



Suicide Attempts in an Italian Population with Substance Use Disorders: Results of a Follow-up Study

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Abstract

Suicide is a leading cause of morbidity worldwide. Among the known risk factors, substance use disorders are particularly relevant, but there are still few data on the epidemiology of suicide attempts in this group during the COVID-19 pandemic. We used electronic health records of the National Health Services to identify individuals who received a diagnosis of substance use disorder in the metropolitan area of Bologna from 2009 to 2019. Within this cohort, we identified those who accessed emergency departments for suicide attempt from 2009 to 2020. The crude suicide rate for 1000 person years was 2.54, higher than in the general population. The risk was higher within 1 year from the first visit in patients with any psychiatric diagnosis, mainly depression, neurotic and somatoform syndromes and personality and behavioural disorders. The risk was higher, but not significantly, in the year 2020 compared to the previous year.

Keywords Substance use disorder · Suicide attempt · Psychiatric disorder · COVID-19

More than 700,000 people die due to suicide every year, and for every suicide, there are about 20 suicide attempts (SA) (WHO, 2021). The most important risk factors are previous

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suicidal ideation, behaviour or mental disorders and socioeconomic disadvantage (García de la Garza et al., 2021; Yuodelis-Flores & Ries, 2015).

SA are non-fatal, self-directed, potentially injurious behaviour with an intention to end life (Klonsky et al., 2016), and the global lifetime prevalence of SA is estimated at 2.7% (Nock et al., 2008). Around two-thirds of suicides might have been preceded by non-fatal self-harm over the previous year (Owens et al., 2002). Forty to fifty percent of patients who presented to emergency departments (ED) with a suicide-related complaint had attempted suicide at least once before (Zahl & Hawton, 2004).

Ill mental health (Borges et al., 2010), loneliness (Hawton et al., 2012), depression (Klonsky et al., 2016), alcohol consumption (Dendup et al., 2020), illicit drug use (Sharma et al., 2015) and poverty (Thompson Jr et al., 2017) have been identified as important risk factors for SA.

In the European population, substance use represents a significant risk of SA at any time (Carrasco-Barrios et al., 2020). From a systematic review, a pooled prevalence rate of SA of 20% in the last year among patients with substance use disorders (SUD) emerged (Armoon et al., 2021). Suicidal behaviours are significant clinical concerns among those seeking treatment for SUD (Espinete et al., 2019), as up to 40% of patients seeking treatment for SUD report a history of SA (Roy, 2009; Roy, 2010; Roy & Janal, 2007), and the risk for highly lethal SA remains elevated even after remission from SUD (Rizk et al., 2021).

Being female; smoking; a history of physical and sexual abuse; depression; polysubstance use; and alcohol, cannabis, cocaine and amphetamine use disorders have been significantly associated with SA in the previous 12 months among patients with SUD (Armoon et al., 2021). Furthermore, SUD are strongly associated with the risk of SA in people with severe mental illness (Østergaard et al., 2017). However, it should be considered that, while a significant association between SUD and SA has been found, further evidence is required to assess and compare the association between suicide outcomes and different types of illicit drugs, the dose-response relationship and the way the drugs are used (Poorolajal et al., 2016).

While data from several countries show no evidence of an increase in suicide during the COVID-19 pandemic thus far (Moutier, 2020), a number of areas appear to have seen fewer suicides relative to the expected number (Pirkis et al., 2021). Adults with suicidal thoughts and behaviours during the COVID-19 pandemic in 2020 seem to have distinct social and psychiatric characteristics compared to patients in the preceding year. In fact, among suicide-related ED visits, adults in 2020 were more likely to have co-occurring SUD (Ridout et al., 2021).

Improved surveillance and monitoring of SA in people with SUD is required for effective suicide prevention strategies. In the present study, we analysed ED visits for SA in a cohort of residents in the metropolitan area of Bologna (northern Italy) who accessed the National Health Services (NHS) for SUD (cocaine, opioids, cannabis) from 01/01/2009 to 31/12/2019. Our aims were to provide information on the rate and characteristics associated with SA in this group from 01/01/2009 to 31/12/2020, to compare it with the rate of the general population and to compare the rates of SA during and before the COVID-19 pandemic.

Materials and Methods

People residing in the metropolitan area of Bologna between the ages of 18 and 79 years who first turned to a hospital ward (HOS), community mental health centre (MHS) or centre for addiction treatment (CAT) for cocaine, cannabis or opioid use disorders were selected. The reference period was between 01/01/2009 and 31/12/2019.

The cases were selected from the IT systems of CATs (10 health services), HOSs (10 facilities) and MHSs (17 services). As an ‘incident case’, the subjects who had not been dismissed to a HOS or admitted to a CAT or MHS for SUD prior to 01/01/2009 were considered.

At the CATs, a digital regional folder is used to collect the data at first admission, personal data, health data, treatments undertaken and substances of use. Admission involves the definition and the start-up of a therapeutic project agreed upon with the patient in compliance with the diagnostic evaluation. Regarding HOSs and MHSs, patients were selected on the grounds of the International Classification of Diseases (ICD)-9 diagnosis of drug addiction (304.0, 304.2, 304.3) and non-dependent drug abuse (305.2, 305.5, 305.6).

Variables related to age, gender, country of birth, residence, substance of use, contact sector and date of contact were used. This information was collected at first contact. Diagnoses of any other psychiatric disorders were identified by cross-matching with electronic health records (EHR) registered by MHSs in the metropolitan area of Bologna during the entire considered period (ICD-9 codes at first contact).

Records of SA within the cohort were identified through cross-matching with EHR of the ED in the metropolitan area of Bologna (16 ED) from 01/01/2009 to 31/12/2020. The records were examined by a multidisciplinary team of psychiatrists and epidemiologists in order to confirm that they were considered SA; the methods of SA were classified according to the ICD-10 (Pavarin et al., 2014). SA were defined as ‘potentially self-injurious behaviour with a non-fatal outcome, for which there is evidence that the person had the intent to kill him/herself, but failed, was rescued or thwarted, or changed one’s mind’ (Silverman, 2006). For the present study, each person’s first access to an ED for SA, after the first visit for SUD, was used as the index episode.

Person years (PY) were calculated from the first documented data of admission to 31 December 2020 or up to the date of the first SA. Continuous and categorical variables were analysed with Student’s *t* test and chi-squared test, respectively. Crude suicide attempt rates (CSARs) per thousand PY and relative 95% confidence intervals (CI) were calculated. Poisson regression analyses were performed to analyse the combined effect of sex, age, substance, psychiatric diagnosis, latency (time from first visit for SUD to SA) and COVID-19 period. Age and latency were treated as time-dependent variables. In general, the evaluation considered the presence or absence of any psychiatric diagnosis and, individually, the presence or absence of every major psychiatric diagnosis. Data analyses were performed using the STATA 15.1 statistical software program. The study protocol was approved by the local research ethics committee.

Results

The cohort included 2874 people with SUD. Twenty percent were represented by females, 19% were non-native, and the average age at first admission was 34.9 ± 11.9 years. Data are shown in Table 1. At the first contact, 77% of the cohort accessed a CAT, 17% accessed a HOS and 6% accessed a MHS. Individuals could have used more than one substance of abuse, but the records indicated that 53% used cocaine, 46% used opiates and 35% used cannabis; 31% had concomitant alcohol use disorders. Thirty percent (872 subjects) of the cohort received a diagnosis of at least one psychiatric disorder; the most common were personality and behavioural disorders (9%), depression (6%), schizophrenia and other functional psychoses (5%) and neurotic and somatoform

Table 1 Patients accessed to health services for substance use disorder from 2009 to 2019 in the Metropolitan Area of Bologna

	Total (2874)			Males (2286)			Females (588)			P
	N	%		N	%		N	%		
Country of birth										
	2342	81.5	1853	81.1		489	83.2	0.241		
Natives										
Non-natives	532	18.5	433	18.9		99	16.8			
Age at first admission	34.94±11.92	35.07±11.42	34.43±13.68	0.2499						
Substance use disorders										
Cocaine	1522	53.0	1250	54.7		272	46.3	<0.0001		
Opiates	1314	45.7	960	42.0		354	60.2	<0.0001		
Cannabinoids	991	34.5	830	36.3		161	27.4	<0.0001		
Concomitant alcohol use disorder										
Yes	879	30.5	724	31.7		155	26.4	0.013		
Any	872	30.3	628	27.5		244	41.5	<0.0001		
Psychiatric diagnosis										
Schizophrenia and other functional psychosis	149	5.2	124	5.4		25	4.3	0.253		
Mania and bipolar affective disorders	52	1.8	43	1.9		9	1.5	0.570		
Depression	175	6.1	113	4.9		62	10.5	<0.0001		
Neurotic and somatoform syndromes	127	4.4	102	4.5		25	4.3	0.825		
Personality and behavioural disorders	261	9.1	160	7.0		101	17.2	<0.0001		
Senile and presenile organic psychotic conditions	16	0.6	15	0.7		1	0.2	0.158		
Mental retardation	18	0.6	15	0.7		3	0.5	0.689		
Other psychic disorders	66	2.3	41	1.8		25	4.3	<0.0001		

syndromes (4%). Among females, we highlight higher percentages of patients with opioid use disorders and with any psychiatric diagnosis, mainly depression and personality disorders; among males, we highlight higher percentages of patients with cocaine and cannabinoids use disorders and with concomitant alcohol use disorders.

There were 17,325 PY in this cohort for the considered period (13,827 for males, 3498 for females) and 44 SA (1.5% of the cohort; 32 males (1.4%) and 12 females (2.0%)). Overall, 11 different modalities of SA were identified; the most frequent one was intoxication (Table 2). One person among those with SA died by suicide (male), while three (2 males and 1 female) died for other reasons during the considered period (1 malignant neoplasm; 1 disease of the digestive system; and 1 endocrine, nutritional and metabolic disease).

The CSAR for 1000 PY was 2.54 (95% CI 1.89–3.41); it was higher in females, people older than 45, people with concomitant alcohol use and people with any psychiatric diagnosis, within 1 year from the first visit or during the COVID-19 period (Table 3). The CSAR was more elevated than that of the general population (females: 493 SA incident cases and 4,118,307 PY, CSAR 11.97 per 100,000 PY, 95% CI 10.94–13.08; males: 355 SA incident cases and 3,886,237 PY, CSAR 9.13 per 100,000 PY, 95% CI 8.21–10.14) in the same period and age class (incidence rate ratio, IRR: females SUD IRR 28.66, 95% CI 14.71–50.51; males SUD IRR 25.34, 95% CI 17.07–36.42).

The combined effects of sex, age, any psychiatric diagnosis, substances of use, COVID-19 period and latency were tested using a Poisson regression. Higher IRRs were found in the year following the first contact in people with any other psychiatric diagnosis (Table 3). More specifically, we highlighted an increased and statistically significant risk of SA in patients with a diagnosis of depression, neurotic and somatoform syndromes and personality and behavioural disorders (Table 4). IRRs were higher, but not statistically significant, in the year 2020 (COVID-19) compared to the previous period.

Table 2 Distribution of methods used in non-lethal attempt suicide, by sex

	Total (44)		Males (32)		Females (12)	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Drugs (X60–X64)	24	54.5	18	56.3	6	50.0
Nonopioid analgesics, antipyretics and antirheumatics (X60)	1	2.3	1	3.1	0	0.0
Psychotropic drugs, anticonvulsants, etc. (X61)	18	40.9	13	40.6	5	41.7
Narcotics and hallucinogens, not elsewhere classified (X62)	1	2.3	1	3.1	0	0.0
Other and unspecified drugs, medicaments and biological substances (X64)	5	11.4	4	12.5	1	8.3
Alcohol (X65)	5	11.4	3	9.4	2	16.7
Unspecified chemicals and noxious substances (X69)	4	9.1	2	6.3	2	16.7
Hanging (X70)	2	4.5	2	6.3	0	0.0
Handgun discharge (X72)	4	9.1	2	6.3	2	16.7
Sharp and blunt object (X78)	5	11.4	3	9.4	2	16.7
Jumping from a high place (X80)	6	13.6	5	15.6	1	8.3
Other unspecified means (X84)	24	54.5	18	56.3	6	50.0

Table 3 Risk profile

		Univariate analysis				Multivariate analysis *		
		SA	PY	CSR	95% CI	IRR	95% CI	P
Sex	Male	32	13827	2.31	1.64–3.27	1	Reference	
	Female	12	3498	3.43	1.95–6.04	1.33	0.67–2.64	0.411
Age group	<45 years	29	12734	2.28	1.58–3.28	1	Reference	
	≥45 years	15	4591	3.27	1.97–5.42	1.37	0.72–2.62	0.343
Latency between first access and SA	≥1 years	33	14535	2.27	1.61–3.19	1	Reference	
	<1 years	11	2790	3.94	2.18–7.12	2.61	1.29–5.30	0.008
Substance use disorders	Cocaine	28	8727	3.21	2.22–4.65	1.90	0.98–3.67	0.056
	Opiates	16	8907	1.80	1.10–2.93	0.79	0.41–1.54	0.491
	Cannabinoids	20	5906	3.39	2.18–5.25	1.55	0.80–3.01	0.194
Concomitant alcohol use disorder	Yes	23	5678	4.05	2.69–6.10	1.58	0.86–2.89	0.138
Calendar period	2009/2019	36	14803	2.43	1.75–3.37	1	Reference	
	2020	8	2522	3.17	1.59–6.34	1.92	0.87–4.24	0.108
Psychiatric diagnosis	No	11	11922	0.92	0.51–1.67	1	Reference	
	Yes	33	5402	6.11	4.34–8.59	5.29	2.60–10.76	<0.0001

SA, non-lethal attempt suicide; PY, person years; CSR, crude suicide attempt ratio for 1000 PY; 95% CI, 95% confidence interval; IRR, incidence rate ratio

*Rate ratio for suicide attempt (Poisson multiple regression analyses)

Discussion

In this study, we used EHR recorded by the NHS to identify SA in patients with SUD in a metropolitan area of northern Italy with about one million residents during the considered

Table 4 Psychiatric diagnoses

	Univariate analysis				Multivariate analysis*		
	SA	PY	CSR	95% CI	IRR	95% CI	P
Schizophrenia and other functional psychosis	4	947	4.22	1.59–11.25	2.32	0.77–7.0	0.136
Mania and bipolar affective disorders	2	321	6.23	1.56–24.93	2.52	0.58–10.97	0.218
Depression	5	1097	4.56	1.90–10.95	2.67	1.0–7.16	0.051
Neurotic and somatoform syndromes	6	798	7.52	3.38–16.73	3.96	1.58–9.93	0.003
Personality and behavioural disorders	14	1662	8.42	4.99–14.22	3.80	1.89–7.65	<0.0001
Senile and presenile organic psychotic conditions	1	88	11.41	1.61–80.97	6.14	0.80–47.09	0.081
Mental retardation	1	133	7.53	1.06–53.45	3.11	0.41–23.44	0.271

SA, non-lethal attempt suicide; PY, person years; CSR, crude suicide attempt ratio for 1000 PY; 95% CI, 95% confidence interval; IRR, incidence rate ratio

*Rate ratio for suicide attempt (Poisson multiple regression analyses) adjusted for sex, age, latency and concomitant substance use

period (2009–2019) (Città metropolitana di Bologna, 2020). We identified 2874 individuals with SUDs (cocaine, cannabis, opiates), about a third of whom had at least one comorbid psychiatric disorder. Among females, there were higher percentages of patients with opioid use disorders and with psychiatric diagnosis, mainly depression and personality disorders.

There were 44 cases of SA (1.5% of the cohort); the most frequent modality of SA was intoxication. The CSAR for 1000 PY was 2.54, and was higher in females, in people older than 45 years, with concomitant alcohol use disorders, or with any psychiatric diagnosis, during the COVID-19 period, and within 1 year from the first visit. As for comparison, CSARs were more elevated in individuals with SUD than in the general population, both for males and females, confirming what was reported by other authors (Armoon et al., 2021).

The higher risk of SA in the year after first contact was confirmed in the multivariate analysis, as well as in patients with any other psychiatric diagnosis. The risk was higher in patients with a diagnosis of depression, neurotic and somatoform syndromes and personality and behavioural disorders. As for the COVID-19 period, the risk was higher, but not statistically significant, in the year 2020 compared to the previous period.

Psychiatric disorders have previously been associated with suicidal behaviours, including SA (Bachmann, 2018). While variables, such as the presence of depressive symptoms, some personality traits and specific stressors, can act as a common trigger for both substance abuse and suicidal behaviour, a strong positive association between cocaine use and a history of SA was found (Abdalla et al., 2019).

Co-occurring SUD and mental disorders (Chang et al., 2011), mostly depression and anxiety, are often reported to be associated with suicidal behaviour, especially in adolescents with SUD, to mediate the relation between suicidal ideations and attempts (Thompson et al., 2005). Monitoring and treating depression symptoms to reduce their severity and fluctuation may attenuate the risk of suicidal behaviour (Melhem et al., 2019).

As for opiates, estimates of lifetime SA rates among individuals with heroin use disorders are gravely elevated, ranging between 17 and 48% (Chen et al., 2010; Darke et al., 2015; Roy, 2010), and the rate of suicidal behaviour is higher among individuals with opioid use disorders than among those without such disorders (Ali & Dubenitz, 2021). However, among patients with opioid use disorders, it has been documented that there are significant reductions in the rate of suicidal behaviours during methadone treatment (Molero et al., 2018). A recent meta-analysis shows that people with opioid dependence are at a substantially lower risk of suicide; cancer; and drug-, alcohol- and cardiovascular-related mortality during opioid agonist treatment compared with periods while not receiving opioid agonist treatment (Santo Jr et al., 2021).

As for cannabis, the current evidence tends to support that chronic cannabis use can predict suicidality, but the lack of homogeneity in the measurement of cannabis exposure, the small number of cases of suicidality included in the various studies and the lack of measurement of other key risk factors (including other substances like alcohol) tempered this conclusion (Borges et al., 2016).

Even if cannabis use disorders are associated with the risk of SA in both young adult men and women, future research is needed to examine the increase in suicidality and to determine whether it is cannabis use or overlapping risk factors that increase risks for both (Han et al., 2021).

While ED are increasingly important in identifying, assessing and treating individuals with suicidal behaviour (Larkin et al., 2008), the majority of patients attending ED for suicide-related presenting complaints are women, and intoxication is the main method of

attempting suicide, especially among females (Prosser et al., 2007). International studies highlighted that females with SUD are at higher risk of SA compared to males with SUD (Armoon et al., 2021; Backmund et al., 2011; Darke et al., 2004). In most Western countries, females have higher rates of suicidal ideation and behaviour than males, yet mortality from suicide is typically lower for females than for males (Barrigon & Cegla-Schwartzman, 2020; Canetto & Sakinofsky, 1998).

As for the COVID-19 period, data from the whole population showed no evidence of an increase in suicide during the pandemic (Moutier, 2020), but professional workers should be aware that co-occurring SUD increased during the pandemic period (Marsden et al., 2020; Volkow, 2020); this could increase suicidal behaviour risk too, as reported in other studies (Ridout et al., 2021).

This study presents some limitations that reduce the generalisability of the results and require additional research. We considered the first diagnosis of SUD and the first SA after SUD diagnosis during the period of 2009–2020, while prior SA could have occurred. Only the resident participants who turned to a CAT, HOS or MHS for opioid, cocaine or cannabis use disorders were enrolled and are not representative of all people with SUD. The geographical area under consideration included only a specific region (i.e. northern Italy). The data used are those available from the initial admission, and many data are missing. It was not possible to consider data concerning age at first use and average consumption variations over time, since they were not retrieved uniformly by the operators. On the other hand, a strength is the specific cohort study design, based on an average follow-up of 6 years and 18,000 PY, which permitted us to calculate the rates of SA and to identify patients at higher risk.

Conclusion

A particularly relevant finding of this study was that the risk of SA was higher during the year of the first visit, highlighting the importance of maintaining closer monitoring in this specific period.

This study confirmed that individuals with SUD should be routinely assessed for psychiatric comorbidities, including somatic and neurotic symptoms other than depression and personality and behavioural disorders. Improved surveillance and monitoring of SA in people with SUD is required, and selective preventive strategies should also be considered for specific groups at elevated vulnerability for suicidal behaviours.

Professionals working in these services should be aware of the individual and environmental risk factors associated with suicidal behaviours, assess suicidality in new patients and promote preventive interventions

Author Contribution All authors contributed to and have approved the final manuscript.

Declarations

Research involving Human Participants All procedures followed were in accordance with the Helsinki Declaration of 1975, as revised in 2000.

Consent for Publication We confirm that neither the manuscript nor any parts of its content are currently under consideration or published in another journal.

Conflict of Interest The authors declare no competing interests.

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