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The Prevalence of Posttraumatic Stress Disorder Symptoms among Addiction Treatment Patients with Cocaine Use Disorders

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Abstract

Co-occurring cocaine use and posttraumatic stress disorders are prevalent and associated with negative treatment, health and societal consequences. This study examined the relationships among PTSD symptoms, gender, and cocaine use problems. Within a cross-sectional design, we gathered archival point prevalence data on new admissions ($n = 573$) to three addiction treatment agencies. Demographic, substance use, and PTSD symptom information were collected across the three agencies. Logistic regression analyses revealed that patients with cocaine use disorders had a two-fold increased odds for a probable PTSD diagnosis, compared to patients without a cocaine use disorder ($OR = 2.19$, 95% $CI = 1.49-3.22$, $p < 0.001$). Among females with cocaine use disorder, multinomial regression yielded a significant increase in the risk of moderate ($RRR = 2.12$, 95% $CI = 1.10-4.10$, $p < 0.05$) and severe ($RRR = 2.87$, 95% $CI = 1.33-6.21$, $p < 0.01$) PTSD symptoms. Males with cocaine use disorders had a two-fold increase in the risk of moderate PTSD symptoms ($RRR = 2.13$, 95% $CI = 1.23-3.68$, $p < 0.01$), but had no increased risk of developing severe PTSD symptoms ($RRR = 1.93$, 95% $CI = 0.85-4.39$, $p = 0.117$). Cocaine use appears to impact the risk of PTSD symptoms, especially in females. Future research should explore the generalizability of these findings to more racially and ethnically diverse samples, as well as among persons with this comorbidity who are not engaged in treatment services.

Keywords

cocaine use disorders; gender; posttraumatic stress disorder

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DECLARATION OF INTEREST

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

Cocaine remains the third most prevalent drug abused in the United States. In 2012, 1.1 million individuals met criteria for cocaine abuse or dependence (SAMHSA 2013). Cocaine use is associated with a number of negative psychosocial and physical health consequences, including increased criminal involvement, social dysfunction, unemployment, and serious medical disease (Riezzo et al. 2012; Lange & Hillis 2001; Karila et al. 2012; Hser et al. 2006). Although more males than females use cocaine, females have higher rates of cocaine dependence and worse outcomes. These include more severe medical, family, employment, and mental health problems, such as mood and anxiety disorders (Chen et al. 2011; Najavits & Lester 2008; Stecker et al. 2007; Wu et al. 2010; Cotto et al. 2010; Griffin et al. 1989; Wong et al. 2002).

Research has found an association between co-occurring cocaine use and posttraumatic stress disorder (PTSD). The prevalence of current PTSD in cocaine users ranges from 8 to 43% (Back et al. 2000; Dansky, Brady & Saladin 1998; Ford et al. 2009; Najavits et al. 2003; Wasserman, Havassy & Boles 1997). A range of 23 to 42% of cocaine users have a lifetime PTSD diagnosis (Back et al. 2000; Halikas et al. 1994; Magura et al. 1998; Wasserman, Havassy & Boles 1997). Variation in prevalence estimates is due to methodological sampling and setting factors, including whether studies are conducted in community settings, residential programs, or in the Veteran's Administration. Across studies, rates of PTSD are especially high in female cocaine users (Brady et al. 1998; Dansky, Byrne & Brady 1999; Falck et al. 2004; Halikas et al. 1994).

Several reports describe potential mechanisms for the relationship between PTSD and cocaine use. Witnessing or experiencing trauma while engaging in high-risk behaviors, such as obtaining, dealing, using or withdrawing from cocaine could contribute to the vulnerability to develop PTSD (Brady et al. 1998; Dansky et al. 1996). Both cocaine use and PTSD frequently co-occur with other Axis I disorders (Back et al. 2006; Najavits et al. 1998). Some researchers have hypothesized that patients may be using cocaine to manage these other negative symptoms, such as mood and anxiety problems (Bremner et al. 1996). While cocaine users may intend for the substance to ameliorate PTSD symptoms, cocaine use may increase hyperarousal and re-experiencing symptoms (Johnson et al. 2010; Tull et al. 2010). Comorbid PTSD and cocaine use disorders are associated with more severe substance use, higher rates of depression, greater interpersonal problems, and worse treatment outcomes than cocaine use problems only (Back et al. 2000; Clark et al. 2001; Hien et al. 2000; Najavits et al. 2003). In samples of treatment-seeking cocaine users, patients with PTSD were more likely to relapse during treatment, had shorter periods of abstinence, and were also less treatment-adherent than those without PTSD (Burns et al. 2010; Hien et al. 2000; Mancino 2010 et al. ; Najavits et al. 2007).

Poor treatment outcomes in patients with co-occurring PTSD and cocaine use disorders may be related to the relationship between substance use and PTSD symptoms. Despite great variation in the temporal onset of PTSD and cocaine use, studies have shown that PTSD symptom severity impacts cocaine use (Brady et al. 1998; Freeman, Collier & Parillo 2002; Johnson, Striley & Cottler 2006; Wasserman, Havassy & Boles 1997). In community and veteran samples, changes in substance use appear to parallel improvement or deterioration in PTSD symptom severity (Back et al. 2006; Bremner et al. 1996; Hien et al. 2010b). Similar

trends are observed in studies of persons with cocaine dependence (Burns et al. 2010; Ouimette et al. 2010). Although these results imply an association between PTSD symptom severity and cocaine use, small sample sizes limit generalizability. Conversely, several studies have found that PTSD severity is unrelated to cocaine use (Ford et al. 2007; 2009). Other research has examined the reverse association and considered whether cocaine use symptoms are instead impacting PTSD symptoms (Back et al. 2006; Hien et al. 2010a).

These conflicting findings suggest that more research is needed to explore the relationship between cocaine use disorders and PTSD severity. No known studies have addressed whether gender differentially influences the relationship between cocaine use disorders and PTSD symptom severity. The aim of the current study is to investigate the prevalence of PTSD symptoms in community outpatients with cocaine use disorders, and to explore the relationship between cocaine use, gender, and PTSD symptom severity.

METHODS

Selection and Description of Study Participants

Within a prospective cross-sectional design, we examined the association between cocaine use disorders and PTSD symptoms in a treatment-seeking population. This sample was comprised of persons newly admitted to three outpatient community addiction treatment agencies during 2011. All new admissions were included, and there were no exclusion criteria. The agencies were located in northern, southern, and western Vermont, USA. Standardized archival chart reviews were completed for all admitted patients. The final sample included 573 patients.

Measures

PTSD symptoms were assessed using the PTSD Checklist-Civilian (PCL-C). The PCL-C is a 17-item, self-administered measure using a five-point Likert scale ranging from “*Not at all = 1*” to “*Extremely bothered = 4*.” After summing all responses, a total score of 44 or greater corresponds to a positive PTSD diagnosis (Blanchard et al. 1996; Terhakopian et al. 2008). Previous studies have shown that the PCL is highly accurate in predicting PTSD symptom severity among community samples (Blanchard et al. 1996; McDonald & Calhoun 2010). Numerous studies have used the PCL for this purpose (Blanchard et al. 1996; Grubaugh et al. 2007; Lang et al. 2003; Wilkins, Lang & Norman 2011). The reliability, validity, sensitivity, and specificity of the PCL have been validated in several studies, demonstrating that the PCL is a psychometrically sound self-report screening tool for PTSD and associated with a diagnosis of PTSD (Blanchard et al. 1996; Ruggiero et al. 2003; Weathers et al. 1993; 1994; McDonald & Calhoun 2010; Wilkins, Lang & Norman 2011).

Substance use problems and demographic information were extracted from patient medical records. Demographic information, including age, gender, race, and ethnicity, was collected by agencies mandated to adhere to the U.S. Substance Abuse and Mental Health Services Administration Treatment Episode Data Set (TEDS) federal reporting requirements. Primary, secondary, and tertiary substance use problems, which may include misuse, abuse, or dependence, were abstracted from the Addiction Severity Index (ASI; McLellan et al.

1985), a requirement of the state regulatory authority. The ASI is a well-established measure of substance use severity and also related to substance use diagnoses (McLellan et al. 1985; Rikoon et al. 2006; Leonhard et al. 2000; Currie et al. 2004; Alterman et al. 2000; McLellan et al. 1992).

Procedures

At admission, new patients completed the PTSD Checklist (PCL) and other standardized assessments. A program staff member at each site gathered information from medical records and linked this information with PCL scores. Data on patient demographics (age, gender, race, and ethnicity), PCL scores, and primary, secondary, and tertiary substance use problems were recorded, de-identified, and securely transferred to the research team. Because all data were de-identified, participant informed consent was not required. This study was conducted with approval from the Dartmouth College Committee for the Protection of Human Subjects (CPHS).

Data Analysis

Demographic, clinical, and substance use characteristics were examined using frequency analysis to calculate means, standard deviations and proportions. T-tests and Pearson's chi-squared tests were used to compare group differences in demographic characteristics and PTSD diagnoses between cocaine users and non-users. PCL scores of 44 to 64 were considered moderate. Any PCL score of 65 and above was considered severe (Blanchard et al. 1996; McDonald & Calhoun 2010).

To determine whether cocaine use was associated with PTSD, logistic regression analysis was used to derive odds ratios and confidence intervals. The initial logistic regression model included the entire sample. Using a forward selection method, age, gender, race, and ethnicity were added to the original model as covariates, to control for confounding. Because of the racial and ethnic homogeneity of this sample, race and ethnicity were not included in the logistic models due to large standard error values. A second logistic regression model was used to derive odds ratios and confidence intervals, while controlling for other substance use. Age was centered before inclusion in analyses. To examine the association between gender, PTSD symptoms, and cocaine use, the odds of PTSD and the odds of cocaine use were calculated using logistic regression equations. Males were used as the referent group. Multinomial logistic regression analyses were conducted to investigate the influence of cocaine use and gender on PTSD symptom severity. Participants were then stratified by gender and analyzed in two separate multinomial regression analyses. Multinomial analyses controlled for age only. Data were analyzed using Stata 13 (StataCorp 2013).

RESULTS

Participant Demographics and Clinical Characteristics

The sample's mean age was 34.64 years (Table 1). The majority of the sample were male, Caucasian, and not Hispanic or Latino. The mean PCL score was 41.10, and 42.4% of the sample met criteria for PTSD based on the PCL score cutoff (≥ 44). Of participants with

probable PTSD, two-thirds met criteria for moderate PTSD severity, while close to one-third had severe PTSD symptoms. Cocaine was analyzed separately from other amphetamines because only three (1.9%) cocaine users also had other amphetamine use problems. Only two participants had cocaine use problems exclusively, and 157 patients had cocaine use problems in combination with other substances. These participants were combined to include all use of cocaine, either alone or in combination ($n = 159$; 27.7%). The most commonly used substances with cocaine were alcohol ($n = 59$), heroin ($n = 44$), and cannabis ($n = 43$).

Association Between Cocaine Use and PTSD

Differences between participants with a cocaine use problem ($n = 159$) and participants without a cocaine use problem ($n = 414$) were compared using t-tests and chi-squared analyses (Table 2). Non-cocaine users were significantly older than cocaine users ($p < 0.05$). Alcohol, prescription narcotics, and heroin were the most common primary substance use problems for patients without cocaine use problems. Other amphetamine use problems were found in only four (<1%) non-cocaine-using patients. Differences in probable PTSD diagnosis and severity were also seen between patients with and without cocaine use problems. Individuals with cocaine use problems were significantly more likely to meet criteria for a probable PTSD diagnosis. Additionally, a greater proportion of cocaine users met criteria for probable PTSD, compared to non-cocaine users.

Results of the first multivariate logistic model are reported in Table 3. After adjusting for age and gender, the odds of having PTSD were 2.19 times higher in patients with cocaine use disorders, than patients without cocaine use disorders. The relationship between PTSD symptoms and cocaine use disorders was strengthened after controlling for other substance use. Alcohol, heroin, cannabis, amphetamine, and prescription opioid use were added to the logistic regression model as dichotomous control variables. Prior to inclusion in this model, correlations between these variables were checked for collinearity. In this model, the odds of probable PTSD in patients with cocaine use was 2.26 times higher than in patients with no cocaine use. The odds of PTSD symptoms were 3.07 times higher in participants using cocaine and alcohol compared to participants using alcohol only, or alcohol and other drugs (95% CI = 1.68–5.44; $p < 0.001$). Results of the first multinomial logistic regression model, adjusted for age and gender, showed that the risk of moderate PTSD symptom severity was 2.11 times higher among patients with cocaine use disorders (95% CI = 1.38–3.21, $p < 0.01$), while the risk of severe PTSD symptom severity was 2.41 times higher (95% CI = 1.39–4.18, $p < 0.01$).

Influence of Gender on the Association Between PTSD Severity and Cocaine Use

This study found that gender confounded the relationship between cocaine use problems and PTSD symptoms. To further examine the relationship between gender, PTSD severity, and cocaine use, substance use and PTSD characteristics were examined in males and females using chi-squared analyses and t-tests (Table 1). Overall, a greater proportion of females had cocaine use problems. After adjusting for age, females had greater odds of having a cocaine use problem than males (OR = 1.54; 95% CI = 1.05–2.24; $p < 0.025$). Females also had significantly higher PCL scores, and were more likely to be diagnosed with PTSD. Among

participants with probable PTSD, a greater proportion of females had severe PTSD symptoms in comparison to males.

The association between PTSD symptom severity and cocaine use problems was different in males and females (Table 4). In females, a cocaine use disorder was associated with an increased risk of moderate and severe PTSD symptoms. While a cocaine use disorder was associated with a two-fold increase in the risk of moderate PTSD in males, a cocaine use disorder was not associated with any increase in the risk of severe PTSD symptoms. To check for effect modification, an interaction term was added to a logistic equation calculating the odds of moderate and severe PTSD. Males were used as the referent group. No effect modification was detected (OR = 1.13, 95% CI = 0.67–1.92, $p > 0.05$).

DISCUSSION

These data suggest a significant association between cocaine use disorders and PTSD diagnosis. Cocaine users were more likely to have a probable PTSD diagnosis than non-cocaine users, even after controlling for other substance use. Females had greater rates of cocaine use problems, and more PTSD symptoms than males. A contribution of this data, not previously reported in the literature, is the unique role of gender in the association between PTSD symptom severity and cocaine use. For females, the risk of moderate and severe PTSD symptoms increased with the presence of a cocaine use disorder. Although males with a cocaine use disorder had two times the risk of having moderate PTSD symptoms, cocaine use disorders were not associated with an increased risk of severe PTSD symptoms.

Limitations of this study are inherent to the cross-sectional design; a limited dataset on substance use, PTSD, and other psychiatric symptoms; and a relatively homogenous sample. These liabilities pose threats to internal and external validity, and attenuate generalizability to more racially and ethnically diverse samples. The basic summary data provided by the three addiction treatment agencies did not include information regarding psychiatric diagnoses such as depression, method of cocaine use (i.e., powder, freebase, or crack), or severity of substance use, and types of traumatic events experienced. The cross-sectional design rendered impossible inferences on the chronology or sequence of symptom development: did cocaine use precede traumatic life events and PTSD symptoms, or did a traumatic life event lead to PTSD symptoms and subsequent cocaine use? These issues can only be examined within longitudinal repeated measure designs. Substance use and PTSD data were collected from chart diagnoses and self-report measures like the PCL, which are less rigorous than research-specific measures such as structured clinical interviews for PTSD and/or substance use.

This study provides important data on the relationship between cocaine use disorders, PTSD symptoms, and gender. In females, cocaine use disorders were associated with a greater risk for more severe PTSD symptoms. Although males with cocaine use disorders had no increased risk of severe symptoms, they were more likely to have moderate PTSD symptoms. In community addiction treatment programs, universal screening for mental health disorders, including PTSD, is recommended (CSAT 2005). The current data verify

that treatment agencies should especially consider selected screening and assessment for PTSD among persons with cocaine use problems. Future research should strive to overcome the limitations of the present study. This would include a longitudinal design, more rigorous and detailed measures of PTSD, substance use and other psychiatric symptoms, and more ethnically and racially diverse sample. Whether or not the present findings are generalizable can only be determined with replication.

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TABLE 1

Demographic and Clinical Characteristics of Adult Patients Newly Admitted to Community Outpatient Addiction Treatment Programs

	Overall (n = 573)	Males (n = 355)	Females (n = 218)	t/ χ^2 Value ^a
Demographic characteristics				
Age, mean [sd]	34.64 [11.72]	35.53 [12.20]	33.19 [10.75]	2.33 *
Gender (% Female)	218 (38.0%)	355 (100%)	219 (100%)	
Race (% Caucasian/White)	541 (96.3%)	333 (95.4%)	208 (97.6%)	2.72
Ethnicity (% Not Hispanic or Latino)	548 (98.9%)	339 (99.1%)	209 (98.6%)	0.35
PTSD symptom severity				
PCL score, mean [sd]	41.40 [17.66]	37.33 [16.60]	47.24 [17.65]	-6.77 ***
Probable PTSD diagnosis (% diagnosed)	243 (42.4%)	119 (33.5%)	124 (56.9%)	30.17 ***
Moderate PTSD symptoms (% diagnosed)	168 (69.1%)	88 (73.9%)	80 (64.5%)	9.24 **
Severe PTSD symptoms (% diagnosed)	75 (30.9%)	31 (26.0%)	44 (35.5%)	32.86 ***
Type of substance use disorders				
Only Cocaine (%)	2 (0.4%)	1 (0.3%)	1 (0.5%)	0.12
Cocaine + other substance(s) (%)	159 (27.8%)	86 (24.2%)	73 (33.5%)	5.78 *
Alcohol (%)	353 (61.6%)	249 (70.1%)	104 (47.7%)	28.74 ***
Prescription opioid (%)	245 (42.8%)	130 (36.6%)	115 (52.7%)	14.36 ***
Cannabis (%)	200 (34.9%)	134 (37.7%)	66 (30.3%)	3.32
Heroin (%)	116 (20.2%)	60 (16.9%)	56 (25.7%)	6.46 *
Co-occurring characteristics				
Cocaine + probable PTSD (%)	91 (15.9%)	40 (11.3%)	51 (23.4%)	14.87 ***
Alcohol + probable PTSD (%)	138 (24.1%)	83 (23.4%)	55 (25.2%)	0.25
Prescription opioid + probable PTSD (%)	116 (20.2%)	49 (13.8%)	67 (30.7%)	23.98 ***
Heroin + probable PTSD (%)	54 (9.4%)	20 (5.6%)	34 (15.6%)	15.70 ***

^aDifferences between groups were tested as follows: means by t-tests, proportions by chi-squared tests.

* p 0.05.

** p 0.01.

*** p 0.001.

TABLE 2

Characteristics of Addiction Treatment Program Patients with Cocaine Use Disorders, Compared to Patients Without Cocaine Use Disorders

Characteristic	Cocaine Use Disorder (n = 159)	No Cocaine Use Disorder (n = 414)	t/ χ^2 Value ^a
Age, mean [sd]	32.96 [8.88]	35.28 [12.59]	2.13 *
Gender, (% Female)	73 (45.9%)	145 (35.0%)	5.78 *
Race, (% Caucasian/White)	144 (92.9%)	397 (97.5%)	17.70 ***
Ethnicity, (% Not Hispanic or Latino)	149 (97.4%)	399 (99.5%)	4.63 *
PCL score, mean [sd]	46.17 [17.56]	39.16 [17.33]	4.32 ***
Probable PTSD diagnosis, (% diagnosed)	91 (57.2%)	152 (36.7%)	19.80 ***
PTSD severity, (%)			20.15 ***
Moderate PTSD symptoms	61 (38.4%)	107 (25.8%)	
Severe PTSD symptoms	30 (18.9%)	45 (10.9%)	

^aDifferences between groups were tested as follows: means by t-tests, proportions by chi-squared tests.

* p 0.05.

** p 0.01.

*** p 0.001.

TABLE 3

The Effect of Cocaine Use on PTSD Symptoms in Community Outpatients

	Multivariate Logistic Model Odds Ratio (95% CI)	p Value
<i>Odds of probable PTSD diagnosis</i>		<0.001
Substance Use Disorders ¹		
No Cocaine Use Disorder	1.00 (reference)	
Cocaine Use Disorder	2.19 (1.49–3.22)	
Age	1.00 (0.99–1.02)	n.s.
Gender		<0.001
Male	1.00 (reference)	
Female	2.53 (1.78–3.61)	
<i>Odds of probable PTSD diagnosis</i>		<0.001
Substance Use Disorders ²		
No Cocaine Use Disorder	1.00 (reference)	
Cocaine Use Disorder	2.26 (1.50–3.39)	
Age	1.01 (0.99–1.03)	n.s.
Gender		<0.001
Male	1.00 (reference)	
Female	2.56 (1.77–3.68)	
Cannabis Use Disorder		n.s.
None	1.00 (reference)	
Cannabis Use Disorder	1.22 (0.83–1.79)	
Alcohol Use Disorder		n.s.
None	1.00 (reference)	
Alcohol Use Disorder	1.19 (0.76–1.87)	
Heroin Use Disorder		n.s.
None	1.00 (reference)	
Heroin Use Disorder	1.15 (0.72–1.83)	
Prescription Opioid Use Disorder		n.s.
None	1.00 (reference)	
Prescription Opioid Use Disorder	1.33 (0.89–2.00)	
Amphetamine Use Disorder		n.s.
None	1.00 (reference)	
Amphetamine Use Disorder	3.86 (0.67–22.36)	

¹ Adjusted for age and gender.

² Adjusted for age, gender, and other substance use (cannabis, amphetamine, heroin, prescription opioid, alcohol).

TABLE 4

The Effect of Cocaine Use on PTSD Severity in Male and Female Community Outpatients

	Multinomial Logistic Model Odds Ratio (95% CI)	p Value
Males		
Risk of moderate PTSD symptoms¹		
Substance Use Disorders ²		<0.01
No Cocaine Use Disorder	1.00 (reference)	
Cocaine Use Disorder	2.13 (1.23–3.68)	
Age	1.00 (0.98–1.02)	n.s.
Risk of severe PTSD symptoms¹		
Substance Use Disorders ²		n.s.
No Cocaine Use Disorder	1.00 (reference)	
Cocaine Use Disorder	1.93 (0.85–4.39)	
Age	0.99 (0.96–1.02)	n.s.
Females		
Risk of moderate PTSD symptoms¹		
Substance Use Disorders ²		<0.05
No Cocaine Use Disorder	1.00 (reference)	
Cocaine Use Disorder	2.12 (1.10–4.10)	
Age	1.02 (0.99–1.05)	n.s.
Risk of severe PTSD symptoms¹		
Substance Use Disorders ²		<0.01
No Cocaine Use Disorder	1.00 (reference)	
Cocaine Use Disorder	2.87 (1.33–6.21)	
Age	1.03 (0.99–1.06)	n.s.

¹No PTSD symptoms: Base outcome.²Adjusted for age.