




The Association Between Substance Use Disorder and Depression During the COVID-19 Lockdown in Spain and the Moderating Role of Social Support: a Cross-Sectional Study

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Abstract

Substance use disorder is on the rise; it has increased massively during the COVID-19 lockdown and has been found as a risk factor for depressive symptoms and major depressive disorder. Less is known about the hypothetical moderating effect of social support in that association. Three thousand five hundred Spanish adults were interviewed by phone during the COVID-19 lockdown (May–June 2020). The 8-item Patient Health Questionnaire Depression Scale (PHQ-8) was used to measure the symptoms of depression. The CAGE Adapted to Include Drugs (CAGE-AID) questionnaire was used to assess substance use disorder during the previous month. Social support was measured through the Oslo Social Support Scale (OSSS-3). Regression models were constructed to assess factors related to depressive symptoms. People with substance use disorder (alcohol and drugs) showed considerable high levels of depressive symptoms, particularly among those with low levels of social support, which reported levels above major depressive disorder cut-off.

Keywords Depressive symptoms · Major depressive disorder · COVID-19 lockdown · Social support · Substance use disorder · Spain

The COVID-19 pandemic, social restriction measures, and associated socioeconomic consequences have all had a detrimental effect on mental health. In particular, the development of anxiety, depressive symptoms, and psychological distress has increased in the COVID-19 pandemic context (Rajkumar, 2020; Vindegaard & Benros, 2020). In addition, increases in substance use disorder have also been reported during the pandemic (Czeisler et al., 2020). For instance, previous research found increases in alcohol use by 23% and drug use by 16% (Taylor et al., 2021). Moreover, the social restriction measures have been

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associated with social disconnectedness (e.g., decrease in social support and increase in feelings of loneliness) (Hwang et al., 2020).

Among mental health problems, depression is one the most prevalent disorders, and it has a great impact on the global burden of disease. The prevalence of depression in Spain was estimated at 5.2% by the WHO (World Health Organization, 2017). And it has been shown to occur more frequently among women, middle-aged people, in poor health, and with low educational levels (Haro et al., 2006).

Substance use disorder is more frequent among males and those with low education levels. Whereas young people between 16 and 35 years of age report a higher percentage of cocaine and cannabis use, older adults report more frequent daily consumption of alcoholic beverages. In Spain, the prevalence of substance use disorder ranges from 11 for alcohol to 2% for cocaine among the active population (Spanish Drug Observatory, 2015).

Several researchers have reported that substance use disorder is related to depressive symptoms (Alsheikh et al., 2020; Esmaeizadeh et al., 2018), and the directionality of substance use-depression comorbidity varies depending on the substance used (Boden & Fergusson, 2011).

People with major depressive disorder and comorbid substance use disorder suffer from greater depression severity, worse illness course, poorer recovery rates from both disorders (Blanco et al., 2012; Hasin et al., 2002), and increased frequency of suicide attempts (Davis et al., 2005). According to a recent systematic review and meta-analysis, the prevalence of any substance use disorder in individuals with MDD was 0.250. Maximum prevalence was found with alcohol use disorder, followed by illicit drug disorder and cannabis use disorder. The pooled prevalence in men was significantly higher than in women (Hunt et al., 2020).

It is widely recognized that social support is a protective factor for mental health (Gariépy et al., 2016), and particularly for depression (Li et al., 2021). Previous studies have also detected a moderating effect of social support on the association of several risk factors such as feelings of loneliness (Domènech-Abella et al., 2017), economic stress factors (Viseu et al., 2018), and physical health (Liu et al., 2021) with depression. Moreover, social support may reduce internalized stigma and improve mental health among people with substance use disorder problems (Birtel et al., 2017). However, information concerning the moderating effect of social support on the association between substance use disorder and depression is lacking.

The study was conducted just after the first COVID-19 lockdown in Spain that started in March 2020. The objectives of the present study were first to test whether substance use disorder is a risk factor for depressive symptoms, secondly, to determine if social support is a protective factor for depressive symptoms, and finally, to examine the moderating effect of social support on the association between substance use disorder and depressive symptomatology.

Material and Methods

Study Design

The data come from a cross-sectional survey of a random sample of the adult non-institutionalized population in Spain, as part of the MIND/COVID project (www.mindcovid.org). Survey's target population included people who were at least 18 years old, had access to a

mobile or landline telephone, and spoke Spanish fluently. The sample was drawn using a dual-frame random digit dialing (DFRDD) telephone survey, including both landlines and mobile telephones. First, a sample of Spanish mobile telephone numbers was generated through an automated system. Subsequently, landline numbers were selected from an internal database developed and maintained by the survey company to ensure that all geographical areas were represented in the required proportion. Up to 7 calls at different times of day were attempted to each number. The distribution of the interviews was planned according to quotas proportional to the Spanish population in terms of age group, sex, and region of residence (INE, 2019). A total of 138,656 numbers were sampled, with a final split of 71% mobile and 29% landline telephones; 45,002 numbers were non-eligible, and 72,428 had unknown eligibility. In the end, 3,500 people were interviewed during the COVID-19 lockdown in Spain.

Ethics Statement

The Parc Sanitari Sant Joan de Déu (PIC 86–20) and Parc de Salut Mar Clinical Research (protocol 2020/9203/I) ethics committees approved this study. Participants were made completely aware of the study's objectives, and oral consent was obtained prior to proceeding with the interview.

Measurements

Depressive Symptoms and Health-Related Variables

Symptoms of depression were measured using the 8-item Patient Health Questionnaire Depression Scale (PHQ-8) (Kroenke et al., 2009). The PHQ-8 contains 8 items, with a total score ranging from 0 to 24, where each item is scored from 0 to 3 (0: Not at all; 1: Several days; 2: More than half of the days; 3: Nearly every day). A PHQ-8 score of ≥ 10 is the established cut-off for detecting major depression (Kroenke et al., 2009). Participants were also asked about their perception of their physical health (no discomfort, light discomfort, strong discomfort, moderate discomfort, and extreme discomfort).

Social Support

To assess and evaluate social support, the Oslo Social Support Scale (OSSS-3) was used. It contains three items ranging from 1 to 4 or 5. The total score range is from 3 to 14, with low scores defining poor levels of social support and high scores characterizing high levels of social support (Kocalevent et al., 2018).

Substance Use Disorder During the Last Month

The CAGE-AID was used to assess substance use disorder during the previous month. It consists of 4 questions with “yes” or “no” answers: (1) “Have you ever felt you ought to cut down on your drinking or drug use?”; (2) “Have people annoyed you by criticizing your drinking or drug use?”; (3) “Have you ever felt bad or guilty about your drinking or drug use?”; and (4) “Have you ever had a drink or used drugs first thing in the morning to steady

your nerves or get rid of a hangover?” Answering “yes” to one or more questions determines substance use disorder (Brown & Rounds, 1995).

Sociodemographic Variables

Sociodemographic information such as gender, age (classified into five age groups: 18–34 years, 35–49 years, 50–64 years, 65–79 years, and 80 years or more), and education level (primary, secondary, professional training, and tertiary) was obtained.

Statistical Analysis

To compensate for survey non-response and ensure the representativeness of the sample, post-stratification weighting was used to restore the distribution of the adult general population of Spain by age group, sex, and geographic region.

A single imputation was performed because the median value of individuals with missing values around the analyzed variables was less than 1%, and all variables had less than 5% missing values (van Buuren, 2018).

Descriptive analyses included weighted proportions and unweighted frequencies for categorical variables and mean with standard deviation (SD) for scales. Groups made according to depressive symptoms (PHQ-8 < 10 vs. PHQ-8 ≥ 10) were compared using Chi square test for categorical variables and Student's *t*-test for scales.

To assess whether sex, age, education level, physical health, social support, and substance use disorder (covariates) were variables with a statistically significant association with depressive symptoms (dependent variable), bivariate and multivariate Tobit regression models were fitted.

Regarding dependent variables with a wide cluster of responses at the lowest value, Tobit models are appropriate. Since the assessed categories are not precise enough to reveal latent values in the depression scale, this method assumes that many responses are censored at the lowest value. Approximately 25% of the sample accumulates at the dependent variable's lowest value (0) and around 50% at the three smallest values (0, 1, and 2). The rest of the sample is distributed among the remaining values, with percentages decreasing as they get further from the lower values. Tobit models produce theoretically continuous values with a normal distribution using the highest possible estimates for censored values and a standard linear model for the rest of the values (Long, 1997).

Interaction of social support with substance use disorder was included in the multivariate Tobit regression model to determine whether social support had a moderating effect on the association between substance use disorder and depressive symptoms. The multivariate model included all covariates. Unstandardized coefficients and 95 percent confidence intervals (95% CI) were reported.

Tobit regression coefficients show the effect on the uncensored latent dependent variables. To assess the interaction effect for expected censored value, estimated means of depression were calculated through margins (Cong, 2001) based on the Tobit regression model with censored dependent variable values. To estimate these means, covariables were centered, taking the real proportion in the sample into account. Figure 1 depicts the expected depression means associated with the relationship of social support and substance use disorder. The major depression cut-off limit was used to display the interaction values with a mean estimated above the cut-off.

All observed p -values were calculated using a two-sided test with a statistical significance level of $p < 0.05$. The survey data were analyzed using Stata SE 13 (StataCorp, 2013).

Results

Table 1 shows the sociodemographic features of the study participants. Percentages of population by age group, 18–34, 35–49, 50–64, 65–79, and 80+, were 22%, 28%, 26%, 20%, and 3%, respectively. Some 43.9% of the participants were male. The mean of depression scale (PHQ-8) was 3.95, and the prevalence of substance use disorder scale was 2.8%. Individuals with major depressive disorder (PHQ-8 \geq 10) were more frequently females, from 18 to 34 years old; had a lower educational level, less social support, and poorer physical health; as well as reporting a higher proportion of substance use disorder (7.9%).

Table 2 shows coefficients of unadjusted and adjusted Tobit regressions models of variables associated with depressive symptoms. Being female, with poor physical health, younger age, and presenting substance use disorder and low levels of social support were significantly associated with depressive symptoms in unadjusted and adjusted models. Nevertheless, lower educational levels were significantly associated with depression as well in adjusted models. According to the interaction included in the adjusted model, the association between substance use disorder and depressive symptoms was stronger for those with lower levels of social support.

Figure 1 depicts the approximate PHQ-8 depression scale mean scores stratified by social support level and drug abuse status. The graph shows that the impact of substance use disorder on depressive symptoms was higher when the social support was low. Participants with lower levels of social support (3–8) and with substance use disorder had depressive symptoms above the major depressive disorder cut-off score (PHQ8 = 10.5, CI 95% 8.5, 12.5 at social support = 8).

Discussion

To the best of our knowledge, this is one of the first studies to examine the moderating role of social support in the association between substance use disorder and depressive symptoms in the context of the COVID-19 outbreak. Substantial differences concerning the effect of substance use disorder on depression were found in terms of social support levels. The link between substance use disorder and depression was indeed stronger among participants reporting low social support levels, leading to a reported level of depressive symptoms above the limit for major depressive disorder.

These results are consistent with those of previous studies indicating a correlation between substance use disorder (Anand et al., 2019) and low levels of social support (Guntzville et al., 2020), with greater depression. Moreover, according to our results, interventions based on providing social support to people with substance use disorder could lower the risk of developing depressive symptoms. In turn, higher levels of social support may help lower substance use disorder since mental well-being has been found to be a factor facilitating this (Birtel et al., 2017).

Table 1 Characteristics of the study sample

Characteristic	Overall (<i>N</i> = 3,500)	Depressive symptoms ≥ 10 (<i>N</i> = 407 (11.2))	<i>p</i> -value ^a
Sex			
• Male	1538 (48.5)	126 (36.0)	<0.001
• Female	1962 (51.5)	281 (64.0)	
Age group			
• 18–34	697 (22.1)	116 (31.8)	<0.001
• 35–49	1054 (28.4)	119 (28.3)	
• 50–64	1127 (25.8)	129 (25.3)	
• 65–79	534 (20.3)	35 (11.9)	
• 80+	88 (3.4)	8 (2.7)	
Education level			
• Primary	237 (7.7)	40 (10.8)	<0.001
• Secondary	1193 (34.2)	179 (43.6)	
• Professional training	663 (18.6)	64 (15.2)	
• Tertiary	1407 (39.6)	124 (30.4)	
Physical health			
• No discomfort	2272 (65.0)	189 (47.7)	<0.001
• Slight discomfort	684 (19.4)	93 (22.6)	
• Moderate discomfort	388 (11.1)	74 (17.2)	
• Strong discomfort	131 (3.7)	39 (9.4)	
• Extreme discomfort	25 (0.8)	12 (3.1)	
Social support scale (3–14)	11.13 (1.89)*	10.39 (0.12)*	<0.001
Depressive symptoms scale (0–24)	3.96 (0.08)*	14.09 (0.19)*	<0.001
Substance use disorder			
• Scale (0–4)	0.10 (0.01)*	0.31 (0.05)*	<0.001
• No (<2)	3406 (97.2)	376 (92.1)	<0.001
• Yes (≥ 2)	94 (2.8)	31 (7.9)	

Weighted proportions and unweighted frequencies are displayed for categorical variables, and mean with standard deviation (SD) is displayed for scales (*)

^aGroups according to depressive symptoms (<10 vs. ≥ 10) were compared using Chi square test for categorical variables and Student's *t*-test for scales

In addition to social support and substance use disorder, we found that depression was associated with being female, with physical health problems, and with lower levels of education, which is consistent with previous studies (Haro et al., 2006). Moreover, the present results suggest that being younger is associated with higher levels of depressive symptoms, which is also in line with previous studies conducted in the context of the COVID-19 lockdown (Solomou & Constantinidou, 2020). The lockdown seems to have affected younger adults in particular, probably because their psychosocial well-being depends on frequent social interactions to a greater extent than it does for older adults (Carstensen, 1993).

A systematic review has shown that the protective effect of distinct social support providers varies depending on age. Parental support was most important among children and adolescents, whereas adults and older adults relied more on spouses, followed by family and then friends (Gariépy et al., 2016).

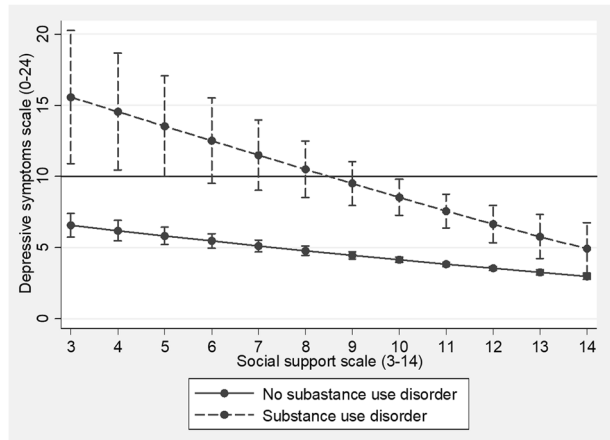
Table 2 Tobit regression models of factors related to depressive symptoms

	Bivariate Coef. [95% CI]	Multivariate Coef. [95% CI]
Intercept	-	9.18 [7.56; 10.79]
Sex		
• Male	Ref	Ref
• Female	1.61 [1.20; 2.03]***	1.60 [1.22; 1.98]***
Age group		
• 18–34	Ref	Ref
• 35–49	- 1.55 [- 2.1; - 0.99]***	- 1.41 [- 1.94; - 0.88]***
• 50–64	- 2.39 [- 2.95; - 1.83]***	- 2.89 [- 3.42; - 2.35]***
• 65–79	- 3.95 [- 4.62; - 3.28]***	- 4.81 [- 5.46; - 4.15]***
• 80 +	- 2.58 [- 3.83; - 1.33]***	- 4.53 [- 5.77; - 3.30]***
Education level		
• Primary	Ref	Ref
• Secondary	0.09 [- 0.88; 1.05]	- 0.72 [- 1.63; 0.18]
• Professional training	- 0.73 [- 1.74; 0.27]	- 1.45 [- 2.40; - 0.50]**
• Tertiary	- 0.93 [- 1.88; 0.02]	- 1.41 [- 2.31; - 0.50]**
Physical health		
• No discomfort	Ref	Ref
• Slight discomfort	1.24 [0.73; 1.76]***	1.69 [1.21; 2.16]***
• Moderate discomfort	2.51 [1.83; 3.19]***	3.17 [2.50; 3.84]***
• Strong discomfort	3.95 [2.83; 5.07]***	4.45 [3.31; 5.58]***
• Extreme discomfort	6.33 [3.18; 9.47]***	6.95 [3.97; 9.92]***
Social support scale		
• Social support	- 0.57 [- 0.69; - 0.45]***	- 0.42 [- 0.54; - 0.31]***
Substance use disorder		
• No	Ref	Ref
• Yes	5.46 [4; 6.92]***	10.42 [3.92; 16.93]**
Interaction: social support × substance use disorder		
• No–No	-	Ref
• Yes–Yes	-	- 0.59 [- 1.19; - 0.01]*

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

We found a substance use disorder prevalence of 7.9% in people with major depressive disorder. This prevalence was higher than in the general population (2.8%) but lower than that reported by a recent systematic review about substance use disorder in major depressive disorder, which was 25% (Hunt et al., 2020). However, because of the varying instruments used to measure substance use disorder in the studies included in this systematic review, there is a wide range in the prevalence reported, from 7 to 51% (Currie et al., 2005; Mueser et al., 2000). Our study has a range of strengths, including the use of a large community-representative sample of Spanish adults from various socioeconomic backgrounds and the ability to control for confounding factors. Nevertheless, we must note several limitations. The cross-sectional design hinders the interpretation of the described associations as causal. Our data are based on self-reports, which could result in recall or reporting bias. Despite this, to minimize recall bias, we kept recall periods short and well-defined in our

Fig. 1 Predicted mean for depressive symptoms according to substance use disorder and social support level. Note: a cut-off point of 10 was used as screening for major depressive disorder (MDD)



research. Finally, since the study was focused on depressive symptoms, we used a screening measure for major depressive disorder. Future studies should replicate our results using a structured psychiatric interview for diagnosis, as this is a more accurate tool.

Conclusion

The findings of this study highlight the importance of objective social support in the relationship between substance use disorder and depression, especially in stressful and unprecedented situations, such as the COVID-19 outbreak in Spain. It appears that maintaining social communication during lockdowns and improving social relationships can minimize the effect of substance use disorder on mental health and facilitate the ceasing of substance use disorder.

Author Contribution The study was designed by LHF, JD-A, AG-P, MF-N, PM, GV, BO, JA, RLC, and JM. JD-A conducted the data analyses. LHF and AG-P drafted the article. JD-A supervised the data analyses and development of the paper. The paper was edited and reviewed by all the authors.

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Declarations

Competing Interests The authors declare no competing interests.


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