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Impact of COVID-19 lockdown on individuals under treatment for substance use disorders: Risk factors for adverse mental health outcomes

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ABSTRACT

Background: Individuals with Substance Use Disorders (SUD), are vulnerable to the psychological consequences of the COVID-19 pandemic. This is the first study to assess risk factors of adverse mental health outcomes during lockdown in a SUD population.

Methods: This was a cross-sectional study, conducted through an online survey that was completed by 303 individuals with SUD, attended in the Addiction Unit of University of Barcelona Clínic Hospital. Sociodemographic and clinical data were collected and descriptive analyses were carried out. Depending on whether individuals reported a worsening or no change/improvement in anxiety and depression symptoms during lockdown, the sample was divided in two groups. A logistic regression was then carried out to identify risk factors associated with adverse mental health outcomes.

Results: Overall, frequency of use for the majority of individuals with SUD remained stable during lockdown in comparison to the pre-lockdown era, although a reduction was found in frequency of tobacco, alcohol, cannabis and cocaine use in a small fraction of individuals with SUD. Symptoms of clinical anxiety were found in 58.7% of the sample while 48.2% of participants scored above the clinical threshold for depression. In addition, 50.3% of the sample reported a deterioration in depression and anxiety symptoms during lockdown that was associated with the following risk factors: previous trauma-exposure, female gender, distress and isolation, income reduction and alcohol use.

Conclusion: A high percentage of patients with SUD experienced adverse mental health outcomes during lockdown that were associated with several risk factors, which should be taken into account in policy making and prevention strategies, as well as in clinical practice, in order to provide personalized care to SUD patients during the time of the pandemic.

In March 2020, the World Health Organization declared the COVID-19 outbreak as a pandemic and governments all over the world began to restrict movement and social interaction, in order to limit the spread of the virus. Spain has been one of the most affected countries in the world, as well as the one that imposed the strictest lockdown in Europe. This near-total lockdown has affected the most vulnerable populations, such as people with mental health and substance use problems, in ways that are not yet fully understood.

Past studies that examined the psychosocial consequences of other epidemics and pandemics refer to a potential “mental health catastrophe” (Maunder, 2009). More specifically, after the severe acute respiratory syndrome epidemic, in 2003, researchers observed a 30%

increase in suicide of elders and an increased risk for developing post-traumatic stress disorder (PTSD) and depression in the general population (Tsang et al., 2004; Yip et al., 2010). Similarly, various forms of psychological distress, including depression, anxiety, anger and grief were observed after the Ebola (James et al., 2019) and the Middle East Respiratory Syndrome epidemics (Jeong et al., 2016). On the same line, studies carried out during the current pandemic in the most affected countries have shown high rates of moderate to severe anxiety symptoms (C. Wang et al., 2020), fear of contagion (Ahorsu et al., 2020), trauma-related disorders and depression (González-Sanguino et al., 2020) (Czeisler et al., 2020). These psychiatric symptoms were associated with risk factors including female gender, feeling of loneliness,

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number of psychiatric diagnoses and economic instability, among others (González-Sanguino et al., 2020). Given the economic and social consequences of the current pandemic, as well as the changes in traditional healthcare that came with it, with a drastic shift towards telehealth applications, there is an increased risk of people with mental health and substance use problems for adverse mental health outcomes (Volkow, 2020; Yao et al., 2020). Vulnerable populations are more likely to use substances as a coping mechanism in the context of crises and it has been suggested that they show an elevated risk for an increase in fear symptomatology, anxiety and depression (Yao et al., 2020). Substance use, in turn, can also contribute to a deterioration of depression and anxiety symptoms (Anker and Kushner, 2019; Boden and Fergusson, 2011), suggesting a complex interaction between conditions that might be exacerbated during lockdown.

Individuals with substance use disorders (SUD) are particularly susceptible to the effects of the pandemic, as they might be in high risk of COVID-19 infection and its adverse outcomes (Q. Q. Wang et al., 2020) and they are often under-privileged regarding social class and access to health-care (Volkow, 2020). Furthermore, evidence suggests that addictive disorders are prone to deterioration when positive reinforcements in the environment are scarce (Bickel et al., 2014), making restrictive measures like social isolation and distancing particularly risky for people with SUD. In addition to this, no study so far has examined the way that changes in treatment of psychiatric disorders, especially the expansion of telehealth, as well as changes in visit frequency and suspension of group therapies, might have affected the evolution and/or maintenance of addictive disorders (Blanco et al., 2020). The first studies that compared substance use before and during restrictive measures suggest a decrease in use during lockdown, at least regarding alcohol (Callinan et al., 2020) and tobacco (Jackson et al., 2020). However, these results were contradicted by another study, which found an increase in alcohol use, especially in women, during lockdown (Boschuetz et al., 2020). Another study that investigated risk factors for relapse to alcohol use disorder, showed that patients with higher depression and anxiety levels as well as patients who felt isolated during lockdown had a higher chance to relapse (Yazdi et al., 2020).

Regarding psychiatric symptoms, a study conducted in Italy, during the rigid quarantine period, found moderate rates of depression, anxiety and PTSD in individuals with addictive disorders (Martinotti et al., 2020). Also, one study conducted in the general population of South Africa showed that childhood trauma was associated with an increase of depressive symptoms during lockdown (A. W. Kim et al., 2020). Given that SUD are often comorbid with (subthreshold) PTSD (Gielen et al., 2012) and that past exposure to traumatic experiences can alter the way one copes with novel stressors (Morris et al., 2020), it is yet unclear how individuals with SUD might have coped with the accumulation of stressors during this time. More studies are needed to shed light into the way that the current pandemic has affected mental health of vulnerable populations. Identifying potential risk and resilience factors as well as particularities of specific disorders, like SUD, has become a research priority (Holmes et al., 2020), as it is an essential step towards developing effective prevention and treatment strategies that can enhance adaptive responses to current stressors. To this end, the aim of this study is 1) to analyze lockdown's effects on substance use and mental health of patients under treatment for a SUD diagnosis, 2) to investigate risk factors for adverse mental health responses in individuals with SUD. We hypothesize that risk factors associated with worst mental health outcomes during lockdown in the general population, like trauma exposure, female gender and perceived loneliness during lockdown, will also affect individuals with SUD. To our knowledge this is the first study so far that aims to assess potential risk factors of adverse mental health outcomes (that is, a worsening in depression and/or anxiety symptoms) due to lockdown in a SUD population.

Methods

Design

This was a cross-sectional study. The study protocol was approved by the Ethics Committee of Hospital Clínic de Barcelona (decision number HCB/2020/0583).

Participants and procedure

The sample consisted of patients with SUD, who had attended the outpatient Addictions Unit of University Hospital Clínic in Barcelona during 2019 at least once. The Addictions Unit of Hospital Clínic offers outpatient treatment, which consists of individual and group therapy and urinalysis. Patients are attended by a multidisciplinary team (psychiatrists, psychologists, social workers and nurses). This Addictions Unit is a referent unit for Alcohol Use Disorder on a regional level, therefore, patients attended in our unit for alcohol use disorders are not restricted to the geographical region of the hospital. A descriptive data analysis of profiles of patients that were attended during one year in the Addiction Unit showed that approximately 46% of patients seek help for Alcohol Use Disorder (AUD), 7.5% seek help for cannabis use disorder (CUD), 7.6% for cocaine use disorder, 4.7% for sedative use disorder, 2.7% for opioid use disorder, 3.2% for other substances, and the rest of patients seek help for either a combination of several SUD or a dual diagnosis. At the first appointment all patients are asked to give consent to be contacted by the personal of the Addictions Unit in the future.

For this study a database of patients who were attended in the Addictions Unit during 2019 was created and patients who had consented to be contacted by email were selected. An informative email was sent to them afterwards, explaining the aims of the study and the procedure that had to be followed. The ones who wished to continue with the study gave the informed consent and proceeded to the questionnaire, which was totally anonymous and lasted for approximately 30 min. Participation in the study was voluntary and no reimbursement was provided. In an effort to grasp the pandemic's consequences in a wide sample of patients, no other exclusion or inclusion criteria were applied. The questionnaire stayed open for 45 days, from June 2020 to July 2020. It was completed by a total of N = 303 patients.

Questionnaire structure and instruments

The questionnaire was organized in three sections: In the first section sociodemographic and clinical data were collected, including age, gender, education level, monthly income, change in income due to the pandemic, perceived stress and isolation due to the pandemic and past psychiatric diagnoses. In addition, selected questions of the ASSIST (World Health Organization, 2015) screening test were used to measure frequency of substance use for a period of 6 months prior to lockdown and during the 3-month strict lockdown implemented in Spain. Questions for the following substances were included: tobacco, alcohol, cannabis, cocaine, sedatives (including hypnotics and anxiolytics), methamphetamine and opioids. In the second section, traumatic events during lifetime were investigated with the standardized questionnaire Childhood Trauma Questionnaire (CTQ) (Bernstein and Fink, 1997) and the Life Event Checklist (LEC) (Weathers et al., 2013) of the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition: DSM-5. PTSD symptomatology was assessed with the Davidson Trauma Scale (DTS) (Davidson et al., 1997). Finally, in the last section symptoms of depression and anxiety were assessed using the standardized questionnaires Beck Depression Inventory (BDI) (Beck, 1996) and State-Trait Anxiety Inventory (STAI) (Spielberger et al., 2010). BDI score interpretation is the following: BDI: a score of 0–13 indicates no depression; of 14–19 a mild depression; of 20–28 a moderate depression and of 29–63 a severe depression. For the STAI questionnaire a cutting score of 40 often used to separate clinically significant anxiety symptoms from

normal fluctuations in everyday anxiety (Spielberger et al., 2010). At the end of the last two questionnaires participants were asked to evaluate whether the assessed symptoms got better, worse or did not change due to quarantine measures.

Statistical analysis

To measure adverse mental health effects of lockdown, a binary variable was created based on whether participants reported that symptoms of depression and anxiety, assessed by the BDI and STAI respectively, showed no change/improved or got worse during lockdown. Therefore, the sample was divided in two groups: the first group consisted of patients who reported an improvement or no differences in depression and anxiety symptoms during quarantine and the second consisted of patients who reported a worsening in either depressive or anxiety symptoms.

Additionally, in order to examine whether lockdown was perceived as a distressing situation, participants were asked to report their subjective perception of stress and isolation during this period. The two variables were then combined to a third one, which represented the extent to which lockdown has been a no/mildly, moderately or highly distressing and isolating situation.

Finally, CTQ and LEC-positives were combined in a third binary variable that represented trauma exposure during lifetime.

Statistical analyses were performed in IBM SPSS Statistics for Windows (SPSS version 26; IBM Corporation, Armonk, NY). Descriptive Statistics were used to determine means, standard deviations and frequencies of the sample. For each substance, substance use frequency before lockdown was compared to use frequency during lockdown using related-samples Wilcoxon signed-ranked tests. Group differences were assessed by means of independent sample *t*-test and chi-square tests for continuous and categorical variables respectively. A binary logistic regression was subsequently carried out in order to assess the impact of the predictors on the likelihood of subjects experiencing adverse mental health outcomes due to lockdown. The model initially included variables that were previously identified in literature (González-Sanguino et al., 2020; A. W. Kim et al., 2020; Yazdi et al., 2020) as potential risk factors during the pandemic, as previously mentioned. Other variables that were identified as significant in prior comparisons between the two groups were also introduced to the model in a blockwise manner and only significant contributors were held in the final model. All *p*-values were two-tailed and statistical significance was set at $p < 0.05$.

Results

Sociodemographic and clinical characteristics of the sample

Within the sample of 303 participants, 61.4% ($n = 186$) identified as male, 37.3% ($n = 113$) as female and 1.3% ($n = 4$) as non-binary/other. The sample had a mean age of 49.3 (SD = 15.6), with a 33.4% having completed secondary school and a 31.7% higher education. Other sociodemographic characteristics are described in detail in Table 1.

A total of 19.4% ($n = 58$) of the sample reported being abstinent of all substances (tobacco, alcohol, cannabis, cocaine, sedatives, methamphetamine, opioids) during lockdown, while 52.5% ($n = 159$) reported use of tobacco, 46.9% ($n = 142$) use of alcohol, 16.6% ($n = 50$) use of cannabis, 9.3% ($n = 28$) use of cocaine, 37% ($n = 112$) use of sedatives, 4.3% ($n = 13$) methamphetamine and 3.9% ($n = 12$) opioids (see Table 2 for a detailed description of substance use). In addition, besides a SUD diagnosis, 34% ($n = 104$) of the sample have been diagnosed with depression and/or anxiety too, 9.7% ($n = 29$) have suffered from disorders including obsessive compulsive disorder, psychosis, eating disorders or bipolar disorder and 9% ($n = 27$) have been diagnosed with more than 3 psychiatric disorders. Regarding depression and anxiety levels at the moment of responding the questionnaire, 51.8% ($n = 158$) of the sample did not score above the clinical threshold for

Table 1
Sociodemographic characteristics of the sample, $N = 303$.

Gender	n	%	mean	SD
Male	186	61.4		
Female	113	37.3		
Non-binary	4	1.3		
Age			49.3	15.6
Education (years)			13.3	2.6
Household income (per month)				
<1000€	46	15.5		
1000-1999€	98	33.1		
2000-2999€	84	28.4		
3000-3999€	27	9.1		
4000-4999€	25	8.4		
>5000€	16	5.3		
Change in household income due to COVID-19				
Income reduction	146	48.3		
No change	145	48		
Income increase	11	3.6		
Distress and isolation due to lockdown				
No/mildly distr	28	9.2		
Moderately distr	86	28.4		
Highly distr.	189	62.5		
COVID-19 positives	5	1.7		
Hospitalization of relatives	43	14.1		

depression, while 17.5% ($n = 55$) classified as mildly depressed, 19.1% ($n = 58$) as moderately depressed and 11.6% ($n = 35$) as severely depressed. Similarly, clinically significant symptoms for the state-Anxiety scale (STAI) were detected in 58.7% ($n = 178$) of the sample. Finally, a total of 122 individuals (40.3%) reported having survived moderate to severe childhood maltreatment and 140 (46.2%) were positive to trauma exposure during lifetime measured by LEC. The combination of the two variables into a binary one revealed that in total, 209 individuals (69% of the sample) reported moderate to severe trauma exposure during lifetime (for a detailed description of clinical characteristics see Table 2).

Substance use and mental health consequences due to lockdown

Frequency of substance use before and during lockdown was measured for the following substances: tobacco, alcohol, cannabis, cocaine, sedatives, methamphetamine and opioids. Generally, a decrease in frequency of use was observed for most substances except for sedatives. However, overall frequency of substance use remained stable. More specifically, regarding tobacco use, 9.5% of patients reduced the frequency of use during lockdown, while only 5.4% of patients reported an increase (total $N = 294$). Similarly, 10% of patients reported a decrease in cannabis use during lockdown, while only 1% reported an increase (total $N = 289$). Regarding alcohol, 18.9% of patients reported a decrease in frequency of use in comparison to 12.5% that reported an increase (total $N = 296$). Likewise, 7% of patients reported a decrease in frequency of cocaine use in comparison to a 3% who reported an increase (total $N = 283$). Regarding methamphetamine use, 4.6% of users reported a decrease of use during lockdown, while only 1% reported an increase (total $N = 282$). Similarly, 2.5% of participants reported a decrease in opioid use during lockdown, while only 1 participant reported an increase in use (total $N = 280$). On the other hand, only 4.5% of patients reported a decrease in sedative use in comparison to 8.8% who reported an increase of use during lockdown (total $N = 284$). A related-samples Wilcoxon signed-ranked test was, then, carried out for each substance and revealed that changes in tobacco, alcohol, cannabis, cocaine, methamphetamine and opioid use were statistically significant ($Z = -2.5$, $p = 0.013$, $Z = -2.3$, $p = 0.019$, $Z = -3.9$, $p = <0.001$, $Z = -2.5$, $p = 0.013$, $Z = -2.12$, $p = 0.034$, $Z = -2.12$, $p = 0.033$ respectively) while changes in sedative use remained on a trend level ($Z = 1.0$, $p = 0.058$).

When gender was taken into account, women reported sedative use

Table 2
Clinical characteristics of the sample a) Psychiatric symptoms, N = 303.

Psychiatric diagnoses	n	%	mean	SD
Only SUD	142	46.9		
Depression	61	20.2		
Anxiety	22	7.3		
Depression-anxiety	21	6.9		
Bipolar Disorder	11	3.6		
Personality Disord.	8	2.6		
Psychotic disorders	4	1.4		
OCD	3	0.9		
ADHD	3	0.9		
Eating disorders	1	0.3		
Multiple diagnoses	27	9		
BDI score			14.5	10.4
No depression	158	51.8		
Mild depression	55	17.5		
Moderate depr.	58	19.1		
Severe depression	35	11.6		
STAI score			45.3	13.7
>40 cutting score	178	58.7		
CTQ				
Positive	123	40.6		
LEC				
Positive	140	46.2		
Trauma exp. lifetime				
Positive	209	69		
PTSD+	72	34.4*		
Substance Use Freq				
	Before lockdown		During lockdown	
	n	%	n	%
Tobacco				
Never	126	42.9	144	47.5
1-2 times	9	3.1	12	4
monthly	3	1	4	1.3
Weekly	10	3.4	8	2.6
Daily	146	49.7	135	44.6
Alcohol				
Never	143	48.3	161	53.1
1-2 times	36	12.2	47	15.5
monthly	17	5.7	5	1.7
Weekly	60	20.3	49	16.2
Daily	41	13.5	41	13.5
Cannabis				
Never	218	75.4	253	83.5
1-2 times	24	8.3	16	5.3
monthly	6	2.1	3	1
Weekly	18	6.2	10	3.3
Daily	23	8	21	6.9
Cocaine				
Never	244	86.2	275	90.8
1-2 times	19	6.7	16	5.3
monthly	9	3.2	4	1.3
Weekly	6	2.1	7	2.3
Daily	5	1.8	1	0.3
Sedatives				
Never	175	61.6	191	63
1-2 times	30	10.6	26	8.6
monthly	11	3.9	7	2.3
Weekly	13	4.6	14	4.6
Daily	55	19.4	65	21.5
Metamphet.				
Never	263	93.3	290	95.7
1-2 times	11	3.9	8	2.6
monthly	2	0.7	0	0
Weekly	3	1.1	3	1
Daily	3	1.1	2	0.7
Opioids				
Never	263	93.9	291	96
1-2 times	4	1.4	3	1
monthly	3	1.1	1	0.3
Weekly	2	0.7	1	0.3
Daily	8	2.9	7	2.3

SD: Standard deviation, SUD: Substance use disorder, OCD: Obsessive-Compulsive Disorder, ADHD: Attention deficit hyperactivity disorder, BDI: Beck Depression Inventory, STAI: State Trait Anxiety Inventory, CTQ: Childhood

Trauma Questionnaire, LEC: Life Event Checklist, PTSD+: Post-traumatic stress disorder positives, *: this percentage refers to trauma-exposed individuals. The percentage of the total sample is 23.8%.

significantly more often than men before lockdown ($\chi^2 (4, N = 299) = 13.81, p = 0.008$) and while use of most substances in both genders decreased during lockdown, frequency of sedative use in women significantly increased ($Z = -1.965, p = 0.04$). Similarly, while frequency of alcohol use during lockdown significantly decreased for men ($Z = -2.59, p = 0.01$), no decrease in alcohol use frequency was observed in women ($Z = -0.193, p = 0.85$).

Regarding the way lockdown affected psychiatric symptomatology, a total of 133 (44%) of participants reported that their depressive symptomatology got worse and 146 (48%) participants that anxiety symptoms got worse due to lockdown. Taken together, an overall of 153 participants (50.5% of the sample) reported a worsening of psychiatric symptoms due to restrictive measures, while the rest of participants mentioned an improvement or no change in these symptoms.

Risk factors associated with adverse mental health effects during lockdown

A binary logistic regression was carried out to assess risk factors related to adverse mental health effects of lockdown (Table 3). The final model that included the following predictors: trauma exposure, gender, perceived stress and isolation, income reduction and alcohol use was statistically significant ($p < 0.001$), indicating that it was able to distinguish participants with a perceived deteriorated mental health from ones with no changes. The final model explained between 29.5% (Cox and Snell R square) and 39.3% (Nagelkerke R square) of the variance and correctly classified 76.6% of cases. Five variables significantly contributed to the model: trauma exposure ($\beta = 0.70$; Wald = 4.94; $p = 0.02$; OR = 2.02; CI 1.09–3.62), gender ($\beta = -0.93$; Wald = 9.51; $p = 0.002$; OR = 2.54; CI 1.4–4.58), change in income ($\beta = -0.70$; Wald = 7.84; $p = 0.005$; OR = 2; CI 1.2–3.3), perceived distress and isolation due to lockdown ($\beta = 1.72$; Wald = 38.67; $p < 0.001$; OR = 5.63; CI 3.25–9.64), and alcohol use ($\beta = 0.4$; Wald = 3.84; $p = 0.05$; OR = 1.49; CI 1–2.2). Therefore, experiencing the restrictions as highly distressing and isolating, being female, having experienced traumatic events during lifetime, having experienced a decrease in income due to lockdown, and consuming alcohol were associated with a worse response to the pandemic challenge for SUD individuals (see Table 4).

Discussion

The aim of this study was to investigate potential changes in substance use and psychopathology and identify potential risk factors for adverse mental health outcomes during lockdown in a SUD population. Substance use frequency before and during lockdown was measured for tobacco, alcohol, cannabis, cocaine, methamphetamine, opioids and sedatives. The majority of participants reported no changes in frequency of substance use. For the ones who did report changes in frequency of substance use during lockdown, a significant reduction of frequency of use was found for all substances except sedatives. However, 50.5% of patients reported a deterioration in depression and anxiety symptoms. This deterioration was associated with the following risk factors: trauma exposure, female gender, perceived stress and isolation, income reduction and alcohol use.

Regarding substance use, the aforementioned reduction in frequency of use for most substances is in line with previous studies that propose a reduction in frequency of tobacco and alcohol use during lockdown in the general population and in a SUD sample (Callinan et al., 2020; Jackson et al., 2020). Here, it is interesting to note that in this study, participants were not divided according to principal substance of use, therefore it is not surprising that a general reduction across substances was found. If one was to take into account changes in specific SUD (for

Table 3
Baseline differences between patients that reported a deterioration in mental health versus those who reported an improvement or no change.

	RESILIENT GROUP, N = 148	DETERIORATED GROUP, N = 151	T/X2	DF	P
GENDER					
MALE	107 (72.3%)	79 (52.3%)	12.692	1	<.001
FEMALE	41 (27.7%)	72 (47.7%)			
AGE					
	50.67 (16.39)	46.62 (14.61)	2.274	301	.024
YEARS OF EDUCATION					
	13.24 (2.65)	12.8 (2.74)	1.428	301	.154
HOUSEHOLD INCOME					
<1000€	14 (9.6%)	32 (21.3%)			
1000-1999€	49 (33.6%)	49 (32.7%)	11.947	3	.008
2000-2999€	40 (27.4%)	44 (29.3%)			
>3000€	43 (29.5%)	25 (16.7%)			
CHANGE IN INCOME					
REDUCTION					
NO CHANGE	91 (60.7%)	54 (35.5%)			
INCOME INCREASE	3 (2%)	8 (5.3%)	19.620	2	.000
PERCEIVED STRESS AND ISOLATION					
MILDLY/NO DISTR.					
	25 (16.7%)	3 (2%)			
MODERATELY DISTR.					
	68 (45.3%)	18 (11.8%)	76.095	2	.000
HIGHLY DISTRESSING					
	57 (38%)	132 (86.3%)			
TRAUMA EXPOSURE DURING LIFETIME					
YES	90 (60%)	119 (77.8%)	11.187	1	.001
NUMBER OF PSYCH. DIAGNOSES	1.13 (.389)	1.27 (.541)	2.726	301	.007
SUBSTANCE USE FREQ TOBACO					
ABSTINENT					
	82 (54.7%)	62 (40.5%)			
SOMETIMES					
	11 (7.3%)	13 (8.5%)	6.182	2	.045
DAILY					
	57 (38%)	78 (51%)			
ALCOHOL					
ABSTINENT					
	92 (61.3%)	69 (45.1%)			
SOMETIMES					
	44 (29.3%)	57 (37.3%)	9.052	2	.011
DAILY					
	14 (9.3%)	27 (17.6%)			
CANNABIS					
ABSTINENT					
	131 (87.3%)	122 (79.7%)			
SOMETIMES					
	14 (9.3%)	15 (9.8%)	6.087	2	.048
DAILY					
	5 (3.3%)	16 (10.5%)			
COCAINE					
ABSTINENT					
	138 (92%)	137 (89.5%)			
SOMETIMES					
	12 (8%)	15 (13.6%)	1.307	2	.520
DAILY					
	0	1 (0.5%)			
SEDATIVES					
ABSTINENT					
	105 (70%)	86 (56.2%)			
SOMETIMES					
	22 (14.7%)	25 (16.3%)	7.696	2	.022
DAILY					
	23 (15.3%)	42 (27.5%)			

Table 4
Summary of the predictors held in the final model.

	OR	CI	P
GENDER (FEMALE)	2.54	1.4–4.58	.002
TRAUMA	2.02	1.09–3.62	.02
STRESS + ISOLATION	5.63	3.25–9.64	< .001
INCOME REDUCTION	2	1.2–3.3	.005
ALCOHOL USE	1.49	1–2.2	.05

OR: Odds ratio, CI: Confidence Interval.

example, to measure changes of alcohol use in AUD -only patients) then results might have been different. More specifically, we cannot exclude the possibility of an overrepresentation of patients with AUD, within the population that reported an increase in alcohol use during lockdown. For example, other studies have shown that substance use increased during lockdown (Boschuetz et al., 2020; J. U. Kim et al., 2020),

suggesting that the aforementioned decrease in frequency might be masking an increase in quantity or in binge-substance use. Notably, while frequency of use decreased for most substances both in men and women, women reported a significant increase in daily sedative use, which, might represent an increased risk for developing sedative use disorder in the future. Similarly, while frequency of alcohol use decreased in men during lockdown, women did not show a similar decrease. Taken altogether, a general decrease in frequency of substance use has been observed during lockdown, which was gender-dependent for alcohol and sedatives. A possible explanation for this reduction is that social restrictions have diminished the availability of substances, which has been shown that contributes to reductions in use (WHO, 2017). In addition, substance use often occurs in social contexts that have disappeared during lockdown. Overall, it is interesting to note that for most substances the observed increase in abstinent users came from a reduction in occasional substance use, while daily use remained mostly unaffected. This suggests that different prevention strategies might be needed depending on the severity of substance use of individuals.

Regarding adverse mental health effects of the pandemic, it was shown that a high percentage of the sample presented clinical levels of anxiety and/or depression and that 50.5% of the sample reported a worsening in these symptoms due to lockdown. These results are in line with findings from Italy, that showed a high prevalence of depression, anxiety and PTSD symptoms in a SUD population during the rigid quarantine period there (Martinotti et al., 2020). Of the risk factors that were associated with adverse mental health outcomes during lockdown, trauma exposure during lifetime, female gender and perceived isolation were the strongest predictors of a worsening of depression or anxiety symptoms. In line with a recent European study on alcohol use during the pandemic (Kilian, C., Rehm, J., Allebeck, P., Braddick, F., Gual, A., Barták, M., Bloomfield, 2020), other risk factors that significantly contributed to the model include reductions in income due to the pandemic and alcohol use. This suggests a complex interaction between substance use and depression and anxiety symptoms during lockdown, which is in line with literature that suggests that one condition contributes to the deterioration of the other and vice versa (Anker and Kushner, 2019; Boden and Fergusson, 2011).

Trauma exposure was reported by 69% of participants, which is in line with past literature that suggests that prevalence of trauma is particularly high in SUD patients (Gielen et al., 2012). This underlies the necessity to explore and treat past trauma in clinical practice, as this often does not occur due to educational and personal barriers of the professionals (Blakey and Bowers, 2014). Past trauma-exposure can provoke physical and neurobiological adaptations that alter the way one deals with novel stressors (Morris et al., 2020; Olf et al., 2005). Therefore, it is essential to provide personalized care to individuals who have experienced traumatic situations and endorse policies that enhance community resilience during the current pandemic.

Female gender was also found as a risk factor of adverse mental health outcomes. In addition, it was shown that women reported an increased frequency of sedative use during lockdown. These observations are in line with a study that found an increase in gender-based violence during lockdown in the in Spain (Rodriguez-Jimenez et al., 2020) and findings in the general population in Spain and in Italy that also suggested that female gender was a risk factor for high rates of depression and anxiety symptoms during lockdown (González-Sanguino et al., 2020; Rossi et al., 2020). A possible explanation for this, as suggested by Gonzalez-Sanguino et al., is that, for social reasons, women tend to assume more caregiving responsibilities than men, which they have to balance with paid and unpaid work (González-Sanguino et al., 2020). During the pandemic, women find themselves in the frontline of care-work, while are often structurally excluded by decision-making processes (John et al., 2020). All in all, it is not surprising that in this situation of overload they show higher levels of anxiety-related symptoms and a consequent increase in sedative-use.

This study has several limitations: First of all, the sample was a

convenience sample and particular SUDs, like heroin use disorder, are underrepresented. It is foreseeable that addiction to legal drugs creates different situations than addiction to illegal drugs therefore the heterogeneity of the sample should be taken into account (for consulting Spain's legislation on drug use we refer the reader to the website of the regional government https://drogues.gencat.cat/en/ciudadania/les_drogues_davant_la_llei/).

In addition, its dependency on online tools probably has excluded people with limited access to technological means. In other words, there is a certain risk of selection bias due to the methodology of this study. However, the practical challenges faced by a study of this nature and the fact that the target population is not easy to recruit to research has to be taken into account. Secondly, the main dependent variable was based on participants' self-reports and therefore bound to subjective perceptions. Nevertheless, our results agree with those of other similar studies, suggesting that self-reports were actually consistent across countries. Moreover, in an effort to grasp a wide sample of patients we did not exclude or include participants based on the stage of treatment, which made the sample quite heterogeneous. However, this is in line with the real-life population that clinicians attend in outpatient addiction units. Finally, the data collected refer only to lockdown period, excluding detection of possible changes in substance use and psychiatric symptomatology after restrictions were lifted. Future studies should be carried out to verify whether substance use and mental health outcomes during lockdown change after the restrictions are lifted.

Taken altogether, this is the first study that explored risk factors of adverse mental health outcomes during lockdown in a SUD population. Individuals with SUD show an elevated risk for depression and anxiety symptoms during lockdown (Yao et al., 2020) and comorbidity between disorders yields an increased risk for social and personal impairment (Davis et al., 2008). Our results indicate that trauma exposure and female gender are important risk factors associated with adverse responses with regard to anxiety and depression symptoms. Other risk factors include perceived stress and isolation, a reduction in income and alcohol use. Identifying populations at increased risk for adverse mental health outcomes should inform policies to address health inequity. Improved access to care and treatment options, as well as expanded use of telehealth applications for the populations at risk, have already been suggested as potential solutions that might reduce COVID-19-related mental health consequences (López-Pelayo et al., 2020; Ornell et al., 2020). All in all, the risk factors of adverse mental health outcomes identified in this study should be taken into account in policy making and prevention strategies, as well as in treatment services in order to provide personalized care to individuals with substance use problems.

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Authors contribution

CB, LN and LM were responsible for the study concept and design. BP assisted with the preparation of the questionnaire and the database. CB carried out the data analysis and drafted the manuscript. LN and LM provided critical revision of the manuscript for important intellectual content. All authors critically reviewed content and approved the final version for publication.

Declaration of competing interest

Laia Miquel has received honoraria from Lundbeck, outside the work for this project. Antoni Gual has received honoraria and travel grants from Lundbeck, Janssen, D&A Pharma, and Servier, all outside the work for this project. The other authors declare that they have no competing

interests. The authors whose names are listed immediately below certify that they have NO affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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