



Demographic and clinical profile of young adult emergency ward patients in Serbia who attempted suicide by poisoning during the COVID-19 pandemic: a retrospective cohort study

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Suicide is the fourth leading cause of death in young adults worldwide. Given the vulnerability of this population, the aim of our retrospective cohort study was to examine the demographic and clinical profile of 193 young adult emergency ward patients at the Clinic for Emergency and Clinical Toxicology of the National Poison Control Centre (NPCC), Military Medical Academy (MMA) in Belgrade, Serbia who attempted suicide by poisoning in 2020–2023. More than half suffered from a mental disorder, and poisoning mainly involved marketed prescription drugs (most often benzodiazepines). Women attempted suicide by poisoning more often and had a history of previous attempts, while men had more ensuing complications and were older. Current mental disorders and current psychopharmacotherapy positively correlated with the number of suicide attempts by poisoning and with the history of previous poisoning with prescription drugs. The number of suicide attempts by poisoning also correlated positively with self-harm. Our results suggest that the experience of the pandemic has highlighted the need to strengthen mental healthcare. Developing the resilience of young people, establishing help centres, and improving public awareness of this important issue could help reduce the incidence of suicide attempts in young adult population.

KEY WORDS: benzodiazepines; deliberate self-poisoning; depression; mental disorders; psychopharmacotherapy; SARS CoV 2; self-harm

Suicide is a highly complex phenomenon and the fourth leading cause of death among people aged 15–29 years (1–3). Because of relatively high rates of mental health issues, young adults (18–25 years) seem to be at particular risk (4, 5). Research indicates that as many as 10.9 % of young adults have experienced a major depressive episode, as opposed to 7.4 % reported in adults aged 26–49 years and 4.8 % in those aged 50 years or older (6, 7). In addition, the age-specific prevalence of depression is the highest in those aged 18 to 24 years (21.5 %) and the lowest in those aged ≥65 years (14.2 %) (8). Among people who have committed or attempted suicide the most common mental disorder is some kind of mood disorder (25 % and 21 %, respectively), followed by schizophrenia (8 % and 7 %, respectively) (9). The most common method of suicide attempt among young adults is self-poisoning, most often with readily available legal prescription drugs such as analgesics, benzodiazepines, atypical antipsychotics, and antidepressants (10).

With an average suicide rate of about 19 per 100,000 inhabitants, Serbia is one of the leading European countries in this respect (11), especially since the 13.5 % increase in mental health issues coinciding

with the United Nations economic sanctions, NATO bombing, refugee and displacement issues, and social unrests between 1999 and 2002 (12). The year 2020 seems to have worsened the issue with the COVID-19 pandemic, as 10.8 % of students reported feeling depressed, while symptoms of depression, anxiety, and stress among university students increased significantly at the peak of the pandemic (9.9 %, 26.4 %, and 16.2 %, respectively) (13, 14). At the same time, emergency departments reported a 60 % (spring 2020), 10 % (summer 2020), and 30 % (winter 2021) increase in interventions over suicide attempts compared to 2019 (15). Risk factors for attempted suicide during COVID-19 included female gender, younger age, and depressive disorder (16, 17).

Given the vulnerability of young adults, the aim of our retrospective cohort study was to look deeper into the demographic and clinical profile and the characteristics of committed and attempted suicides by poisoning in young adult Serbian population during the COVID-19 pandemic.

METHODS

Our study included data about 193 patients aged 18–25 years, hospitalised over intentional self-poisoning at the Clinic for Emergency and Clinical Toxicology of the National Poison Control Centre (NPCC), Military Medical Academy (MMA) in Belgrade, Serbia between 2020 and 2023, as this four-year period coincides with the COVID-19 pandemic.

We analysed their anonymised electronic medical records entered into the NPCC database, which include data collected from admission to discharge. Beside the age of 18–25 years, the inclusion criteria were hospitalisation over intentional self-poisoning (X60–X69) according to the International Statistical Classification of Diseases and Related Health Problems (ICD-10) (18). Excluded were hospitalised patients outside the age range, outpatients of any age, and patients received over accidental (unintentional) poisoning.

The study was approved by the Ethics Committee of the MMA (Decision No. 65/2024) and conducted in accordance with the Declaration of Helsinki and its amendments (19).

Statistical analysis

Data were analysed using SPSS v. 22.0 statistical software (IBM Corp., Armonk, NY, USA).

Demographic, clinical, and self-poisoning data are presented with absolute and relative frequencies, arithmetic means and standard deviations (SD). To determine the normality of distribution we used the Kolmogorov-Smirnov or the Shapiro-Wilk test. Relationships between qualitative variables were determined with the chi-squared test or Fisher's exact test when the expected frequencies were <5 or for 2×2 contingency tables. Significant chi-squared results for crosstabs larger than 2×2 were further examined with post-hoc pairwise comparisons of column proportions using the Bonferroni correction. The Mann-Whitney *U* test was used for continuous variables. The correlations between the patients' clinical profile and characteristics of suicide attempt was assessed with Pearson's correlation coefficient. Statistical significance was set at $p < 0.05$.

RESULTS

Table 1 shows the demographic and clinical profile of 193 young adult emergency ward patients who attempted suicide by poisoning and characteristics of their suicide attempts. Even though 53 had no specified mental disorder diagnosis on record, we included them as having a mental disorder, because the record showed previous psychiatric treatment. Self-harm recorded for 15 patients refers to self-inflicted injuries on body surface, either by cutting (in 13 patients) or by hitting and banging their head (in two patients). The terms "organic diseases" and "organic medications" refer to diseases other than psychiatric and prescription drugs other than those used in psychopharmacotherapy. Complications associated with self-poisoning include pneumonia and other respiratory tract diseases,

urinary infections, central nervous system disorders, cardiovascular complications, and gastrointestinal symptoms.

Of the five patients who died, three were male and two female. The youngest among them was 18 and the oldest 25 years old. All had attempted suicide for the first time and used not only legal, prescription drugs but corrosive substances and illicit drugs as well. Their toxicological-chemical blood analysis revealed the presence of valproate [630 mg/L (therapeutic concentrations 50–100 mg/L)] in the first deceased patient; concentrated sodium acids in the second; enalapril [10.82 mg/L (therapeutic concentrations 0.01–0.1 mg/L)], bromazepam [0.71 mg/L (therapeutic concentrations (0.05–0.2 mg/L)], and nifedipine [0.38 mg/L (therapeutic concentrations 0.01–0.2 mg/L)] in the third; 3,4-methylenedioxyamphetamine [1.34 mg/L (coma and fatal concentrations 1–4.2 mg/L)] in the fourth; and venlafaxine [1.25 mg/L (therapeutic concentrations (0.06–0.4 mg/L)], klonazepam [0.3 mg/L (therapeutic concentrations (0.004–0.07 mg/L)], and olanzapine [1.2 mg/L (therapeutic concentrations (0.001–0.08 mg/L)] in the fifth.

There is no significant difference in the number of young adults who attempted suicide by poisoning between the study years (chi-squared=3.041, $df=3$, $p=0.385$), but using two or more substances was significantly more common than using one substance alone (chi-squared=86.622, $df=2$, $p=0.000$).

Table 2 shows differences between the genders. Briefly, female young adults were significantly younger than male and had a history of poisoning attempts more often, yet had fewer complications than male patients.

Table 3 shows a significant positive correlation of current mental disorder and current psychopharmacotherapy with the overall number of suicide attempts by poisoning per patient, history of previous self-poisoning, and the number of substances used. There is also a positive correlation between self-harm and the number of suicide attempts and substances used.

The Pearson correlation coefficient also revealed a positive correlation between self-harm and current mental disorders ($r=0.200$, $p=0.008$).

DISCUSSION

To the best of our knowledge, this is the first study in Serbia to specifically analyse young adults who attempted suicide by poisoning. Our findings show that more than half suffered from a mental disorder and that they mostly used prescription drugs (benzodiazepines in particular) to commit suicide. This is in line with earlier research in adult Serbian population identifying benzodiazepines as the most common drug in suicide attempts (20). In fact, the rate of benzodiazepine prescriptions is very high in Serbia (21). This is also in line with reports claiming that adolescents under the age of 18 attempt suicide with paracetamol and ibuprofen (22, 23), where as older adults resort to prescribed drugs with worse outcomes (24).

Table 1 Demographic and clinical profile of young adult emergency ward patients who attempted suicide by poisoning and characteristics of suicide attempts (N=193)

		N (%) or mean \pm SD
Gender	female	107 (55.4)
	male	86 (44.6)
Age (years)		21.60 \pm 2.20
Year of self-poisoning	2020	39 (20.3)
	2021	49 (25.4)
	2022	49 (25.4)
	2023	56 (28.9)
Current mental disorders		109 (56.5)
Categories of current mental disorder	depressive disorder	22 (11.4)
	neurotic disorder	7 (3.6)
	psychotic disorder	5 (2.6)
	personality disorder	8 (4.1)
	addiction	14 (7.3)
	NA	53 (27.5)
Current psychopharmacotherapy		79 (40.9)
Categories of current psychopharmacotherapy	benzodiazepines	45 (23.3)
	antidepressants	41 (21.2)
	antipsychotics	49 (25.4)
	mood stabilisers	46 (23.8)
Self-harm		15 (7.8)
Organic diseases		34 (16.1)
Organic medications		21 (10.9)
Characteristics of suicide attempts by poisoning		
Duration of hospitalisation (days)		2.94 \pm 3.77
Number of attempts	1	130 (67.4)
	\geq 2	46 (23.8)
	NA	17 (8.8)
Substances used	Prescription drugs	137 (71.0)
	PAS (illegal drugs / alcohol)	4 (2.1)
	Prescription drugs + PAS	33 (17.1)
	Other (corrosives, insecticides, acid)	9 (4.7)
	Prescription drugs + other (corrosives, insecticides, acid)	10 (5.1)
Number of substances used	1	68 (35.2)
	\geq 2	125 (64.8)
Prescription drugs used in self-poisoning	benzodiazepines	109 (56.5)
	antidepressants	28 (14.5)
	antipsychotics	50 (25.9)
	affective stabilizers	67 (34.7)
	cardiovascular	29 (15.0)
	analgesics	38 (19.7)
History of previous attempts at self-poisoning with prescription drugs		38 (19.7)
Reason for self-poisoning	personal issues	68 (35.2)
	family issues	18 (9.3)
	health issues	2 (1.0)
	NA	104 (53.9)
Complications of self-poisoning		66 (34.2)
Outcome of self-poisoning	non-fatal	188 (97.4)
	fatal	5 (2.6)

NA – data not available; PAS – psychoactive substances; SD – standard deviation

Table 2 Gender distribution in relation to the demographic and clinical profile and characteristics of suicide attempts by poisoning in young adult patients (N=193)

Demographic and clinical profile	N (%) or mean \pm SD		Z / chi-squared test	p-value	
	Male (n=86)	Female (n=107)			
Age	22.16 \pm 2.12	21.15 \pm 2.16	-3.143	0.002	
Current mental disorders	no	32 (37.1)	33 (30.8)	0.058	0.810
	yes	45 (52.2)	64 (59.8)	1.082	0.298
	NA	9 (10.7)	10 (9.4)	2.372	0.124
Current psychopharmacotherapy	no	35 (40.7)	40 (37.3)	0.221	0.638
	yes	34 (39.5)	45 (42.1)	0.122	0.726
	NA	17 (19.8)	22 (20.6)	0.020	0.889
Self-harm	no	80 (93.0)	97 (91.6)	0.372	0.542
	yes	6 (7.0)	9 (7.5)	0.152	0.697
	NA	0 (0.0)	1 (0.9)	0.810	0.368
Characteristics of suicide attempts by self-poisoning					
Number of self-poisoning attempts	1	64 (74.4)	66 (61.7)	3.534	0.060
	≥ 2	13 (15.1)	33 (30.8)	6.502	0.011
	NA	9 (10.5)	8 (7.5)	0.533	0.465
Year of self-poisoning	2020	19 (22.1)	20 (18.7)	0.336	0.562
	2021	18 (20.9)	31 (29.0)	1.638	0.201
	2022	20 (23.3)	29 (27.1)	0.372	0.542
	2023	29 (33.7)	27 (25.2)	1.664	0.197
Duration of hospitalisation (days)		3.63 \pm 5.20	2.39 \pm 1.88	-1.266	0.206
Reason for self-poisoning	personal	28 (32.6)	40 (37.4)	0.490	0.484
	family	7 (8.1)	11 (10.3)	0.260	0.610
	health	1 (1.2)	1 (0.9)	0.026	0.873
	NA	50 (58.1)	55 (51.4)	1.124	0.289
Number of substances used	1	26 (30.2)	42 (39.3)	1.700	0.226 ^a
	≥ 2	60 (69.8)	65 (60.7)		
History of previous self-poisoning attempts with prescription drugs	no	65 (75.6)	71 (66.4)	1.960	0.162
	yes	11 (12.8)	27 (25.2)	4.666	0.031
	NA	10 (11.6)	9 (8.4)	0.563	0.453
Complications of self-poisoning	no	49 (57.0)	78 (72.9)	5.370	0.023^a
	yes	37 (43.0)	29 (27.1)		
Outcome of self-poisoning	fatal	3 (3.5)	2 (1.9)	0.495	0.657 ^a
	non-fatal	83 (96.5)	105 (98.1)		

SD – standard deviation; ^aFisher's exact test

Table 3 Pearson’s correlation between the clinical profile and characteristics of suicide attempts by poisoning in young adult patients (N=193)

Characteristics of suicide attempts by self-poisoning	Clinical profile				
	Current mental disorders	Current psychopharmacotherapy	Self-harm	Organic diseases	Organic medications
Number of suicide attempts	0.283**	0.317**	0.176*	0.083	0.020
History of previous suicide attempts with prescription drugs	0.269**	0.268**	-0.071	0.095	0.053
Number of substances used	0.304**	0.288**	0.166*	0.086	0.089
Complications of self-poisoning	0.188	0.106	0.053	-0.086	-0.049

Significant Pearson’s correlations are in boldface: * $p < 0.05$; ** $p < 0.01$

It is also important to note that more than half of our patients used a combination of two substances or more.

More young women than men had had a history of previous self-poisoning attempts, while young men suffered from more complications. These findings are consistent with the “gender paradox” in suicide, i.e., that women attempt suicide more often than men but use less lethal means or doses, which suggests that adverse psychosocial factors play a greater role in suicide in men (25–27). Our findings are also similar to earlier reports for populations of a similar age (26, 28–30).

Among mental disorders, depressive disorders prevailed in both genders. However, these findings are limited, as no diagnosis data were available for nearly a third of the patients registered as having some kind of mental disorder. Before the COVID-19 pandemic, a significant increase was reported in serious psychological distress among young adults in the US between 2008 and 2018, with nearly half experiencing and nearly 40 % receiving treatment for mental health issues (31–33). However, since the pandemic broke out, there was a significant increase in intentional self-poisonings among 13–15-year-old girls but not among young adults (22, 34).

We had expected a higher prevalence of self-poisoning with illegal drugs (psychoactive substances) and alcohol (2 %), given the 2018 reports of alcohol and illicit drug use among over a third of young adult Americans (35). In England, Tyrrell et al. (36) found that 7.6 % of patients aged 10–24 years used opioids and 4.2 % used psychostimulants for self-poisoning(36). Instead, we found a higher prevalence (17.0 %) of those attempting suicide by combining alcohol, psychostimulants, and prescription drugs.

Furthermore, current mental disorder and current psychopharmacotherapy significantly correlate with the number of suicide attempts by poisoning, previous history of suicide attempts with prescription drugs, and the number of substances involved in self-poisoning. The same is true for the correlation between self-harm and the number of suicide attempts by poisoning. Similar correlations have been reported by Lumpe et al. (37), especially between current mental disorders (mainly depressive disorder) and repeated suicide attempts, but their age span is quite larger than ours. They also found that most patients used their own legally prescribed drugs, usually in combination.

Study limitations

Our study is retrospective, i.e., data were collected from available medical records, and certain information is lacking, most notably on specific mental disorders in 53 patients. Another limitation is that the period before the COVID-19 pandemic is not part our study, which makes a comparison and some insight into possible trends impossible. To overcome these limitations, further research should be prospective and follow up surviving patients through every stage of recovery, from initial treatment on hospital admission to home care.

CONCLUSION

Our results suggest that the experience of the pandemic has highlighted the need to strengthen mental healthcare in Serbia. This could be achieved by developing resilience in young people, establishing help centres, and encouraging populations at risk to seek professional help in case of a crisis through national information campaigns.

To be effective, suicide prevention programmes should include raising public awareness of the issue through both traditional media and social networks. Psychiatric assessment and support should become mandatory components of treatment. Additionally, psychosocial interventions and long-term monitoring can help lower the risk of repeated self-poisoning.

Conflict of interests

None to declare.

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Demografski i klinički profil mladih odraslih pacijenata hitne pomoći u Srbiji koji su pokušali samoubojstvo trovanjem tijekom pandemije bolesti COVID-19 – retrospektivno kohortno ispitivanje

Samoubojstvo je četvrti vodeći uzrok smrti među mladim odraslima diljem svijeta. S obzirom na ranjivost ove populacije, cilj ovoga retrospektivnog kohortnog ispitivanja bio je utvrditi demografski i klinički profil 193 mlada odrasla pacijenta hitne pomoći na Klinici za urgentnu i kliničku toksikologiju Nacionalnoga centra za kontrolu trovanja (NPCC) Vojnomedicinske akademije (VMA) u Beogradu koji su pokušali samoubojstvo trovanjem od 2020. do 2023. godine. Više od polovice njih patilo je od mentalnog poremećaja, a trovanje je uglavnom obuhvaćalo lijekove na recept (najčešće benzodiazepine). Žene su češće pokušavale samoubojstvo trovanjem i imale povijest prethodnih pokušaja, a muškarci su imali više komplikacija i bili su stariji. Postojeći mentalni poremećaji i postojeća psihofarmakoterapija u pozitivnoj su korelaciji s brojem pokušaja samoubojstva trovanjem i s povijesti ranijih trovanja legalnim lijekovima. Broj pokušaja samoubojstva trovanjem također je u pozitivnoj korelaciji sa samoozljeđivanjem. Naši rezultati upozoravaju na to da je s pandemijom postala jasnija potreba za jačanjem sustava zaštite mentalnog zdravlja. Razvijanje otpornosti mladih ljudi, osnivanje centara za pomoć i obrazovanje javnosti o ovom važnom pitanju mogli bi smanjiti učestalost pokušaja samoubojstva.

KLJUČNE RIJEČI: benzodiazepini; depresija; mentalni poremećaji; namjerno samotrovanje; psihofarmakoterapija; samoozljeđivanje; SARS CoV 2