Use of Cocaine by Heavy Drinkers Increases Vulnerability to Developing Alcohol Dependence: A 4-Year Follow-Up Study

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Objective: The development of alcohol dependence is associated with specific individual personality traits and previous consumption of other drugs of abuse. However, there is little information on these risk factors in heavy drinkers before and after they meet the criteria for alcohol dependence. This study examined the influence of cocaine use and the role of impulsivity in the development of DSM-IV alcohol dependence in nondependent drinkers in a 4-year follow-up study.

Method: A prospective cohort study was conducted to establish the risk factors associated with DSM-IV alcohol dependence. Four hundred seventy-one (nondependent) heavy drinkers were enrolled in a prospective study. At baseline, 280 were classified as heavy drinkers (HD) and 191 as heavy drinkers who also used cocaine (HD + Co). Clinical variables related to alcohol and cocaine use were assessed at 2 years and at the end of the 4-year follow-up period. The study was conducted from September 2001 until September 2006 in Madrid, Spain.

Results: At the 4-year follow-up assessment, 67.9% of the HD + Co group met DSM-IV criteria for alcohol dependence compared to 13.6% of the HD group. Odds ratios for alcohol dependence were 12.3 and 7.0 for male and female cocaine users, respectively. Clinical and psychological variables related to impulsivity were associated with the development of alcohol dependence. The amount of cocaine used during follow-up was associated with a more rapid progression to alcohol dependence.

Conclusions: This study revealed that cocaine use or an impulsive personality in heavy drinkers increased the risk of developing DSM-IV alcohol dependence by 3.8 and 12.6 times, respectively. These results may be useful in designing new strategies for preventing the development of alcohol dependence.

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Alcohol abuse and cocaine abuse are among the most serious public health problems in the U.S.[1] and Europe.[2] The use of both drugs, often together,[3] has been reported in the general population and in clinical samples from the U.S.[4–6] and European countries.[2,7]

Despite higher rates of alcohol use disorders in Western countries and the frequent co-occurrence of alcohol use and cocaine use, a lack of consistent clinical studies makes it difficult to clearly identify cocaine use as a risk factor for the development of alcohol dependence. Most available information is from studies that have examined alcohol and cocaine disorders separately, which limits the possibility of evaluating the effects of both drugs in users.[8,9] Other studies have included clinical samples with subjects already diagnosed as being alcohol and cocaine dependent, a design that did not allow the precise role of cocaine use in the development of alcohol dependence to be pinpointed. Subjective reports from cocaine

TAKE-HOME POINTS

- The co-occurrence of cocaine use in heavy drinkers increases the risk of developing alcohol dependence.
- Lifetime psychiatric comorbidity, specifically impulsivity disorders in men and affective disorders in women, is related to alcohol dependence.
- Clinicians should consider screening for cocaine use in all heavy drinkers in order to prevent alcohol dependence.

users suggest that both the stimulant and toxic effects of cocaine can induce simultaneous heavy drinking.[10] Taken together, it can be hypothesized that cocaine use can increase vulnerability to the development of alcohol dependence in heavy drinkers, thus facilitating rapid progression to alcohol use disorders.

The relationship between substance abuse and impulsivity is a relevant research topic that has been examined in recent years. Several studies have shown higher rates of comorbidity between substance misuse and impulsivity related disorders.[11,12] These findings support the hypothesis that dysfunctional impulsivity as a personality trait may increase vulnerability to alcohol and cocaine use disorders.[11,13]

There is a lack of prospective studies of the effects of both impulsivity and cocaine use on the development of substance use disorders in individuals who are initially nondependent. An exhaustive evaluation of these associations may help to determine whether higher scores on impulsivity measures or cocaine use are associated with a greater prevalence of alcohol dependence. Proper analyses of these associations in heavy drinkers may suggest screening and prevention strategies that can be implemented in subjects with impulsivity traits.

The purpose of this study was to examine the role of cocaine use and impulsivity in the development of DSM-IV alcohol dependence in nondependent heavy drinkers. All the subjects received brief counseling and were interviewed at 2 years and 4 years of follow-up. Risk factors for DSM-IV alcohol dependence were assessed during follow-up.

METHOD

Participants

The participants were 628 adults with a heavy drinking profile devoid of any previous or baseline formal addiction. Mean age was 37.4 years, mean education 15.2 years, and mean onset of regular alcohol use 17.4 years. Participants had not previously received any type of medication to treat problems related to substance use. Most were male (63.1%) and married (54.0%). More than half of the subjects had been using alcohol 3 days a week during the 12-month period before study initiation. The study was conducted from September 2001 until September 2006 in Madrid, Spain.

Treatment

All subjects received brief counseling, during which the therapist informed them about their mean weekly alcohol intake compared to that of the general population, emphasizing physical or social problems related to their drinking pattern and recommendations for safe drinking limits.[14] All subjects were instructed to contact their treatment centers if they needed any assistance in managing alcohol-related problems.

Recruitment

Participants at the community site (N = 628) were recruited from primary care centers. They were screened using the Spanish version of the Alcohol Use Disorders Identification Test (AUDIT)[15] in 12 primary care centers; subjects with AUDIT scores of 8 or more were recruited (heavy drinker criteria are shown in Figure 1). Cocaine consumption was considered recreational when the subject was snorting cocaine less than 2 times monthly. The timing of assessments and number of subjects excluded and lost to follow-up are shown in Figure 1. After providing informed consent, participants completed the baseline inventory described below (N = 471). At baseline, subjects were classified as heavy drinkers (HD, N = 280) or heavy drinkers who used cocaine (HD + Co; N = 191). The study was conducted in compliance with the Declaration of Helsinki. The study protocol was approved by the institutional review boards of the participating sites. All participants gave written informed consent.

Baseline and Follow-Up Assessments

Clinical evaluation confirmed that each participating subject was abstinent prior to baseline assessments. During the 2 days preceding testing, participants took a urine test for alcohol, cocaine, opiates, and cannabis. In addition, blood samples were obtained for γ-glutamyltransferase, aspartate aminotransferase, and alanine aminotransferase. Two years after study initiation, participants were located and contacted by telephone

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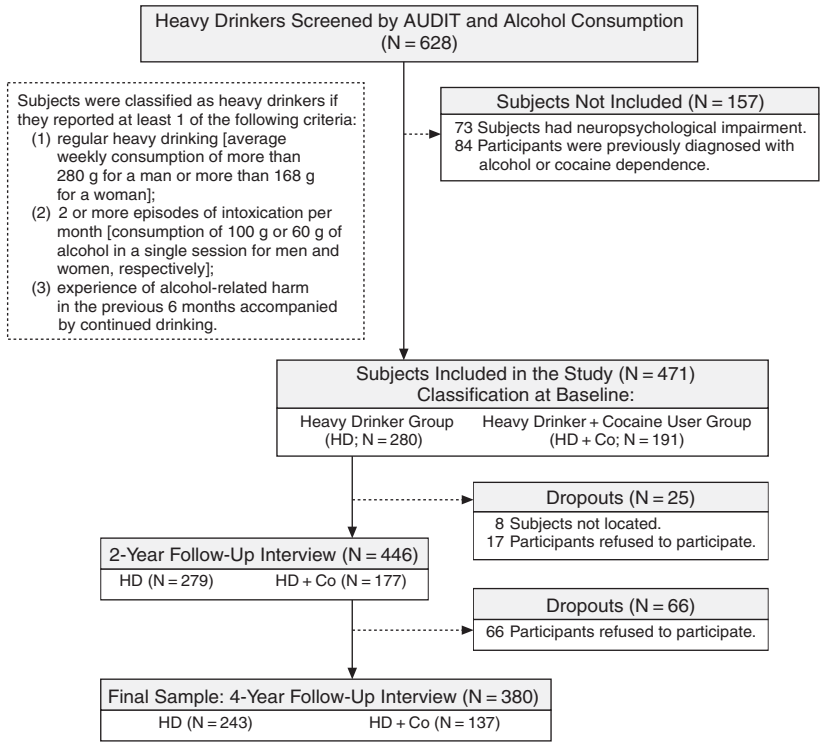
Figure 1. Timing of Assessments of Heavy Drinkers Enrolled in Primary Care Centers



Abbreviation: AUDIT = Alcohol Use Disorders Identification Test.

whenever possible and were asked to complete an assessment focused on alcohol and cocaine use that included AUDIT (N = 446).

At 4 years of follow-up, 380 participants were evaluated with the same instruments used at baseline. More subjects were lost to follow-up in the HD + Co group than in the HD group (N = 54 [28%] vs. N = 37 [13%]), respectively (Figure 1). Only results from subjects who had had both baseline and 4-year follow-up assessments were included in this study. The clinical and demographic characteristics of 380 subjects assessed at baseline and 4 years later are shown in Table 1.

Measures

At the baseline and 4-year follow-up sessions, we assessed the respondent's drinking patterns and related problems, amount of cocaine use, and current psychiatric disorders. Participants also were assessed with self-report measures of impulsivity. At a 2-year follow-up evaluation, we evaluated drinking patterns, related problems, and amount of cocaine use.

Diagnostic Instruments

Psychiatrists administered the patient version of the Structured Clinical Interview for DSM-IV (SCID-I/P).[16] In order for Axis II diagnoses to be made, patients completed the Patient Questionnaire (SCID-PQ) for the Structured Clinical Interview for Axis II DSM-IV Personality Disorders (SCID-II).[17]

The Wender Utah Rating Scale (WURS)[18,19] was used for retrospective assessment of adults with attention-deficit/hyperactivity disorder (ADHD). Family history of alcoholism was elicited by interviewing first-degree relatives.

Questionnaire Measures

Psychological scales. The Barratt Impulsiveness Scale, version 11 (BIS-11)[20]; the Hamilton Rating Scale for Anxiety (HAM-A); and the Hamilton Rating Scale for Depression (HAM-D)[21,22] were used to assess subjects' impulsivity and mood.

Alcohol and cocaine assessments. The Severity of Alcohol Dependence Scale (SADS),[23] the 10-item Alcohol Use Disorders Identification Test (AUDIT, Spanish version),[15] and the 5-item Severity of Cocaine Dependence Scale (SDS)[24] were used to assess subjects' alcohol and cocaine abuse and dependence. Time-line follow-back techniques were used to gather self-reports of alcohol and cocaine use during the 12 months preceding the study and the 48-month follow-up period.[25]

Other variables. The age at onset of alcohol or cocaine use was considered to be the mean age at which the subject began to drink alcohol or take cocaine. The age at which a subject met criteria for alcohol or cocaine dependence (DSM-IV) was assessed during follow-up. The estimated amount of alcohol and cocaine consumption was calculated. The amount of alcohol consumed during the follow-up period was the number of alcohol units (1 unit = 10 g alcohol) drunk during the follow-up period. The amount of cocaine used was measured as the number of grams consumed during the follow-up period (1 g of street cocaine = 36–60 Euros).

Data Analysis

Baseline measurements of impulsivity and questionnaire responses were directly compared between heavy drinkers (HD) and heavy drinkers who used cocaine (HD + Co) with the independent, 2-tailed t test. Where group differences were detected in a measure, the effect size of the group difference was calculated. Dichotomous variables were evaluated using the Pearson χ^2 test or the 2-tailed Fisher exact test. Logistic regression analysis was performed to identify the variables involved in the pres-

Table 1. Demographic and Clinical Characteristics of Heavy Drinker Groups at Enrollment

Variable	Heavy Drinker Group (N = 243)	Heavy Drinker and Cocaine User Group (N = 137)	Significance
Gender, male, N (%)	145 (59.7)	94 (68.6)	NS
Age, mean (SD), y	38.2 (7.1)	35.7 (8.4)	t = 3.10, df = 378, p = .003
Education, mean (SD), y	15.3 (3.1)	16.7 (4.1)	NS
Employment during recent years, mean (SD), mo	10.2 (0.4)	10.1 (0.5)	NS
Marital status, N (%)			
Married	167 (68.7)	38 (27.7)	$\chi^2 = 68.6$, df = 2, p < .001
Never married	71 (29.2)	76 (55.5)	
Separated/divorced/widowed	5 (2)	23 (16.8)	
Alcohol consumption			
Alcohol consumption, mean (SD), units/wk			
Male	36.4 (3.5)	40.4 (6.1)	t = 2.3, df = 378, p = .04
Female	28.3 (4.8)	31.3 (4.2)	t = 2.1, df = 378, p = .04
Type of usual beverage, N (%)			
Beer	120 (49.4)	67 (48.9)	$\chi^2 = 6.3$, df = 2, p = .04
Combinations (spirits and beer)	71 (29.2)	53 (38.7)	
Wine	52 (21.4)	17 (12.4)	
Consumption frequency, N (%)			
Daily	121 (49.8)	43 (31.4)	$\chi^2 = 12.0$, df = 2, p < .001
Weekly	122 (50.2)	94 (68.6)	
Age at first drink, mean (SD), y	16.0 (2.2)	14.1 (2.4)	t = 5.0, df = 378, p < .001
Age at regular alcohol use, mean (SD), y[a]	18.2 (1.9)	18.3 (4.3)	NS
Alcohol Use Disorders Identification Test score, mean (SD)	11.3 (2.4)	13.6 (4.1)	NS
Severity of Alcohol Dependence Scale score, mean (SD)	5.19 (2.2)	5.54 (1.9)	NS
Alcohol use disorders, N (%)			
Alcohol abuse	36 (14.8)	33 (24.1)	$\chi^2 = 5.06$, df = 1, p = .024
Cocaine consumption			
Cocaine consumption, mean (SD), g/mo	…	0.5 (0.2)	…
Cumulative cocaine use (last year), mean (SD), g	…	3.1 (1.1)	…
Severity of Cocaine Dependence Scale score, mean (SD)	…	1.2 (0.3)	…
Age at first consumption, mean (SD), y	…	21.2 (6.8)	…
Biological markers			
Elevated γ-glutamyltransferase levels, N (%)	61 (25.1)	47 (24.3)	$\chi^2 = 3.6$, df = 1, p = .056
Barratt Impulsiveness Scale score, mean (SD)	38.0 (12.6)	53.4 (14.9)	t = 12.9, df = 378, p < .001
Hamilton Rating Scale for Depression score, mean (SD)	2.9 (1.4)	4.3 (2.0)	t = 8.9, df = 378, p < .001
Hamilton Rating Scale for Anxiety score, mean (SD)	4.3 (3.2)	5.7 (4.6)	t = 3.8, df = 378, p < .001

[a]At least once/wk.
Abbreviation: NS = nonsignificant.

ence of alcohol dependence at the end of the follow-up period. The number of patients with alcohol dependence at the end of 4 years was determined by means of the Kaplan-Meier product-limit survival test.

RESULTS

Baseline Differences

Nineteen percent of the sample (N = 91) was lost during follow-up. These subjects belonged mainly to the HD + Co group (N = 54, $\chi^2 = 16.48$, p < .001). At intake, 50% of these participants were drinking significantly more alcohol than the rest of the subjects (data not included).

Table 1 shows the demographic and clinical data obtained at intake on the 380 subjects who completed the follow-up period (HD = 243, HD + Co = 137). The results revealed significant differences between groups: HD + Co subjects were younger (t = 3.10, df = 378, p = .003) and more likely to be unmarried ($\chi^2 = 68.6$, df = 2, p < .001) than HD patients. HD + Co subjects were also better educated than HD subjects, but the difference was not significant. All cocaine users took cocaine powder intranasally. Average cocaine consumption was less than one-half gram monthly (40 Euros/mo). No other significant differences related to substance use were found.

Impulsivity scores and anxiety and depression scale scores were significantly higher in the HD + Co group compared to the HD group. The HD + Co patients had higher rates of lifetime comorbidity than HD patients (43.8% vs. 16.9%, $\chi^2 = 31.1$, df = 2, p < .001), specifically for impulse control disorders (29.9% vs. 7.8%, $\chi^2 = 30.5$, df = 2, p < .0001) and ADHD (13.9% vs. 2.0%, df = 2, p < .01). The rates of alcoholism familial history (AFH+) were significantly higher in the HD + Co group (37.2% vs. 11.5%, $\chi^2 = 33.6$, df = 2, p < .001).

Outcomes at the End of the 4-Year Follow-Up Period

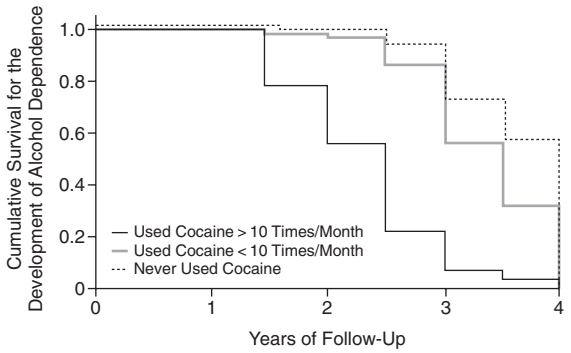
Average alcohol consumption at the 4-year follow-up by subjects in the HD + Co group was twice as high as at baseline (Table 2). Sixty-eight percent of HD + Co patients met DSM-IV criteria for alcohol dependence (versus 13.6% of HD group). Only a small percentage of HD participants used cocaine during follow-up. In contrast, nearly all of HD + Co subjects were still taking cocaine, and were

Table 2. Clinical Outcomes by Group Classification at Intake

Clinical Outcomes at the End of the 4-Year Follow-Up Period	Group Classification at Baseline: Heavy Drinker Group (N = 243)	Group Classification at Baseline: Heavy Drinker and Cocaine User Group (N = 137)	Significance
Alcohol dependence, N (%)	33 (13.6)	93 (67.9)	$\chi^2 = 114.1$, df = 1, $p < .001$
Alcohol abuse, N (%)	8 (3.3)	5 (3.6)	NS
Alcohol consumption, mean (SD), units/wk			
Male	31.7 (6.3)	80.2 (18.5)	t = 8.2, df = 378, $p < .001$
Female	13.8 (3.6)	49.3 (18.2)	t = 7.1, df = 378, $p < .001$
Severity of Alcohol Dependence Scale score, mean (SD)	6.0 (4.2)	16.0 (10.1)	t = 13.3, df = 378, $p < .001$
Cocaine users, N (%)	15 (6.1)	127 (92.7)	$\chi^2 = 280$, df = 1, $p < .001$
Cocaine dependence, N (%)	0 (0)	34 (24.8)	$\chi^2 = 63.2$, df = 1, $p < .001$
Cocaine abuse, N (%)	3 (1.2)	8 (5.8)	Fisher exact test, p = .02
Amount of cocaine consumption during follow-up, mean (SD), g	10.2 (8.1)	72.7 (68.3)	t = 14.3, df = 378, $p < .001$
Severity of Cocaine Dependence Scale score	0.2 (0.1)	2.7 (1.9)	t = 12.1, df = 378, $p < .001$
Biological markers			
Elevated γ-glutamyltransferase levels, N (%)	37 (15.2)	99 (72.3)	$\chi^2 = 123.6$, df = 1, $p < .001$

taking it in larger amounts than at baseline. Indeed, 30% of them met DSM-IV criteria for cocaine use disorders (25% dependence and 5% abuse). All subjects were classified according to the frequency of cocaine consumption in the previous year (none, less than 10 times a month, more than 10 times a month). These groups were created for statistical analyses. Figure 2 shows that the progression to DSM-IV alcohol dependence was related to the frequency of cocaine use (survival analyses: log rank 63.6, df = 2, $p < .001$).

Figure 2. Risk of Developing Alcohol Dependence During the Follow-Up Period in Heavy Drinkers Classified According to Their Frequency of Cocaine Consumption[a]



[a]At the end of follow-up, 100% (27/27) of subjects who were using cocaine more than 10 times/mo met criteria for alcohol dependence. For the 2 other groups, the proportions were 44/66 (67.0%) and 33/210 (15.7%), respectively.

Variables Related to Alcohol Dependence

An exploratory analysis (logistic regression) was made using each of variables listed in Table 3 as candidate predictor variables. Because of the low percentage of some psychiatric disorders, the variable "impulsivity-related disorders" was created, which included ADHD, impulse control disorders, and borderline and antisocial personality disorders. Age and sex were used to adjust regression models. As depicted in Table 3, there were sex-related differences in regression models. For the whole sample, the variables with more risk for the development of alcohol dependence were comorbidity with psychiatric disorders (5–19 times), AFH+ (10 times), substance use/abuse (3–3.8 times), and impulsivity measured by BIS-11 (1.08 times). In men and women, cocaine use, AFH+, and higher BIS-11 scores increased the likelihood of developing alcohol dependence. Male and female cocaine users were 12 and 7 times, respectively, more likely to become alcohol dependent than subjects without cocaine consumption. Years of education (men) and lifetime affective disorders (women) significantly increased the probability of developing alcohol dependence during follow-up.

DISCUSSION

The results of this study revealed that cocaine use or an impulsive personality markedly increased the likelihood of developing alcohol dependence in nondependent heavy drinkers screened in primary care centers. The frequency of cocaine consumption was related to a more rapid progression to alcohol dependence. A higher self-reported impulsivity score increased the likelihood that alcohol dependence would develop, particularly in men. In contrast, lifetime affective disorders increased the probability of developing alcohol dependence in women.

The findings of the present study reinforce the idea that cocaine use significantly increases vulnerability to alcohol dependence. A number of alternative and compatible hypotheses support this idea. HD + Co subjects may be highly vulnerable to using both drugs due to specific genetic alterations in brain regions closely related to reinforcement and gratification.[26,27] In favor of this hypothesis is the well-known frequent comorbidity between both substance use disorders in the general population and

Table 3. Risk Factors for Alcohol Dependence at the End of the Follow-Up Period According to Baseline Variables

Baseline Variable	All Subjects[a] B	All Subjects[a] Significance	All Subjects[a] Odds Ratio (95% CI)	Male,[b] Odds Ratio (95% CI)	Female,[c] Odds Ratio (95% CI)
Cocaine user	1.34	.043	3.84 (1.72 to 15.94)	12.30 (3.61 to 41.8)	7.01 (1.42 to 34.33)
Alcohol abuser	1.10	.125	3.01 (0.73 to 12.35)	…	…
Lifetime psychiatric comorbidity for anxiety disorders	1.72	.030	5.63 (1.12 to 26.90)	…	…
Family history of alcoholism	2.33	< .001	10.30 (3.52 to 29.54)	35.71 (4.30 to 57.3)	7.81 (1.90 to 32.61)
BIS-11	0.07	< .001	1.08 (1.04 to 1.12)	1.06 (1.01 to 1.11)	1.12 (1.05 to 1.19)
Lifetime psychiatric comorbidity for affective disorders	2.94	.002	19.07 (2.88 to 56.31)	…	45.3 (3.01 to 73.21)
Severity of Alcohol Dependence Scale	0.15	.234	0.85 (0.65 to 1.11)	…	…
Education, y	0.18	.383	1.20 (1.00 to 1.42)	1.69 (1.24 to 2.30)	…
Lifetime psychiatric comorbidity for disorders related to impulsivity[d]	2.53	< .001	12.64 (4.20 to 37.30)	32.20 (2.91 to 53.7)	…
Sex	2.11	.001	8.84 (2.31 to 33.01)	…	…
Sex × cocaine use interaction	0.92	.28	4.51 (0.4 to 13.62)	…	…
Age × cocaine use interaction	0.34	.32	1.7 (0.5 to 3.2)	…	…

[a]All variables included; goodness of fit test 31.1, df = 8, p = .001; 93% of subjects classified.
[b]Variables with significance < .05 included; goodness of fit test 0.53, df = 2, p = .02; 94.5% of subjects classified.
[c]Variables with significance < .05 included; goodness of fit test 33.8, df = 8, p = .0001; 92.1% of subjects classified.
[d]Disorders related to impulsivity = impulse-control disorders, attention-deficit/hyperactivity disorder, and antisocial or borderline personality disorder.
Abbreviations: BIS-11 = Barratt Impulsiveness Scale, HAM-A = Hamilton Rating Scale for Anxiety.

in clinical settings[4,5,28–30] and the frequent co-occurrence of both consumptions in epidemiologic studies. Alcohol consumption may be a sensitization factor for cocaine use, with the interaction between both drugs potentially enhancing the likelihood of developing alcohol dependence. Alcohol and cocaine may share common neurochemical mechanisms of action. Chronic ethanol administration alters dopamine-related mechanisms involved in the acquisition of cocaine-taking behavior. On the other hand, chronic cocaine administration significantly reduces dopamine binding to D_2 receptors in rats[26] and in human cocaine abusers.[31] It is tempting to speculate that chronic alcohol and cocaine use may induce a more significant reduction in dopamine D_2 receptors, which would increase the likelihood of developing dependence for both substances.

Pharmacokinetic alterations induced by chronic consumption of both alcohol and cocaine may modify subsequent responses to these drugs.[32,33] Indeed, it has been reported that chronic preexposure to 10% ethanol in drinking water led to increases in plasma cocaine concentrations.[32] Prospective studies in healthy subjects support the idea that alcohol and cocaine use decreases the subjective feeling of inebriation and increases the sense of being "high."[34] Therefore, a subgroup of heavy drinkers may have combined alcohol and cocaine to achieve these effects. The consumption of both drugs may accentuate the reinforcing properties of each, thus increasing the vulnerability of subjects to developing drug dependence.[35] Furthermore, it is possible that cocaine use exposes an individual to increased contacts with people with severe alcohol dependence and that this process may contribute to accelerating the progression to alcohol dependence.

The results of this study showed that more frequent cocaine use was associated with a more rapid progression of alcohol use disorders. Although there are no studies available for comparison, findings from subjects with other substance use disorders support these results.[8]

The precise mechanisms mediating the expression of alcohol dependence in subjects with abnormal impulsivity remain to be further explored. In our study, the characteristics associated with impulsivity (impulsivity-related disorders and self-reported impulsivity) at baseline predicted alcohol dependence during follow-up. These findings support the link between impulsivity and alcohol dependence shown in other studies.[11] Patients with psychiatric disorders related to impulsivity usually exhibit weakened inhibitory control, inability to delay gratification, and lack of ability to sustain attention. This in turn results in diminished feature-intensive processing, which may affect the perception of risk (such as risk inherent to substance use).[36] Moreover, immediate (rewarding) consequences may have a stronger impact on such a person's behavioral control than delayed consequences. When substances have been taken, their effects on mesolimbic and frontal structures impair the individual's ability to stop consuming drugs.[37]

This study revealed that lifetime psychiatric comorbidity for affective disorders was related to increased risk and severity of alcohol dependence. These findings are consistent with previous reports showing that negative mood states are more prevalent in women than men[38] and that psychiatric comorbidity usually precedes alcohol dependence in both sexes.[39,40]

In summary, our findings provide clear evidence that cocaine use may be a high-risk factor for the development of alcohol dependence. Furthermore, the results support

the idea that impulsive people are more likely to develop alcohol dependence. Alcohol-related brief interventions were shown to have little efficacy in this study; consequently, this therapeutic intervention may not be suitable in heavy drinkers who use cocaine or have pathologic impulsivity.

There are a number of limitations to this study. For instance, due to the inclusion of only clinical subjects, the results may not be generalizable to nonclinical populations. It is important to consider that approximately 50% of participants lost to follow-up drank large amounts of alcohol at intake. Therefore, the final sample probably represents less severe heavy drinkers. In addition, the association of alcohol dependence with impulsivity may be a cohort-specific finding that occurs only in young people (under 40 years old). Alternatively, people with poorer behavior control may be at risk of engaging in habits of alcohol consumption and of developing alcohol dependence.

We firmly believe that the findings of our study may have important public health implications. Heavy drinkers may come into contact with treatment mainly through primary care services, and general practitioners should be alert to patients with problems related to concurrent cocaine and alcohol use. Health care professionals in emergency services and in mental health facilities may need additional training to improve their ability to detect, assess, and respond to subjects with concurrent alcohol and cocaine problems. To maintain the benefits of brief interventions in heavy drinkers more effectively, regular follow-up and reinforcement are likely to be required. It is possible that heavy drinkers with concurrent cocaine consumption or pathologic impulsivity require a more intensive treatment approach than brief interventions.

Disclosure of off-label usage: The authors have determined that, to the best of their knowledge, no investigational information about pharmaceutical agents that is outside U.S. Food and Drug Administration–approved labeling has been presented in this article.

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