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Original research

The association between substance use and depressive symptomatology in nursing university students in Mexico

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ABSTRACT

The present study represents an *ex post facto* non-experimental study of undergraduate nursing students (N = 1,176) residing in Mexico whereby we examined the association between substance use and depressive symptomatology. The sample was composed primarily of women (70.1%), between the ages of 18 and 23 years (89.5%). Outcomes suggest a significant association between current clinically relevant depressive symptomatology 3-month marijuana, alcohol, and sedative use. Additionally, current depressive symptomatology was significantly associated with lifetime alcohol and sedative use. Lastly, current depressive symptomatology was significantly associated with both moderate/high risk level due to alcohol and sedative use. The present study is innovative as it examines possible associations between depressive symptomatology and 10 classes of substances concurrently for a group that is largely understudied, further contributing to the international literature in this area. Findings are discussed with regards to study limitations.

1. Background

The relationship between substance use disorders (SUDs) and depression has been well-established (Baker et al., 2012; Grant, 1995; Grant et al., 2004; Kessler et al., 1996; Merikangas et al., 1998; Regier et al., 1990; Swendsen et al., 2010; Trinkoff et al., 2000). Co-occurring substance use and depressive symptomatology may result in significant impairments to individuals and health care organizations - an area of importance for the nursing workforce who often practice in high-intensity settings (Rushton et al., 2015). Understanding, preventing, and reducing the presence of substance use and depressive symptomatology in nurses and nursing students is important for the overall functioning and wellbeing of the workforce. Thus, in line with international calls to action to increase attention to substance use (American Nurses Association, 2016; Strobbe and Crowley, 2017) and depression in nurses (Brandford and Reed, 2016), the results presented herein represent an initial step toward understanding the association between these disorders in Mexican university nursing students, thereby contributing to the international literature in this area.

1.1. Substance use by nurses

Health professionals, most commonly nurses, have been noted in the international literature as a group especially at risk for utilizing substances (Bell et al., 1999; Trinkoff et al., 2000). Nursing students are a population of interest as they represent the future workforce. Attention to this area suggests substance use by nursing students is a pressing concern internationally, including the United States (Kenna and Wood, 2004), Iran (Ahmadi et al., 2004), Brazil (Rassool et al., 2006), Hungary (Pikó, 1999), Chile (Romero et al., 2009), and Mexico (Armendáriz et al., 2014; García et al., 2014; Pinos et al., 2008), among others. For example, in Latin America, in a sample of first-year nursing students, benzodiazepine use prevalence has been estimated at 10.5% for lifetime use, 6.1% for past-year use, and 3.9% for last-month use (Pinos et al., 2008). Moreover, a study of Mexican first-year university students enrolled in a nursing program found approximately 28.2% reported lifetime tobacco use and 23.3% reported use during the previous month (García et al., 2014). Alcohol use is also high, with estimated rates of consumption at 92.2% for lifetime use, 85.1% for past-year use, and 60.4% for past-month use in a sample of Mexican university students (Armendáriz et al., 2014). Recent work utilizing the same sample of nursing students as the present study (Tiburcio, et al., 2016) reported 3-

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month prevalence of substance use ranged from 0.3% (opioids) to 8.1% (marijuana).

The high prevalence of substance use by nurses has led to increased research aimed at understanding risk and protective factors, to guide intervention efforts. Proposed risk factors for substance consumption include access to substances through the workplace (Trinkoff et al., 1999), frequency of prescribing (Hughes, 1990), perceived availability of substances (Gfroerer, 1994), familiarity with and knowledge about substances, and "pharmacological optimism" (i.e., attitudes and beliefs that consuming substances is an acceptable means by which to alter feelings, Brewster, 1994; Buxton, 1982). One theory of interest in the discussion of risk factors for substance use in nurses is Winik's (1980, cited in Trinkoff et al., 2000) theory of drug dependence, which has been garnered empirical support as an explanation for substance use in nurses. Winik posits individuals who (a) have access to substances, (b) experience freedom from proscriptions against their use, and (c) experience role strain are at higher risk of having drug dependence. Nursing students conceivably experience the first and the latter components of this theory, thus putting them at higher risk for consuming substances.

1.2. Depressive symptomatology in nurses

Depression is common worldwide (World Health Organization [WHO], 2012), and it represents an even more significant challenge within the nursing workforce who evidence elevated rates (Brandford and Reed, 2016). International research in this area, carried out in several countries, including the U.S., Australia, Canada, China, England, Japan, Norway, Taiwan, and the Caribbean countries of St. Vincent and Trinidad and Tobago, indicates that depression represents a significant problem within the nursing workforce (Brandford and Reed, 2016). Moreover, the state of the science in this area is nascent and thus further rigorous research studies aimed at better understanding the scope and depth of the problem would contribute to the development of infrastructure to address this area of concern (Brandford and Reed, 2016).

The presence of depressive symptomatology in nursing students is equally a pressing issue. For example, studies carried out in Latin America with nursing students have found approximately 60% report depressive symptomatology ranging from low to severe, and 15% have attempted suicide, both of which represent higher percentages than in the general population (Amézquita et al., 2003). Additionally, recent research on Mexican university students of numerous bachelor's programs, including nursing, indicates that approximately 12.4% of the participants evidence clinically significant symptomatology suggestive of a major depressive episode (MDE), and 27.3% have depressive symptomatology not meeting diagnostic threshold for MDE (González et al., 2012; Jiménez, Wagner, Heredia & González, 2015). Taken together, these findings point to the need for a better understanding of depressive symptomatology specifically in university nursing students.

There may be contextual factors that represent protective and risk factors for the development of depressive symptomatology within nursing students specifically. Depressive symptomatology has been linked to high levels of stress such as workplace stress, exhausting work schedules, distress, and tension (Martínez et al., 2005), which are of particular importance when considering that nursing is a profession that can be demanding (Rushton et al., 2015; Trinkoff et al., 2000).

1.3. The association between substance use and depressive symptomatology

Substance use and depression commonly co-occur in adults, a finding that has been well-documented internationally. For example, results from the *International Consortium in Psychiatric Epidemiology* (comprising samples from the US, Mexico, Germany, the Netherlands, and Canada) found that having any depressive disorder was significantly associated with substance use problems, and dependence (Merikangas et al., 1998). Further, research on the epidemiology of dual diagnosis reveals the association between these disorders is reciprocal (Kessler, 2004). Some studies have garnered support for the temporal relationship of substance use preceding depressive symptomatology (Brown et al., 1997) while other indicates depressive symptomatology precedes substance use (Hesselbrock et al., 1986; Moss et al., 2015; Bradizza et al., 2006; Kessler, 2004). Regardless of the temporal relationship, the co-morbidity between these two disorder classes is relevant.

1.4. Functional impairment due to substance use and depressive symptomatology

The co-occurring presence of substance use and depressive symptomatology have important implications for the functioning of the nursing workforce. Depression can greatly impair an individual's functioning, sleep disturbance, fatigue, lack of concentration (Medina-Mora et al., 2008). Depression is associated with increases in work absenteeism (pattern of absences from work, usually unplanned), short-term disability, decreased productivity, and presenteeism (being physically present at work, but not functioning at full capacity due to a physical or psychological condition; CDC, 2012). Similarly, substance use by nurses has been linked with threat to patient safety (Bennett and O'Donovan, 2001; Bush and Autry, 2002), unreliability, absenteeism, voluntary resignation, and termination from an employer (Bush and Autry, 2002). Importantly, the impact of substance use on individuals depends on the level of frequency and intensity of use. Together, substance use and depressive symptomatology may amplify the impact. Findings from the *Global Burden of Disease Study (2010)* indicate that worldwide, mental and substance use disorders combined represent the fifth leading disorder category of global disability-adjusted life years (Whiteford et al., 2013). The presence of co-occurring disorders evidence higher rates of suicide, impairment, disability, and severity and persistence of both disorders (Davis et al., 2008; Kessler, 2004; Ortíz-Gómez et al., 2014).

1.5. Aims of the present study

While a growing international literature documents the link between substance use and depressive symptomatology, especially within the healthcare workforce, our review of the literature indicates no such study has been conducted for Mexican nursing students. Characterizing the relationship between these co-occurring disorder categories in Mexico represents a first step toward furthering knowledge in this area, which may be crucial for understanding the scope and depth of problems within this group to synergize with ongoing international efforts to document and target this area of need. Ultimately, research in this area may inform the development of interventions and policies aimed at decreasing their prevalence and impact on the productivity and well-being of the incoming nursing workforce. Thus, the aims of the current study are three-fold. First, as an initial step toward understanding the predictive association between substance use and depressive symptomatology, we explored the relationship between lifetime substance use and current depressive symptomatology. Second, to understand the comorbidity between the variables of interest, we explored the relationship between past 3-month substance use and current depressive symptomatology. Third, to understand the role of sociodemographic characteristics and substance use risk in depressive symptomatology, we explored the extent to which age, marital status, and employment status and substance use risk predict current depressive symptomatology.

2. Methods

2.1. Participants

The present study conducted secondary analyses on a sample of Mexican undergraduate nursing students (N = 1,176) who participated in a larger *ex post facto* non-experimental study aimed at determining the psychometric properties of a self-administered version of the ASSIST for university students in the health-care field. Complete protocol information is presented elsewhere (Tiburcio, et al., 2016). The broader purpose was to develop as self care prevention program focused on mental health after needs assessment community diagnosis (Rosete, 2006).

2.2. Measures

Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST) (WHO ASSIST Working Group, 2002). The ASSIST is an eight-item screening tool for substance use that identifies the use of 10 substance categories (i.e., tobacco, alcohol, marijuana, cocaine, amphetamine-type stimulants, inhalants, sedatives, hallucinogens, opioids, other drugs) in the past 3 months. The ASSIST measures risk level for each substance category and places individuals into low risk (0–3 points for most substances; 0–10 for alcohol), moderate risk (4–26 points; 11–26 for alcohol), or high risk (> 26 points) by calculating a sum score for the measure (with the exception of the first question, which asks about lifetime use of a substance and is used as a screening item to proceed with the rest). The ASSIST has evidenced acceptable validity and reliability (Hides et al., 2009; Humeniuk et al., 2008; Khan et al., 2011). The Spanish version of the ASSIST in Mexico has also evidenced it is a valid measure for this population with an alpha of 0.87 for the full scale (Tiburcio, et al., 2016).

Center for Epidemiological Studies Depression Scale (CES-D) (Radloff, 1977). The CES-D is a screening tool for depressive symptomatology (affective, psychological, and somatic symptoms), with an emphasis on depressed mood, over the past week. The instrument consists of 20 questions on a Likert-type scale, with scores ranging from zero to 60. The Spanish version of the CES-D in Mexico has evidenced adequate internal consistency reliability, test–retest reliability, and concurrent validity (González et al., 2011; Masten et al., 1986). In this population, it presented an adequate internal consistency with a Cronbach's alpha equal to .91, and good exploratory factorial validity, which explains 58.2% of the total variance (KMO = .94, and Bartlett's sphericity test = .000). Previous research has generally supported a cut-off score of 16 to indicate a probable clinical depression (Boyd et al., 1982; Weissman et al., 1977).

2.3. Data analysis

In order to elucidate the relationship between lifetime substance use, 3-month substance use and current depressive symptomatology, we conducted two-by-two X^2 tests for independence with Yates Continuity Correction for each of the 10 substance categories of the ASSIST (reported lifetime substance use/did not report lifetime substance use, consumed a substance in the last 3 months/did not consume a substance in the last 3 months) and depressive symptomatology via CES-D score (< 16 points, > 16 points). The effect size was assessed using Cohen (1988) criteria of 0.10 for small effect, 0.30 for medium effect and 0.50 for large effect.

To assess the impact of sociodemographic variables and substance use risk levels on the likelihood that respondents would report clinically significant depressive symptomatology, we carried out a direct logistic regression. The predictor variables were two risk categories (i.e., low risk, moderate/high risk) for each of the 10 substances explored in the ASSIST, we combined the moderate and high risk individuals into a single category to maximize the robustness of the analysis as there were few moderate and high risk users within many of the substance categories, age (18–20 years, 21–23 years, 24–26 years, 27–30 years, 30 + years), marital status (single, married, separated), and employment status (unemployed, part-time, full-time, only work on the weekends). The outcome variable was the CES-D score (< 16 points, > 16 points). The model contained 32 independent variables, representing three sociodemographic variables and 10 substances.

3. Results

3.1. Sample characteristics

The sample was composed primarily of women (70.1%) between the ages of 18 and 23 years (89.5%), and who were single (87.5%). Complete sample demographic characteristic and substance use frequencies are presented elsewhere (Tiburcio, et al., 2016). Regarding depressive symptomatology, using a cut-off score of 16, results indicated approximately 24% demonstrated signs of a probable clinical depression. The mean score for the CES-D for the entire sample was 12.07 (SD = 9.81), with higher scores in women (M = 12.71; SD = 10.33) compared to men (M = 10.52; SD = 8.17).

3.2. Lifetime substance use and current depressive symptomatology

Results show significant associations between depression level and lifetime use of sedatives (χ^2 [1, n = 917] = 27.121, p < 0.001, phi = 0.177), such that individuals with any lifetime use of sedatives tended to have probable current depression, this difference was equivalent to a small to medium effect. No significant associations were found between probable depression and lifetime use of the other substances considered, however, tobacco, alcohol and stimulants evidenced trends toward significance (Table 1).

3.3. Three-month substance use and current depressive symptomatology

As to the relationship between 3-month substance use and depressive symptomatology, the analysis yielded significant associations with alcohol (χ^2 [1, n = 915] = 4.857, p = 0.028, phi = 0.076) equivalent to a less than small effect; marijuana (χ^2[1, n = 918] = 5.451, p = 0.020, phi = 0.082) equivalent to a less than small effect, and sedatives(χ^2[1, n = 919] = 14.774, p < 0.001, phi = 0.133), equivalent to a small to moderate effect. We are not able to report on the results for cocaine, stimulants, inhalants, hallucinogens, opiates, and other substances due to insufficient cases (Table 2).

3.4. Association between sociodemographic variables, substance use risk level, and clinically-relevant depressive symptomatology

The full model containing all predictors was statistically significant (χ^2[19, n = 710] = 49.063, p < 0.001) indicating that the model was able to distinguish between respondents who had a probable clinical depression and those who did not. The model as a whole explained between 6.7% (Cox and Snell R square) and 9.9% (Nagelkerke R squared) of the variance in depressive symptomatology, and correctly classified 76.2% of cases. The strongest predictor of having clinically significant depressive symptomatology was moderate/high sedative use risk level (OR = 6.132, CI = 1.549–24.270), followed by age group 27–30 years old (OR = 2.903, CI = 1.027–8.207), age group 24 to 26 years old (OR = 2.357, CI = 1.215–4.574), and moderate/high risk alcohol use (OR = 2.166, CI = 1.352–3.472) (Table 3). We could not perform *post hoc* analysis of these relationships due to insufficient cases in some categories.

4. Discussion

The present study sought to understand the relationship between

Table 1
Lifetime substance use and depressive symptomatology.

		CES-D Score: n (%)		χ^2	Sig.	Phi
		< 16 pts.	< 16 pts.			
Tobacco[c]	Yes	442 (48.2%)	148 (16.1%)	.923[e]	.337	.034
	No	255 (27.8%)	72 (7.9%)			
Alcohol[b]	Yes	606 (66%)	201 (21.9%)	3.272[e]	.070	.064
	No	91 (9.9%)	18 (2%)			
Marijuana[a]	Yes	148 (16.2%)	60 (6.6%)	3.068[e]	.080	.061
	No	547 (59.8%)	160 (17.5%)			
Cocaine[b]	Yes	21 (2.3%)	10 (1.1%)	.800[e]	.371	.037
	No	676 (73.8%)	209 (22.8%)			
Stimulants[d]	Yes	22 (2.4%)	13 (1.4%)	2.757[e]	.097	.061
	No	676 (73.6%)	207 (22.5%)			
Inhalants[d]	Yes	20 (2.2%)	10 (1.1%)	.978[e]	.323	.040
	No	677 (73.7%)	211 (23%)			
Sedatives[c]	Yes	40 (4.4%)	38 (4.1%)	27.121[e]	< .001**	.177
	No	657 (71.6%)	182 (19.8%)			
Hallucinogens[c]	Yes	19 (2.1%)	7 (0.8%)	.015[e]	.903	.012
	No	678 (73.9%)	213 (23.2%)			
Opiates[b]	Yes	11 (1.2%)	5 (0.5%)	.151[e]	.698	.023
	No	685 (74.8%)	215 (23.5%)			
Other[b]	Yes	10 (1.1%)	7 (0.8%)	1.919[e]	.166	.055
	No	686 (74.9%)	213 (23.3%)			

[a]n = 915, [b]n = 916, [c]n = 917, [d]n = 918.
*p ≤ 0.05, **p ≤ 0.01.
Note. CES-D < 16 indicates clinical depression is not probable. CES-D > 16 indicates clinical depression is probable.

Table 2
Chi-square tests for 3-month substance use and depressive symptomatology.

		CES-D Score: n (%)		χ^2	Sig.	Phi
		< 16 pts.	> 16 pts.			
Tobacco[a]	Yes	291 (31.8%)	104 (11.4%)	1.774[d]	0.183	.047
	No	404 (44.2%)	116 (12.7%			
Alcohol[a]	Yes	516 (56.4%)	180 (19.7%)	4.857[d]	0.028*	.076
	No	179 (19.6%)	40 (4.4%)			
Marijuana[b]	Yes	51 (5.6%)	28 (3.1%)	5.451[d]	0.020*	.082
	No	646 (70.4%)	193 (21%)			
Sedatives[c]	Yes	21 (2.3%)	21 (2.3%)	14.774[d]	0.001**	.133
	No	677 (73.7%)	200 (21.8%)			

[a]n = 915, [b]n = 918, [c]n = 919.
*p ≤ 0.05, **p ≤ 0.001.
Note. CES-D < 16 indicates clinical depression is not probable. CES-D > 16 indicates clinical depression is probable.
Results for cocaine, stimulants, inhalants, hallucinogens, opiates, and other substances were excluded due to insufficient cases.

substance use and depressive symptomatology in a sample of Mexican nursing undergraduate students; it represents advancement in the field as it examined risk level due to substance use in a group that has been largely understudied.

The findings consistently indicated an association between sedative use and depressive symptomatology, such that individuals who used this substance during their lifetime, in the last 3 months, and who are higher risk users are more likely to have probable clinical depression. This relationship was supported through Chi-square analyses and logistic regression. Previous literature has proposed a link between sedative use and health care workers and thus to that extent our analyses replicate those findings (Chen et al., 2014; Pinos et al., 2008).

A second main finding from the present study is the association between alcohol use and depressive symptomatology such that those who reported lifetime, 3-month, and high risk alcohol use were more likely to have a probable clinical depression. This association has been well-cited in the literature (Bradizza et al., 2006; Marín et al., 2013), and thus our finding also provides support for this link. The last finding from the present analyses indicated there was an association between 3-month marijuana use and depressive symptomatology such that those who reported consuming marijuana in the last 3 months were more likely to have a probable clinical depression.

One possible explanation for the link between these substances use and depression is that some of the physiological and psychological effects (e.g., slurred speech, impairments to cognition, neurochemical impacts) and withdrawal symptoms (e.g., psychomotor agitation, insomnia) from these depressant substances (e.g., sedatives, alcohol, marijuana) coincide with depressive symptomatology (e.g., psychomotor retardation; psychomotor agitation; insomnia; inhibition of excitatory neurotransmitters; APA, 2013; Grant et al., 2004) and thus might be picked up by the CES-D.

While the symptoms of intoxication and withdrawal for sedatives, alcohol, and marijuana may partly explain the finding of higher depression, the same rationale could be applied to other classes of substance that did not evidence significant findings such as opiates. Our analyses did not yield significant associations with other substances due to few cases of individuals using those substances, let alone those who experience significant problems that might have been picked up by the ASSIST. Moreover, as previously mentioned, there is an inverse relationship between depressive symptomatology and substance use in Mexican men and women, which compounded with low levels of substance use, might have added to the problem of a non-normal distribution of scores on our instruments. Thus, future studies ought to recruit more gender-balanced samples as well as screen for level of substance use in order to detect statistically and clinically significant differences.

In searching for alternative explanations for our findings, aspects of Winik's (1980) theory of drug dependence (previously mentioned) may be especially useful. Our sample is composed of nursing students, who conceivably have access to addictive substances through clinical practice and training. Furthermore, the sociodemographic information (Tiburcio, et al., 2016) points to the conclusion most of the students in the sample have to balance multiple demands on their time as the majority both attended classes and also worked. Role strain might also, in part, explain elevated rates of depressive symptomatology. Additionally, anecdotal evidence indicates many of the students in our sample experience long commutes to attend university in a city that is densely populated – another factor that may play a role with regards to

Table 3
Logistic regression predicting likelihood of depression with sociodemographic variables.

	B	S.E.	Wald	df	Sig.	Odds Ratio	95% C.I. for Odds Ratio	
							Lower	Upper
Age			9.177	4	.057			
18–20 yrs old	Ref.							
21–23 yrs old	.332	.202	2.697	1	.101	1.394	.938	2.073
24–26 yrs old	.857	.338	6.427	1	.011*	2.357	1.215	4.574
27–30 yrs old	1.066	.530	4.038	1	.044*	2.903	1.027	8.207
30 + yrs old	.694	.747	.863	1	.353	2.002	.463	8.664
Marital status			.604	2	.739			
Single	Ref.							
Married	.240	.314	.581	1	.446	1.271	.686	2.353
Separated	.143	.570	.063	1	.801	1.154	.378	3.526
Employment			3.040	3	.386			
Unemployed	Ref.							
Part-time	.196	.283	.482	1	.488	1.217	.699	2.119
Full-time	-.546	.382	2.046	1	.153	.579	.274	1.224
Weekends	-.113	.301	.141	1	.707	.893	.495	1.611
Tobacco								
Tob low risk	Ref.							
Tob mod/high risk	.154	.205	.567	1	.452	1.167	.781	1.742
Alcohol								
Alc low risk	Ref.							
Alc mod/high risk	.773	.241	10.321	1	.001**	2.166	1.352	3.472
Marijuana								
MJ low risk	Ref.							
MJ mod/high risk	-.321	.429	.560	1	.454	.726	.313	1.681
Cocaine								
Coc low risk	Ref.							
Coc mod/high risk	.256	1.392	.034	1	.854	1.291	.084	19.773
Stimulants								
Stim low risk	Ref.							
Stim mod/high risk	1.322	.999	1.751	1	.186	3.751	.529	26.573
Inhalants								
Inha low risk	Ref.							
Inha mod/high risk	.449	1.444	.097	1	.756	1.567	.092	26.561
Sedatives								
Seds low risk	Ref.							
Seds mod/high risk	1.814	.702	6.675	1	.010*	6.132	1.549	24.270
Hallucinogens								
Halluc low risk	Ref.							
Halluc mod/high risk	-.282	1.490	.036	1	.850	.754	.041	13.998
Opiates								
Opi low risk	Ref.							
Opi mod/high risk	−4.369	2.417	3.267	1	.071	.013	.000	1.445
Other								
Other low risk	Ref.							
Other mod/high risk	.502	1.259	.159	1	.690	1.653	.140	19.497
Constant	−1.627	.161	102.799	1	.000	.196		

*p ≤ 0.05, **p ≤ 0.01.

role strain.

Nursing students who use substances – namely sedatives, alcohol, and marijuana – may be at higher risk for depression. The ASSIST total score does take into account a degree of functional impairment (e.g., interpersonal, occupational, health, legal). However, it consists of self-reported data and thus is not an objective measure. It is unknown to what degree these subjective ratings would coincide with objective ratings of impairment. Thus, future studies ought to include an objective measure of functional impairment.

One interesting finding indicates individuals who fall within 24 and 30 years are at higher risk for experiencing higher levels of depressive symptomatology. Individuals over 24 years of age are generally non-traditional undergraduate nursing students in Mexico. It is possible these individuals face different stressors and role strain, compared to other subjects. However, being in an age group of individuals over the age of 30 was not a significant predictor of clinically relevant depressive symptomatology. Alternatively, rather than the possibility that being 24–30 years of age increases an individual's chances of having clinically relevant depressive symptomatology, it could be other age groups had a relatively small prevalence of clinically relevant depressive symptomatology. Additionally, the increase in risk for experiencing depressive symptomatology in these ages might be driven by higher rates of substance use. Another alternative explanation is that life pressures due to role strain may contribute to depressive symptoms. It is also possible there is at least one confounding variable driving these results. However, our inability to conduct post-hoc analyses due to insufficient cases in some categories limits our ability to answer this question.

The main findings yielded from this study ought to be considered in the context of significant limitations. First, results are based on self-report of unlawful and stigmatizing behavior and/or symptoms, which may result in an underestimate within our sample. However, biological substance screens are costly and time-ineffective. Thus, these results represent a first step in filling the gap in the literature in this area.

A second limitation worth mentioning is that our survey is limited in its generalizability, as it was carried out in a sample of nursing undergraduate students who were primarily women. It is important to note, however, there exists a dearth of evidence on the substance use

and depressive symptomatology patterns within this population in Mexico, thus these results begin to shed light on a population that is understudied.

A major empirical question concerns the temporal relationship between substance use and depressive symptomatology. A third limitation of our study is its cross-sectional design, which limits our ability to make any causal inferences. At best, we are able to detect the presence of co-occurring symptomatology. Thus, future research conducted in this population must be longitudinal in order to elucidate further the aforementioned relationship. However, even longitudinal designs might face that challenge of self-reporting bias.

Fourth, a large limitation of the current study is that results consisted of scores on screening instruments, versus diagnostic tools. While we are not able to fully discern what percentage of our sample met diagnostic criteria for substance use disorders or depressive disorders, our analyses and subsequent interpretations are based on a conservative estimate based on the cut-off used on the CES-D, and thus we believe it indicates clinically-relevant symptomatology in these areas. Thus, the present study extends our knowledge of the association between substance use and depressive symptomatology in Mexican nursing students.

The present study findings highlight important mental health concerns in this population for various reasons. First, Mexico's university students have evidenced a steadily rising prevalence of substance use in recent years (Quiroga et al., 2003; Villatoro et al., 2012). Secondly, this developmental period (i.e., young adulthood, attending university) represents a time full of risk factors that could increase the odds of developing depression or substance use disorders. Third, our sample was composed of students in the health care field, and it is arguably more important that they are not impacted by substance use and depressive symptomatology as this may have deleterious effects on the care they provide to their patients; it is paramount to develop self-care strategies when caring others, a practice that nursing students often fail (Stark et al., 2005) as our results suggest. Fourth, while numerous evidence-based treatments exist for substance use disorders and for depression, none exist yet that target both areas simultaneously. This is of importance in a country, such as Mexico, that faces challenges in infrastructure in the mental health field that would facilitate the implementation and dissemination of such treatments. Lastly, our results relied on data collected through screening measures. While low-levels of substance use and depressive symptomatology were detected, it is important to intervene to prevent these symptoms from becoming full-blown clinical diagnoses. In addition to the deleterious effects substances can have on an individual's social, occupational, physical, and psychological function (WHO, 2004), other factors increase the urgency of intervening to ameliorate or prevent this phenomenon from taking place. Screening, brief intervention and referral to treatment (SBIRT) programs might represent a feasible option to identify and reduce the risk of developing more severe substance use problems among nursing students. Exposing this population to SBIRT during their formative years might increase the probability that they will apply this strategy as a part of their everyday clinical practice (Agley et al., 2016). Thus, it is important to revise the academic nursing curricula to ensure the inclusion of subjects devoted to mental health and substance use problems.

Specifically, substance use by nurses can impact their ability to adequately provide quality health services to others as well as it is behavior that constitutes a violation of ethical and professional standards (Trinkoff and Storr, 1998).

Conflicts of interest

All authors declare that they have no conflicts of interest.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.nepr.2019.03.005.

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