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ORIGINAL PAPER

Posttraumatic Stress Symptoms and their Relationship to Drug and Alcohol use in an International Sample of Latino Immigrants

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Abstract We identify the prevalence and correlates of posttraumatic stress (PTSD) symptoms and their relationship to alcohol and substance use disorders (AUD/SUD) among Latino immigrants in two countries. A screening battery assessing PTSD symptoms (PCL-C), alcohol use (AUDIT), drug abuse (DAST), and psychological measures was administered to 562 Latino immigrants recruited in clinics. We used logistical regression analyses to evaluate the relationship between PTSD symptoms and AUD/SUD. Prevalence of elevated PTSD symptoms was high (53.7 % in Boston, 47.9 % in Madrid and, 43.8 % in Barcelona). Screening positive for psychological measures was significantly correlated to screening positive on the PCL-C ($p < 0.001$). Significant gender differences in risk of AUD/SUD were moderated by PTSD symptoms. Presence of any PTSD symptoms predicted problems with benzodiazepine misuse. Given the high rates of co-morbidity between PTSD symptoms and AUD/SUD, we recommend early interventions for dual pathology for Latino immigrants with trauma history.

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Introduction

The association between post-traumatic stress disorder (PTSD) and alcohol/substance use disorders (AUDs/SUDs) is well established, particularly among veterans, adolescents, and those in substance abuse treatment [1]. Individuals who meet criteria for PTSD have up to 4.5 times the likelihood of having co-morbid AUDs/SUDs [2]. Studies demonstrate more pervasive functional impairment and psychiatric and medical co-morbidities among individuals with partial PTSD (not meeting full criteria) than trauma-exposed individuals not meeting PTSD criteria [3, 4]. Little is known about the relationship between PTSD symptom clusters (i.e., re-experiencing, numbing/avoidance and hyper-arousal) and AUDs/SUDs among adult Latinos, who are often at high risk for PTSD due to trauma exposure, migration, and residence in communities with high crime rates [5, 6]. We examine this relationship in an international sample of Latino immigrants. In the U.S., Latinos are the largest, fastest growing immigrant group [7], and in Spain constitute approximately 20 % of the immigrant population [8].

The self-medication hypothesis posits that individuals exposed to trauma are at risk of substance use to manage PTSD symptoms [9, 10]. Regarding symptom clusters, re-experiencing symptoms have significant associations with alcohol abuse [11]. Elevated hyper-arousal symptoms (hyper-vigilance, irritability, exaggerated startle response) are associated with drug use, while avoidance and numbing symptoms are more common among alcohol users [12]. In veteran populations, all three symptom clusters have significant associations with both AUDs and SUDs [13].

Psychosocial factors, such as acculturation, family cultural conflict, and perceived discrimination may explain variations in PTSD [14] and AUDS/SUDS development [15]. Studies have shown racial discrimination to moderate the relationship between PTSD and AUDs/SUDs [16, 17]; strong ethnic identity may buffer the risk of AUDs/SUDs [18], while race-related stress may increase PTSD symptom severity [19]. Acculturation stress, family cultural conflict, and discrimination are correlated with AUDs/SUDs, while family cohesion has been shown to be protective [15].

We investigated the prevalence of probable PTSD and the association of PTSD symptom clusters with AUDs/SUDs among Latino immigrants in both countries, and tested for differences given varied socio-cultural and clinical factors. Understanding which PTSD symptom clusters are associated with AUDs/SUDs is essential for developing risk profiles and screening protocols for prevention interventions, and for assisting providers in treatment decisions. We identified psycho-socio-cultural factors common to participants with probable PTSD which may contribute to AUDs/SUDs risk.

Methods

Setting and Study Sample

This study was approved by the institutional review boards of participating institutions. Participants were recruited from primary care, mental health, substance use, and HIV clinics in Boston, Massachusetts, and Madrid and Barcelona, Spain, between July 2013 and August 2014. Clinics were community-based or safety-net health organizations serving diverse, often low-income Latino populations (demographics in Table 1).

Procedures

Research assistants recruited participants directly in clinic waiting rooms or by calling patients attending clinics and community agencies. After obtaining informed consent, research assistants conducted 90-min audio-recorded interviews. Participants were compensated with $40/30€ gift cards. Both the recruitment and interviews were conducted in Spanish.

Measures

The *Post-Traumatic Stress Disorder Checklist* (PCL-C) [20] is a 17-item self-report PTSD screen. Participants rate symptoms over the past month in relation to traumatic experiences. Likert scale ratings (1 = *not at all* to 5 = *extremely*) are scored to examine whether a participant meets PTSD criteria by identifying items selected for each criterion (re-experiencing, avoidance/numbing, and hyper-arousal symptoms) of the Diagnostic and Statistical Manual IV-TR (DSM-IV) diagnosis, and for severity of PTSD by summing items. Scores range from 17 to 85; the score of 50 or more indicates possible PTSD diagnosis. Internal consistency in the current study was $\alpha = 0.97$).

Symptom cluster variables were constructed by adding questions for each PTSD criterion as defined in the DSM-IV, since the study began before publication of DSM-V (i.e., at least one item for the re-experiencing cluster, at least three items for the avoidance cluster, and at least two items for the hyper-arousal cluster).

The *Brief Trauma Questionnaire* (BTQ) [21], a 10-item self-report measure, identifies participants exposed to different types of traumatic events, and whether events meet criterion A.1 for PTSD of the DSM-IV-TR [22]. Traumatic events included: war trauma, natural disasters, life threatening illnesses, car accidents, physical and sexual abuse, death of a loved one, and witnessing others being attacked. Participants answer "yes" or "no" to each item.

The *Alcohol Use Disorders Identification Test* (AUDIT) [23] is a 10-item scale developed by the World Health Organization to identify harmful and hazardous drinking. Three domains are assessed: quantity and frequency of alcohol intake, dependency symptoms, and alcohol related problems. Scores range from 0 to 40, with a score ≥ 10 denoting hazardous or harmful drinking ($\alpha = 0.90$).

The *Drug Abuse Screening Test-10* (DAST-10) [24] is a self-report measure that assesses substance abuse. "Yes" items are added, with scores from 0 to 10. A cut-off score of 3 indicates drug abuse or drug dependence ($\alpha = 0.91$). Hereafter, we use the terminology and criteria of DSM-V substance use disorder (SUD) when referring to diagnostic categories that subsumed what was previously substance abuse and substance dependence disorders found in DSM-IV. The terminology of "abuse" and "dependence" refer to the screening symptom cutoff scores for the DAST-10.

The *Benzodiazepines Dependence Questionnaire* (BDEPQ) [25] is a 30-item measure that asks participants about experiences with benzodiazepine tranquilizers, sedatives, and hypnotics over the last month. We selected 12 items with higher loading and face validity for Latinos. Items were summed. Higher scores denote problems with benzodiazepine dependence ($\alpha = 0.88$).

The *Patient Health Questionnaire* (PHQ-9) assesses nine criteria upon which a depression diagnosis is based, using DSM-IV criteria for major depressive disorder ($\alpha = 0.89$) [26].

The *General Anxiety Disorder 7* (GAD-7) is a brief clinical measure for the assessment of generalized anxiety ($\alpha = 0.90$) [27].

Table 1 Sample characteristics by PCL-C screening status (n = 562)

	PCL-C screening negative (n = 291)		PCL-C screening positive (n = 271)		*p* values
	% or mean	sd	% or mean	sd	
Socio-demographics					
Age group					
18–34	30 %		30 %		0.993
35+	70 %		70 %		
Gender					
Male	38 %		38 %		0.836
Female	62 %		62 %		
Race					
Nonwhite	80 %		73 %		0.096
White	20 %		27 %		
Economic status					
Live very well or comfortably	34 %		25 %		0.036
Live check-to-check or poor	66 %		75 %		
Clinical profile					
Depression (PHQ-9)	4.5	(3.90)	12.6	(5.77)	<0.001
Generalized anxiety (GAD-7)	3.1	(3.44)	9.6	(5.03)	<0.001
Drug misuse (DAST)	0.2	(0.87)	0.8	(2.08)	<0.001
Alcohol misuse (AUDIT)	3.5	(5.21)	7.5	(9.19)	<0.001
Benzodiazepines	0.8	(2.29)	4.7	(5.62)	<0.001
Any trauma exposure					
No	25 %		7 %		<0.001
Yes	75 %		93 %		
Psychosocial factors					
Citizenship					
Noncitizen	41 %		38 %		0.521
Citizen	59 %		62 %		
Sense of belonging					
No	20 %		40 %		<0.001
Yes	80 %		60 %		
Mean years in US/Spain	14.40	(9.63)	16.40	(11.52)	0.024
Number of home visits in the past 12 months	0.30	(0.69)	0.40	(0.72)	0.156
Discrimination scale	0.50	(1.06)	1.10	(1.31)	<0.001
Ethnic identity scale	9.70	(2.09)	9.20	(2.41)	0.007
Family conflict scale	1.00	(1.53)	2.50	(2.23)	<0.001

Experiences of discrimination in the host country over the last year were measured using three questions from the Family Environment Scale [28], translated into Spanish [29]. Responses on a 3-point Likert scale (from *rarely or never* to *frequently*) are summed. Higher scores indicate more discrimination experiences ($\alpha = 0.71$).

The *Ethnic Identity Scale* (EIS) is a 3-item measure derived from a subset of the Cultural Identify Scale for Latinos [30]. Responses are on a 4-point Likert scale. Lower scores indicate stronger ethnic identity ($\alpha = 0.78$).

The *Family Cultural Conflict Scale* is a 5-item measure derived from the Family/Culture Stress subscale of the Hispanic Stress Inventory (HIS) [31]. The scale measures cultural and intergenerational conflict in relation to disagreement between participant goals and values versus family goals and values. Responses are on a 0–2 Likert scale (from *rarely or never* to *frequently*). Higher scores indicate higher family conflict ($\alpha = 0.76$).

Sense of Belonging was assessed using one item of the Family/Culture subscale of the HIS; "*Do you feel like you*

do not belong to either your Latin country and U.S./ Spain?" [31]. Responses are on a 0–2 scale (from *rarely or never to frequently*); higher scores indicate poorer sense of belonging.

In prior studies, many of these measures, including the PCL-C, AUDIT, and HIS items, were adapted or validated for use with Spanish-speaking populations [29, 32–34].

Data Analysis

To address missing data in the variables of interest (less than 19 % missing on the DAST; five unanswered responses to the PCL-C, psychosocial and sociodemographic status variables), we implemented multiple imputations using the MI procedure in Stata [35]. This technique creates 20 complete datasets, imputes missing values using a chained equations approach, analyzes each dataset, combines estimates and adjusts standard errors for uncertainty due to imputation [36]. For the DAST, we imputed scores for a subset of patients who did not receive the full DAST module due to an incorrect questionnaire skip pattern, but reported use of substances elsewhere in the survey.

We calculated PCL-C frequency for the entire sample and separately for each site, and disaggregated the sample into subgroups by PCL-C screening status (positive or negative). We examined distributions of socio-demographics, clinical profile, and psychosocial factors between the groups to detect significant differences between subgroups by regression over PCL-C screening status (see Table 1).

To test the relationship of PTSD symptom clusters, socio-demographics, clinical profile and psychosocial factors with positive screen for alcohol and drug, we used logistic regressions to investigate these outcomes: alcohol misuse only, benzodiazepines misuse only, and drug (excluding benzodiazepines) misuse. Patients who positively screened for both alcohol and benzodiazepines were treated as benzodiazepine misuse, because we assumed that any combined use of benzodiazepines with alcohol could easily escalate to more harmful drug use. Patients who screened positively for both alcohol and non-benzodiazepines drug were treated as drug abuse. We categorized individuals with dual substance use problems to differentiate them from those with alcohol as a singular problem in the analyses. For each outcome, we fit models to a sample including participants without substance use problems and participants positive in that specific outcome. Our full model included clinical measures, PTSD symptom clusters, socio-demographics and psychosocial factors with interaction terms entered additionally as presented in Model (A) and Model (B). Model (A) examined interactions of age group and trauma/PCL-C; Model (B) tested interactions between gender and trauma/PCL-C. Omnibus test were used to detect the joint significance of the interactions. Several sensitivity analyses were conducted to test the robustness of the results. First, we ran analyses controlling for type of recruitment site to account for potential sample selection issues. In separate analyses, we categorized the status of immigrants as undocumented or documented instead of being a citizen or not, to test association to substance use problems. The relation between PTSD symptoms and multiple substance use was addressed by logistic models in a subsample of participants with multiple substance use problem and those without substance use problems. Lastly, we implemented all regressions in the unimputed sample to evaluate the consistency of findings.

We reported predicted probabilities of each outcome by clinical profile and socio-demographics based on estimates from the full model, taking into account significant cross products of PTSD clusters and socio-demographics. Predicted probability of each covariate was calculated while holding other covariates at sample means.

Results

Of the total sample, 47.8 % screened positive on the PCL-C: 53.7 % in Boston, 47.9 % in Madrid, and 43.8 % in Barcelona, with no significant differences between unadjusted rates detected across sites. Table 1 summarizes socio-demographics, clinical measures and psychosocial factors by PCL-C screening status. The only significant difference detected across groups was socioeconomic condition; those living paycheck-to-paycheck were more likely to score positively on the PCL-C. Individuals who scored positive on the PCL-C scored higher for symptoms of depression and generalized anxiety. Reported discrimination, elevated family conflict, lower ethnic identity, and lower sense of belonging were psychosocial factors significantly associated with positive screen in the PCL-C.

Each panel in Table 2 has an estimation of the likelihood of a specific positive AUD/SUD outcome and odds ratios of model predictors. For alcohol disorder (Panel 1), although positively correlated with higher odds (ORs > 1), most PTSD clusters remained non-significant after adjusting for individual confounding factors, i.e., age, gender, race, and economic status. Interactions for age group and PTSD clusters were significant in Model (A), suggesting that older participants (35+) with re-experiencing symptoms had elevated risk of alcohol disorder. Females that experienced numbing or avoidance, as suggested by Model (B), were more likely to engage in alcohol misuse. However, PTSD clusters jointly were not significantly related to alcohol misuse. Level of depression symptoms was positively associated with benzodiazepines misuse (Panel 2), but not with any of the PTSD clusters.

Table 2 Association between alcohol/drug positive, clinical, socio-demographics, and psychosocial factors (presented as odds ratios [OR]) (n = 562)

	Panel 1: alcohol misuse compared to no misuse (n = 370)		Panel 2: benzodiazepines misuse compared to no misuse (n = 360)		Panel 3: drug (other than benzodiazepines) misuse compared to no misuse (n = 332)	
	Model (A) (3)+ Interaction of PCL-C and age group	Model (B) (3)+ Interaction of PCL-C and Gender	Model (A) (3)+ Interaction of PCL-C and age group	Model (B) (3)+ Interaction of PCL-C and gender	Model (A) (3)+ Interaction of PCL-C and age group	Model (B) (3)+ Interaction of PCL-C and gender
Depression (PHQ-9)	1.06	1.12*	1.23***	1.26***	1.15	1.27**
	[0.95, 1.17]	[1.01, 1.24]	[1.09, 1.39]	[1.11, 1.44]	[0.98, 1.36]	[1.07, 1.51]
Generalized anxiety (GAD-7)	1.04	0.99	1.01	1.01	1.11	1.13
	[0.93, 1.16]	[0.89, 1.11]	[0.89, 1.13]	[0.89, 1.14]	[0.95, 1.30]	[0.95, 1.34]
Any trauma exposure	1.42	1.37	0.52	0.54	2.69	1.19
	[0.36, 5.61]	[0.43, 4.41]	[0.04, 6.49]	[0.05, 5.49]	[0.23, 31.66]	[0.09, 15.14]
Re-experiencing	0.30	1.84	1.15	1.28	1.39	0.48
	[0.06, 1.49]	[0.66, 5.17]	[0.12, 11.58]	[0.24, 6.96]	[0.29, 6.71]	[0.04, 5.95]
Numbing or Avoidance	2.30	0.11*	0.65	0.12*	0.76	0.00***
	[0.49, 10.86]	[0.02, 0.63]	[0.08, 5.52]	[0.02, 0.91]	[0.12, 4.98]	[0.00, 0.07]
Hyper-arousal	2.77	2.77	3.53	6.74	1.13	15.53*
	[0.52, 14.61]	[0.71, 10.75]	[0.38, 32.55]	[0.81, 56.26]	[0.19, 6.55]	[1.08, 223.91]
Sociodemographics						
Age group						
18–34 (ref)						
35+	0.81	0.78	0.09	1.38	0.08**	0.04***
	[0.17, 3.91]	[0.39, 1.56]	[0.00, 6.25]	[0.46, 4.12]	[0.01, 0.52]	[0.01, 0.16]
Female	0.25***	0.39	0.44	0.01*	0.28*	0.08*
	[0.13, 0.47]	[0.09, 1.74]	[0.19, 1.05]	[0.00, 0.84]	[0.09, 0.83]	[0.01, 0.64]
White	1.44	1.71	1.90	1.75	0.74	1.25
	[0.71, 2.90]	[0.85, 3.45]	[0.77, 4.69]	[0.70, 4.40]	[0.19, 2.92]	[0.30, 5.27]
Economic status						
Live very well or comfortably (ref)						
Live check-to-check	0.69	0.71	3.35	3.48	2.27	2.35
	[0.36, 1.34]	[0.36, 1.40]	[0.97, 11.54]	[1.00, 12.15]	[0.70, 7.43]	[0.63, 8.84]
Citizenship	1.03	1.00	0.83	0.80	0.28*	0.25
	[0.53, 1.98]	[0.52, 1.94]	[0.34, 2.06]	[0.32, 1.99]	[0.08, 0.96]	[0.06, 1.03]
Sense of belonging	0.90	0.98	0.86	1.15	0.89	1.01
	[0.44, 1.83]	[0.47, 2.04]	[0.34, 2.16]	[0.44, 2.98]	[0.25, 3.21]	[0.28, 3.64]
Mean years in US/ Spain	0.98	0.99	0.99	0.99	1.05	1.08*
	[0.94, 1.01]	[0.95, 1.02]	[0.95, 1.03]	[0.95, 1.03]	[0.99, 1.11]	[1.01, 1.16]
Number of home visits in the past 12 months	1.08	1.04	1.09	1.13	1.41	1.40
	[0.64, 1.82]	[0.62, 1.74]	[0.54, 2.23]	[0.50, 2.58]	[0.78, 2.55]	[0.71, 2.75]
Discrimination scale	0.90	0.89	1.10	1.14	0.65	0.63
	[0.67, 1.20]	[0.66, 1.19]	[0.80, 1.51]	[0.82, 1.59]	[0.39, 1.09]	[0.36, 1.11]
Ethnic identity scale	0.98	1.01	0.90	0.90	0.82	0.79
	[0.85, 1.13]	[0.88, 1.17]	[0.76, 1.07]	[0.76, 1.07]	[0.65, 1.04]	[0.63, 1.01]
Family conflict Scale	1.15	1.16	1.04	1.06	1.24	1.28
	[0.98, 1.37]	[0.99, 1.38]	[0.84, 1.28]	[0.86, 1.32]	[0.94, 1.65]	[0.95, 1.72]

Table 2 continued

	Panel 1: alcohol misuse compared to no misuse (n = 370)		Panel 2: benzodiazepines misuse compared to no misuse (n = 360)		Panel 3: drug (other than benzodiazepines) misuse compared to no misuse (n = 332)	
	Model (A) (3)+ Interaction of PCL-C and age group	Model (B) (3)+ Interaction of PCL-C and Gender	Model (A) (3)+ Interaction of PCL-C and age group	Model (B) (3)+ Interaction of PCL-C and gender	Model (A) (3)+ Interaction of PCL-C and age group	Model (B) (3)+ Interaction of PCL-C and gender
Interaction terms						
Trauma exposure # age group 35+	0.82 [0.14, 4.69]		8.42 [0.14, 524.49]		Omitted due to colinearity	
Re-experiencing # age group 35+	11.80** [1.92, 72.55]		3.20 [0.24, 42.11]		2.01 [0.16, 25.83]	
Numbing or avoidance = 1 # age group 35+	0.16 [0.02, 1.05]		1.00 [0.10, 10.26]		0.05 [0.00, 1.33]	
Hyper-arousal = 1 # age group 35+	0.23 [0.03, 1.63]		0.78 [0.07, 9.25]		1.68 [0.12, 24.44]	
Trauma exposure # female		0.53 [0.10, 2.84]		8.94 [0.12, 687.38]		Omitted due to colinearity
Re-experiencing # female		0.90 [0.20, 3.95]		5.44 [0.49, 60.19]		5.54 [0.25, 122.46]
Numbing or avoidance# female		15.89** [2.11, 119.49]		9.76* [1.04, 91.23]		544.69*** [14.23, 20846.97]
Hyper-arousal# female		0.15* [0.02, 0.98]		0.41 [0.04, 4.74]		0.01* [0.00, 0.46]
F statistics from omnibus test omnibus Test)	2.52*	2.18	*0.66*	2.24	1.14	4.03***
Degree of freedom	4	4	*4*	4	3	3

Sample is limited to patients with non-missing values in the PCL-C. Models were estimated based on one imputed data. 95 % Confidence Intervals (CIs) of ORs are reported in brackets

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Being female and living more years in the host country were positively related to drug misuse (Panel 3). Model (B) suggested older females (35+) were significantly less likely to misuse drugs than younger females. The interaction of gender and PTSD clusters were jointly significant; suggesting that females with symptoms of numbing or avoidance were significantly positively associated with drug misuse. Comparatively, females experiencing hyper-arousal were significantly less likely to misuse drugs. Because all patients age 35 and above and all females (except for one patient) reported a traumatic experience and problems with other drugs, interactions between age group (female) and trauma add no further information than age group (female) alone in predicting misuse. The tests for trauma and age, and trauma and gender, were omitted in Models (A) and (B). Adjusting for type of recruitment site, previous significant explanatory power of interactions was non-significant. This result was unsurprising because individual and clinical characteristics (i.e. substance clinics) were confounded with the recruitment sites chosen to optimize diversity of the patient sample.

Additional sensitivity analyses found that among PTSD clusters, only hyper-arousal was associated with higher odds of multiple substance use problems for both genders. As with citizenship status, undocumented status was not significant in predicting substance misuse. Estimates of similar magnitudes and significance levels were found in the sensitivity test using the unimputed sample.

Table 3 shows the predicted probabilities of misusing alcohol/drugs as a function of PTSD clusters and demographic characteristics. PTSD clusters were most related to misuse of benzodiazepines, as patients with re-experiencing symptoms or hyper-arousal symptoms were almost twice as likely as patients with no symptoms to report

Table 3 Predicted Probabilities (Presented as Average Marginal Effects) by PCL Clusters and Demographics from Logistic Regression Model (3)

	(1) Alcohol misuse	(2) Benzodiazepines misuse	(3) Other Drug Misuse (Excluding Benzodiazepines)
PCL clusters			
Re-experiencing			
No	0.11	0.03	0.01
Yes	0.17	0.08	0.01
Numbing or avoidance			
No	0.14	0.05	0.01
Yes	0.09	0.03	0.00
Hyper-arousal			
No	0.13	0.03	0.01
Yes	0.13	0.10	0.01
Age group			
18–34	0.14	0.03	0.08
35+	0.12	0.05	0.00
Gender			
Male	0.26	0.07	0.03
Female	0.08	0.03	0.01
PCL Clusters # Age Group			
Re-experiencing # 18–34	0.07	0.06	0.11
Re-experiencing # 35+	0.25	0.09	0.00
Numbing or avoidance # 18–34	0.24	0.02	0.02
Numbing or avoidance # 35+	0.06	0.03	0.00
Hyper-arousal # 18–34	0.26	0.07	0.07
Hyper-arousal # 35+	0.09	0.10	0.01
PCL Clusters # Gender			
Re-experiencing # male	0.32	0.13	0.02
Re-experiencing # female	0.11	0.06	0.01
Numbing or avoidance # male	0.19	0.05	0.00
Numbing or avoidance # female	0.06	0.02	0.01
Hyper-arousal # Male	0.26	0.15	0.25
Hyper-arousal # Female	0.08	0.06	0.00
Age group # gender			
18–34 Male	0.27	0.06	0.24
18–34 Female	0.09	0.02	0.05

misuse. Young adults were more likely to misuse other drugs than older adults. As expected, males were more likely to report alcohol, benzodiazepines, and other drug misuse than females.

Breaking down PTSD clusters by age group, young adults had consistently higher chances of misuse of other drugs regardless of PTSD symptoms, as shown in Table 3 column [3]. This relationship was not found in alcohol or benzodiazepine misuse. Reviewing the relationship of PTSD clusters to alcohol and drug use by gender, males with any PTSD clusters were generally more likely to have problematic alcohol and drug use. For other drug misuse, gender differences were small, partly because misuse in other drugs was rare overall.

Discussion

To our knowledge, this is one of the first studies examining the relationship between PTSD symptom clusters and AUDs/SUDs in Latino immigrants. Probable PTSD rate was high (47.8 %) across sites, comparable with rates of

PTSD found in other non-Latino specific populations: 32 % in hospitalized patients [37], more than 50 % in treatment-seeking populations with lifetime PTSD [38], 59–65 % in veteran samples [39], and 25–50 % in substance abuse treatment-seeking populations [10, 40]. However, the rates are substantially higher than other primary care population studies screening co-morbid PTSD: 11.8 % in a White middle-class sample being treated for depression, anxiety, and SUD [41], and 36–37 % among depressed veterans [42, 43]. The low prevalence rate of PTSD for the White sample correlated to fewer instances of personal trauma (e.g., injury, sexual abuse/assault) compared to war trauma experienced by veterans or migration trauma of immigrant Latinos.

In this study, participants who may have experienced challenges in migration adjustment were more likely to screen positive on the PCL-C. In unadjusted models, these individuals tended to have fewer economic resources and had lived longer in the U.S. or Spain. They were less likely to feel a sense of belonging and reported higher incidence of discrimination, weaker ethnic identity, and greater family conflict. A study using population data documented higher rates of perceived discrimination for more acculturated Latinos, i.e., with higher English-proficiency and greater integration in U.S. culture, particularly for Latinos arriving in the U.S. at younger ages with more time spent in the U.S. [44]. This constellation of characteristics suggests the need for greater material and social supports to ease adjustment for immigrant Latinos, thus buffering traumatic stress. Although the ability to address such supports in the clinical setting is limited, practitioners could enhance potential protective factors, including sense of belonging and ethnic identity.

Consistent with the literature, our results show high co-morbidity between PTSD symptoms, depression, anxiety, and AUDs/SUDs among Latino immigrants. Research shows that when PTSD does not improve or worsens after treatment of AUDs/SUDs, individuals risk relapse [11]. Moreover, improvements in substance problems do not guarantee PTSD improvements [45]. Therefore, we recommend that practitioners screen for PTSD when Latinos present with symptoms of depression, anxiety, and/or substance use problems and make appropriate referrals. Researchers recommend integrated treatment for both PTSD and AUDs/SUDs [46], which results in positive outcomes for both disorders [45, 47].

In adjusted tests of associations between PTSD symptom clusters and AUDs/SUDs, PTSD symptom clusters did not directly correlate with alcohol or drug use problems. However, gender and age moderated several associations. The association between re-experiencing and alcohol use problems showed males and older adults at greater risk for alcohol use problems. Females with numbing and avoidance symptoms had higher risk of having drug use problems other than benzodiazepine use problems, while hyper-arousal decreased the risk of having other drug problems. Given PTSD symptoms, this pattern of drug use suggests that females may use substances to relieve emotional numbing or to assist in avoiding trauma triggered memories, consistent with previous research [12]. Studies examining gender differences in the association between PTSD symptoms and AUDs/SUDs suggest that differences may be accounted for by the tendency of men to have greater difficulties understanding and differentiating emotional states, leading to more alcohol or substance use to manage PTSD symptoms [48]. Bornovalova and colleagues found that females with substance problems have difficulties controlling impulsive behavior when distressed [48]. Participants 35 years-old or older had five times the reduced risk of other drug problems. This may reflect generational patterns of drug use and impulsivity that put younger immigrants at greater risk for particular substance use, while older adults, particularly men, are at greater risk of social drinking turning into alcohol problems [49].

This study found any presence of PTSD symptom clusters as associated with increased risk of benzodiazepine misuse. Given the significant association between positive screen of depression and PTSD in this study, those with benzodiazepine misuse might be over-prescribed benzodiazepines. Valenstein and colleagues suggest that providers may prescribe benzodiazepines at a fairly high rate for depressed patients because they are continuing previously prescribed prescriptions, avoiding confrontation with patients requesting these medications, or because benzodiazepines serve as early symptom relievers and may increase likelihood of patient compliance with antidepressant treatments [50]. Participants with re-experiencing and hyper-arousal symptoms may be drawn to this type of drug for self-medication, increasing risk of use problems [51].

Limitations

Though the screener used in the current study provides an initial prevalence rate for trauma exposure and some information on types of trauma experience, inclusion of trauma type is beyond the scope of this paper. This initial investigation of symptom clusters incorporated a relatively large number of statistical tests, increasing the possibility of Type 1 errors; thus, we focus on results with p values of higher significance ($p < 0.01$). Inclusion of psychosocial factors added little explanatory results to our adjusted models; however, these constructs were significant in unadjusted models and have meaningful theoretical validity. Further investigation is necessary to understand whether non-significant findings reflect a more relatively homogeneous experience for Latino immigrants at risk for co-occurring

symptom clusters and substance use. The U.S. immigrant sample of Latinos on the East Coast lacks representation of those of Mexican or Cuban descent found in the west and the south. This, along with limited measurement of psychosocial constructs may explain the lack of findings related to psychosocial factors. We were unable to consistently gather reliable information regarding citizenship on legal status; however, research on low-income, recent Latino immigrants in the U.S. found that high levels of acculturative stress were not moderated by legal status [52].

Conclusion

Latino immigrants are a population at high risk for lifetime traumatic exposure(s) and for experiencing posttraumatic problems including PTSD, depression, anxiety, and alcohol and substance use. Rates of PTSD among Latino immigrants are closer to rates found in hospitalized [37] and veteran populations [39], much higher than non-immigrant populations in primary care [41]. Because trauma-exposed Latino men are at high risk for AUDs/SUDs, we recommend early interventions, with attention to the role of masculine ideology as a potential risk factor. Additionally, Latino immigrants with PTSD symptoms may be at risk of developing benzodiazepine use problems. We recommend that practitioners follow these patients closely to monitor use and continued need for benzodiazepine treatment. Benzodiazepines are not considered evidence-based treatments for PTSD [53]. Furthermore, important differences appeared in the association of specific symptom clusters with AUDs/SUDS and risk variations by gender and age, suggesting a need to develop risk profiles and screening protocols for use in prevention and treatment interventions for specific subgroups of Latino immigrants.

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Compliance with Ethical Standards

Conflict of interest No conflicts of interest are declared.

Ethics Approval The study was approved by the institutional review boards of the Cambridge Health Alliance in Somerville, MA, the Massachusetts General Hospital in Boston, MA, the Fundación Jimenez Diaz in Madrid and Vall D'Hebron University Hospital in Barcelona.

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