



Suicidal ideation among inpatients with substance use disorders: Prevalence, correlates and gender differences

Helle Wessel Andersson^{a,*}, Mats P. Mosti^a, Trond Nordfjærn^{a,b}

^a Department of Research and Development, Clinic of Substance Use and Addiction Medicine, St. Olavs University Hospital, Pb 3250 Sluppen, Trondheim 7006, Norway

^b Department of Psychology, Norwegian University of Science and Technology, Trondheim, Norway

ARTICLE INFO

Keywords:

Personality disorders
Depression
Psychological symptoms
Substance use onset
Males
Females

ABSTRACT

We examined the prevalence of suicidal ideation (SI) among inpatients with substance use disorders (SUD) and investigated the association between SI and demographic (age, education, gender) and clinical factors (SUD, psychiatric disorders, anxiety/depression symptoms, substance use onset age). We collected medical record data including types of ICD-10 SUD and psychiatric diagnoses (i.e. mood: F30-39; anxiety: F40-48; personality: F60-F60.9; F61.0; F62; ADHD: F90-F90.9) and patient-reported data from 563 patients admitted to inpatient SUD treatment. Lifetime SI was measured by one question from the Addiction Severity Index (ASI). Gender differences in SI rates were examined using Chi-square tests. To determine variables that were uniquely associated with SI we conducted hierarchical regression analyses. The overall prevalence of SI was 50%, and it occurred more frequently among females (61.9%) than males (45.4%). SI was associated with female gender, younger age of substance use onset, mood and personality disorders, and higher anxiety/depression symptoms. Male gender accounted for the significant association between younger age of onset and SI. Diagnostic information on mood and personality disorders, and screening of patient-reported anxiety/depression symptoms at treatment intake may be useful for clinicians in identifying and providing personalized treatment for SUD inpatients who are at increased risk of SI.

1. Introduction

Suicidal ideation (SI: i.e., thoughts of ending one's life) has been shown to be an early warning of suicidal behaviors (Franklin et al., 2017), that may occur independent of prior suicide attempts (Hubers et al., 2018). A relation between SI and subsequent suicide attempts, or death by suicide, have been found across different populations (Ribeiro et al., 2016), including substance use disorder (SUD) (Britton and Conner, 2010), psychiatric (Chen et al., 2020; Hubers et al., 2018) and non-psychiatric populations (Hubers et al., 2018). Patients admitted to SUD treatment with suicidal thoughts comprise a particular target group for preventive measures as close to 20% of those who died by suicide had recently been in contact with specialist SUD treatment services (Walby et al., 2020).

Inpatient treatment facilities for SUD provide a controlled environment that is well suited for suicide preventive efforts (Haynes et al., 2021). SUD inpatients, who represent about 10–20% of all patients who receive specialized SUD treatment in Norway and European countries (EMCDDA, 2019; Norwegian Directorate of Health, 2021), are

characterized by severe substance use-related problems, including psychiatric disorders and social problems (López-Goñi et al., 2017; López-Goñi et al., 2018). The prevalence of SI among SUD inpatients might be as high as 60–70% (Haynes et al., 2021; López-Goñi et al., 2018). Although SUD inpatients constitutes an important target group for the prevention of suicidal behaviors, there is limited research on the characteristics of SUD inpatients with SI.

Studies conducted in both mixed outpatient/inpatient (Cottler et al., 2005; Ilgen et al., 2010) and outpatient programs (Rodríguez-Cintas et al., 2018), have shown that female gender is a risk factor for SI, as also found in the general population (Nock et al., 2008). In the study by Cottler et al., the SI rate was 50% for females versus 31% for males. However, studies conducted in other treatment settings (i.e. intensive outpatient, detoxification or merged inpatient/outpatient) did not find significant gender differences in SI rates (Kelly et al., 2020; López-Goñi et al., 2018; Wines et al., 2004). Conflicting findings also exist regarding the influence of education level on SI risk among SUD patients. Although one study found elevated SI rates among patients with higher education level (Ilgen et al., 2010), others reported no link between SI and

* Corresponding author.

E-mail address: helle.wessel.andersson@stolav.no (H.W. Andersson).

<https://doi.org/10.1016/j.psychres.2022.114848>

Received 29 April 2022; Received in revised form 8 September 2022; Accepted 11 September 2022

Available online 13 September 2022

0165-1781/© 2022 The Author(s). Published by Elsevier B.V. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

education (Kelly et al., 2020; Rodríguez-Cintas et al., 2018), or did not include education in their analyses (Cottler et al., 2005; Wines et al., 2004). Age constitutes another uncertain factor in the prevalence of SI among SUD patients. SI has been associated with younger (Wines et al., 2004) or older age (Ilgen et al., 2010), but also reported to be unrelated to age at current admission (López-Goñi et al., 2018) and dependency onset (Rodríguez-Cintas et al., 2018). One study found that patients with SI were of younger age at first alcohol consumption relative to patients without SI (López-Goñi et al., 2018).

The relative impact of SUD diagnosis on SI among patients also remains unclear. Whereas some studies reported higher SI rates among patients with alcohol use disorders (Cottler et al., 2005; Wines et al., 2004), others found that lifetime SI was associated with cocaine and sedative dependence and poly drug use (Rodríguez-Cintas et al., 2018), and one study could not find any associations (López-Goñi et al., 2018). The inconsistent findings may relate to diverging ways of categorizing substance use, along with different number of drugs included in analyses. Another limitation in previous research is the lack of an objective measure of substance use dependence, i.e., a clinical SUD diagnosis (López-Goñi et al., 2018; Rodríguez-Cintas et al., 2018; Wines et al., 2004). Moreover, the association between objective diagnoses of psychiatric disorders and SI has not been well researched among SUD patients. One study found elevated rates of SI among SUD outpatients with co-occurring mood and borderline personality disorder, which coincides with findings from a study comprising both outpatients and inpatients in mental health treatment settings (Andersson et al., 2022). Another study suggested that males with SI were more likely than females to have a co-occurring antisocial personality disorder (Cottler et al., 2005).

Several studies across different treatment settings (i.e. outpatient or mixed outpatient/inpatient) have suggested an elevated risk of SI in SUD patients with anxiety/depression symptoms (Cottler et al., 2005; Ilgen et al., 2010; López-Goñi et al., 2018; Rodríguez-Cintas et al., 2018; Wines et al., 2004). Whether symptoms of anxiety/depression among SUD inpatients are associated with SI independent of psychiatric diagnoses is still not known.

Previous studies regarding possible risk factors of SI among SUD patients in clinical treatment report inconsistent findings, which warrants more research. Only a few studies were conducted in inpatient treatment settings, where the vast majority of SUD patients with severe substance use problems and particularly elevated risk for death by suicide are treated (López-Goñi et al., 2017, 2018). In addition, previous research did not analyze the SI risk associated with clinical SUD and psychiatric diagnoses. The present study will expand current knowledge on lifetime SI among SUD patients by utilizing a large non-selected sample of patients admitted to publicly funded SUD inpatient treatment, and by the use of objectively assessed SUD and psychiatric diagnostic information. Specifically, the aims were to: i) examine the prevalence of lifetime SI among SUD inpatients, and ii) investigate the associations between SI and demographic (i.e. age, education, gender) and clinical factors (i.e. SUD, psychiatric disorders, anxiety/depression symptoms, age of substance use onset), and possible gender differences regarding these associations. Previous findings made us hypothesize that SI would be associated with female gender (Cottler et al., 2005; Ilgen et al., 2010; Rodríguez-Cintas et al., 2018), and co-occurring mood and personality disorders (Andersson et al., 2022; Rodríguez-Cintas et al., 2018).

2. Materials and methods

2.1. Study design and setting

The current study focused exclusively on the baseline assessments from a prospective cohort study of individuals admitted to SUD treatment at five inpatient clinics in Central Norway, from 2014 to 2016. The study had dedicated research staff who were responsible for continuous patient recruitment. In principle, all patients admitted to SUD inpatient

treatment were eligible to participate. The only exclusion criteria were persons considered mentally incapable of giving their signed consent for participation. The participation rate was 84%. Baseline data were collected using information from the electronic medical records and self-report data collected from a standard questionnaire completed at the beginning of the inpatient stay. The design and procedures have been described in greater detail previously (Andersson et al., 2018). The Regional Ethical Committee of Medical Research in Norway (application #2013/177) approved the study.

2.2. Variables

2.2.1. Suicidal ideation

Information about each patient's lifetime suicidal ideation (yes/no) was available from medical records, based on one item from the ASI interview (McLellan et al., 1992) asked at treatment entry: "Have you had a significant period of time in your life in which you have experienced serious thoughts of suicide?"

2.2.2. Demographics

Demographic characteristics were collected from medical records and included gender, admission age, and education level graded as low (primary/secondary school) or high (high school/vocational school or above).

2.2.3. Substance use characteristics

We collected information from medical records about SUD diagnoses and the most frequently used substances in the six months before admission. Information about the most frequently used substances was included to supplement missing data on SUD diagnoses. The five most prevalent types of SUD diagnoses were specified and classified according to ICD-10 as follows: alcohol use disorder (F10); opiate use disorder (F11); cannabis use disorder (F12); sedative use disorder (F13); and stimulant use disorder (F15). A variable indicating polysubstance use was established for the presence of two or more SUD diagnoses (yes/no).

Age of substance use onset was included in the questionnaire at treatment intake and measured by asking the question: "How old were you the first time you used drugs".

2.2.4. Psychiatric disorders

Information about co-occurring psychiatric diagnoses according to the International Classification of Diseases, ICD-10 (WHO, 1992), was collected from medical records. Medical specialists or clinical psychologists made the diagnoses. The recorded diagnoses were made during a previous SUD or mental health treatment stay, or were based on clinical assessments made during the current stay. We included the four most common diagnostic categories in the sample: anxiety disorders (F40–F48); mood disorders F30–F39); ADHD (specific diagnoses included F90–F90.9), and personality disorders. Due to small occurrences, the different dimensions of personality disorders that occurred in the sample (i.e. F60–F60.9; F61.0; F62.0), were merged into one category labeled personality disorders. The remaining psychiatric disorder diagnostic categories occurring in the sample had a prevalence below 10%, and were thus not considered for analyses to avoid Type II error inflation.

2.2.5. Anxiety/depression symptoms

The patients completed the Norwegian version (Strand et al., 2003) of the 10-item Hopkins Symptom Checklist (Derogatis et al., 1974) to rate their frequency of anxiety/ depression symptoms in the previous seven days on a four-point scale ranging from 1 ("not at all") to 4 ("extremely"). The average scale score was used in the analyses. The scale had a Cronbach's alpha coefficient of 0.893 (females: 0.894; males: 0.891).

2.2.6. Statistical analyses

We used descriptive statistics to provide an overview of the study sample. Rates of SI according to types of SUD diagnoses and co-occurring psychiatric diagnoses were reported as the odds ratio (OR) and 95% confidence intervals (CI). Possible gender differences in SI prevalence rates were analyzed using Chi-square tests. We used bivariate logistic regression analysis to examine the associations between SI and each independent variable (i.e. SUD diagnoses; polydrug use; psychiatric disorder diagnostic categories; anxiety/depression symptoms; age of onset; admission age; education level, and gender). Further, to determine the variables that were uniquely associated with SI we conducted hierarchical regression analyses. All independent variables that were significantly associated ($p < 0.05$) with SI in the bivariate analyses were entered in the first step. In the second step, we examined possible differences between males and females with respect to the strength of the association between independent variables and SI. In addition to all the variables that were entered in step1, this step included interaction terms between gender and the independent variables that appeared significantly ($p < 0.05$) associated with SI in the first step (i.e. the adjusted independent variables).

The five clinics that participated in the study had somewhat different treatment profiles (see Andersson et al. 2018). The current data showed treatment site differences in the prevalence of the four specific psychiatric diagnoses included in the study (variations in prevalence: Anxiety: 4.8% to 42.7%; Mood: 8.6% to 25.0%; Personality: 3.6% to 28.1%; ADHD: 1.2% to 33.3%). There were however only small site differences in the prevalence of SI (variation in prevalence: 42.3% to 58.3%). We controlled for site differences in the multivariate analyzes by including each treatment center as an independent dummy variable (0/1). We performed all statistical analyses using IBM SPSS statistics (version 27).

3. Results

3.1. Sample

The initial sample consisted of 611 inpatients. Cases with missing data on SI ($n = 48$; 33 males and 15 females) were excluded. The final analytical sample comprised 563 patients: 403 males and 160 females. Approximately one third of the cohort had low education levels. The mean age of substance use onset was roughly 15 years (age median: 14.0), and the mean admission age was about 37 years (age median: 35.0). Table 1 presents an overview of the sample. Among the five specified SUD diagnoses (among 25 cases this information was obtained from self-reports of the most frequently used substance), alcohol use disorder was the most prevalent (55.8%), followed by cannabis (39.4%), stimulants (33.0%), and sedatives (30.2%). Slightly above half of the sample reflected polydrug use (51.9%). In total, 266 of the patients (47.2%) had a diagnosed psychiatric disorder, of whom 109 (41.0%) had more than one diagnosis. Close to one fourth of the patients had a co-occurring diagnosis of anxiety (23.1%). Almost one in five (17.1%) had a diagnosis of mood disorders, whereas 10.8% were diagnosed with personality disorders. The most common subtype of personality disorder (38% of those diagnoses under the actual diagnostic categories of F60, F61, F62) was emotionally unstable personality disorder (F60.3). In total, 13% of the patients had an ADHD diagnosis. Significant gender differences appeared in several variables. Having a cannabis use disorder was more common among males ($p = 0.021$), who were also younger at substance use onset ($p = 0.025$) than females. More females than males were diagnosed with anxiety ($p = 0.014$) and personality disorders ($p = 0.045$), and females had higher levels of anxiety/depression symptoms ($p = 0.002$).

3.2. Prevalence of lifetime suicidal ideation

Table 2 shows the rates of SI by types of SUD diagnoses and co-occurring psychiatric disorders. The lifetime SI rate in the total sample

Table 1
Characteristics of the study sample.

	Total <i>n</i> = 563	Females <i>n</i> = 160	Males <i>n</i> = 403	χ^2 or <i>t</i> - test	<i>p</i> - value	Effect size
Alcohol use disorder				0.80	0.370	0.038
Yes	314 (55.8)	94 (58.8)	220 (54.6)			
No	249 (44.2)	66 (41.3)	183 (45.4)			
Opiate use disorder				0.38	0.537	0.026
Yes	107 (19.0)	33 (20.6)	74 (18.4)			
No	456 (81.0)	127 (79.4)	329 (81.6)			
Cannabis use disorder				5.34	0.021	0.100
Yes	341 (39.4)	51 (31.9)	171 (42.1)			
No	222 (60.6)	109 (68.1)	232 (57.6)			
Sedative use disorder				0.91	0.340	0.040
Yes	170 (30.2)	53 (33.1)	117 (29.0)			
No	393 (69.8)	107 (66.9)	286 (71.0)			
Stimulant use disorder				0.59	0.443	0.032
Yes	186 (33.0)	49 (30.6)	137 (34.0)			
No	377 (67.0)	111 (69.4)	266 (66.0)			
Polydrug use				0.42	0.519	0.028
Yes	279 (51.9)	77 (49.7)	202 (52.7)			
No	259 (48.1)	78 (50.3)	181 (47.3)			
Mood disorders				2.79	0.095	0.070
Yes	96 (17.1)	34 (21.3)	62 (15.4)			
No	467 (82.9)	126 (78.8)	341 (84.6)			
Anxiety disorders				6.00	0.014	0.103
Yes	130 (23.1)	48 (30.0)	82 (20.3)			
No	433 (76.9)	112 (70.0)	342 (79.7)			
Personality disorder				4.01	0.045	0.084
Yes	61 (10.8)	24 (15.0)	37 (9.2)			
No	502 (89.2)	136 (85.0)	366 (90.8)			
ADHD				0.24	0.627	0.020
Yes	73 (13.0)	19 (11.9)	54 (13.4)			
No	490 (87.0)	141 (88.1)	349 (86.6)			
Education level				0.16	0.688	0.017
Low	183 (33.3)	50 (32.1)	133 (33.8)			
Middle/high	366 (66.8)	106 (67.9)	260 (66.2)			
Substance use onset				-1.96	0.025	0.195
<i>n</i>	548	155	393			
(mean/SD)	(14.8/ 3.4)	(15.3/ 4.1)	(14.6/ 3.0)			
Admission age				0.45	0.326	0.036
<i>n</i>	562	159	403			
(mean/SD)	(37.4/ 13.7)	(37.0/ 14.8)	(37.5/ 13.2)			

0.002 0.271
(continued on next page)

Table 1 (continued)

	Total n = 563	Females n = 160	Males n = 403	χ^2 or t- test	p- value	Effect size
Anxiety/ depression sympt.				-2.83		
n	563	160	403			
(mean/ SD)	(2.16/ 0.7)	(2.16/ 0.7)	(2.29/ 0.7)			

Note. Categorical variables presented as n (%). Effect sizes were measured using Cohen’s d and Cramer’s V, as appropriate.

was 50.1% (n = 282). The SI rate was significantly higher among females (61.9%) than males (45.4%) (p < .001). For both males and females, the SI rates varied between diagnostic categories, with the highest rate for patients with a co-occurring personality disorder (67.7% and 83.3% for males and females, respectively). For both males and females, the lowest SI rate was observed for patients with an alcohol use disorder (41.4% and 61.7%). Significantly higher female than male SI rates were found among those with alcohol use, opiate use, sedative use, or anxiety disorders.

3.3. Variables associated with suicidal ideation

The results of the bivariate analyses of the associations between each independent variable and SI for the total sample are presented in Table 3. The following variables were significantly (p < .05) associated with having SI: opiate use disorder (OR = 1.71, 95% CI: 1.110 – 2.619), polydrug use (OR = 1.41, 95% CI: 1.002 – 1.977), mood disorders (OR = 2.87, 95% CI: 1.783 – 4.623), anxiety disorders (OR = 1.76, 95% CI: 1.177 – 2.617), personality disorders (OR = 3.15, 95% CI: 1.731–5.712), ADHD (OR = 1.72, 95% CI: 1.037 – 2.840), anxiety/depression symptoms (OR = 1.97, 95% CI: 1.536 – 2.530), younger age of substance use onset (OR = 0.93, 95% CI: 0.881 – 0.984), younger admission age (OR = 0.99, 95% CI: 0.975 – 0.999), and gender (OR = 1.95, 95% CI: 1.342 – 2.837).

Table 4 shows the results of the hierarchical multiple logistic regression analysis, including the independent variables that were significantly associated with SI in the bivariate analysis. Female gender remained significantly associated with having SI after multivariate adjustment (OR = 1.71, 95% CI: 1.12 – 2.62). Among the variables related to substance use, only younger age of substance use onset was independently associated with having SI (OR = 0.93, 95% CI: 0.88 – 0.99). In addition, co-occurring mood disorders (OR = 2.00, 95% CI: 1.17 – 3.43), personality disorders (OR = 2.97, 95% CI: 1.48 – 5.95) and anxiety/depression symptoms OR = 1.72, 95% CI: 1.29 – 2.28)

Table 2

Prevalence of suicidal ideation in females and males by types of SUD diagnoses and co-occurring mental disorders.

	Total males		Males with suicidal ideation		Total females		Females with suicidal ideation		Males vs females p-value	
	n	%	n	%	n	%	n	%		
Total SUD diagnoses	403		183	45.4	38.2;52.6	160	99	61.9	52.3;71.5	< 0.001
Alcohol	220		91	41.4	31.2;51.5	94	58	61.7	49.2;74.2	< 0.001
Opiates	74		40	54.1	38.6;69.6	33	25	75.8	58.9;92.7	0.034
Cannabis	171		79	46.2	35.2;57.2	51	31	60.8	43.6;78.0	0.067
Sedatives	117		56	47.9	34.8;61.0	53	34	64.2	48.1;80.3	0.049
Stimulants	137		79	51.1	40.1;62.1	49	31	63.3	46.2;80.4	0.142
Polydrug	202		103	51.0	41.1;60.6	77	49	63.3	49.8;76.8	0.058
Co-occurring diagnoses										
Mood	62		42	67.7	53.6;81.8	34	26	76.5	60.2;92.8	0.368
Anxiety	82		44	53.7	39.0;68.4	48	35	72.9	58.2;87.6	0.030
Personality	37		25	67.6	49.4;85.8	24	20	83.3	67.0;99.6	0.171
ADHD	54		30	55.6	37.8;73.4	19	15	78.9	57.9;99.9	0.071

Note. Boldface indicates statistical significance (p < 0.05)

remained significantly associated with SI in the model. By adding the interaction terms with gender (Gender x Age of onset; Gender x Mood disorders; Gender x Personality disorders; Gender x Anxiety/depression symptoms) (Step 2), we observed a significant effect, indicating that the association between age of substance use onset and SI depended on male gender (OR = 1.16, 95% CI: 1.02 – 1.31). Among patients with SI, the mean age of substance use onset was significantly lower among males than females. However, there was no gender difference in age of onset among patients without SI (Fig. 1).

4. Discussion

This is one of few studies that have examined the prevalence and characteristics of persons with SI in an inpatient SUD treatment setting. The study contributes to existing research by showing the impact of several important variables on SI that have not been adequately investigated among SUD inpatients, including objective measures of co-occurring psychiatric disorders, patient-reported anxiety/depression symptoms at treatment intake, and age of substance use onset.

To our knowledge, this is the first study among SUD inpatients to demonstrate that having diagnosed mood and personality disorders was independently associated with SI. The increased SI risk associated with having these disorders among this high-risk subsample of SUD patients was expected, and support findings among other samples (Andersson et al., 2022; Rodriguez-Cintas et al., 2018). In their retrospective study of clinical profiles among SUD outpatients, Rodrigues-Cintas et al.

Table 3

Bivariate regression results of variables associated with suicidal ideation.

Variables	OR	95% CI	p-value
Alcohol use disorder	0.79	0.564;1.099	0.160
Opiate use disorder	1.71	1.110;2.619	0.015
Cannabis use disorder	0.97	0.688;1.353	0.836
Sedative use disorder	1.12	0.821;1.689	0.374
Stimulant use disorder	1.29	0.905;1.830	0.161
Polydrug use	1.41	1.002;1.977	0.048
Mood disorders	2.87	1.783;4.623	< 0.001
Anxiety disorders	1.76	1.177;2.617	< 0.001
Personality disorder	3.15	1.731;5.712	< 0.001
ADHD	1.72	1.037;2.840	0.036
Anxiety/depression symptoms	1.97	1.536;2.530	< 0.001
Age of onset	0.93	0.881;0.984	0.011
Admission age	0.99	0.975;0.999	0.031
Education level ^a	1.36	0.952;1.041	0.091
Gender ^b	1.95	1.342;2.837	< 0.001

Note. Reference category for each of the substance use and psychiatric diagnoses was not having the specific diagnosis. ^a0 = medium/high, 1 = low. ^b0 = male 1 = female.

Boldface indicates statistical significance (p < 0.05)

Table 4
Hierarchical logistic regression analyses of characteristics associated with suicidal ideation.

Variables	Step 1			Step 2 Including interaction terms with gender		
	OR	95% CI	p-value	OR	95% CI	p-value
Gender ^a	1.71	1.12;2.62	0.013	0.21	0.21;2.18	0.193
Opiate use disorders	1.46	0.85;2.49	0.167	1.43	0.84;2.44	0.192
Polydrug use	0.95	0.59;1.53	0.838	0.91	0.56;1.47	0.689
Age of onset	0.93	0.88;0.99	0.026	0.87	0.79;0.95	0.002
Admission age	1.00	0.98;1.02	0.759	1.00	0.98;1.02	0.958
Mood disorders	2.00	1.17;3.43	0.011	2.24	1.17;4.27	0.014
Anxiety disorders	1.23	0.74;2.02	0.425	1.29	0.78;2.14	0.325
Personality disorder	2.97	1.48;5.95	0.002	3.33	1.41;7.86	0.006
ADHD	1.41	0.78;2.55	0.262	1.41	0.78;2.56	0.261
Anxiety/depression symptoms	1.72	1.29;2.28	< 0.001	1.70	1.21;2.39	0.002
Gender x Age of onset				1.16	1.02;1.31	0.023
Gender x Mood disorder				0.71	0.23;2.19	0.555
Gender x Personality disorders				0.79	0.18;3.41	0.753
Gender x Anxiety/depression symptoms				0.99	0.54;1.82	0.978

Note. Cases included in analysis: $n = 525$. Nagelkerke's R²/Cox & Snell R²: Step1:0.16/0.12; Step 2:0.17/0.13. Reference category for each of the substance use and mental diagnoses was not having the specific diagnosis. ^a0 = male, 1 = female. Boldface indicates statistical significance ($p < 0.05$).

(2018) found that borderline personality disorder, which frequently co-occurs with other personality disorders (McGlashan et al., 2000; Zanarini et al., 2000) was associated with a fourfold risk, whereas the presence of a depressive disorder doubled the risk of SI. The current results extend these findings by suggesting that among the co-occurring psychiatric disorders, personality disorders appear to be associated with particularly high risk of SI among SUD inpatients.

An association between measures of mental distress and SI has been found in various samples of SUD patients in other than the inpatient treatment setting (Cottler et al., 2005; Ilgen et al., 2010; López-Goñi et al., 2018; Rodríguez-Cintas et al., 2018; Wines et al., 2004). However,

our results elaborate these findings showing that among SUD inpatients, the association between patient-reported anxiety/depression symptoms and SI was independent of the presence of a psychiatric diagnosis, and that it appeared to be similar for both males and females. This particular finding points to a possible clinical importance of performing multifaceted assessments of psychiatric and psychological functioning of SUD inpatients.

We found that younger age at substance use onset was associated with an increased likelihood of having SI. This contrasts with findings in previous SUD treatment studies i.e. (López-Goñi et al., 2018; Rodríguez-Cintas et al., 2018). However, due to methodological and sample differences, results of the previous studies are not directly comparable with the present study. For instance, the previous studies included outpatients, had a considerable higher proportion of patients with cocaine dependence and used different measures of substance use onset. The mean age of substance use onset in the current sample was 14.8 years of age. Onset of substance use in adolescence, which is a critical period of brain development (Guerra and Pascual, 2010), may cause psychological dysfunction (Taber-Thomas and Perez-Edgar, 2016), which is a condition associated with SI (Thompson et al., 2012). The increased risk of SI associated with early substance use onset could also reflect common underlying risk factors (Wells et al., 2004), such as exposure to adverse childhood experiences (e.g., sexual abuse) (Dube et al., 2001; Ilgen et al., 2010; Rodríguez-Cintas et al., 2018).

The interaction effect of gender with early onset substance use indicated that males accounted for the association between early onset and the presence of SI. Given that SI is associated with early life trauma (Bruffaerts et al., 2010), our finding could reflect that males and females adopted different strategies to cope with traumatic stressors, among which use of alcohol or drugs early in life was a more common strategy for males (El Mhamdi et al., 2017; Grigsby et al., 2020). Moreover, there may be gender differences in how early onset of drug use is associated with subsequent SUD and SI. There is evidence that early onset is more strongly associated with the development of SUD for males than females (Pitkänen et al., 2008; Pitkänen et al., 2005). Thus, since males were younger than females at substance use onset, they probably also developed severe drug problems at a younger age. A gender difference in the association between early onset of problem drug use and suicidal behaviors, with stronger associations for males than females, have been found in previous research (Cho et al., 2007). However, we cannot rule out that the interaction effect found in the current study might be a statistical issue related to lower proportion of females in the patient

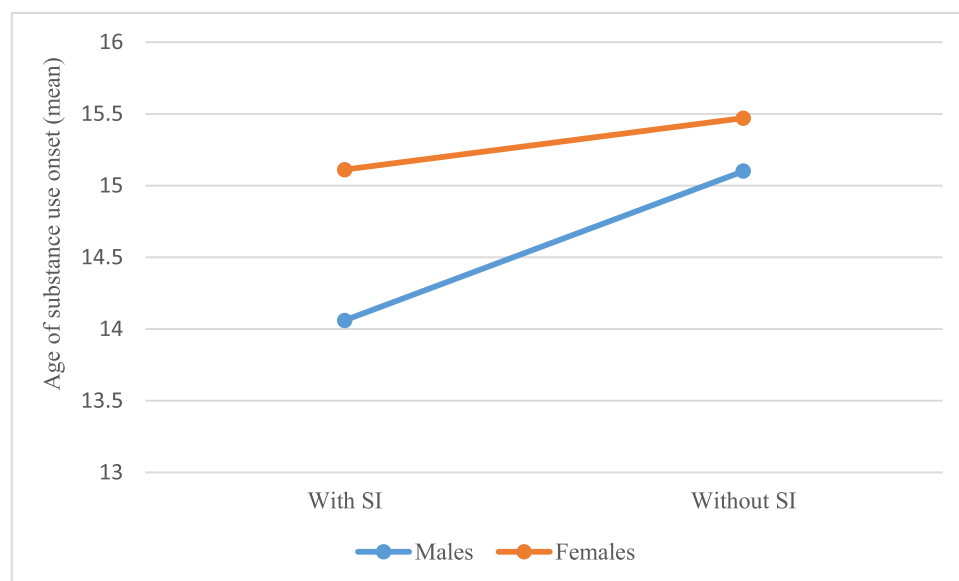


Fig. 1. Interaction effect of gender with age of substance use onset on suicidal ideation (SI).

sample. Further research should investigate the impact of substance use onset and gender differences in factors associated with SI (and other suicidal behaviors) among SUD inpatients more closely by employing larger samples. In addition, applying an additional qualitative research approach among a sub-sample of male and female SUD patients who endorsed suicidal ideation may provide important in-depth explanations of gender differences in SI.

The current study supports previous research suggesting a higher SI rate in female than in male SUD patients (Cottler et al., 2005; Ilgen et al., 2010; Rodríguez-Cintas et al., 2018), and aligns with findings in other samples (Franklin et al., 2017; Nock et al., 2008).

The bivariate results indicated higher female than male SI rates only among those with alcohol, opiate, or sedative use dependence. Gender differences in the prevalence of and types of SUD associated with SI have been investigated in previous research to a small extent; however, an elevated SI risk for females with alcohol use disorders has been suggested by others (Cottler et al., 2005). We found that female gender was independently associated with having SI after adjustment for psychiatric diagnoses, anxiety/depression symptoms and types of SUD. This finding indicated that the gender difference in SI rates might be explained by gender-specific mediating factors that were not captured in the present study. Males and females may diverge regarding exposure to different forms of adverse childhood experiences, for example sexual abuse (Stoltenborough et al., 2011; Roy and Janal, 2006), which may have caused gendered associations with lifetime SI. More large-scale studies among SUD inpatients are needed to understand the impact of gender on lifetime SI in this population.

4.1. Strengths and limitations

This study is one of the few investigations of the prevalence and characteristics of SUD inpatients with lifetime SI. The study examined the impact of several important variables in this patient group, that have not been adequately investigated in previous SUD treatment studies, such as objective measures of specific SUDs and co-occurring psychiatric disorders. An additional strength of the study was the naturalistic design including unselected patients from publicly financed inpatient treatment programs. However, the study has some limitations that warrant discussion.

The current SI measure was limited to one question from the ASI interview (McLellan et al., 1992), and data from supplementary notes on whether the patient seriously considered a plan for taking his/her life was not included. Thus, the current measure of SI may include both passive (i.e., a desire rather than a plan to end one's life) and active ideation (i.e. desire to make an active suicide attempt/ending one's life) (Beck et al., 1979). An unstated definition of SI may have a weaker predictive effect concerning future suicidal behaviors, compared with definitions that include clearly active ideation (Franklin et al., 2017). However, suicide prevention researchers have argued the importance of attending to all aspects of SI (Jobs and Joiner, 2019). Single-item assessments comparable to that used in this study have also been applied in several recent reports of SI in the SUD treatment population (Haynes et al., 2021; Kelly et al., 2020; López-Goñi et al., 2018; Rodríguez-Cintas et al., 2018). Prior suicide attempts are common among SUD patients (Iglén et al., 2010) and may be as high as 40% among those with lifetime SI (Lopez-Goni et al., 2019). Suicidal ideation and attempts may share several associated conditions and precursors, including increased psychiatric and substance use severity (Ilgen et al., 2005; Lopez-Goni et al., 2019; Janakiraman et al., 2020). Since we did not have data to control for prior suicide attempts, we could not examine factors that may potentially be uniquely associated with SI. We consider this an interesting and important topic for future research in the SUD treatment population.

The sample size in this study is comparable to most previous studies in this field including the proportion of female patients, which typically is less than 30% of the SUD treatment patients e.g. (Haynes et al. 2021,

López-Goñi et al. 2018, Rodríguez-Cintas et al. 2018). Increasing the sample size would lend more power to the analyses of associations between types of SUD and psychiatric disorders and SI, in particular for females.

The current study did not include information on the types of treatment measures provided for patients with SI. Future research may investigate the adequacy of treatment for patients' suicidal thoughts during the SUD treatment stay and the perceived consequences of this treatment for their substance use and mental health outcomes.

5. Conclusion

This study emphasizes that in addition to obtaining diagnostic information on mood and personality disorders, screening of patient-reported symptoms of anxiety/depression at treatment intake may be useful for clinicians in identifying and providing personalized treatment for SUD inpatients who are at increased risk of SI. The study also suggests that due to female patients having a higher SI prevalence than males, gender is a relevant variable that should be taken into account in future suicide prevention research in this patient population.

Role of funding source

Funding for this study was provided by the Norwegian University of Science and Technology (NTNU), Trondheim, Norway, St. Olav's University Hospital, Trondheim, Norway, and Møre and Romsdal Hospital Trust, Ålesund, Norway. The funding sources had no role in the study design, data collection, analyses, writing, or the decision to submit the manuscript for publication.

CRediT authorship contribution statement

Helle Wessel Andersson: Conceptualization, Formal analysis, Writing – original draft, Writing – review & editing. **Mats P. Mosti:** Writing – review & editing. **Trond Nordfjærn:** Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

We want to thank the research assistants of the participating clinics for their contribution to the implementation of the study: Marit Mag-nussen, Kristin Øyen Kvam, Snorre Rønning, Eli Otterholt, Kristian Bachmann, and Helene Tjelde. We also want to thank the patients for their contribution to this research.

References

- Andersson, H.W., Lilleeng, S.E., Ruud, T., Ose, S.O., 2022. Suicidal ideation in patients with mental illness and concurrent substance use: analyses of national census data in Norway. *BMC Psychiatry* 22 (1), 1–9. <https://doi.org/10.1186/s12888-021-03663-8>.
- Andersson, H.W., Steinsbekk, A., Walderhaug, E., Otterholt, E., Nordfjærn, T., 2018. Predictors of dropout from inpatient substance use treatment: a prospective cohort study. *Subst. Abuse* 12, 1–10. <https://doi.org/10.1177/1178221818760551>.
- Beck, A.T., Kovacs, M., Weissman, A., 1979. Assessment of suicidal intention: the scale for suicide ideation. *J. Consult. Clin. Psychol.* 47 (2), 343. <https://doi.org/10.1037/0022-006X.47.2.343>.
- Britton, P.C., Conner, K.R., 2010. Suicide attempts within 12 months of treatment for substance use disorders. *Suicide Life Threat. Behav.* 40 (1), 14–21. <https://doi.org/10.1521/suli.2010.40.1.14>.
- Bruffaerts, R., Demyttenaere, K., Borges, G., Haro, J.M., Chiu, W.T., Hwang, I., Karam, E. G., Kessler, R.C., Sampson, N., Alonso, J., 2010. Childhood adversities as risk factors for onset and persistence of suicidal behaviour. *Br. J. Psychiatry* 197 (1), 20–27. <https://doi.org/10.1192/bjp.bp.109.074716>.
- Chen, Q., Zhang-James, Y., Barnett, E.J., Lichtenstein, P., Jokinen, J., D'Onofrio, B.M., Faraone, S.V., Larsson, H., Fazel, S., 2020. Predicting suicide attempt or suicide

- death following a visit to psychiatric specialty care: a machine learning study using Swedish national registry data. *PLoS Med.* 17 (11), e1003416 <https://doi.org/10.1371/journal.pmed.1003416>.
- Cho, H., Hallfors, D.D., Iritani, B.J., 2007. Early initiation of substance use and subsequent risk factors related to suicide among urban high school students. *Addict. Behav.* 32 (8), 1628–1639. <https://doi.org/10.1016/j.addbeh.2006.11.017>.
- Cottler, L.B., Campbell, W., Krishna, V., Cunningham-Williams, R.M., Abdallah, A.B., 2005. Predictors of high rates of suicidal ideation among drug users. *J. Nerv. Ment. Dis.* 193 (7), 431. <https://doi.org/10.1097/01.nmd.0000168245.56563.90>.
- Derogatis, L.R., Lipman, R.S., Rickels, K., Uhlenhuth, E.H., Covi, L., 1974. The Hopkins symptom checklist (HSCL): a self-report symptom inventory. *Syst. Res. Behav. Sci.* 19 (1), 1–15. <https://doi.org/10.1002/bs.3830190102>.
- Dube, S.R., Anda, R.F., Felitti, V.J., Chapman, D.P., Williamson, D.F., Giles, W.H., 2001. Childhood abuse, household dysfunction, and the risk of attempted suicide throughout the life span: findings from the adverse childhood experiences study. *JAMA* 286 (24), 3089–3096. <https://doi.org/10.1001/jama.286.24.3089>.
- El Mhamdi, S., Lemieux, A., Bouanene, I., Salah, A.B., Nakajima, M., Salem, K.B.A.I.M., 2017. Gender differences in adverse childhood experiences, collective violence, and the risk for addictive behaviors among university students in Tunisia. *Prev. Med.* 99, 99–104. <https://doi.org/10.1016/j.ypmed.2017.02.011>.
- EMCDDA, 2019. European Drug Report 2019: trends and developments. http://www.emcdda.europa.eu/system/files/publications/11364/20191724_TDAT19001IT_N_PDF.pdf (Accessed 29 August 2022).
- Franklin, J.C., Ribeiro, J.D., Fox, K.R., Bentley, K.H., Kleiman, E.M., Huang, X., Musacchio, K.M., Jaroszowski, A.C., Chang, B.P., Nock, M.K., 2017. Risk factors for suicidal thoughts and behaviors: a meta-analysis of 50 years of research. *Psychol. Bull.* 143 (2), 187. <https://doi.org/10.1037/bul0000084>.
- Grigsby, T.J., Rogers, C.J., Albers, L.D., Benjamin, S.M., Lust, K., Eisenberg, M.E., Forster, M., 2020. Adverse childhood experiences and health indicators in a young adult, college student sample: differences by gender. *Int. J. Behav. Med.* 27 (6), 660–667. <https://doi.org/10.1007/s12529-020-09913-5>.
- Guerra, C., Pascual, M., 2010. Mechanisms involved in the neurotoxic, cognitive, and neurobehavioral effects of alcohol consumption during adolescence. *Alcohol* 44 (1), 15–26. <https://doi.org/10.1097/00005053-200208000-00010>.
- Haynes, C.J., Deane, F.P., Kelly, P.J., 2021. Suicidal ideation predicted by changes experienced from pre-treatment to 3-month postdischarge from residential substance use disorder treatment. *J. Subst. Abuse Treat.* 131, 108542 <https://doi.org/10.1016/j.jsat.2021.108542>.
- Hubers, A., Moaddine, S., Peersmann, S., Stijnen, T., Van Duijn, E., Van der Mast, R., Dekker, O., Giltay, E., 2018. Suicidal ideation and subsequent completed suicide in both psychiatric and non-psychiatric populations: a meta-analysis. *Epidemiol. Psychiatr. Sci.* 27 (2), 186. <https://doi.org/10.1017/S2045796016001049>.
- Ilgen, M.A., Burnette, M.L., Conner, K.R., Czym, E., Murray, R., Chermack, S., 2010. The association between violence and lifetime suicidal thoughts and behaviors in individuals treated for substance use disorders. *Addict. Behav.* 35 (2), 111–115. <https://doi.org/10.1016/j.addbeh.2009.09.010>.
- Ilgen, M.A., Quyen, T., Finney, J.W., Harris, A.H.S., 2005. Recent suicide attempt and the effectiveness of inpatient and outpatient substance use disorder treatment. *Alcohol Clin. Exp. Res.* 29 (9), 1664–1679. <https://doi.org/10.1097/01.alc.0000179411.88057.3a>.
- Janakiraman, R., Gowin, J.L., Sloan, M.E., Schwandt, M.L., Diazgranados, N., Ramchandani, V.A., Kwako, L.E., 2020. History of suicidality and alcohol craving trajectories during inpatient treatment for alcohol use disorder. *Drug Alcohol Depend.* 209, 107918. <https://doi.org/10.1016/j.drugalcdep.2020.107918>.
- Jobs, D.A., Joiner, T.E., 2019. Reflections on suicidal ideation. *Crisis* 40 (4), 227–230. <https://doi.org/10.1027/0227-5910/a000615>.
- Kelly, L.M., Rash, C.J., Alessi, S.M., Zajac, K., 2020. Correlates and predictors of suicidal ideation and substance use among adults seeking substance use treatment with varying levels of suicidality. *J. Subst. Abuse Treat.* 119, 108145 <https://doi.org/10.1016/j.jsat.2020.108145>.
- López-Goñi, J.J., Fernández-Montalvo, J., Arteaga, A., Esarte, S., 2017. Searching objective criteria for patient assignment in addiction treatment. *J. Subst. Abuse Treat.* 76, 28–35. <https://doi.org/10.1016/j.jsat.2017.02.014>.
- López-Goñi, J.J., Fernández-Montalvo, J., Arteaga, A., Haro, B., 2018. Suicidal ideation and attempts in patients who seek treatment for substance use disorder. *Psychiatry Res.* 269, 542–548. <https://doi.org/10.1016/j.psychres.2018.08.100>.
- López-Goñi, J.J., Fernández-Montalvo, J., Arteaga, A., Haro, B., 2019. Suicidal attempts among patients with substance use disorders who present with suicidal ideation. *Addict. Behav.* 89, 5–9. <https://doi.org/10.1016/j.addbeh.2018.09.006>.
- McGlashan, T.H., Grilo, C.M., Skodol, A.E., Gunderson, J.G., Shea, M.T., Morey, L.C., Zanarini, M.C., Stout, R.L., 2000. The collaborative longitudinal personality disorders study: baseline axis I/II and II/II diagnostic co-occurrence. *Acta Psychiatr. Scand.* 102 (4), 256–264. <https://doi.org/10.1034/j.1600-0447.2000.102004256.x>.
- McLellan, A.T., Kushner, H., Metzger, D., Peters, R., Smith, I., Grissom, G., 1992. The fifth edition of the addiction severity index. *J. Subst. Abuse Treat.* 9 (3), 199–213. [https://doi.org/10.1016/0740-5472\(92\)90062-S](https://doi.org/10.1016/0740-5472(92)90062-S).
- Nock, M.K., Borges, G., Bromet, E.J., Cha, C.B., Kessler, R.C., Lee, S., 2008. Suicide and suicidal behavior. *Epidemiol. Rev.* 30 (1), 133–154. <https://doi.org/10.1093/epirev/mxn002>.
- Norwegian Directorate of Health. 2021. Tjenester i psykisk helsevern og TSB 2020. SAMDATA Spesialisthelsetjenesten. [Specialized mental health and substance use treatment services 2020. SAMDATA. Rapport psykisk helsevern og TSB 2020 - SISTE versjon til publisering.pdf (helsedirektoratet.no) (Accessed 30 August 2022)].
- Pitkänen, T., Kokko, K., Lyyra, A.L., Pulkkinen, L., 2008. A developmental approach to alcohol drinking behaviour in adulthood: a follow-up study from age 8 to age 42. *Addiction* 103, 48–68. <https://doi.org/10.1111/j.1360-0443.2008.02176.x>.
- Pitkänen, T., Lyyra, A.L., Pulkkinen, L., 2005. Age of onset of drinking and the use of alcohol in adulthood: a follow-up study from age 8 to age 42 for females and males. *Addiction* 100 (5), 652–661. <https://doi.org/10.1111/j.1360-0443.2005.01053.x>.
- Ribeiro, J.D., Franklin, J.C., Fox, K.R., Bentley, K.H., Kleiman, E.M., Chang, B.P., Nock, M.K., 2016. Self-injurious thoughts and behaviors as risk factors for future suicide ideation, attempts, and death: a meta-analysis of longitudinal studies. *Psychol. Med.* 46 (2), 225–236. <https://doi.org/10.1017/S0033291715001804>.
- Rodríguez-Cintas, L., Daigre, C., Braquehais, M.D., Palma-Alvarez, R.F., Grau-López, L., Ros-Cucurull, E., Rodríguez-Martos, L., Abad, A.C., Roncero, C., 2018. Factors associated with lifetime suicidal ideation and suicide attempts in outpatients with substance use disorders. *Psychiatry Res.* 262, 440–445. <https://doi.org/10.1016/j.psychres.2017.09.021>.
- Roy, A., Janal, M., 2006. Gender in suicide attempt rates and childhood sexual abuse rates: is there an interaction? *Suicide Life Threat. Behav.* 36 (3), 329–335. <https://doi.org/10.1521/suli.2006.36.3.329>.
- Stoltenborgh, M., Van Ijzendoorn, M.H., Euser, E.M., Bakermans-Kranenburg, M.J., 2011. A global perspective on child sexual abuse: meta-analysis of prevalence around the world. *Child Maltreat.* 16 (2), 79–101. <https://doi.org/10.1177/1077559511403920>.
- Strand, B.H., Dalgard, O.S., Tambs, K., Rognerud, M., 2003. Measuring the mental health status of the Norwegian population: A comparison of the instruments SCL-25, SCL-10, SCL-5 and MHI-5 (SF-36). *Nord. J. Psychiatry* 57 (2), 113–118. <https://doi.org/10.1080/08039480310000932>.
- Taber-Thomas, B., Perez-Edgar, K., 2016. Chapter 8. Emerging adulthood brain development. editor. In: Arnett, J.J. (Ed.), *The Oxford Handbook of Emerging Adulthood*. Oxford University Press, New York, NY, pp. 126–141.
- Thompson, R., Proctor, L.J., English, D.J., Dubowitz, H., Narasimhan, S., Everson, M.D., 2012. Suicidal ideation in adolescence: examining the role of recent adverse experiences. *J. Adolesc.* 35 (1), 175–186. https://books.google.no/books?hl=no&lr=&id=E7uYCgAAQBAJ&oi=fnd&pg=PA126&ots=YK2VdgZLv&sig=Ijs5SoDsoPu6Fo2pDnCdGIdRSCY&redir_esc=y#v=onepage&q&f=false.
- Walby F.A., Myhre M.Ø., Kildahl A.T., 2020. 1910 døde pasienter. Selvmord i psykisk helsevern og tverrfaglig spesialisert rusbehandling 2008 til 2015 - en nasjonal registerstudie. [1910 dead patients: Suicide in specialized mental health and substance use treatment 2008 to 2015 - a national register study]. Available from: www.uio.no/kartleggingssystemet.
- Wells, J.E., Horwood, L.J., Fergusson, D.M., 2004. Drinking patterns in mid-adolescence and psychosocial outcomes in late adolescence and early adulthood. *Addiction* 99 (12), 1529–1541. <https://doi.org/10.1111/j.1360-0443.2004.00918.x>.
- WHO, 1992. The ICD10 Classification of Mental and Behavioral Disorders: Clinical Descriptions and Diagnostic Guidelines. Geneva, Switzerland: World Health Organization. <http://apps.who.int/iris/handle/10665/37958>.
- Wines, J.D., Saitz, R., Horton, N.J., Lloyd-Travaglini, C., Samet, J.H., 2004. Suicidal behavior, drug use and depressive symptoms after detoxification: a 2-year prospective study. *Drug Alcohol Depend.* 76, S21–S29. <https://doi.org/10.1016/j.drugalcdep.2004.08.004>.
- Zanarini, M.C., Skodol, A.E., Bender, D., Dolan, R., Sanislow, C., Schaefer, E., Morey, L.C., Grilo, C.M., Shea, M.T., McGlashan, T.H., 2000. The collaborative longitudinal personality disorders study: Reliability of axis I and II diagnoses. *J. Pers. Disord.* 14 (4), 291–299. <https://doi.org/10.1521/pedi.2000.14.4.291>.