Clinical and epidemiological characteristics of patients with intentional self-poisoning

Características clínico-epidemiológicas de los pacientes intoxicados con intencionalidad suicida

Rafael Perelló[1], Cristobal Montilla[1], Sara Anaya[2], August Supervía[2,3], Alejandra Losada[1], Jordi Puiguriguer[3,4], Bartolomé Verd[4], Xavier Durán[6], Marta Torrens[5-7], Gabriel Vallecillo[5-7]

Suicidal behavior is a complex, multicausal phenomenon determined by the interaction of individual, interpersonal, community, and social factors.[1] It is the leading cause of non-natural death among young adults in Spain.[2] Hospital emergency departments (EDs) care daily for patients after a suicide attempt.[3] Toxicological causes are primarily medication-related, mainly due to benzodiazepines (BZDs), and drugs used in neuropsychiatric care.[4] Populations at risk include those with associated mental health disorders (MHD), substance use, social problems, discriminated groups, global social events (eg, post–COVID-19 pandemic), prior suicide attempts, traumatic events (sexual abuse),[5] and infection with human immunodeficiency virus (HIV), especially among women.[6]

To describe the characteristics of patients with acute poisoning (AP) presenting with suicidal behavior, identify the substances most commonly used, and evaluate the role of HIV, we conducted a retrospective, multicenter observational study in the EDs of 3 tertiary referral centers: *Hospital Clínic and Hospital Parc Salut Mar* (both in Barcelona, Spain), and *Hospital de Son Espases* (Palma de Mallorca, Spain). The inclusion period comprised the months of October, February, and June (to avoid bias from tourism-related fluctuations) in 2016, 2019, and 2022. The following variables were collected: sex, age, HIV infection, patient origin, route of exposure, and implicated toxic agent (ethyl alcohol; illegal drugs of abuse such as cocaine, cannabis, ketamine, amphetamines, opioids, gamma-hydroxybutyrate –GHB–, mephedrone; nitrites; BZDs; paracetamol; digoxin; neuroleptics; antiepileptics; pregabalin; lithium; antidepressants); carbon monoxide; mushrooms; and chemical products. Also recorded were the presence of MHD, hospital admission, admission to an intensive care unit (ICU), and mortality during the episode, as well as the Poisoning Severity Score (PSS). Urine drug screening, performed identically in all 3 hospitals (opioids, cocaine, amphetamines, cannabis, and BZDs), was conducted using immunoassay (DRI®; Abbott Diagnostics, Texas, USA). Confirmation analyses and detection of ketamine, mephedrone, and nitrites were performed using gas chromatography–mass spectrometry (GC-MS, Agilent 5975/68901, Santa Clara, California, USA).[7] A specific method was used to detect GHB when intake was suspected.[8] Blood ethanol was measured using enzymatic spectrophotometry (Cobas Integra 4000, Roche). Serum drug levels (eg, digoxin) were determined using immunoturbidimetry; paracetamol by spectrophotometry; and carbon monoxide concentrations through spectrophotometry/co-oximetry. Urinary amanitin levels were assessed via ELISA. Confirmatory testing using liquid chromatography–mass spectrometry was performed when toxicological verification was required. No artificial intelligence tools were used in preparation of this manuscript. Categorical variables were expressed as frequencies and percentages, and continuous variables as mean and standard deviation. Student's t-test and chi-square test were used for comparisons. Crude and adjusted odds ratios (OR) for predictors of suicidal behavior were estimated using binary logistic regression. Variables were introduced based on clinical criteria, as well as those that were significant or near significance in crude analysis. Statistical analyses were performed using STATA version 15.1. The study adhered to the principles outlined in the Declaration of Helsinki for research in humans and was approved by Hospital Clínic of Barcelona Research Ethics

Table 1. Univariate analysis of the variables included in the study

	No suicidal behavior N = 2,055 (79%)	With suicidal behavior N = 526 (20%)	Crude OR (IC 95%)	*P*-value
MHD history	701 (34%)	440 (83.7%)	9.88 [7.71; 12.7]	**.000**
Male sex	1,359 (66.2%)	195 (36.1%)	0.30 [0.25; 0.37]	**.000**
HIV	105 (5%)	10 (2%)	0,36 [0.19; 0.69]	**.001**
Spanish nationality	1,175 (57%)	431 (82%)	3.40 [2.68; 4.31]	**.000**
IV route	51 (3%)	12 (2%)	0.92 [0.49; 1.73]	.812
Snorted route	304 (14.8%)	29 (5.5%)	0.34 [0.23; 0.50]	< **.001**
Oral route	1,764 (85.9%)	510 (97%)	5.26 [3.15; 8.79]	< **.001**
Smoked route	237 (11.6%)	25 (4.8%)	0.38 [0.25; 0.58]	< **.001**
Inhaled route	80 (4%)	4 (0.8%)	0.19 [0.07; 0.53]	< **.001**
Ethanol	1,444 (70.3%)	184 (35%)	0.23 [0.19; 0.28]	**.000**
Cocaine	365 (17.8%)	37 (7%)	0.35 [0.25; 0.50]	< **.001**
Amphetamines	67 (3.3%)	7 (1.4%)	0.40 [0.18; 0.88]	**.012**
Methamphetamines	57 (2.8%)	1 (0.2%)	0.07 [0.01; 0.48]	< **.001**
MDMA	85 (4.2%)	7 (1.4%)	0.31 [0.14; 0.68]	**.001**
GHB	72 (3.5%)	1 (0.2%)	0.05 [0.01; 0.38]	< **.001**
Ketamine	26 (1.3%)	4 (0.8%)	0.45 [0.14; 1.49]	.176
THC	273 (13.3%)	27 (5.2%)	0.35 [0.23; 0.53]	< **.001**
BZD	145 (7%)	297 (56.5%)	17.1 [13.4; 21.7]	**.000**
Digoxin	7 (0.4%)	1 (0.2%)	0.56 [0.07; 4.54]	.653
Lithium	9 (0.5%)	2 (0.4%)	0.87 [0.19; 4.03]	.915
Heroin	52 (2.6%)	5 (1%)	0.37 [0.15; 0.93]	**.020**
Nitrites	2 (0.1%)	0 (0.00%)	NC	**.000**
Mephedrone	1 (0.1%)	0 (0.00%)	NC	.796
Pregabalin	21 (2%)	26 (5%)	5.04 [2.81; 9.03]	< **.001**
Iron	0 (0.00%)	2 (0.4%)	NC	**.041**
Beta-blockers	2 (0.1%)	3 (0.6%)	5.89 [0.98; 35.3]	.068
Calcium antagonists	2 (0.1%)	1 (0.2%)	1.96 [0.18; 21.6]	.603
Paracetamol	21 (1.2%)	44 (8.4%)	8.84 [5.21; 15.0]	**.000**
Chemical products	65 (3.8%)	16 (3.1%)	0.96 [0.55; 1.67]	.908
Ammonia (oral)	7 (0.4%)	2 (0.4%)	1.12 [0.23; 5.39]	.847
Hypochlorite (oral)	30 (1.5%)	9 (1.8%)	1.04 [0.48; 2.29]	.886
Hydrochloric acid (oral)	6 (0.3%)	4 (0.8%)	2.62 [0.74; 9.31]	.162
Pesticides	4 (0.2%)	2 (0.4%)	1.96 [0.36; 10.7]	.457
CO	32 (1.6%)	7 (1.4%)	0.85 [0.37; 1.94]	.734
Cyanide	6 (0.3%)	4 (0.8%)	2.24 [0.63; 7.98]	.236
ICU	26 (2.3%)	14 (2.7%)	1.57 [0.81; 3.03]	.17
MHD medication	17 (0.1%)	65 (12.4%)	16,9 [9.82; 29.1]	**.000**
Age (per year)	36.3 (16.0)	40.0 (17.5)	1.01 [1.01; 1.02]	< **.001**

MHD: mental health disorder; HIV: human immunodeficiency virus; MDMA: 3,4-Methylenedioxymethamphetamine; GHB: gamma-hydroxybutyrate; THC: tetrahydrocannabinol; BZD: benzodiazepines; CO: carbon monoxide; ICU: intensive care unit; MHD medication: medication prescribed for MHD; NC: not calculable; CI: confidence interval; OR: odds ratio
Values in bold denote statistical significance ($P < .05$).

Table 2. Multivariate analysis of predictive variables for suicidal behavior

	OR ajustado IC (95%)	p
Background MHD	8.67 (6.58-11.43)	< **.001**
Male sex	0.39 (0.31-0.50)	< **.001**
Age	0.99 (0.99-1.00)	.106
VIH	0.40 (0.20-0.81)	**.011**
Spanish nationality	2.06 (1.56-2.72)	< **.001**
Oral route	2.91 (1.54-5.50)	**.001**
Medica MHD	9.48 (17.86)	< **.001**

MHD: mental health disorders; Medica MHD: Medication prescribed for the treatment of MHD; CI: confidence interval; OR: odds ratio.
Values in bold denote statistical significance ($P < .05$).

Committee (ref. HCB-2024-0135).

A total of 2,055 patients were treated for AP, predominantly men (1,554; 76%) and patients with MHD (1,241; 60%) (Table 1). A total of 526 (26%) presented with suicidal behavior, with a mean age of 40 (17–49) years and predominance of women (62.9%). Ten patients (1.9%) had HIV infection. Patients with MHD accounted for 440 (86.3%). AP with suicidal intent occurred more frequently among native Spanish individuals (431 cases; 81.9%), followed by Latin Americans (26 patients; 4.9%). Among Asian patients, 53% of all poisonings were due to suicidal behavior. The most common toxic agents were drugs, particularly BZDs in 297 patients (56.4%), followed by ethyl alcohol in 184 (34.9%). Other drugs involved included paracetamol and pregabalin in 44 (8.3%) and 26 (4.9%) cases, respectively. Drugs of abuse (cocaine, amphetamine, etc.) accounted for 15% of cases, and chemical products such as sodium hypochlorite for 1.5%. Carbon monoxide was involved in 7 patients (1.3%). A total of 112 patients (21.2%) required hospital admission; 98 of these (87.5%) were admitted to psychiatric units (PSS = 2), and 14 (12.5%) required ICU care (PSS = 3). Mortality rate of the entire series was 0.4% (2 deaths), both due to opioid consumption with secondary bronchoaspiration (PSS = 4). Toxic agents associated with need for admission included BZDs, methamphetamine, cocaine, antidepressants, and opioids.

Univariate analysis (Table 1) showed that age, female sex, patient origin, MHD, and ingestion of certain toxic agents were associated with suicidal poisoning ($P < .05$), whereas HIV infection was inversely associated with suicidal behavior ($P < .01$). However, multivariate analysis (Table 2) showed that women, MHD and its medical therapy (neuroleptics and antidepressants), oral ingestion, and Spanish origin were predictors of suicidal AP ($P < .05$). Male sex and HIV infection were protective factors.

The study showed that drugs—primarily BZDs—and ethyl alcohol were the substances most widely involved in AP with suicidal intent, findings consistent with their widespread use and the fact that they are routinely screened in EDs. Neuroleptics and antidepressants, although frequent among suicidal poisonings, did not account for large numbers, likely due to stricter prescribing controls limiting population access. An increase in pregabalin-related AP was noted, likely due to its potent analgesic effects and its euphoric and withdrawal-reducing properties when combined with drugs of abuse.[9]

Female sex was independently associated with suicidal behavior, which is consistent with former studies[10], which show that specific socio-

demographic characteristics in women, along with MHD, are associated with suicide attempts.[11] As in Oquendo *et al.*[12], the present study highlights the importance of MHD as a predictive factor of suicidal AP. However, our results differ from those of Xiao *et al.*[13], where MHD plays a minor role in suicidal behavior, attributed instead to physical health problems, polysubstance use, alcohol consumption, and relationship difficulties. This discrepancy might be due to the U.S. context, where lack of universal healthcare means that illness represents an economic burden, potentially leading to poverty, drug use, and ultimately an increased risk of suicide attempts.[14] Patients with HIV showed a lower proportion of suicidal AP vs non-HIV patients. This could be explained by improved life expectancy in Spain due to advances in antiretroviral treatment, social inclusion policies, and excellent adherence to HIV care.[15] No geographic differences were observed, but a high percentage of suicidal poisonings occurred among patients of Asian origin, partly explained by the high prevalence of MHD in this group.[16]

Study limitations include the inability to quantify exact levels of illegal drugs due to lack of quantitative testing, reliance mainly on qualitative detection, and potential underdiagnosis of GHB intoxication due to its narrow detection window. The proportion of HIV-positive patients was small, limiting conclusions regarding suicide risk. In conclusion, patients with suicidal AP were predominantly female, native Spanish, and had MHD. HIV infection was associated with non-suicidal AP.

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Author Affiliations: [1]Servicio de Urgencias, Hospital Clinic, Barcelona, Spain. [2]Servicio de Urgencias, Hospital del Mar, Barcelona. Unitat Funcional de Toxicología Clínica, Barcelona, Spain. [3]Grup de Teball de Toxicologia de la SoCMUE (SoCMUETox). [4]Servicio de Urgencias, Hospital Son Espases, Palma de Mallorca, Spain. [5]Institut de Neuropsiquiatria i Addiccions, Hospital del Mar, Barcelona, Spain. [6]IMIM (Institut Hospital del Mar d'Investigacions Mèdiques), Barcelona, Spain. [7]Red de Investigación en Atención Primaria de Adicciones (RIAPAd, RICORS) "RD24/0003/0001", funded by Instituto de Salud Carlos III (ISCIII) and co-funded by the European Union.
Email: rperello@clinic.cat
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Corresponding Author: Rafael Perelló. Servicio de Urgencias. Hospital Clínic. Villarroel 170. 08036 Barcelona, Spain.