, did you think that [Name] definitely had some problems with overactivity?" for hyperactivity; "During childhood, did you think that [Name] definitely had some problems related to poor concentration?" for attention deficit; "During childhood, did s/he often bully, threaten people or start fights?" for childhood onset of aggressiveness; "During adolescence, did s/he often bully, threaten people or start fights?" for adolescence onset of aggressiveness.

Adverse academic outcomes: Information about grade repetition (yes/no, age at first time) and school dropout (yes/no, age at dropout) was systematically collected from parents and adolescents.

Drug use pattern : We assessed substances use by asking questions of the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST)(WHO, n.d.) [35]. For lifetime and current use of tobacco, alcohol, cannabis, cocaine and crack, we used these questions: "Which of the following substances have you ever used?" and "In the past three months, how often have you used the substances you mentioned?". For those who had used the substances, we also investigated the age at the first use of each one of them. We defined substance use disorder when the adolescent reported at least weekly use of any of the substances described. When multiple substances were used concurrently, the substance of preference was defined as the one with predominant use according to the adolescent's report.

Adverse childhood experiences: Questions about adverse childhood experiences were adapted from the Childhood Trauma Questionnaire (CTQ) [29,36]. We divided neglect into maternal or paternal by using this question: "When you were growing up, did you feel loved by your mother/father?". Emotional, physical and sexual abuses were assessed with these questions, respectively: "When you were growing up, did you believe that you were emotionally/physically/sexually abused?". Additionally, we investigated parental death (mother/father), adoption, and living in an orphanage; all these answers were dichotomous: "yes" or "no".

Family history of mental disorders : Regarding family history, subjects were asked about suicidal behaviour (suicide attempts and complete suicides), problematic drinking or alcoholism, illicit drug use, depression, mental illness (other than depression), and incarceration of the mother and father separately.

about prenatal drug exposure (e.g., tobacco, illicit drugs), maternal age at birth (<18 or >18 years), and if the pregnancy was planned or not, was obtained.

Previous treatments and involvement with the criminal justice: The history of residential inpatient treatment [37], previous hospitalizations (general hospital or specialized unit), therapeutic community treatment, and involvement with the criminal justice (with and without freedom deprivation) and age at the first time were assessed.

Statistical analysis

The sample was divided, according to substance of preference, into four groups: control, cannabis, cocaine, and crack. Differences in the frequencies of psychiatric symptoms, grade repetition, school dropout, lifetime substance use, adverse childhood experiences, family history of mental disorders, maternal pregnancy history (unplanned, <18 years at birth, and prenatal drug exposure), previous treatments, and involvement with criminal justice were analyzed with the Chi-square test. Means (and standard deviation, SD) were calculated to describe age at first grade repetition, school dropout, first lifetime substance use, and first involvement with the criminal justice; and compared by ANOVA. Because some distributions were asymmetric, correlations between these variables were calculated through Spearman's.

Using a binary logistic regression model, odds ratios (ORs) and 95% confidence intervals (95% CIs) were obtained to estimate the likelihood of each illicit drug related disorder through the presence of each binomial variable. When any of observed counts in two by two subset table scored zero, we controlled it by using a simple correction (adding 0.5 to each cell) as suggested by Agresti [38]. These analyses were conducted with the IBM SPSS statistical package (version 20; SPSS Inc). *P* values <.05 were considered statistically significant.

RESULTS

Risk factors

Table (1) shows the odds ratios for psychiatric symptoms, adverse academic outcomes, and childhood adversities. Regarding psychiatric symptoms, our study showed that aggressiveness, regardless the age of onset, was strongly associated with use of all illicit drugs in adolescence, mainly for childhood onset. Moreover, post-traumatic symptoms were significantly associated with crack use disorder (OR=34.0, 95%CI, 1.68-688.94). The mean age for first grade repetition was 10.6 (+/-2.30), and it was not associated with any illicit drug disorders. School dropout was strongly associated with cocaine and crack use disorder. The mean age for school dropout was 14.3 (+/- 2.34). Paternal neglect was the only type of childhood adversity associated with any illicit drug disorder. However, when we analyzed the groups according to substance of preference, paternal neglect was moderately associated only with cocaine use disorder (OR=4.2, 95%CI, 1.01-17.43).

Table (2) presents the effect of family history of mental disorders, analyzing parents separately. As for mothers, only suicidal behavior was associated with cannabis use disorder in their teens (OR=7.28, 95%CI, 1.02-52.00). In respect to fathers,

Maternal pregnancy history: Information

Table 1: Risk of illicit drug disorder associated with psychiatric symptoms, adverse academic outcomes, and adverse childhood experiences.

Risk factor		Control (n = 36)	Any illicit drug (n = 32)	Cannabis (n = 10)	Cocaine (n = 12)	Crack (n = 10)
Hyperactivity	%	61.8	64.5	60.0	66.7	66.7
	OR (95% CI)	1	1.12 (0.41-3.09)	0.92 (0.22-3.92)	1.23 (0.31-4.94)	1.23 (0.26-5.82)
Attention deficit	%	76.7	65.4	62.5	90.0	37.5
	OR (95% CI)	1	0.57 (0.17-1.85)	0.50 (0.09-2.67)	2.73 (0.29-25.53)	0.18 (0.03-0.96)*
Learning difficulties	%	80.6	65.5	55.6	63.6	77.8
	OR (95% CI)	1	0.45 (0.14-1.41)	0.30 (0.06-1.42)	0.42 (0.09-1.85)	0.84 (0.14-4.98)
Grade repetition	%	77.8	93.1	90.0	100.0	88.9
	OR (95% CI)	1	3.85 (0.75-19.82)	2.57 (0.28-23.44)	6.28 (0.38-103.88)	2.28 (0.24-21.09)
School dropout	%	25.7	75.0	30.0	91.7	100.0
	OR (95% CI)	1	8.66 (2.87-26.09)*	1.23 (0.26-5.83)	31.77 (3.58-281.94)*	58.58 (3.56-965.23)*
Aggressiveness (childhood)	%	2.8	34.4	30.0	41.7	30.0
	OR (95% CI)	1	18.33 (2.20-152.34)*	15.00 (1.35-166.05)*	25.00 (2.51-248.17)*	15.00 (1.35-166.05)*
Aggressiveness (adolescence)	%	8.3	34.4	40.0	33.3	30.0
	OR (95% CI)	1	5.76 (1.43-23.10)*	7.33 (1.29-41.42)*	5.50 (1.02-29.64)*	4.71 (0.78-28.41)
Post-traumatic symptoms	%	0.0	15.6	0.0	16.7	30.0
	OR (95% CI)	1	14.60 (0.81-264.45)	NA	14.6 (0.69-308.09)	34.07 (1.68-688.94)*
Depressive mood	%	41.7	21.9	40.0	8.3	20.0
	OR (95% CI)	1	0.39 (0.13-1.14)	0.93 (0.22-3.83)	0.12 (0.01-1.09)	0.35 (0.06-1.88)
Irritability	%	13.9	3.1	0.0	8.3	0.0
	OR (95% CI)	1	0.20 (0.02-1.81)	0.27 (0.02-4.71)	0.56 (0.05-5.37)	0.27 (0.02-4.71)
Paternal neglect	%	22.2	50.0	57.1	54.5	33.3
	OR (95% CI)	1	3.50 (1.14-10.74)*	4.66 (0.86-25.30)	4.20 (1.01-17.43)*	1.75 (0.27-11.35)
Maternal neglect	%	13.9	32.3	30.0	41.7	22.2
	OR (95% CI)	1	2.95 (0.88-9.88)	2.65 (0.51-13.83)	4.42 (1.00-19.57)	1.77 (0.28-11.08)
Emotional abuse	%	13.9	12.9	10.0	16.7	11.1
	OR (95% CI)	1	0.91 (0.22-3.77)	0.68 (0.07-6.67)	1.24 (0.20-7.41)	0.77 (0.07-7.60)
Physical abuse	%	11.1	12.9	0.0	8.3	33.3
	OR (95% CI)	1	1.18 (0.27-5.19)	0.34 (0.02-6.09)	0.72 (0.07-7.22)	4.00 (0.70-22.61)
Sexual abuse	%	5.6	9.7	0.0	8.3	22.2
	OR (95% CI)	1	1.82 (0.28-11.67)	0.66 (0.03-13.02)	1.54 (0.12-18.73)	4.85 (0.58-40.55)
Parental death (father)	%	16.7	22.6	30.0	8.3	33.3
	OR (95% CI)	1	1.45 (0.43-4.91)	2.14 (0.42-10.73)	0.45 (0.04-4.21)	2.50 (0.48-12.88)
Adopted	%	11.1	6.5	10.0	8.3	0.0
	OR (95% CI)	1	0.55 (0.09-3.24)	0.88 (0.08-8.97)	0.72 (0.07-7.22)	0.38 (0.02-6.69)
Orphanage	%	2.8	9.7	10.0	0.0	22.2
	OR (95% CI)	1	3.75 (0.37-38.04)	3.88 (0.22-68.38)	0.95 (0.04-22.27)	10.0 (0.79-126.02)

* $P < .05$ (Fisher's Exact Test).
 NA = not applicable.

only illicit drug use was associated with crack use disorder in their teens (OR=20.62, 95%CI, 2.96-143.60). When all illicit drug disorders were analyzed as a single group, paternal illicit drug use also increased sevenfold the likelihood of this outcome. No risk factor related to maternal pregnancy history was associated with illicit drug use disorder in our sample.

Drug use pattern

The mean age (SD) for first drug use in the total sample was: 11.8 (2.5) for alcohol (n=44, 64.7%), 12.1 (2.2) for tobacco (n=38, 55.9%), 12.9 (1.8) for cannabis (n=34, 48.5%), 13.7 (1.3) for cocaine (n=25, 38.2%), and 14.3 (1.7) for crack (n=12, 17.6%).

Table 2: Risk of illicit drug disorder associated with family history of mental disorder (maternal or paternal) and maternal pregnancy history.

Risk factor		Control (n = 36)	Any illicit drug (n = 32)	Cannabis (n = 10)	Cocaine (n = 12)	Crack (n = 10)
Maternal						
Depression	%	44.4	41.9	60.0	25.0	44.4
	OR (95% CI)	1	0.90 (0.34-2.38)	1.87 (0.45-7.80)	0.41 (0.09-1.79)	1.00 (0.23-4.34)
Mental illness (except depression)	%	8.3	16.1	30.0	8.3	11.1
	OR (95% CI)	1	2.11 (0.46-9.68)	4.71 (0.78-28.41)	1.00 (0.09-10.63)	1.37 (0.12-15.02)
Suicidal behavior	%	5.6	12.9	30.0	8.3	0.0
	OR (95% CI)	1	2.51 (0.42-14.80)	7.28 (1.02-52.00)*	1.54 (0.12-18.73)	0.73 (0.04-14.30)
Incarceration	%	5.6	3.2	10.0	0.0	0.0
	OR (95% CI)	1	0.56 (0.04-6.56)	1.88 (0.15-23.25)	0.55 (0.03-11.05)	0.73 (0.04-14.30)
Alcoholism	%	2.8	9.7	0.0	8.3	22.2
	OR (95% CI)	1	3.75 (0.37-38.04)	1.13 (0.05-26.26)	3.18 (0.18-55.19)	10.00 (0.79-126.02)
Illicit drug use	%	5.6	16.1	10.0	16.7	22.2
	OR (95% CI)	1	3.26 (0.58-18.21)	1.88 (0.15-23.25)	3.40 (0.42-27.29)	4.85 (0.58-40.55)
Paternal						
Depression	%	0.0	6.7	20.0	0.0	0.0
	OR (95% CI)	1	6.23 (0.30-129.14)	20.88 (0.98-446.74)	NA	NA
Mental illness (except depression)	%	2.9	0.0	0.0	0.0	0.0
	OR (95% CI)	1	0.38 (0.02-9.13)	1.10 (0.05-25.53)	1.00 (0.04-23.43)	1.21 (0.05-28.04)
Suicidal behavior	%	0.0	0.0	0.0	0.0	0.0
	OR (95% CI)	1	NA	NA	NA	NA
Incarceration	%	14.3	26.7	10.0	27.3	44.4
	OR (95% CI)	1	2.18 (0.62-7.58)	0.66 (0.06-6.47)	2.25 (0.44-11.48)	4.80 (0.95-24.25)
Alcoholism	%	31.4	36.7	40.0	45.5	22.2
	OR (95% CI)	1	1.26 (0.45-3.53)	1.45 (0.34-6.21)	1.81 (0.45-7.26)	0.62 (0.11-3.50)
Illicit drug use	%	5.7	30.0	10.0	27.3	55.6
	OR (95% CI)	1	7.07 (1.39-35.98)*	1.83 (0.14-22.58)	6.18 (0.88-43.43)	20.62 (2.96-143.60)*
Maternal pregnancy history						
Unplanned pregnancy	%	48.4	53.3	57.1	50.0	50.0
	OR (95% CI)	1	1.21 (0.35-4.19)	1.42 (0.27-7.43)	1.06 (0.18-6.12)	1.06 (0.06-18.62)
Teenage pregnancy	%	0.0	14.8	10.0	18.2	16.7
	OR (95% CI)	1	12.83 (0.69-238.80)	10.58 (0.43-260.50)	17.63 (0.83-375.05)	18.27 (0.73-456.88)
Intrauterine tobacco exposure	%	29.4	20.0	20.0	27.3	0.0
	OR (95% CI)	1	0.60 (0.17-2.04)	0.60 (0.10-3.33)	0.90 (0.19-4.10)	0.26 (0.02-3.89)
Intrauterine drug exposure†	%	20.6	16.0	40.0	0.0	0.0
	OR (95% CI)	1	0.73 (0.19-2.84)	2.57 (0.56-11.68)	0.16 (0.01-2.69)	0.41 (0.03-6.26)

* $P < .05$ (Fisher's Exact Test).
 † Other than tobacco.
 NA = not applicable.

Table (3) shows the proportion of adolescents with lifetime drug experimentation that developed drug-related disorder. Crack and tobacco were the substances with larger proportion, 83.3 and 76.3%, respectively. Lifetime tobacco use and related

disorder were strongly associated with any illicit drug disorder (OR=124.00, 95%CI, 14.34-1071.67, and OR=91.80, 95% CI, 16.50-510.55, respectively). However, lifetime alcohol use and related disorder were less associated with any illicit drug

Table 3: Proportion of adolescents with lifetime drug experimentation that developed drug-related disorder.

Drug	Proportion
Alcohol	33.3%
Tobacco	76.3%
Cannabis	30.3%
Cocaine	46.2%
Crack	83.3%

disorder (OR=67.36, 95%CI, 4.01-1132.88, and OR=7.33, 95%CI, 1.82-29.42) than tobacco. Table (4) shows the lifetime use and respective substance use disorder associations with other illicit drug disorders. Table (5) presents the correlations between age at first experimentation of several drugs, grade repetition, school dropout and criminal justice involvement. Tobacco had a large association with cannabis ($r=0.60$, $P<0.01$), and moderate association with cocaine and school dropout ($r=0.48$ and $r=0.45$, respectively, $P<0.05$ for both).

Outcomes

Table (6) presents odds ratio for several outcomes according to substance of preference. Regarding previous treatments, cocaine use disorder increased the likelihood for residential inpatient (OR=11.66, 95%CI, 1.08-125.90), general (OR=6.00, 95%CI, 1.45-24.74) and specialized hospitalization (OR=70.00, 95%CI, 6.86-713.73). On the other hand, crack use disorder had a very large association with specialized hospitalization (OR=315.00, 95%CI, 17.91-5538.83) and therapeutic community stay (OR=105.44, 95%CI, 5.35-2079.66). Cannabis use disorder was not associated with previous inpatient treatment. However, cannabis and crack use disorder were likewise associated with

involvement with criminal justice without freedom deprivation (OR=7.28, 95%CI, 1.02-52.00). The mean age for first criminal justice involvement was 14.5 (+/-1.51).

DISCUSSION

Main findings

The lifetime risk factor of each illicit drug-related disorder during adolescence seems to be different in this sample. Among psychiatric symptoms analyzed, only a child onset of aggressiveness increased substantially the risk for all illicit drug-related disorders analyzed. Adverse childhood experiences history, such as maltreatment or parental death, were not significantly associated with crack related disorder. On the other hand, post-traumatic symptoms were strongly associated with crack use disorder. Regarding family history of mental disorders, the risk factors were different between fathers and mothers. We also found that among licit drugs, only tobacco experimentation before adulthood was associated with illicit drug experimentation during adolescence [39]. Lastly, the adolescents come to the outpatient treatment in an advanced phase of the illicit drug disorder, usually after involvement with criminal justice. The main findings were summarized in (Figure 1).

Our results are consistent with previous studies that showed that male sex is associated with illicit drugs use [10,40,41]. Kuhn C [42], points that biological factors, psychiatric co-morbidities, as well as personality and environment, pose sex/gender-specific risks, as adolescents begin to initiate substance use. A number of protective factors in females also influence initiation and progression of substance use; these include greater capacity for self-regulation and lower peak levels of impulsivity/sensation seeking [43].

Table 4: Lifetime use and respective substance use disorder associations with other illicit drug disorders.

Risk factor		Control (n = 36)	Any illicit drug (n = 32)	Cannabis (n = 10)	Cocaine (n = 12)	Crack (n = 10)
Lifetime tobacco use	%	20.0	96.9	90.0	100.0	100.0
	RR (95% CI)	1	124.00 (14.34-1071.67)*	36.00 (3.88-333.93)*	95.00 (5.61-1608.60)*	79.80 (4.76-1337.29)*
Tobacco use disorder	%	5.6	84.4	60.0	91.7	100.0
	RR (95% CI)	1	91.80 (16.50-510.55)*	25.50 (3.79-171.58)*	187.00 (15.42-2266.47)*	289.80 (14.62-5743.96)*
Lifetime alcohol use	%	45.7	100.0	100.0	100.0	100.0
	RR (95% CI)	1	67.36 (4.01-1132.88)*	20.09 (1.26-319.23)*	27.18 (1.67-441.17)*	22.45 (1.40-359.87)*
Alcohol use disorder	%	8.3	40.0	11.1	91.7	0.0
	RR (95% CI)	1	7.33 (1.82-29.42)*	1.37 (0.12-15.02)	121.0 (11.38-1286.39)*	0.50 (0.04-5.78)
Lifetime cannabis use	%	8.6	96.8	-	100.0	90.0
	RR (95% CI)	1	320.00 (31.53-3247.54)*	NA	213.57 (11.51-3962.92)*	96.00 (8.87-1038.23)*
Lifetime cocaine use	%	2.9	92.6	80.0	-	90.0
	RR (95% CI)	1	425.00 (36.47-4951.55)*	136.00 (7.05-2622.16)*	NA	306.00 (17.39-5383.61)*
Lifetime crack use	%	0.0	46.2	20.0	9.1	-
	RR (95% CI)	1	61.21 (3.54-1058.74)*	23.67 (0.94-597.11)	10.14 (0.41-249.52)	NA

Table 5: Correlations between age at first: experimentation of several drugs, grade repetition, school dropout and criminal justice involvement.

	Grade repetition	Alcohol	Tobacco	Cannabis	Cocaine	Crack	School dropout	Criminal justice
Grade repetition	1.00							
Alcohol	-0.08	1.00						
Tobacco	0.15	0.32	1.00					
Cannabis	0.25	0.29	0.60**	1.00				
Cocaine	0.24	0.08	0.48*	0.46*	1.00			
Crack	0.59	-0.32	0.20	-0.01	0.51	1.00		
School dropout	0.30	0.19	0.45*	0.32	0.55**	0.85**	1.00	
Criminal justice	-0.64	0.32	0.19	0.22	0.53	0.95*	0.78*	1.00

*Correlation is significant at the level 0.05 level (2-tailed), Pearson.

**Correlation is significant at the level 0.01 level (2-tailed), Pearson.

Table 6: Previous treatments and involvement with the criminal justice.

		Control (n = 36)	Any illicit drug (n = 32)	Cannabis (n = 10)	Cocaine (n = 12)	Crack (n = 10)
Residential inpatient	%	2.8	9.4	0.0	25.0	0.0
	OR (95% CI)	1	3.62 (0.35-36.69)	1.13 (0.05-26.26)	11.66 (1.08-125.90)*	1.13 (0.05-26.26)
General hospital	%	25.0	43.8	20.0	66.7	40.0
	OR (95% CI)	1	2.33 (0.83-6.52)	0.75 (0.13-4.20)	6.00 (1.45-24.74)*	2.00 (0.45-8.72)
Specialized unit	%	2.8	56.3	10.0	66.7	90.0
	OR (95% CI)	1	45.00 (5.47-370.02)*	3.88 (0.22-68.38)	70.00 (6.86-713.73)*	315.00 (17.91-5538.83)*
Therapeutic community	%	0.0	28.1	10.0	16.7	60.0
	OR (95% CI)	1	29.51 (1.71-510.69)*	11.53 (0.47-284.25)	17.38 (0.82-368.89)	105.44 (5.35-2079.66)*
Without liberty deprivation	%	5.6	28.1	30.0	25.0	30.0
	OR (95% CI)	1	6.65 (1.31-33.64)*	7.28 (1.02-52.00)*	5.66 (0.81-39.20)	7.28 (1.02-52.00)*
With liberty deprivation	%	0.0	15.6	20.0	8.3	20.0
	OR (95% CI)	1	14.6 (0.81-264.45)	21.47 (1.00-459.55)	9.52 (0.39-233.96)	21.47 (1.00-459.55)

Estimated rates of comorbid mental illness among adolescents with substance use disorders range from 60 to 75% [44,45]. Our study supports the fact that aggressive behavior in childhood predisposes drug use and precedes delinquent behaviour [35,46]. A previous study found that the most common psychiatric comorbidity among adolescent crack user was conduct disorder (81.8%), followed by oppositional defiant disorder (52.3%) and attention-deficit/hyperactivity disorder (44.3%) [47], which is consistent with our findings. However, ADHD symptoms were not associated as an overall risk factor for drug use in adolescence in our study. A 10-year follow-up study indicated that ADHD is a significant risk factor for the development of substance use disorder and cigarette smoking in both sexes [48]. On the other hand, our results are consistent with the current data indicating that ADHD does not increase the risk of illicit substance use beyond the effects of conduct disorder or oppositional defiant disorder [49,50], besides linking ADHD to increased risk of substance use disorder, stated that individuals with ADHD who were treated with stimulants presented reduced risk to drug use and experienced a protective effect for age at first stimulant use on substance use disorder, which diminished with age and seemed to reverse around the age of 18 [51].

Adolescent illicit drug use influences the risk of school dropout and conduct problems in part by contributing to deviant peer affiliation [52]. Our study results showed that illicit drug use in adolescence is highly associated with school dropout, especially in crack users, in which dropout rates were 100%, 58 fold higher than that of the control group. The "VI National Survey on Psychotropic Drug Use among Students of Elementary Education and Secondary Education of the Public Networks and Private in 27 Brazilian Capitals" observed that crack is not a prominent drug among students [10], that could be explained by the fact that the great majority of crack users have already dropped school, which makes studies regarding crack use in scholar teenagers impracticable. Although our results associating the use of cannabis with school dropout were not statistically significant, previous studies have shown that smoking marijuana is a strong predictor of school drop out [5,7]. Marijuana use has bidirectional associations with the school performance: it can be both a consequence and a cause for poor academic outcomes. The low educational attainment and cannabis use are not directly related, but share a common underlying cause, namely, deviant behaviour, peers or family dysfunction [53].

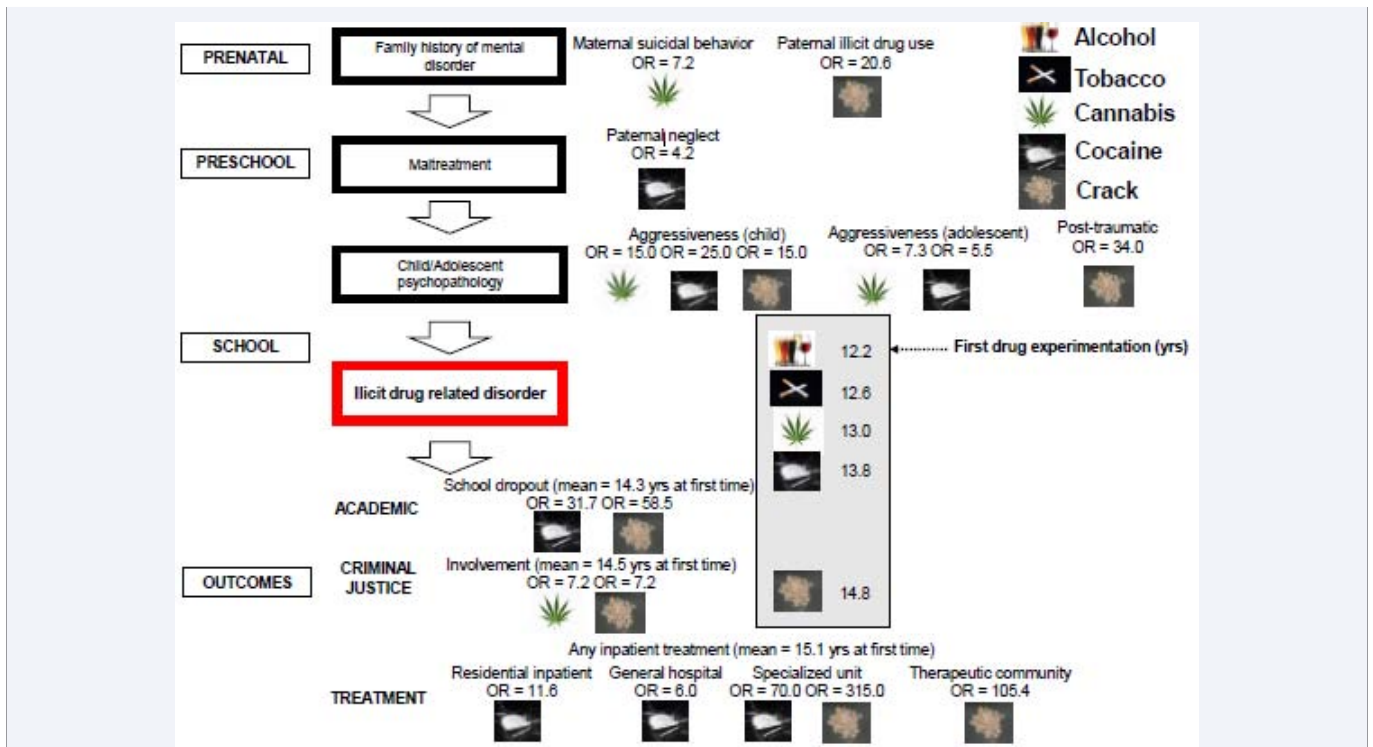


Figure 1 The lifetime course of each illicit drug-related disorder during adolescence.

Even though a small number of subjects was included in our study, it reveals that exposure to abuse (physical, emotional, and sexual) in childhood is associated with the use of illicit drugs [35]. However, we found that only paternal neglect was moderately associated with cocaine related disorder. Paternal drug use and neglect seem to be related and often coexisted in our study. We did not find studies analyzing such a specific kind of maltreatment with drug use in adolescence. Furthermore, our results did not find a connection between maternal neglect and substance use in adolescence. Even though our study reveals that other traumatic histories did not increase the risk of illicit drug disorders, previous studies considered exposure to trauma as being important contributors to cannabis use [54], and to a lesser extent, transition to cannabis use disorder (abuse or dependence) [55]. Nevertheless, we found strong association between post-traumatic symptoms and crack use disorder. Previous studies have shown post-traumatic stress disorder as a common comorbidity among patients with cocaine use disorders, corroborating our findings [56,57]. Our hypothesis is that crack is used as “self-medication” to alleviate the post-traumatic symptoms.

We found an association between maternal suicidal behaviour and cannabis use disorder in adolescence. We did not find studies analyzing this specific behavior in mothers with drug use in their offspring. There are many conditions related to suicidal behavior such as depression and borderline personality disorder (BPD). Individuals with BPD are 5 to 10 times more likely to meet the criteria for a lifetime drug or alcohol dependence diagnosis [58,59]. BPD has genetic (heritability) and individual-specific environmental factors in its structure, 0.49 vs. 0.51, respectively; whilst major depression has 0.43 vs. 0.57, respectively [60]. Our hypothesis is that the interaction of genetic and environmental

factors appears to influence the increased cannabis use in adolescence and could explain why maternal suicidal behavior is related to this outcome.

Several individual and environmental factors are involved in the initiation of substance use and each subject has his/her own treatment needs, which demand personal approaches, as well as taking into account the specific substance used. Crack addiction, for instance, demands a more intensive approach, being necessary prolonged hospitalization followed by long-term residential treatment in nearly all cases. The high rates of early relapse after hospital discharge, 65.9% in the first and 86.4% in the third month, found by Lopes-Rosa R et al. in a similar sample, suggest that intensive outpatient treatment strategies targeting this population should be developed and implemented to prevent early relapse after detoxification [61]. Unfortunately, the access to long-term residential treatment for adolescents in Brazil is scarce, and nonexistent in some places. Adolescence is a period of diminished cognitive control, when rates of drug-related behaviors peak [61,62]. According to the Brazilian Civil Code, individuals under 16 years of age have no civil capacities. In addition to that, adolescents with illicit drug-related disorders have extremely impaired critical judgement as a general rule, and should not be able to decide whether to continue or abandon a treatment. However, therapeutic communities legislation in Brazil does not allow involuntary stay, making this one of the biggest obstacles to proper treatment. Due to this, the treatment of drug addiction in teenagers is still a big challenge in Brazil. Furthermore, our results were consistent with previous studies that showed that criminal involvement was common among illicit drug user adolescents, regardless of their substance of preference [63].

Although our study has a small sample, we found similar pathway of progression to crack use that found by Pianca TG et al. in sample of 90 adolescents [40]. Alcohol and tobacco are the most used drugs among adolescents in Brazil general population, and their use usually precedes the illicit drugs initiation [10]. Most studies have supported the gateway hypothesis, which propose that individuals rarely use “heavier” drugs (such as cocaine and crack) without using “gateway” substances, such as legal drugs or cannabis [13,35,64,65]. Supporting the gateway hypothesis, our results showed that licit drugs first use, mainly tobacco, generally occurs before illicit drugs. The association between tobacco and cannabis use arises from a reciprocal feedback loop involving simultaneous causation between tobacco use disorder and cannabis use disorder [66]. Initial subjective reactions to tobacco are associated with later onset of DSM-IV diagnosis of cannabis abuse/dependence, whereas initial subjective reactions to cannabis are only associated with the onset of diagnosis of DSM-IV cannabis abuse/dependence. Genetic and environmental factors underpin the overlap of the factors representing the association for tobacco smoking and cannabis involvement [67,68]. Since nicotine and cocaine are drugs with psychostimulants properties, unlike alcohol, which is a central nervous system depressant, we hypothesized that only nicotine can be a sensitizer to “heavier” stimulants drugs, thus supporting the gateway hypothesis [60].

STRENGTHS AND LIMITATIONS

The strengths of the study include: (1) analyses of specific illicit drug-related disorders in a clinical sample instead of mere illicit drug experimentation in community samples, allowing to explore adolescents with uncommon drug use patterns; (2) a Brazilian sample, since most of research addressing illicit drug use in adolescence was conducted in developed countries; (3) this sample did not include street youth, whereas previous studies analysing crack user teenagers were conducted with this infrequent population around the world, thus reducing the external validity of its findings.

The main limitation of the study was the small sample. Among Brazilian adolescents, withdrawal of treatment occurs frequently in the first month [16], and the search for treatment is low. Thus, given the potential for sampling bias, and unclear generalizability of the sample in this particular public mental health service, it would be appropriate to consider this as a hypothesis-generating study which requires further, definitive study designs (e.g. longitudinal with community samples or case-control with multicentre samples to increase the number of cases) to confirm the current preliminary findings. Furthermore, a challenge posed by this kind of research is to filling in extensive questionnaires. Anyway, the use of whole questionnaires (e.g. DAWBA, ASSIST, CTQ) could have increased the internal validity of the findings.

CONCLUSIONS

The risk factors for specific illicit drug related disorders during adolescence seem to be different for each substance of preference (cannabis, cocaine powder and crack cocaine). Identifying which elements predict the risk of involvement with a particular substance may provide public healthcare with the opportunity to develop particular intervention policies to prevent each drug initiation and related disorders. Furthermore, rigorous longitudinal

studies in developing countries are needed to evaluate the risk factors of each substance use disorder during adolescence to prevent consequences (e.g., homicide, interpersonal, domestic and traffic violence), since most of the published studies have evaluated all illicit drugs as a single group.

CONFLICT OF INTEREST

We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

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